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COVID-19: Knowledge, Attitude and Preventive Behaviours of Medical and Dental Students

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Abstract

In 2020, a new strain of coronavirus was first reported in Wuhan, China after the detection of a cluster of cases of pneumonia. After initial local spread, the virus soon became a worldwide outbreak with the index case of Malaysia on 25th January 2020 in Sungai Buloh, Selangor. Since then, the virus has inflicted considerable strain on medical and economic sectors of Malaysia with drastic measures taken to contain the virus. An analytical cross-sectional study was conducted to assess and infer on the knowledge, perception and attitude with associated preventive behaviours of medical and dental students in Melaka Manipal Medical College (MMMC), Malaysia, a private tertiary institution. A questionnaire was distributed online to clinical phase medical and dental students of this college and a total of 174 responses was collated. Results revealed that 55.2% of 174 students had good knowledge of COVID-19 with scores above 80 while 44.8% possessed moderate knowledge with scores of 60-80. There was no student with poor knowledge with scores below 60. Summarising scores of all participants, the mean averages of knowledge and attitude with associated preventive behaviours of students was 81.5% (SD=6.3) and 85.7% (SD=13.1) respectively highlighting a good level of both. There were no statistically significant relationships between sociodemographic factors and both knowledge and attitude with corresponding preventive behaviours. Again, while statistically insignificant with a p-value of 0.540, knowledge had a positive association with attitude and preventive behaviours (regression coefficient=0.097, standard error=0.158). Perceptions of students towards this ongoing pandemic was generally excellent, with commendable awareness on its severity and concurrence with the measures taken by the Malaysian government. Our study demonstrates the high level of knowledge and capability of medical and dental students in Malaysia in the face of the COVID-19 pandemic. However, deficiencies are noted in participants' knowledge of treatment measures and signs and symptoms of COVID-19. As such, we recommend integration of COVID-19 in the academic curriculums of medical and dental schools with lectures or study materials and validate the efficiency and practicality of mobilising final year medical students into a nation's health workforce.

Keywords

COVID-19, Knowledge, Attitude, Preventive Behaviours, Perception, Medical Students, Dental Students, Cross-Sectional Study, Malaysia

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1. Introduction

Coronavirus disease (COVID-19) which was first reported in Wuhan, China has garnered worldwide attention since its emergence in January 2020. [1] As of 20th May 2020, a total of 4.81 million cases were confirmed globally with 319,000 deaths. In Malaysia, the number of cases reached 6,978 with 114 fatalities. The worrying spread has evoked responses in the government with the most drastic measure being a restriction intervention known as the Movement Control Order that began on 18th March 2020. [2, 3] The disease has

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several negative ramifications inciting massive pressure on healthcare systems with exponential increase in bed demand and mechanical ventilator need on both developing and developed nations and causing economic disruptions sparing no country. [4] Observing from a holistic viewpoint, COVID-19 has also inflicted undue strain on communities' health affecting individual's physical, emotional and mental aspects with a percentage of individuals infected admitted to Intensive Care Units (ICUs) and abrupt rises in rates of anxiety, depression and stress. [5-7]

Currently, there are no proven treatment or vaccination against COVID-19. The primary intervention to minimise the spread in the community and in the health care settings are strong infection control measures. This highly infectious respiratory disease requires proper public awareness in limiting the spread of the infection, mainly middle and low-income countries.

With the meteoric rise of social media platforms like Facebook and Twitter over the past decade, it has revolutionised how the society at large consumes, perceives and behaves towards an unprecedented global event. This has also sparked a resurgence of 'Fake News' which has significantly altered society's greater understanding of COVID-19. [8] Medical professionals are at the forefront of the battle against this deadly zoonotic pathogen. It is essential to understand the perceptions, misconceptions and awareness of the general public in order to educate the society on measures to take with the primary goal of extensively weakening virus infection and spread, information which should be disseminated through government agencies and clinicians conferring to patients. [9] As COVID-19 is a newly emerged disease, it has caused confusion, anxiety and fear amongst the general public such as the incorrect statement that administration of non-steroidal anti-inflammatory drugs (NSAIDs) could exacerbate the infection. [10] The substantial increase in the number of COVID-19 cases and the ever-increasing morbidity and mortality rates have been the largest setback. A SMS survey was conducted among the public in South Africa, Kenya and Nigeria. This study was carried out to understand the level of knowledge about COVID-19 among the general community. They acknowledged that the media played a significant role in conveying the information to them. Moreover, most knowledge gained was through WhatsApp. [11]

The knowledge and attitudes of the public are expected to largely influence the degree of personal protective measures and ultimately a good clinical outcome. A cross sectional observational study was carried out in India to evaluate the knowledge, attitude, anxiety and healthcare needs in the community during the coronavirus pandemic. The study had concluded that most educated people and health professionals were aware of the infection, possible preventive measures, and the importance of social distancing. [12] Another quantitative online survey was conducted in Berlin to assess risk perception of Coronavirus Disease (COVID-19) with regards to cognitive and affective dimensions. With regards to the age of the respondents, it was found that elderly people were significantly more worried than younger people in becoming infected. Apart from that, it was formulated that 68.2% of the women respondents were more worried of being infected with COVID-19 as opposed to men with a percentage of 55.7%. [13]

Like any other country, many surveys and studies were conducted in the United Arab Emirates in the recent past. A poor understanding of the disease among Health Care Workers (HCWs) may implicate in delayed treatment and the rapid spread of the disease. A cross sectional web-based study was conducted to investigate the knowledge and perceptions of HCWs about COVID-19 and most participants involved were doctors and medical students. Most of the participants used social media to obtain knowledge regarding COVID-19. A significant portion of the participants had poor knowledge on its mode of transmission and symptoms but showed keen perception of its prevention and control. Besides that, factors such as age and profession were also associated with inadequate knowledge and poor perception about COVID-19. [14] A cross sectional survey was carried out in Egypt to learn about the knowledge, perceptions, and attitude of Egyptians towards the Novel Coronavirus Disease (COVID-19). This study concluded that their participants had a good knowledge about the disease and a positive attitude towards protective measures. This knowledge is gained mainly through media channels. [15]

One of the many countries that are affected due to this virus includes Australia. Being a developed country, the public's knowledge regarding this pandemic should be well established. An online survey was conducted via Facebook advertisements among the general population of Australia to learn about their perception, knowledge and vaccine intentions on COVID-19. It was learned that one third of the participants are worried and concerned about the widespread nature of this disease. Another third was moderately worried. It was also learned that participants were well aware about the mode of transmission and are taking sufficient precautionary steps. [16]

Many students had been affected due to the outbreak of the coronavirus. In March 2020, an online survey was done among international students and students who were planning to study abroad in the near future. [17] This study was conducted to understand their perceptions on COVID-19 and how it may affect their plans to study abroad. In short, currently students in their home countries are more

concerned about travel restrictions and study budgets. Many considered to postpone their plans and considered online learning. They have a good knowledge about this pandemic and are taking all measures to be safe.

