

Article

Knowledge, attitude and practice on COVID-19 among students during the early phase of pandemic in a university in Borneo, Malaysia

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Abstract

Introduction: COVID-19 related knowledge, attitude and practice plays a major role in determining the readiness of the community to adopt the behavioural change towards recommended preventive measures outlined by public health officials. This study aims to assess the knowledge, attitude, and practice regarding COVID-19 among university students as well as its associated factors.

Design and methods: This is a cross sectional study that was conducted among students in a public university during the early phase of COVID-19 pandemic in Malaysia. An online validated self-administered questionnaire was used to collect the data. Mann-Whitney U and Kruskal Wallis test was used to determine the association between independent variables with knowledge, attitude, and practice score.

Results: Overall response rate of this study was 92.9 (n=524). Median score of knowledge domain was 78.0 (IQR= ±12.0), median attitude score of 49.0 (IQR= ±5.0), and median practice score of 80.0 (IQR= ±11.0). The mean knowledge, attitude and practice score were significantly higher among diploma holder (vs degree holder, p<0.05), residing in main Kota Kinabalu campus (vs non-KK campus, p<0.001), studying in medical faculty (vs non-medical faculty, p<0.001), and attended COVID-19 education (vs non-attendance; p<0.05).

Conclusion: COVID-19 related knowledge and attitude were below satisfactory level during earlier phase of the pandemic. However, majority of respondents have positive behaviour towards COVID-19 prevention. This highlights the importance of accurate and tailored health education to improve the level of knowledge, attitude and practice of recommended measures to prevent COVID-19 spread.

Introduction

In December 2019, a pneumonia like illness with unknown cause was reported in Hubei Province in China which later led to a major epidemic in China resulting in a nationwide lockdown at the end of January 2020. The pathogen later was identified as a novel coronavirus named as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). SARS-CoV-2 causes COVID-19, a disease that presented with mild, moderate and severe illness, in which severe illness could be manifested with severe pneumonia, ARDS, sepsis and septic shock.¹ It was presumed that COVID-19 was initially emerged as animal to human transmission, which was later causing human to human transmission via possible route such as respiratory droplets from coughing and sneezing and protracted exposure to elevated aerosol concentrations in closed space.^{1,2} The World Health Organization (WHO) declared the epidemic as public health emergency of international concern (PHEIC) on 30th January 2020, in which subsequently WHO declared the COVID-19 as pandemic on 11th March 2020.³

Malaysia was not exempted from being affected by the epidemic. Malaysia had announced the Movement Control Order (MCO) which prohibit mass movements and gatherings, international and interstate travels, closure of all education institution as well as government and private non-essential services. In addition, Malaysian citizens were advised to stay at home to avoid contact with possible infected individuals, which is an important measure to break the COVID-19 infection chain.⁴

Community is characterized by their common ecology, interest, structure, and system, in which these characteristics will subsequently affects their behaviour and health outcome during COVID-19 epidemic. Therefore, it is important to ensure community adherence to the preventive measures that was recommended

Significance for public health

This study has important public health impact in relations to the current COVID-19 pandemic. It exhibits the importance of a tailored health education strategies to specific target groups. It also shows the lack of KAP at the early phase of pandemic which need to be addressed.

by government, which is largely influenced by their awareness towards COVID-19 and lead to changes of attitude and behaviour towards COVID-19 prevention. Given the high infectivity of COVID-19, improving health literacy among individuals on prevention and control of COVID-19 serve as an important channel to control the COVID-19 epidemic.⁵

Assessing the students' in higher education views in COVID-19 will increase the understanding regarding factors that influence their knowledge, attitude and practice (KAP) of COVID-19 prevention and subsequently will help public health experts to develop more effective strategy to increase community's adherence to recommended measures to contain COVID-19 spread.^{6,7} Therefore, this study was aimed to assess the knowledge, attitude, and practice regarding COVID-19 among university students and its associated factors.

Design and methods

This is a cross sectional study where the data was collected between 1st and 14th April 2020 among students in a public higher education institution, Sabah, Malaysian Borneo. This study was conducted during the early phase of COVID-19 pandemic as well as the early phase of MCO that was issued by the Malaysian government to curb the spread of COVID-19. This university has three campuses situated in different districts, which are Kota Kinabalu, Sandakan, and Federal Territory of Labuan. It consists of ten faculties and six academic centres or institutes, which most of it are located at Kota Kinabalu campus.