Acknowledging which risk perceptions influence multiple psychological, societal and cultural factors that are in constant change with time and place is essential for a pandemic preparedness and planning. Thereby these risk perceptions aid in individuals' judgements and evaluations of threats. However, this in time can limit the public compliance with response to information portrayed by authorities. A study was done on the students of the Medical University of Gdańsk and results had shown that students' concerns were related to the education crisis while medical professionals reported higher fear of the pandemic compared to others. [18] A cross sectional study was carried out in Karachi, Pakistan among the undergraduate medical students from three different medical institutes to understand their concerns towards the outbreak of COVID-19. Majority of the participants considered this virus a life-threatening disease. Many students felt obligated to look after the patients and denied skipping ward rounds even during the outbreak. Proper use of face mask and isolation of infected individuals were the common opinions stated by the participants to overcome this pandemic. [19]

The outbreak has inevitably impacted all stakeholders in education in an unprecedented manner. Among them, university students represent a special group characterised by increased autonomy and the intensive need to live independently, however this overlooks their general lack of life experience. Subsequently, their perceptions and behaviours are greatly affected by the global pandemic. Another study was done among university undergraduates from 10 universities in Shaanxi Province, China. It was found that among the total 4,360 answers, 3,590 possessed correct knowledge regarding COVID-19 symptoms whilst showing positive attitude and proactive practices against the outbreak. [20]

Health professionals and medical students are the first individuals who may have the highest risk of close contact with the affected people. Subsequently, it is crucial to have proper related knowledge and risk perception. A cross sectional study was conducted on Iranian medical students to investigate their COVID-19 related knowledge, self-reported preventive behaviours and risk perception. A total of 240 medical students responded and it was found that 79.6% of medical students who participated in the survey had a high level of related knowledge on this infectious disease. [21]

However, there are certain limitations that may arise corresponding to factors such as gender, ethnicity, or education level. An online Malaysian survey was conducted to assess the knowledge, perception, and communication of COVID-19 amongst Malaysians. It was gathered that a higher proportion of Malay-survey (95.2%) compared to English-survey (66.3%) or Chinese-survey respondents (61.65%) agreed that COVID-19 was a deadly disease. These results imply that the enforcement of preventive measures such as social distancing may rely on the detrimental effects of the disease and also a cultural bias in the perception altogether. [22]

All epidemics and pandemics have their own characteristics in terms of casualty, progression and control measures. Hence, it is important that health professionals and students have proper knowledge to educate the public and create awareness in such situations to control and prevent the spread of disease. [23, 24]

1.1. Research Question

What is the level of knowledge that medical and dental students of Melaka Manipal Medical College (MMMC) possess regarding COVID-19, their perceptions on the ongoing pandemic and their attitudes and associated preventive behaviours towards this disease?

1.2. Research Objectives

1) To investigate Malaysian medical and dental students' knowledge, perception, attitudes and preventive behaviours towards COVID-19 during the rapid rise period of the outbreak.
2) To determine the self-education and awareness of medical and dental students on COVID-19 during the pandemic.
3) To assess the responsibility of medical and dental students as a part of the medical community in keeping abreast with the latest updates regarding COVID-19.
4) To address this gap in the current knowledge and identify misconceptions about COVID-19 among medical and dental students in Melaka-Manipal Medical College, Malaysia.

1.3. Research Hypothesis

Students with greater knowledge about COVID-19 will have better attitudes towards this disease and will partake in more preventive behaviours.

2. Methodology

2.1. Study Design, Setting, Time and Population

This study was conducted as an analytical cross-sectional study allowing us to collate and infer the relationship between knowledge, perception and attitude among medical and dental students in view of the ongoing pandemic.

Beginning in May 2020, the study concluded in June 2020 for a period spanning 6 weeks. Melaka Manipal Medical College (MMMC) is a private university in Malaysia offering medical and dental degrees. The medical degree has two stages where the first half is organised in Manipal, India for a total of 5 semesters lasting two and a half years. The returning students would then spend a year in Muar, Malaysia before ending the programme after one and a half years in Semesters 8 to 10 in Melaka, Malaysia. Contrastingly, dental students are stationed in India for 2 years of their 5 year course with the remaining 3 years in Melaka campus, Malaysia. Participants enrolled in our study all belong to the institution and involve students in different stages in their programme. In summary, our study population comprises the student population in MMMC ranging from medical students in Semester 6 and dental students in Semester 5 of their respective medical and dental programmes to final year students in their last semesters.

2.2. Sample Size

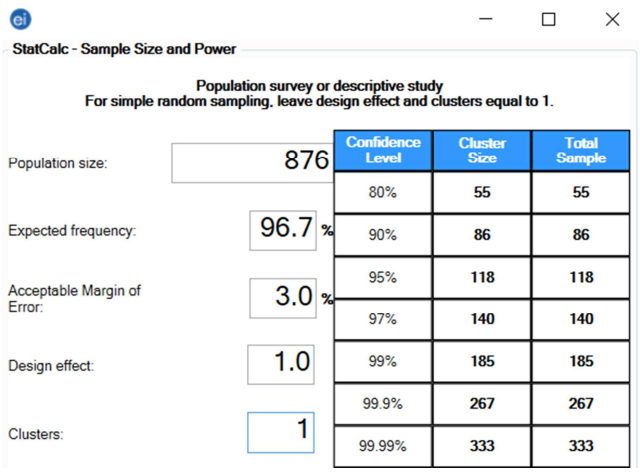

Figure 1. Calculation of minimum sample size.

Through previous literature, it was learned that the expected frequency of medical students increasing the practice of handwashing was 96.7% through a related study regarding preventive behaviours among medical students in Iran. As such, though StatCalc on Epi Info software, minimum sample size recommended was calculated with the following parameters:

Population size: 876 medical and dental students of MMMC Malaysia

Expected frequency: 96.7% practising good hand hygiene
Acceptable margin of error: 3%

Minimum sample size with 95% confidence intervals=118

Analysing the table post calculation, our study's recommended minimum sample size was 118 students according to the 95% confidence interval. Consequently, a non-response rate of 30% was expected and factored in our sample size estimation.

The final sample size was calculated using the following formula:

$$n_{final} = \frac{Minimum\ sample\ size}{1 - non\ response\ rate}$$

$$n_{final} = \frac{118}{1 - (0.3)}$$

$$n_{final} = 169$$

Finally, including the non-response rate to the minimum sample size our final sample would involve 169 students. Five additional responses were obtained hence our final sample size included in this study was 174 participants.

2.3. Sampling

The sampling method that was used was purposive sampling which is a type of non-probability sampling. Using this sampling method, the members of the population to participate in this research was chosen not at random but selected based on availability and accessibility.

The inclusion criteria for this study was MBBS and BDS students of Melaka Manipal Medical College in Muar and Melaka campuses, Malaysia. The exclusion criteria for this research were participants who have submitted incomplete questionnaires or denied consent to participating.

2.4. Data Collection

The study was conducted through an online survey with the aid of creating a Google Form to allow participants to access the questionnaire with ease considering the time and accessibility constraints imposed by the ongoing movement control order in Malaysia with concurrent closure of universities.

Regarding the questionnaire in this study, it was a self-constructed questionnaire with questions compiled from three previous studies including "COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviours and Risk Perception", "Knowledge and perceptions of COVID-19 among the general public in the United States and the United Kingdom: A cross-sectional online survey" and 'Knowledge, Perceptions, and Attitude of Egyptians Towards the Novel Coronavirus Disease (COVID-19)'. Authors of stated articles have been consulted for permission and approval was granted.

Section 1 of our questionnaire was aimed at understanding participants' background and sociodemographic characteristics. Questions of age, gender, nationality, ethnicity, residence, and academic programme were listed.

Section 2 comprised of 11 questions attempting to gauge students' knowledge of COVID-19. They consisted of two varieties including 'True' and 'False' questions and multiple-choice questions with a single best answer. The epidemiological characteristics of the novel coronavirus, vulnerable groups, symptoms and signs of the disease and preventive and management measures were asked. Correct responses to questions were summed up and a final percentage was calculated on a 100-point scale.

Section 3 centred on perception of participants towards COVID-19. This portion of the survey examined volunteers' awareness of the disease burden in Malaysia, transmissibility of the virus and opinions towards measures that can be enforced to mitigate the coronavirus impact in Malaysia.

Finally, Section 4 assessed students' attitudes and preventive behaviours towards this current disease. A 5-point Likert scale was devised with a compendium of statements all focusing on outlook and preventive practices of participants in view of COVID-19. The five responses for participants to express the strength of the accuracy of the statement with their own viewpoints were "Certainly no", "Mostly no", "Not sure", "Probably yes" and "Definitely yes" which were each assigned a score of 1,2,3,4 and 5 respectively excluding questions 1 and 2 where the scale was reversed with scores of 5,4,3,2,1. This is due to the statements indicating likelihood of participants' shaking hands and hugging which are discouraged as those actions increase the possibility of infecting other individuals. Each participants' cumulative scores were averaged and converted to a percentage to have a succinct overview on their general attitude and preventive behaviours.

2.5. Data Processing and Data Analysis

Collated data was analysed using Microsoft Excel and analysed using statistical software (Epi Info version 7.2). Descriptive characteristics including age, gender, nationality, ethnicity, residence and academic programme were calculated and summarised.

For inference and association between independent and dependent variables, statistical analyses were conducted including unpaired t-test, ANOVA and linear regression and values tabled. This research being a cross-sectional study, odds ratio was utilised to measure the strength of association between variables. The level of significance was set at 0.05 with 95% confidence intervals.

Table 1. Variables and Statistical Tests Used in Data Analysis.

Independent variable	Dependent variable	Statistical test
Gender		Unpaired t-test
Nationality		Unpaired t-test
Ethnicity	Knowledge	ANOVA
Residence		Unpaired t-test
Academic Programme		Unpaired t-test
Gender		Unpaired t-test
Nationality		Unpaired t-test
Ethnicity	Attitude with associated preventive behaviours	ANOVA
Residence		Unpaired t-test
Academic Programme		Unpaired t-test
Knowledge	Attitude with associated preventive behaviours	Linear regression

2.6. Ethical Consideration

This cross-sectional study was conducted to investigate Malaysian medical and dental students' knowledge, perception, attitude and associated preventive behaviours towards COVID-19 during the rapid rise period of the outbreak. Permission for access to medical records was not required. The participants were not offered any incentive and the questionnaire participation was voluntary. Confidentiality of data was preserved throughout the study. Before answering the questionnaire, participants were required to select an option (Yes/No) as informed written consent after reading the introductory questionnaire consent form which details this study's objectives and requirements. This study was approved by the Research Ethics Committee, Faculty of Medicine, Melaka-Manipal Medical College, Muar Campus, Muar, Johor, Malaysia.

3. Results

Table 2. Sociodemographic Characteristics of Medical and Dental Students.

Variables	Frequency (%)
Age	
<22	21 (12.1)
22-25	152 (87.3)
>25	1 (0.6)
Mean (SD)	22.83 (1.2)
Minimum - Maximum	20-26
Gender	
Male	50 (28.7)
Female	124 (71.3)
Nationality	
Malaysian Student	167 (96.0)
International Student	7 (4.0)
Ethnicity	
Malay	28 (16.1)
Chinese	60 (34.5)
Indian	67 (38.5)

Variables	Frequency (%)
Other	19 (10.9)
Residence	
Rural areas	31 (17.8)
City areas	143 (82.2)
Academic Programme	
MBBS	106 (60.9)
BDS	68 (39.1)

A total of one hundred and seventy-four medical students had taken part in answering and completing the questionnaire. Table 2 shows the socio-demographic characteristics of the studied participants. The majority of respondents were female (71.3%) and the remaining were male respondents (28.7%). The mean age was 22.83 years. Among the respondents, 167 (96.0%) were Malaysian students and 7 (4.0%) were International students. In regard to the respondents' ethnicity, there were mostly Indian respondents (38.5), followed by Chinese (34.5%) and Malay respondents (16.1%) and the remaining 10.9% respondents do not fall under any of these three races. Most of the participants (82.2%) resided in city areas while 31 (17.8%) heralded from rural regions. About 106 (60.9%) students were under the MBBS programme and the other 68 participants (39.1%) were BDS students.

Table 3. Knowledge of COVID-19.

Questions	Correct Responses n (%)
1. The origin of COVID-19 is not clear but it seems that it has been transmitted to humans by sea food, snakes or bats.	
(a) True*	144 (82.8)
(b) False	
2. Only older adults can become infected with the new coronavirus.	
(a) True	160 (92.0)
(b) False*	
3. Its incubation period is up to 14 days with a mean of 5 days.	
(a) True*	158 (90.8)
(b) False	
4. It can be diagnosed by PCR test on samples collected from nasopharyngeal and oropharyngeal discharge or from sputum and bronchial washings.	
(a) True*	165 (94.8)
(b) False	
5. What is the main way in which people are currently getting infected with the new coronavirus? Please select one response only.	
(a) Eating or touching bats	
(b) Faecal contaminants in drinking water	
(c) Unhygienic preparation of food	
(d) Sexual intercourse or sharing needles for drug use	168 (96.6)
(e) Mosquito bites	
(f) Droplets of saliva that land in the mouths or noses of people who are nearby when an infected person sneezes or coughs*	
(g) Eating undercooked meat products	
(h) Directly coming into touch with someone's bodily fluids like blood, vomit or sweat	
(i) Snake bites or touching snakes	
6. What are signs or symptoms of an infection with the new coronavirus? Please select 'True' or 'False' for each option.	
Nose bleeds	
(a) True	170 (97.7)
(b) False*	
Cough	
(a) True*	173 (99.4)
(b) False	
Fever	
(a) True*	172 (98.9)
(b) False	
Aches and pain	
(a) True*	108 (62.1)
(b) False	
Sneezing	
(a) True	40 (23.0)
(b) False*	
Skin rash	
(a) True*	31 (17.8)
(b) False	
Shortness of breath	
(a) True*	170 (97.7)
(b) False	
Vomiting	
(a) True*	46 (26.4)
(b) False	
Runny nose	

Questions	Correct Responses n (%)
(a) True*	116 (66.7)
(b) False	
7. Which of the following actions help prevent catching an infection with the new coronavirus?	
Please select 'True' or 'False' for each option.	
Getting a vaccination against pneumonia	
(a) True	136 (78.2)
(b) False*	
Gargling mouthwash	
(a) True	115 (66.1)
(b) False*	
Washing your hands	
(a) True*	173 (99.4)
(b) False	
Eating garlic	
(a) True	163 (93.7)
(b) False*	
Avoiding close contact with people who are sick	
(a) True*	173 (99.4)
(b) False	
Taking antibiotics	
(a) True	160 (92.0)
(b) False*	
Using a hand dryer	
(a) True	151 (86.8)
(b) False*	
Putting sesame oil on your skin	
(a) True	172 (98.9)
(b) False*	
Avoiding touching your eyes, nose and mouth with unwashed hands	
(a) True*	171 (98.3)
(b) False	
Regularly rinsing your nose with saline	
(a) True	145 (83.3)
(b) False*	
8. When they have been infected, what age groups are most likely to die from the new coronavirus?	
(a) Children	174 (100)
(b) Young adults	
(c) Older adults*	
9. Are those with other health problems more likely to die from an infection with the new coronavirus disease than those without any other health problems?	166 (95.4)
(a) Yes*	
(b) No	
10. The disease can be treated by using antiviral drugs.	
(a) True	80 (46.0)
(b) False*	
11. There is currently a vaccine available that protects against infection with the new coronavirus.	
(a) True	169 (97.1)
(b) False*	