The study population is consisting of students that are registered and studying in public higher education institution in Sabah, regardless of their campus location. The list of all students was obtained from the student affairs department. Students who are not giving his consent to participate was excluded from this study.

The sample size was estimated using a single mean formula for hypothesis testing. A total of 567 respondents was required in this study with the assumed study population' standard deviation of 3.4 [33], 95% confidence interval and desired precision of 0.3.

Data collection was conducted using online medium to adhere the social distancing measures that is recommended to prevent spread of COVID-19. A self-administered questionnaire was used in both English and Bahasa Malaysia language. The questionnaire was developed where the content was verified by three content experts among public health medicine specialists to ensure the content validity. The questionnaire also was pre-tested among 30 students in the same university, which was not selected in the main study, to ensure face validity of the questionnaire.

The questionnaire has four sections which consist of: i) sociodemographic information, ii) knowledge section, iii) attitude section, and iv) practice section. For knowledge domain, it has 20 questions, attitude domain with 13 questions and practice domain with 20 questions. In the knowledge section, the respondents were asked regarding COVID-19' epidemiology, incubation period, clinical manifestation, fatalities, mode of transmission, high risk group of infection and mortality, preventive measures and vaccination. Meanwhile, in the attitude section, the respondents were asked regarding their perceived need for education regarding COVID-19, personal belief that the disease is preventable, perceived risk/ seriousness/ and worries of infection or getting infected, perceived ability to prevent themselves from being infected, personal feeling of being unsafe in public areas, personal belief that the government are taking adequate measures to prevent spread of infectious disease, and perceived need to stop the inter-

national entry for travellers until the disease is under control. Finally, in practice section, the respondents were asked whether they practiced recommended preventive measures such as avoiding areas with COVID-19 cases, avoiding from being close with person who are ill, avoidance of public areas, or avoiding the use of public transport. In addition, the respondents were also asked whether they are wearing face mask, frequently hand wash using soap or hand sanitizer, practicing proper cough etiquette, avoiding touching face or handshake, taking supplements, use of antiseptic products, taking nutritious food, have adequate sleep, and frequently exercise. A Likert scale of 5 was used for knowledge, attitude, and practice section. Summation of the total score will be calculated and transformed into percent score. The authors decided to use cut off value of 80%, where the score of 80% and above is considered as good KAP score, while the score below than 80% is con-

Table 1. Characteristics of participants (n=524).

Variable	n	%
Age		
Median ± IQR	22.0±2	Range min 18, max 34
Gender		
Male	150	28.6
Female	374	71.4
Total	524	100
Campus location		
Kota Kinabalu	266	50.8
Non-Kota Kinabalu	258	49.2
Total	524	100.0
Education level		
Diploma	114	21.8
Degree	391	74.6
Post-graduate	19	3.6
Total	524	100.0
Faculty		
Medical	189	36.1
Non-medical	335	63.9
Total	524	100.0
Years of study		
One	134	25.6
Two	131	25.0
Three	211	40.3
Four	48	9.2
Total	524	100.0
Attended any COVID-19 course		
Yes	63	12.0
No	461	88.0
Total	524	100.0
Knowledge score		
Median (IQR)	78.0 (±12.0)	
High	229	43.7
Low	295	56.3
Total	524	100.0
Attitude score		
Median (IQR)	49.0 (±5.0)	
High	147	28.1
Low	377	71.9
Total	524	100.0
Practice score		
Median (IQR)	80.0 (11.0)	
High	272	51.9
Low	252	48.1
Total	254	100.0

sidered as poor KAP score.

Data was analysed using International Business Machine Statistical Program for Social Sciences (IBM SPSS) version 26. The normality of the data was determined using histogram, Q-Q plot, boxplot, and Shapiro Wilk test, where all the knowledge, attitude and practice score were noted to be not normally distributed. Non-parametric test was used to determine the association between independent variables with knowledge, attitude, and practice score; p-value less than 0.05 is considered statistically significant.