*Correct answer

Table 3 highlights COVID-19 related knowledge questions compromising a total of 11 questions altogether. The highest correct response rate recorded of all questions was 100% where all 174 participants agreed that older aged individuals are most likely to die from the infection. 82.8% of the respondents had the right impression as to how COVID-19 is transmitted to humans, which may have been by sea food, snakes or bats. 92.0% knew that not only older adults can be infected by the virus. 90.8% of the respondents answered that the incubation period of the virus is up to 14 days. The diagnostic approach done by PCR test on samples collected from nasopharyngeal and oropharyngeal discharge, sputum and bronchial washings were also known by 94.8% of students. About 96.6% of the participants selected the right responses for the main way in which people are getting infected with the coronavirus. In regard to a question on symptoms related to COVID 19 infection, percentages of participants opting for the correct response include, 97.7% selected false for Nose bleeds, 99.4% selected true for Cough, 98.9% selected true for Fever, 62.1% selected true for Aches and pain, only 23.0% selected false for Sneezing, 17.8% selected true for Skin rash, 97.7% selected true for Shortness of breath, 26.4% selected true for Vomiting and 66.7% selected true for Runny nose. In terms of selecting the right answers to actions that help in proper

preventive measures of catching the COVID-19, 78.2% selected false for getting a vaccination against pneumonia, 66.1% selected false for gargling with mouthwash, 99.4% selected true for washing hands, 93.7% selected false for eating garlic, 99.4% selected true for avoiding close contact with sick people. 92.0% selected false for taking antibiotics, 86.8% selected false for using a hand dryer, 98.9% selected false for putting sesame oil on their skins, 98.3% selected true for avoid touching eyes, nose and mouth with unclean hands and 83.3% selected false for regularly rinsing nose with saline.

95.4% of the participants were aware that those with other health problems and comorbidities were most likely to die from COVID-19 infection as opposed to those without. More than half of the participants (54.0%) had thought that the disease can be treated by using antiviral drugs. This would be incorrect with the absence of a globally FDA-approved antiviral drug to treat the infection. The last question in this part of the questionnaire was also answered fairly correctly where 97.1% of the participants knew that there is no available vaccine that helps protect against the COVID-19 infection.

Table 4. Perception of COVID-19.

Questions	n (%)
1. The population of Malaysia is approximately 31 million (31,000,000). What do you think is the number of people living in Malaysia who are infected with the new coronavirus? The number should include both those who have been diagnosed and those who have not been diagnosed.	
(a) 0	0 (0.0)
(b) 1-100	10 (5.8)
(c) 101-1,000	8 (4.6)
(d) 1,001-10,000	105 (60.3)
(e) 10,001-50,000	33 (19.0)
(f) 50,001-100,000	8 (4.6)
(g) 100,001-1 million	3 (1.7)
(h) More	7 (4.0)
2. What percentage of people who get infected with the common flu end up dying from the flu?	
(a) 0-20%	142 (81.6)
(b) 21-40%	21 (12.1)
(c) 41-60%	6 (3.4)
(d) 61-80%	4 (2.3)
(e) 81-100%	1 (0.6)
3. What percent of people who get infected with the new coronavirus die from this infection? No one knows the correct answer to this, so please just give it your best guess.	
(a) 0-20%	95 (54.6)
(b) 21-40%	55 (31.6)
(c) 41-60%	19 (10.9)
(d) 61-80%	5 (2.9)
(e) 81-100%	0 (0.0)
4. The current population of Malaysia is Malaysia is approximately 31 million people. How many people do you think will die from the new coronavirus by the end of 2020?	
(a) 0	0 (0.0)
(b) 1-100	14 (8.0)
(c) 101-500	90 (51.7)
(d) 501-1,000	28 (16.1)
(e) 1,001-10,000	29 (16.7)
(f) 10,001-100,000	5 (2.9)
(g) 100,001-1 million	4 (2.3)
(h) More	4 (2.3)
5. Approximately how far do you think the new coronavirus can travel through the air (in metres) to transmit the infection from one person to another?	
(a) 0	5 (2.9)
(b) 1-3	117 (67.2)
(c) 4-8	30 (17.2)
(d) 9-13	9 (5.2)
(e) 14-20	5 (2.9)
(f) More	8 (4.6)
6. Is the following statement true or false? Consistently wearing a face mask is highly effective. For the purpose of this question, "highly effective" is defined as reducing your risk of getting infected by 95% and a "face mask" is a common medical mask.	
(a) True	104 (59.8)
(b) False	70 (40.2)
7. Suppose that you see an adult in your neighbourhood who wears a face mask. What is the probability (in percent from 0-100%) that her or she is infected with the new coronavirus?	
(a) 0-20%	133 (76.4)
(b) 21-40	29 (16.7)
(c) 41-60%	7 (4.0)

Questions	n (%)
(d) 61-80%	4 (2.3)
(e) 81-100%	1 (0.6)
8. Do you think you would not eat at a restaurant for the next few weeks to reduce the risk of getting infected with the new coronavirus?	
Yes	157 (90.2)
No	17 (9.8)
9. Grab is a ride-sharing app that allows people to request and pay for a car ride via their phone.	
If you were a Grab driver today, would you try to reject ride requests from people requesting rides to/from the hospital or clinic to reduce your risk of getting infected with the new coronavirus?	
(a) Always	38 (21.8)
(b) Often	28 (16.1)
(c) Sometimes	66 (37.9)
(d) Never	42 (24.1)
10. Does receiving a letter or package from China put you at risk of getting infected with the new coronavirus?	
(a) Yes	43 (24.7)
(b) No	131 (75.3)
11. If you have a fever or cough and recently visited China, or spent time with someone who did, what would be the best course of action?	
(a) Go to your primary care doctor, such as by taxi or public transport to avoid driving yourself	9 (5.2)
(b) Have someone drive to the emergency room	15 (8.6)
(c) Stay home and call your primary care doctor	106 (60.9)
(d) Rest more than usual and then call your primary care doctor if you still feel sick after 2-3 days	44 (25.3)
12. Do you feel that the media coverage about this disease is exaggerated?	
(a) Yes	42 (24.1)
(b) No	132 (75.9)
13. At this point in the coronavirus pandemic, do you think your government should implement the following measures to prevent the spread of the virus?	
Quarantine everyone coming abroad for 14 days	
(a) Yes	174 (100.0)
(b) No	0 (0.0)
Suspend air travel to your country	
(a) Yes	167 (96.0)
(b) No	7 (4.0)
Go door to door to measure everyone's temperature	
(a) Yes	56 (32.2)
(b) No	118 (67.8)
Close all schools	
(a) Yes	172 (98.9)
(b) No	2 (1.1)
Forbid any mass gatherings (e.g. sport events or concerts)	
(a) Yes	173 (99.4)
(b) No	1 (0.6)
Make it mandatory for adults to wear a face mask while outdoors	
(a) Yes	157 (90.2)
(b) No	17 (9.8)
Require everyone to remain in their home except to seek medical care and obtain food	
(a) Yes	165 (94.8)
(b) No	9 (5.2)
14. Do you think it is likely that the new coronavirus is a bioweapon developed by a government or terrorist organisation?	
(a) Extremely likely	19 (10.9)
(b) Moderately likely	31 (17.8)
(c) Slightly likely	39 (22.4)
(d) Neither likely nor unlikely	35 (20.1)
(e) Slightly unlikely	6 (3.4)
(f) Moderately unlikely	22 (12.6)
(g) Extremely unlikely	22 (12.6)