Results

Out of 564 respondents who were agreed to participate in this study, only 524 respondents completed the questionnaire, giving the overall response rate of 92.9%. The remaining 40 respondents (7.0%) were excluded because their survey form was not complete.

Table 1 shows the characteristics of the respondents who participated in this study. The respondents' age was ranged from 18 to 34 years old, with the median age of 22 years old (Interquartile Range [IQR]: ± 2). Majority of respondents were among female, residing in Kota Kinabalu (KK) main campus, degree as their highest education level, studying in non-medical faculty. Meanwhile, majority of respondents were at their third year of their study and never attended any COVID-19 course or health talk.

The distribution of respondents based on their knowledge regarding COVID-19 indicated that majority had poor knowledge (56.3%, n=295). Median score of knowledge domain was 78.0 (IQR= ± 12.0) (Table 1). From the statistical analysis, there were significant differences in mean knowledge score with respondents' characteristics such as education level, residential location, student's faculty, and attendance to any COVID-19 course (Table 2).

After been adjusted for multiple tests using Bonferroni correction, mean knowledge score was significantly higher among diploma holder (*vs* degree holder; mean score= 300.43 *vs* 250.45; $p < 0.01$), residing in KK campus (*vs* non-KK campus; mean score= 377.45 *vs* 143.98; $p < 0.001$), studying in medical faculty (*vs* non-medical faculty; mean score= 338 *vs* 191.59; $p < 0.001$), and attended COVID-19 courses (*vs* non-attendant; mean score= 353.02 *vs* 250.13; $p < 0.001$).

The distribution of respondents according to their attitude score indicated that majority of respondents had negative attitude score regarding COVID-19 (71.9%, n= 377) with median attitude score of 49.0 (IQR= ± 5.0) (Table 1). Table III shows the factors associated with attitude score. From the statistical analysis, it was found that several factors had significant association with attitude score regarding COVID-19, namely education level, campus location, students' faculty, and attendance to any COVID-19 course. After been adjusted for multiple tests using Bonferroni correction, mean attitude score was significantly higher among diploma holder (*vs* degree holder; mean score= 306.97 *vs* 248.55; $p < 0.01$), residing in KK campus (*vs* non-KK; mean score= 360.45 *vs* 161.52; $p < 0.001$), studying in medical faculty (*vs* non-medical faculty; mean score= 363.95 *vs* 205.26; $p < 0.001$), and attended COVID-19 courses (*vs* non-attendant; mean score= 329.25 *vs* 253.38; $p < 0.001$). However, there was no significant differences in respondents' mean attitude score between gender ($p > 0.05$).

Majority respondents were observed to have positive behaviour regarding COVID-19 or had scored their practice domain 80% and more (51.9%, n=272). Median score for respondents' practice regarding COVID-19 was 80.0 (IQR: 11.0) (Table 1). Mean practice score was found to be significantly differed across various respondents' characteristics, such as their education level, campus location, students' faculty, and attendance to any COVID-19 course or health talk (Table 4). After been adjusted for

Table 2. Factors associated with knowledge score regarding COVID-19.

Variables	Knowledge		Mean score	Median score (IQR)	Test statistic	p
	n	%				
Gender						
Male	150	28.6	278.63	78.5 (13.0)	U=25631.0	0.122
Female	374	71.4	256.03	77.0 (12.0)		
Total	524	100.0				
Education level#					F=10.011 (d.f: 2)	0.007*
Diploma	114	21.8	300.43	82.0 (12.0)		
Degree	391	74.6	250.45	77.0 (11.0)		
Post-graduate	19	3.6	282.97	78.0 (9.0)		
Total	524	100.0				
Degree <i>vs</i> postgraduate					-32.526	1.000
Degree <i>vs</i> diploma					49.978	0.006*
Postgraduate <i>vs</i> diploma					17.452	1.000
Campus						
Kota Kinabalu	266	50.8	377.45	87.0 (9.0)	U=3736.5	<0.001*
Non-Kota Kinabalu	258	49.2	143.98	75.0 (3.0)		
Total	524	100.0				
Faculty						
Medical	189	36.1	338.18	87.0 (8.0)	U=7904.0	<0.001*
Non-medical	335	63.9	191.59	76.0 (4.0)		
Total	524	100.0				
Attendance to COVID-19 course						
Yes	63	12.0	353.02	86.0 (10.0)	U=8819.0	<0.001*
No	461	88.0	250.13	77.0 (12.0)		
Total	524	100.0				