Table 4 concerning perception of students towards COVID-19 above shows that 60.3% of the participants assumed that 1,001-10,000 people will be diagnosed with coronavirus, 81.6% perceive that 0-20% of people who get infected with the common flu, ends up dying from the flu, 54.6% said that 0-20% of the people who are infected by the coronavirus will die from this infection. 51.7% assumed that 101-500 will die due to this virus by the end of 2020, 67.2% said that the coronavirus is capable in travelling 1-3 meters through air to transmit this infection, 59.8% agreed that consistently wearing a mask is highly effective, 76.4% said that 0-20% of people who wear masks have the probability of being infected by the coronavirus, 90.2% agreed that not eating at a restaurant for a few weeks may reduce the risk of getting infected by the virus. 37.9% feel that should they be a Grab driver, they would only reject people requesting rides to hospitals or clinics sometimes to reduce the risk of getting infected with COVID-19. 75.3% said that receiving a package from China does not put them at

risk of getting infected, 60.9% are of the opinion for one who has recently visited China, they should stay at home and call their primary care doctor, 75.9% feels that the media does not exaggerate about this disease, 100% agreed to quarantine everyone coming abroad for 14 days, 96% said to suspend air travel, 67.8% said it is unnecessary to go door to door to measure everyone's temperature, 98.9% said all schools should be closed, 99.4% agree to forbid any mass gatherings, 90.2% concur to make it mandatory for adults to wear face mask while outdoors and 94.8% agreed that everyone should remain indoors except to seek medical care or to obtain food. 22.4% of all participants said that the chance of COVID-19 being a bioweapon developed by a government or terrorist organisation is slightly likely.

Table 5. Attitude and Preventive Behaviours.

Statements	Certainly no	Mostly no	Not sure	Probably yes	Definitely yes
	n (%)	n (%)	n (%)	n (%)	n (%)
1. When I meet my friends and colleagues, I usually greet them with a handshake.	63 (36.2)	75 (43.1)	10 (5.7)	20 (11.5)	6 (3.5)
2. When I meet my friends and colleagues, I usually greet them with a hug.	72 (41.4)	63 (36.2)	13 (7.4)	20 (11.5)	6 (3.5)
3. I cancelled or postponed meetings with friends, eating out and sport events.	11 (6.2)	6 (3.4)	12 (6.9)	52 (29.8)	93 (53.5)
4. I reduced the use of public transportation.	11 (6.2)	2 (1.2)	7 (4.0)	33 (18.8)	121 (69.8)
5. I avoided places where many people are gathered.	10 (5.7)	3 (1.7)	7 (4.0)	24 (13.8)	130 (74.8)
6. I wash my hands regularly and for enough period of time.	6 (3.5)	3 (1.7)	11 (6.2)	48 (27.7)	106 (60.9)
7. I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces).	6 (3.5)	9 (5.2)	24 (13.8)	52 (29.9)	83 (47.6)
8. I usually put a facemask to protect myself from the risk of infection.	7 (4.0)	1 (0.6)	10 (5.7)	52 (29.9)	104 (59.8)
9. If I find that I contacted a person infected with the virus, I will inform the health authorities.	6 (3.5)	1 (0.6)	17 (9.8)	32 (18.4)	118 (67.7)
10. If I have any of the symptoms associated with the disease, I will inform the health authorities.	5 (2.9)	1 (0.6)	9 (5.2)	35 (20.1)	124 (71.2)
11. If I find that I contacted a person with the virus, I agree to be isolated at home for a certain period of time until it is proven that I am free from the disease.	6 (3.4)	0 (0.0)	9 (5.2)	19 (10.9)	140 (80.5)
12. If I found that I contacted a person infected with the virus, I agree to be isolated at an isolation hospital for a certain period of time until it is proven that I am free from the disease.	5 (2.9)	4 (2.3)	17 (9.8)	30 (17.2)	118 (67.8)
13. If there is an available lab test for detection of the virus, I am willing to do it.	10 (5.7)	8 (4.6)	21 (12.1)	32 (18.4)	103 (59.2)
14. If there is an available vaccine for the virus, I am willing to get it.	6 (3.4)	6 (3.4)	19 (10.9)	25 (14.4)	118 (67.8)
15. I usually follow the updates about the spread of the virus in my country.	5 (2.9)	2 (1.1)	16 (9.2)	55 (31.6)	96 (55.2)
16. I usually follow the updates about the spread of the virus worldwide.	4 (2.3)	9 (5.2)	23 (13.2)	62 (35.6)	76 (43.7)
17. If a lecture about the virus is organised near me, I am willing to attend it.	20 (11.5)	16 (9.2)	64 (36.8)	41 (23.6)	33 (19.0)
18. If protective measures and equipment are available at an affordable price, I will buy them.	7 (4.0)	3 (1.7)	20 (11.5)	54 (31.0)	90 (51.7)
19. I discussed COVID-19 prevention with my family and friends.	5 (2.9)	3 (1.7)	17 (9.8)	51 (29.3)	98 (56.3)

The table above shows the preventive behaviours taken by the participants. 43.1% of the participants will mostly not greet their friends with a handshake while 41.4% will definitely not greet with a hug. 53.5% will certainly cancel or postpone meetings and events as well as 69.8% of students definitely reducing the use of public transport. Furthermore, 74.8% of participants will certainly avoid places where large number of people are gathered, 60.9% will assuredly wash their hands regularly for enough period of time, and 47.6% definitively increasing the frequency of cleaning and disinfecting items. 59.8% will most certainly usually put on face mask to protect themselves from the risk of infection, 67.7% will unquestionably inform the health authorities if they have been in contact with a person who has been infected by the virus, 71.2% will undoubtedly inform the health authorities if they show any symptoms associated with the disease. 80.5% will surely agree to be isolated at home if they have been in contact with an infected person, 67.8% will certainly agree to be isolated in the hospital if they have been in contact with an infected person, 59.2% will decidedly do a lab test for detection of the virus is it is available and 67.8% of participants will definitely get the vaccine for the virus if is available. 55.2% will assuredly follow the updates about the spread of the virus in the country while 43.7% will follow the updates about the spread of the virus worldwide definitely. The lone exception to the trend where participants are highly opinionated is attending a lecture about the virus if one is organised nearby where 36.8% of students forming the majority are indecisive. 51.7% will certainly get protective measures and equipment if they are at an affordable price and 56.3% will definitely discuss COVID-19 prevention with their family and friends.

Table 6. Knowledge of COVID-19, Attitudes and Preventive Behaviours of Medical and Dental Students.

Variable	n (%)
Knowledge (0-100)	
High (>80%)	96 (55.2)
Moderate (60%-80%)	78 (44.8)
Poor (<60%)	0 (0.0)
Mean (SD)	81.5 (6.3)
Minimum-Maximum	67.9-92.9
Attitudes and Preventive Behaviours (0-100)	
Mean (SD)	85.7 (13.1)

Table 6 summarises average percentages of knowledge and attitude with associated preventive behaviours scores. 55.2% of participants (96) scored high under knowledge while

44.8% (78) scored a moderate score and none of the participants scored poor. Mean scores for students' knowledge about COVID-19 was 81.5 (6.3) and highest score attained was 92.9 with a low of 67.9. Concerning attitudes and preventive behaviours, overall participants scored a mean of 85.7 with a standard deviation of 13.1.

Table 7. Association between Sociodemographic Characteristics and Knowledge of COVID-19.

Independent variables	Knowledge percentage Mean (SD)	Mean difference (95% CL)	p-value
Gender			
Male	81.3 (6.5)	0.3 (-1.8, 2.3)	0.813
Female	81.5 (6.3)		
Nationality			
Malaysian Student	81.4 (6.4)	1.2 (-3.6. 6.1)	0.613
International Student	82.7 (2.5)		
Ethnicity			
Malay	81.9 (5.5)	-	0.404
Chinese	82.3 (5.9)		
Indian	80.4 (7.1)		
Other	81.8 (5.7)		
Residence			
City	81.2 (6.2)	-1.4 (-3.9, 1.1)	0.270
Rural	82.6 (6.9)		
Programme			
MBBS	80.8 (6.1)	1.8 (-0.1, 3.7)	0.066
BDS	82.6 (6.5)		

Table 7 shows the relationship between participants' sociodemographic characteristics and knowledge percentage and the association between them. All independent variables were not statistically significant ($p>0.05$) with gender ($p=0.813$), nationality ($p=0.613$), ethnicity ($p=0.404$), residence ($p=0.270$) and programme ($p=0.066$). Individuating scores in each comparison group, it was noted that females and males were almost identical with females a tad higher with 81.5 (6.3) to males' 81.3 (6.5). International students also were deemed to have higher knowledge regarding the current disease with scores of 82.7 (2.5) to Malaysian students' 81.4 (6.4). Chinese participants had the highest percentages among ethnic groups with 82.3 (5.9) with scores for Malays, other races and Indians at 81.9 (5.5), 81.8 (5.7) and 80.4 (7.1) respectively. Students residing in rural areas had higher averages with 82.6 (6.9) in comparison to students from city areas 81.2 (6.2). Dental students as well bettered their medical counterparts, 82.6 (6.5) to 80.8 (6.1).

Table 8. Association between Sociodemographic Characteristics and Attitude and Preventive Behaviours.

Sociodemographic Characteristics	Attitude and Preventive Behaviours	Mean difference (95% CL)	p-value
Gender			
Male	83.7 (14.1)	2.8 (-1.5, 7.2)	0.196
Female	86.5 (12.7)		
Ethnicity			
Malay	87.1 (12.3)	-	0.930
Chinese	85.7 (14.5)		
Indian	85.3 (11.5)		
Other	85.0 (15.9)		
Nationality			
Malaysian Student	85.6 (13.3)	3.5 (-6.5, 13.5)	0.495
International Student	89.0 (6.3)		
Residence			
City	86.0 (13.1)	1.6 (-3.5, 6.8)	0.530
Rural	84.3 (13.6)		
Academic Programme			
MBBS	86.9 (11.6)	-3.2 (-7.2, 0.8)	0.120
BDS	83.7 (15.1)		

Table 8 examines and assesses the amount of association between students' sociodemographic characteristics and their attitudes and associated preventive behaviours. Once again, societal factors did not heavily influence the attitudes of our participants to a significant extent with gender ($p=0.196$), ethnicity ($p=0.930$), nationality ($p=0.495$), residence ($p=0.530$) and academic programme ($p=0.120$) all statistically insignificant. However, female students were found to have better attitudes and partake in more preventive behaviours than male students with averages of 86.5 (12.7) to 83.4 (14.1). Malay participants with averages of 87.1 (12.3) had better attitudes and increased preventive behaviours grouping based on ethnicity followed by Chinese (85.7, SD=14.5), Indian (85.3, SD=11.5) and students of other races

(85.0, SD=15.9). International students with averages of 89.0 (6.3) had better attitudes and utilised more preventive measures in comparison to Malaysian students 85.6 (13.3). City dwellers whose scores of 86.0 (13.1) were deemed to possess greater attitudes and preventive behaviours to participants from rural areas with averages of 84.3 (13.6). Among medical and dental students, medical students' means were 86.9 (11.6) to dental students' 83.7 (15.1).

Table 9. Simple linear regression analysis of association between Knowledge of COVID-19 and Attitude with Associated Preventive Behaviours towards COVID-19.

	Attitude	Standard Error	p-value
	b	SE	
Knowledge	0.097	0.158	0.540

b=Regression coefficient

The association between knowledge of COVID-19 and attitude with associated preventive behaviours was assessed. Although statistically insignificant (p=0.540), there was a slight correlation between these two variables (0.097) with a standard error of 0.158, indicating with every single percent rise in knowledge, attitude and preventive behaviours were also increased by 0.097 percent.

4. Discussion

This study was conducted among clinical phase medical and dental cohorts of Melaka Manipal Medical College, Malaysia to investigate the students' knowledge, perception, attitude and preventive behaviours towards COVID-19 and determine their self-education and awareness. Furthermore, we examined the responsibilities of medical and dental students as part of the medical community in staying abreast with latest updates regarding the new coronavirus and identify deficiencies in current knowledge and misconceptions among the student population.

Our study revealed among medical and dental students in Malaysia, encouragingly, 55.2% of participants had high knowledge with scores of over 80% with 44.8% possessing moderate knowledge with a cumulative mean of 81.5% (SD=6.3) among all participants. Questions in our study examined volunteers' knowledge in COVID-19's epidemiological characteristics, susceptibility of individuals, symptoms and signs of this disease and treatment measures. While students were proficient in knowledge of epidemiological features and vulnerable groups, mixed results were obtained in the latter two aspects. Positive symptoms of COVID-19 reported by the WHO and CDC which include skin rash and vomiting were identified in only 17.8% and 26.4% of participants respectively. 46% of study participants also shared a belief that COVID-19 can be treated by using antiviral drugs. While there have been numerous clinical trials on the efficacy of antiviral drugs in treating patients with coronavirus, namely remdesivir and hydroxychloroquine, thus far, none have been approved conclusively. In India, a questionnaire-based survey was conducted among 1,562 healthcare students and professionals in assessing awareness of COVID-19 disease and infection control practices. This study reported that overall knowledge scores calculated was 71.2% with the highest knowledge scores originating from medical and dental students and the dental faculty among the study's subgroups. [25]

Participants have generally good attitudes regarding the disease and practice a high proportion of preventive measures with the derived mean from all participants amounting to 85.7% (SD=13.1). In accordance with measures that have been promoted by the WHO, majority of students agree with cessation of handshakes, hugs and reduced usage of public transportation. Hand washing, another critical activity in breaking the chain of transmission was highly regarded with 60.9% practising regular hand washing and 27.7% more inclined to do so for a summative score of 88.6% of participants viewing hand hygiene a pertinent protective factor. Students were also found to be proactive and keen on following the progress and containment of the virus nationally and worldwide. A cross-sectional study was completed in Bangladesh among 305 medical students and it was shown that 89.5% of participants were washing hands frequently and thoroughly to curb COVID-19 infection and transmission. [26]

In regard to sociodemographic characteristics and knowledge demonstrated in our study, our findings show no statistically significant relationships between the two variables. For instance, almost similar knowledge mean scores were observed for female and male participants amounting to 81.5 (SD=6.3) and 81.3 (SD=6.5) respectively. Similarly, a study that has been conducted in Egypt among Egyptian adults found that there was no significant association seen between gender and knowledge on COVID-19. Researchers also found that mean scores for females were higher as compared to males. [15] Pertaining to other variables such as Nationality, Ethnicity, Residency and Academic Programme, it was found that none of these factors have significant association with knowledge on COVID-19 as well. A similar study was carried out among healthcare workers in Ho Chi Minh City concluded that knowledge regarding COVID-19 did not present any significant associations with age, gender, ethnicity and experience. [27] However, an Indian study conducted to investigate the knowledge, attitude and preventive behaviours of participants towards COVID-19 amongst the Indian adult population, stated that confounding factors such as education level and occupation are strong

indicators of knowledge domain regarding COVID-19. [28]