U, Mann-Whitney U test; F, Kruskal Wallis test; #significance values have been adjusted by the Bonferroni correction for multiple tests; * $p < 0.05$.

multiple tests using Bonferroni correction, mean practice score was significantly higher among diploma holder (*vs* degree holder; mean score= 296.60 *vs* 250.83; $p<0.05$), residing in KK campus (*vs* non-KK; mean score= 360.93 *vs* 161.01; $p<0.001$), studying in medical faculty (*vs* non-medical faculty; mean score= 364.97 *vs* 204.69; $p<0.001$), and attended COVID-19 courses (*vs* non-attendant; mean score= 318.83 *vs* 254.80; $p<0.01$). However, respondents' gender ($p=0.743$) was found to have no significant association with practice score.

Discussion

Students are among the affected group due to the COVID-19 pandemic and movement control order (MCO) that was imposed by Malaysian government to curb the COVID-19 spread. This study results shows that majority of respondents had unsatisfactory level of knowledge and attitude regarding COVID-19 but displayed positive behaviour towards COVID-19. Unsatisfactory level of knowledge among participants in current study is contradicting with findings in Chinese and Malaysian studies,^{8,9} health care worker¹⁰ and University students.^{11,12} However, previous study among Bangladeshi university students shows consistent results with current study.¹³ There are various reasons for low knowledge regarding COVID-19 among respondents. Students who were trapped in their university during MCO had limited access to information,¹⁴ compared to general population that has lesser barrier to information. Furthermore, the most reliable source of information, which is mainly from the government might be inadequate or inaccessible considering that the epidemic of COVID-19 in Malaysia was still at earlier period during the data collection and there might be issues with internet coverage.^{14,15} In addition, previous study observed that during the early period of

COVID-19 pandemic, majority of online information regarding COVID-19 were coming from non-reliable resources and poor quality information without scientific support.¹⁶ Therefore, it is very important to ensure that students are specifically catered to have adequate knowledge that will influence their self-prevention habits that will at the end of the day help curb the spread of COVID-19 infection.^{6,7} Besides that, it may have psychological effects on those students who are currently being emotionally disturbed by the movement control order implementation.^{17,18}

Present study found that education level has significant association with COVID-19 knowledge score, consistent with previous study which found the association of low education level with poor knowledge on infectious disease such as tuberculosis,¹⁹ MERS-CoV,²⁰ and COVID-19.⁸ Previous study suggested that educated individuals absorb and respond to health information more quickly, including COVID-19 misinformation.^{21,22}

Comparing the respondents' residential location with knowledge about COVID-19 found that those who are located near to Kota Kinabalu (KK) main campus had significantly higher knowledge score compared to those located outside the main campus (non-KK campus). Higher knowledge score among students resides in KK main campus, which is located near to city centre, compared to respondents resides outside the main campus (non-KK campus) could be explained by differences in accessibility to health information. Community in rural areas is commonly hampered by problems of accessing health information and lack of literacy in searching for health information. Poor accessibility of health information could subsequently lead to lack of health literacy and negative behaviour on COVID-19 prevention.^{15,23} The statement is supported by previous study which found that study subjects that lived in urban areas were four times more knowledgeable compared to those resided in rural areas.¹²

Current study also found students from medical faculty have better knowledge score compared to non-medical faculty, which is

Table 3. Factors associated with attitude score towards COVID-19.