In this study, attitudes toward COVID-19 was evaluated by understanding how respondents viewed the disease, and to what extent they were affected by COVID-19. These questions reviewed the potential negative impact of COVID-19 on health, finances and access to care. Likewise, it was found in our study that most societal variables do not show substantial correlation towards their attitudes nor their preventive behaviours. Our results yielded that with gender, ethnicity, nationality, residence and academic programme serving as independent variables, they demonstrated that societal factors were statistically insignificant. While most participants showed high levels of concerns and had utilised precautionary measures, more female students had positive attitudes and preventive behaviours than male students, with averages of 86.5% (12.7) and 83.7% (14.1) respectively. Similarly, a survey done in Hubei, China amongst the residents of Hubei province had found that relatively high levels of socioeconomic status, in particular women, had optimistic attitudes and appropriate practices towards COVID-19. [29] Another cross-sectional study carried out in China amongst university undergraduates from 10 universities in Shaanxi Province, reported similar results where 73.81% subjects demonstrated positive attitudes, with levels significantly higher in females. [20]

Knowledge among COVID-19 and its degree of association with students' attitudes and preventive measures was examined next. In our study, although statistically insignificant, there was a slight positive correlation between these two variables, with every percent rise in knowledge, attitude and preventive behaviours were also increased by 0.097%. However, in an online cross-sectional survey organised in China among residents, significant positive association was determined between increased knowledge and effective preventive practices with a higher COVID-19 knowledge score linked with marked increase in willingness of participants to wear a mask and reluctance in going to a crowded place. [29] A research was conducted in Jordan, investigating knowledge, attitudes and precautionary measures among medical students. Several results obtained were similar with this study. In our study, 95.4% of the participants were aware that those with other health problems and comorbidities were most likely to die from COVID-19 infection as opposed to those without. Similar to our findings, 95.0% of medical students from the Jordan study also believed that people with chronic illness are highly susceptible to being infected by the virus. [30] Another study that was conducted targeted healthcare workers with a total of 134 medical students from various geographical locations in the United Arab Emirates. This study did not indicate a good knowledge of participants towards the route of transmission and onset of symptoms but showed that majority of the participants relied on social media as their main source to obtain information about the pandemic. [14]

Based on our results, participants are aware of key preventive measures such as wearing masks and proper hand washing methods. It is important to consider that in the recommendation of the Ministry of Health of Malaysia (MOH), the government had encouraged and supported people to remain home and avoid unnecessary outdoor activities since the Movement Control Order had been established. The Ministry had also focused on providing preventive education for the nation in a wide range. In our study, the highest response was 99.4% with most participants viewing it sensible and justified for the government to forbid any mass gatherings including sport events or concerts. A survey was conducted among Iranian medical students in early April 2020. They also had similarly concluded that 30.8% of participants had high, 32.9% had moderate and 36.3% had low risk perception. [21]

Our study also highlighted the keen perception that our participants have on this novel coronavirus disease. Overall awareness on the disease impact on Malaysia was excellent with the majority of participants able to approximate the number of Malaysians infected and at risk of fatal illnesses. Students were also very responsive and compliant with government initiatives including the Movement Control Order (MCO) and Conditional Movement Control Order (CMCO). MCO which was implemented on 18 March 2020 involved several measures including prohibition of movement and mass assembly on a national scale and closure of industries excluding essential services. In a Susceptible-Infected-Removed (SIR) epidemiological model formulated among researchers in Malaysia, it suggested the MCO had been critical in reducing the number of susceptible population and number of infected cases collectively. Their research distinctively highlights the MCO's effectiveness where in the absence of MCO, the model forecasts a peak of infection on 1 May 2020 and a total of 1.6 million infected cases while post-MCO predictions detail a peak of infection on 10 April 2020 and a collective sum of 6562 infected cases. [31] Participants were generally adherent to the restrictions stated in both legislations with 98.9% in favour of closure of schools and 94.8% supportive of the public to remain in their homes unless the need for medical care or provisions arose. While the CMCO eased restrictions including permitting the public to dine at eateries following stringent standard operating procedures (SOPs), it was found most students were hesitant and 90.2% preferring to not frequent a restaurant during this turbulent period.

Limitations & Strengths:

The limitations of this project include a study sample which is relatively small at 106 MBBS students and 68 BDS students. Being a cross sectional study, we were unable to observe changes over time where knowledge might be moderate now but may increase with time as students learn and understand more about COVID-19. This study was conducted exclusively in one institution hence our results cannot be generalised into another setting or medical college.

Recommendations:

Deficient areas we observed in the knowledge of participants are unawareness regarding absence of universally approved antiviral drugs and signs and symptoms of COVID-19, thus pathology, signs, symptoms, treatment and prevention should be included into medical schools' curriculums to enhance medical students' knowledge and understanding of this recent disease. Medical students should regularly update themselves with developments of COVID-19 on the MOH or WHO website. [32] During the COVID-19 pandemic, medical students should function as learners to build altruism and service in time of crisis. As observed in our study, medical students are well equipped with the knowledge and do practice effective behaviours satisfactorily. Provided they fulfil the academic requirements of a final medical student, as evidenced in our study they are valuable assets in reducing the burden of more senior medical practitioners as they combat COVID-19 along with existing diseases.

5. Conclusion

In summary, we have observed that most medical and dental students in Malaysia have good and moderate knowledge about COVID-19 and none were poor with an overall mean of 81.5 (SD=6.3). Correspondingly, participants possess good attitudes and frequently practice preventive behaviours with a collective percentage of 85.7 on a 100-point scale. There were no observable factors that significantly influenced the knowledge, attitude and preventive behaviours of participants. Although the association is minute, heightened knowledge is linked to a better attitude and increased preventive behaviours. Medical students should keep abreast with all recent developments whether in vaccines or preventive behaviours regularly. We would recommend that medical universities use this opportunity to further educate students to widen their knowledge on not COVID-19 singularly but also practical skills in times of crisis and suggest that final year medical students be considered effective personnel to a country's medical infrastructure if they are to be mobilised early.

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Appendix: Questionnaire

COVID-19: Knowledge, Attitude and Preventive Behaviours of Medical and Dental Students in Malaysia

You are being invited to take part in a research project which aims to assess medical and dental students in their knowledge, perception, attitude and preventive behaviours in combating the novel COVID-19 pandemic.

This survey will ask for basic information without breaking anonymity. Data will be collected by using online survey questionnaire and this will take approximately 5-10 minutes. Participation in this study is voluntary and you have the right to deny and/or withdraw from the study at any time and there is no need to give a reason. Any information you provide is anonymous. Results of this study will be reported as a total collective and not individually.

Thank you very much for your participation.

Informed Consent: I consent to participate in the study as titled above on my own free will. I further understand that I have the freedom to choose not to participate in the study.

(a) I consent to participate in the study as titled above of my own free will

(b) I do not want to participate in this survey

Questionnaire

Section 1: Sociodemographic details

Q1. What is your age (years)?

Q2. What is your gender?

a) Male

b) Female

Q3. What is your nationality?

a) Malaysian

b) International students

Q4. What is your ethnicity?

a) Malay

b) Chinese

c) Indian

d) Other

Q5. Where do you live?

a) City area

b) Rural area

Q6. What programme are you studying?

a) MBBS

b) BDS

Q7. Which batch are you from?

a) MBBS

b) Batch 37

c) Batch 38

d) Batch 39

e) Batch 40

f) Batch 41

g) BDS

h) BDS 7

i) BDS 8

j) BDS 9

Section 2: Knowledge of COVID-19

1. The origin of COVID-19 is not clear but it seems that it has been transmitted to humans by sea foods, snakes or bats.

a) True

b) False

2. Only older adults can become infected with the new coronavirus.

a) True

b) False

3. Its incubation period is up to 14 days with a mean of 5 days.

a) True

b) False

4. It can be diagnosed by PCR test on samples collected from nasopharyngeal and oropharyngeal discharge or from sputum and bronchial washings.

a) True

b) False

5. What is the main way in which people are currently getting infected with the new coronavirus? Please select one response option only.

a) Eating or touching bats

b) Faecal contaminants in drinking water

c) Unhygienic preparation of food

d) Sexual intercourse or sharing needles for drug use

e) Mosquito bites

f) Droplets of saliva that land in the mouths or noses of people who are nearby when an infected person sneezes or coughs

g) Eating undercooked meat products

h) Directly coming into touch with someone's bodily fluids like blood, vomit or sweat

i) Snake bites or touching snakes

6. What are signs or symptoms of an infection with the new coronavirus? Please select 'True' or 'False' for each option.

Table 10. Signs and Symptoms of an Infection.

	True	False
Nose bleeds		
Cough		
Fever		
Aches and pain		
Sneezing		
Skin rash		
Shortness of breath		
Vomiting		
Runny nose		

7. Which of the following actions help prevent catching an infection with the new coronavirus? Please select 'True' or "False' for each option.

Table 11. Actions that Prevent Infection with COVID-19.

	True	False
Getting a vaccination against pneumonia		
Gargling mouthwash		
Washing your hands		
Eating garlic		
Avoid close contact with people who are sick		
Taking antibiotics		
Using a hand dryer		
Putting sesame oil on your skin		
Avoiding touching your eyes, nose and mouth with unwashed hands		
Regularly rinsing your nose with saline		

8. When they have been infected, what age groups are most likely to die from the illness caused by the new coronavirus?

a) Children

b) Young adults

c) Older adults

9. Are those with other health problems more likely to die from an infection with the new coronavirus disease than those

without any other health problems?

a) Yes

b) No

10. The disease can be treated by using antiviral drugs.

a) True

b) False

11. Is there currently a vaccine available that protects against infection with the new coronavirus?

a) True

b) False

Section 3: Perception of COVID-19

1. The population of Malaysia is approximately 31 million (31,000,000). What do you think is the number of people living in Malaysia who are infected with the new coronavirus? This number should include both those who have been diagnosed and those who have not been diagnosed.

a) 0

b) 1-100

c) 101-1,000

d) 1,001-10,000

e) 10,001-50,000

f) 50,001-100,000

g) 100,001-1 million

h) More

2. What percentage of people who get infected with the common flu end up dying from the common flu?

a) 0-20%

b) 21-40%

c) 41-60%

d) 61-80%

e) 81-100%

3. What percentage of people who get infected with the new coronavirus die from this infection? No one knows the correct answer to this, so please just give it your best guess.

a) 0-20%

b) 21-40%

c) 41-60%

d) 61-80%

e) 81-100%

4. The current population of Malaysia is approximately 31 million people. How many people in Malaysia do you think will die from the new coronavirus by the end of 2020?

a) 0

b) 1-100

c) 101-500

d) 501-1000

e) 1,001-10,000

f) 10,001-100,000

g) 100,001-1 million

h) More

5. Approximately how far do you think the new coronavirus can travel through the air (in metres) to transmit the infection from one person to another?

a) 0

b) 1-3

c) 4-8

d) 9-13

e) 14-20

f) More

6. Is the following statement true or false? Consistently wearing a face mask is highly effective in protecting you from getting infected with the new coronavirus.

For the purpose of this question, "highly effective" is defined as reducing your risk of getting infected by 95% and a "face mask" is a common medical mask.

a) True

b) False

7. Suppose that you see an adult in your neighbourhood who wears a face mask. What do you think is the probability (in percent from 0% to 100%) that he or she is infected with the new coronavirus?

a) 0-20%

b) 21-40%

c) 41-60%

d) 61-80%

e) 81-100%

8. Do you think you would not eat at a restaurant for the next few weeks to reduce the risk of getting infected with the new coronavirus?

a) Yes

b) No

9. Grab is a ride-sharing app that allows people to request and pay for a car ride via their phone. The Grab driver then either rejects or accepts the ride request.

If you were a Grab driver today, would you try to reject ride requests from people requesting rides to/from the hospital or clinic to reduce your risk of getting infected with the new coronavirus?

a) Always

b) Often

c) Sometimes

d) Never

10. Does receiving a letter or package from China put you at risk of getting infected with the new coronavirus?

a) Yes

b) No

11. If you have a fever or cough and recently visited China, or spent time with someone who did, what would be the best course of action?

a) Go to your primary care doctor, such as by taxi or public transport to avoid driving yourself

b) Have someone drive to the emergency room

c) Stay home and call your primary care doctor

d) Rest more than usual and then call your primary care doctor if you still feel sick after 2-3 days

12. Do you feel that the media coverage about this disease is exaggerated?

a) Yes

b) No

13. At this point in the coronavirus epidemic, do you think your government should implement the following measures to prevent the spread of the virus?

Table 12. Government Measures to Prevent Spread of COVID-19.

	Yes	No
Quarantine everyone coming in from abroad for 14 days		
Suspend all air travel to your country		
Go door to door to measure everyone's temperature		
Close all schools		
Forbid any mass gatherings (e.g. sport events or concerts)		
Make it mandatory for adults to wear a face mask while outdoors		
Require everyone to remain in their home except to seek medical care and obtain food		

14. Do you think it is likely that the new coronavirus is a bioweapon developed by a government or terrorist organization?

a) Extremely likely

b) Moderately likely

c) Slightly likely

d) Neither likely nor unlikely

e) Slightly unlikely

f) Moderately unlikely

g) Extremely unlikely

Section 4. Attitude and Preventive Behaviours

Table 13. Attitude and Preventive Behaviours Towards COVID-19.

Statement	Certainly no	Mostly no	Not sure	Probably yes	Definitely yes
1. When I meet my friends and colleagues, I usually greet them with a handshake.					
2. When I meet my friends and colleagues, I usually greet them with a hug.					
3. I cancelled or postponed meetings with friends, eating out and sport events.					
4. I reduced the use of public transportation.					
5. I avoided places where a large number of people are gathered.					
6. I wash my hands regularly and for enough period of time.					
7. I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces).					
8. I usually put a facemask to protect myself from the risk of infection.					
9. If I find that I contacted a person infected with the virus, I will inform the health authorities.					
10. If I have any of the symptoms associated with the disease, I will inform the health authorities.					
11. If I find that I contacted a person with the virus, I agree to be isolated at home for a certain period of time until it is proven that I am free from the disease.					
12. If I found that I contacted a person infected with the virus, I agree to be isolated at an isolation hospital for a certain period of time until it is proven that I am free from the disease.					

13. If there is an available lab test for detection of the virus, I am willing to do it.
14. If there is an available vaccine for the virus, I am willing to get it.
15. I usually follow the updates about the spread of the virus in my country.
16. I usually follow the updates about the spread of the virus worldwide.
17. If a lecture about the virus is organised near me, I am willing to attend it.
18. If protective measures and equipment are available at an affordable price, I will buy them.
19. I discussed COVID-19 prevention with my family and friends.

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