Variables	Attitude		Mean score	Median score (IQR)	Test statistic	p
	n	%				
Gender						
Male	150	28.6	278.31	49.0 (5.25)	U=25678.5	0.129
Female	374	71.4	256.16	48.5 (5.25)		
Total	524	100.0				
Education level#					F= χ^2 :13.588 (d.f: 2)	0.001*
Diploma	114	21.8	306.97	50.0 (4.14)		
Degree	391	74.6	248.55	48.0 (5.0)		
Post-graduate	19	3.6	282.66	48.0 (6.0)		
Total	524	100.0				
Degree <i>vs</i> postgraduate	-34.104	1.000				
Degree <i>vs</i> diploma	58.420	0.001*				
Postgraduate <i>vs</i> diploma	24.316	1.000				
Campus					U=8260.0	<0.001*
Kota Kinabalu	266	50.8	360.45	52.0 (5.0)		
Non-Kinabalu	258	49.2	161.52	47.0 (3.0)		
Total	524	100.0				
Faculty					U=12483.0	<0.001*
Medical	189	36.1	363.95	52.0 (5.0)		
Non-medical	335	63.9	205.26	48.0 (3.0)		
Total	524	100.0				
Attendance to COVID-19 course					U=10316.0	<0.001*
Yes	63	12.0	329.25	51.0 (6.0)		
No	461	88.0	253.38	48.0 (6.0)		
Total	524	100.0				

U, Mann-Whitney U test; F, Kruskal Wallis test; #significance values have been adjusted by the Bonferroni correction for multiple tests; * $p<0.05$.

consistent in previous studies.^{24,25} This is because medical students are readily accessible to accurate information that was obtained from their learning in university. Even though current study did not explore on the information source regarding COVID-19, it should be considered that the source of information from the mass media had great influences on student's knowledge regarding infectious disease, especially during the MCO period.²⁶ Obtaining accurate information from reliable source is important which could subsequently reflect their better knowledge about the disease. Furthermore, the findings also emphasized on the importance of mass media as well as social media, as most of students who were trapped in their residence inside their campus, relies on those media as their main source of health information.²⁷

This study also shows that majority of respondents had negative attitude towards COVID-19. This is inconsistent with previous study where majority of their respondents had positive attitude.^{10,28} Negative attitude towards COVID-19 raised concern regarding impact of misinformation that will negatively influence the individual's preventive behaviour to COVID-19.²² Meanwhile, practice score was found to be consistent with other study in the past.^{9,10,28}

The results from this study also found that respondents who had diploma education has significantly higher attitude score towards COVID-19 compared to the respondents' who had degree education. However, contrary findings was reported in previous study, where those with lower level of education were more likely to have negative attitude such as belief on conspiracy theory.²⁹ This finding shows that higher education level does not necessarily resulting in better perception towards infectious disease. The result aligned with observation in previous study among public in Hubei, China, where individuals with education level at degree and higher

were associated with negative perception towards the ability of the country to control the COVID-19 pandemic.⁸

Appropriate attitude that was observed might be contributed by accurate information and accessibility to infrastructure that support information sharing that is mainly obtained through the social media that was enjoyed by students that resides in campus, compared to those outside the campus. Previous study in Sabah reported that 70% of respondents that lived in rural areas preferred non-media communication such as health talk as their main source of health information.¹⁵ Differences in information attainment could explain the variation in attitude among those residing in Kota Kinabalu campus (mainly urban area) and non-Kota Kinabalu campus (mainly rural area).

Those who are currently studying in medical faculty had significantly higher attitude score which was consistent with a study among university students in Serdang.³⁰ This is because students in medical/science-based course had better understanding on medical term and subsequently lead to appropriate attitude towards infectious disease such as COVID-19. Those who attended COVID-19 education activities had higher attitude score which emphasizes the importance of health education, as reported by previous studies.^{31,32} Better mode of communication should be developed which tailored the needs of local community using available infrastructure, especially through the utilization of digital technology and enhancing the role of university's family health physician in increasing the awareness among students.^{33,34}

Respondents who obtained diploma had significantly higher practice score which was inconsistent with some other study the findings,⁸ even though there was evidence that people with higher education had better understanding on preventive measures.³⁵ Meanwhile, health education particularly on preventive measures

Table 4. Factors associated with practice score regarding COVID-19.

Variables	Practice		Mean score	Median score (IQR)	Test statistic	p
	n	%				
Gender						
Male	150	28.6	259.08	79.0 (11.0)	U=27537.5	0.743
Female	374	71.4	263.87	80.0 (11.0)		
Total	524	100.0				
Education level#					F= χ^2 :9.192 (d.f: 2)	0.010*
Diploma	114	21.8	296.60	83.0 (14.0)		
Degree	391	74.6	250.83	79.0 (11.0)		
Post-graduate	19	3.6	298.03	80.0 (9.0)		
Total	524	100.0				
Degree vs diploma	45.770	0.013*				
Degree vs postgraduate	-47.195	0.551				
Diploma vs postgraduate	-1.425	1.000				
Campus						
Kota Kinabalu	266	50.8	360.93	88.0 (12.0)	U=8130.5	<0.001*
Non-Kinabalu	258	49.2	161.01	78.0 (4.0)		
Total	524	100.0				
Faculty						
Medical	189	36.1	364.97	88.0 (12.0)	U=12291.5	<0.001*
Non-medical	335	63.9	204.69	78.0 (5.0)		
Total	524	100.0				
Attendance to COVID-19 course						
Yes	63	12.0	318.83	82.0 (15.0)	U=10972.5	0.002*
No	461	88.0	254.80	80.0 (10.5)		
Total	524	100.0				

U, Mann-Whitney U test; F, Kruskal Wallis test; #significance values have been adjusted by the Bonferroni correction for multiple tests; *p<0.05.

should be focused on the students residing in outside the campus in order to ensure all students are practicing recommended preventive measure. Use of appropriate health communication strategies also should be considered as the accessibility to information might be different from students residing in main campus and others. Previous study in China demonstrated that individuals that resides outside the city were more likely to engage negative behaviour such as not wearing face mask.⁸ Similar to knowledge and attitude mentioned earlier, students in medical/science field had better behaviour in preventive measures as the result of formal education that the students received during their classes in university.³⁰

This study is the first report on COVID-19 related knowledge, attitude, and practice among students in higher education institution in Malaysian Borneo that is located both in urban and rural areas. This paucity has exposed the gap in COVID-19 related knowledge, attitude, and practice among students in Sabah that is diverse in ethnicity, sociocultural, and belief that needed to be explored. In addition, this study also had high response rate, which enhance the ability to generalize and accurate measurement of the outcome. The main limitation for this study is this study is cross sectional design, where the association between factors and outcome variables may not be considered as indication of causality, as the data was only measured at a single time point and reverse causation might occur. Non-response bias might have occurred where the respondents who were invited to participate in this online study did not give response to the invitation, which lead to systematic error to the study findings.

This study was designed to provide more information regarding knowledge, attitude, and practice (KAP) among students in public higher education institution to inform the public health physician on appropriate measures during the early phase of pandemic. Future study is recommended, to explore the KAP among general community, as the background of the general community is more diverse compared to the current study population and different approaches might be needed to enhance the appropriate behaviour among the community.

Conclusion

Level of knowledge and attitude regarding COVID-19 among the respondents at the early phase of pandemic was below the satisfactory level. Meanwhile, majority of the respondents displayed positive behaviour towards prevention of COVID-19. The findings in this study could guide the public health physician in both the clinical and academic field to develop new strategy to improve the knowledge, attitude, and practice among students in higher education institution, especially to achieve effective risk communication during a pandemic. Public health officials also should emphasize on the need to tackle the issues of misinformation regarding COVID-19 by prioritizing the use of evidence-based information to the public. Health promotion and education also should be focused on subgroups reported with low knowledge, attitude and practice regarding COVID-19 such as students in rural areas and students in non-medical field, which ultimately could help the students to adopt appropriate behaviour during pandemic.

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Contributions: MFS, writing a draft manuscript and analysis; SSSAR, research design, questionnaire design, organising research team; MHM, questionnaire design, data collection; AO, data collection, input on manuscript writing, team coordination; NTPP, data collection, input on manuscript writing, team coordination; MSJ, overall supervisory, research concept; YBT, data collection, respondent coordination; NG, questionnaire design, data collection; FHM, research concept, expert opinions; WA, research concept, expert opinions; AHZF, research concept, expert opinions; MR, research concept, expert opinions; MFM, review and expert opinion; KM, review and expert opinion; ARR, review and expert opinion; ZNSA, review and expert opinion; AA, review and expert opinion; MAAR, review and expert opinion; MYI, review and expert opinion.

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