

Knowledge, Attitude, Practices, and Concerns of International Medical University Students Towards COVID-19 Vaccines

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ABSTRACT

The COVID-19 vaccination programme in Malaysia was launched in February 2021, and the government prioritized healthcare workers as the earliest group to receive the vaccination, including medical students. Vaccine hesitancy among the general population is a huge obstacle to making the immunization programme successful. A cross-sectional study involving medical students from International Medical University (IMU) including both the preclinical, and Clinical students was done. Knowledge, Attitude, Practices, and Concerns (KAPC) online questionnaires were used to gather data for the study. A total of 304 medical students responded to the questionnaire. 98% of the medical students have received both doses of COVID-19. The majority of IMU medical students believe that vaccines are useful in protecting them from infection as the reason they agree to take the COVID-19 vaccines. Clinical medical students are familiar with more vaccine brands compared to preclinical students. One-fifth of students think COVID-19 vaccines will give positive results on the COVID-19 RT-PCR test. Four-fifths of participants answered questions about the mechanism of action of inactivated virus vaccine correctly but only 26% of preclinical students and 18.8% of clinical students answered the mechanism of action of virus vector vaccine correctly. Most of them however know that over-the-counter pain medicine can be used after

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taking the COVID-19 vaccine, people can still get infected after taking the vaccine, long-term side effects are not common, and vaccines can be introduced to pregnant mothers.

The most chosen source of information to learn about COVID-19 vaccination among medical students is medical literature, followed by healthcare providers. We concluded that IMU medical students have a high awareness and vaccine acceptance rate.

INTRODUCTION

COVID-19 stands for Coronavirus Disease 2019 which is a respiratory illness caused by a novel coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2). It was first reported to the World Health Organization (WHO) on 31 December 2019 and declared a global pandemic on 11 March 2020 [1].

Fortunately, with the development of COVID-19 vaccines, herd immunity is possible to achieve in which a population is protected from this respiratory disease which is acquired either through vaccination or immunity from the previous infection. Herd immunity through vaccination is supported by the WHO instead of spreading the virus through the whole population as this would result in deaths, especially in the vulnerable and high-risk groups [2].

As of August 2022, 4 types of COVID-19 vaccines are successfully being administered in Malaysia. However, vaccine hesitancy is quite significant in Malaysia which poses a serious challenge to the COVID-19 vaccination campaign. Past vaccine experience, level of education and awareness, risk perception and trust, perceived relevance of vaccination, subjective norms, and religious and moral convictions are all factors that influence vaccination hesitancy [3].

However, there seems to be hesitancy among the general population in accepting COVID-19 vaccinations. There are many factors contributing to this, including misinformation, myths and conspiracies, and lack of knowledge regarding vaccines. Therefore, as future healthcare professionals, students need to be equipped with accurate knowledge and a positive attitude toward vaccines. Our research aimed to study the awareness, knowledge, and behavior of medical students toward the COVID-19 vaccine, particularly at our place of study which is the IMU.

Several studies have been conducted all over the world to study the KPAC regarding the COVID-19 vaccine that led to hesitation or acceptance of the vaccine. Investigating these components among university students in the healthcare department is crucial because medical students are likely to be exposed to COVID-19 infection during their medical practice and to some extent, medical students can influence public acceptance towards vaccination as in the future they are the ones that will shoulder the responsibility of providing health care service and promoting public health.

The KAPC shows knowledge is the basis of behavior change, attitudes, and beliefs are the motive force of behavior change. WHO mentioned in the report on Behavioral Considerations for the Acceptance and Uptake of COVID-19 vaccines, three strategies that increase vaccine acceptance effectively are creating an enabling environment by making it accessible in all relevant aspects, tackling social influences, especially from groups of people in the communities that are particularly trusted, and increase motivation by having effective communication on the safety and efficacy of the vaccination [4].

A study conducted at Southeast Michigan, USA involving medical students, it was found that approximately 98% of the respondents agreed with the importance of developing a COVID-19 vaccine to decrease community spread. Although 98% of students agreed they would likely be exposed to COVID-19, only 53% indicated they would participate in a COVID-19 vaccine trial and 23% of students were unwilling to take a COVID-19 vaccine immediately upon Food and Drug Administration (FDA) approval [5].

In China, online survey among university students shows there is a strong correlation between vaccination acceptance and the adequacy of information about the vaccine. The awareness rate of the vaccine is higher among medical students compared to non-medical students due to a better understanding of the necessity, mechanism of action, effectiveness, and safety of the vaccine [6].

Nursing students in China show satisfactory vaccination acceptance of 84.38%. Some significant influencing factors that influence them are gender, academic background, visits to high-risk areas, vaccination status of family members, and side effects experienced after receiving other vaccines. Those who are reluctant are male students, younger age groups, those with low grades, those who have experienced adverse effects from other vaccines, and those whose family members are anti-vaccine [7].

Besides that, an online questionnaire with the involvement of 1068 participants from medical schools across 22 states in India. The result showed that 689 students (64.5%) had already taken the vaccine and 266 (24.9%) were yet to receive the vaccine. Only 113 students (10.6%) among the medical students were troubled with vaccine hesitancy due to a lack of awareness of medical students regarding their COVID-19 vaccine eligibility, concern regarding vaccine safety and efficacy, and lack of trust in public health authorities. Most of them are willing to take the COVID-19 vaccine so they can resume their clinical posting, and face-to-face classes and get their personal life back on track. Three-fourths of medical students viewed that the COVID-19 vaccine should be made mandatory for both healthcare workers [8].

In the United States, a study done among dental and medical students shows vaccine hesitancy of 45% among dental students and 23% among medical students. Dental students decided not to get vaccines in general and the majority are concerned that the vaccine may not be effective and are only willing to be vaccinated if vaccination is made

mandatory for healthcare professionals. The lower acceptance was also because they have the perception that infection control procedures at their training place are enough to protect them from being infected [9].

In Malaysia, there was one study involving the general public's knowledge of the COVID-19 vaccine by Mohamed NA et al. (2021) shows that 62.0% of the respondents had poor knowledge about the COVID-19 vaccine and 64.5% were willing to get the vaccine despite having inadequate knowledge and information, most of the respondents are still willing to get vaccinated. The data shows they were more likely to accept the vaccines when they were in younger age groups, had higher education levels, and were female [10].

METHODOLOGY

Study design and setting.

A cross-sectional study was carried out from September 2021 to November 2021 among IMU, medical students in Malaysia.

Sample size and sampling.

The target sample of this study was 297, so we decided to recruit medical students including all ethnic groups (Malay, Chinese, Indian, and others).

Inclusion and exclusion criteria

All students from semesters 1 to 10 who were enrolled in the MBBS course were included except for students who were enrolled in other courses such as Dentistry, Psychology, Pharmacy, Nursing, etc.

Questionnaires

An online K questionnaire in the English language was used to gather data for the study, and the information and consent sheet was inserted into the front page of the questionnaire. The questionnaire consists of two sections.

- A. Sociodemographic profile (current semester, gender, and COVID vaccination status)
- B. The KAPC questionnaire has Cronbach's alpha coefficient of 0.86, which suggests good internal consistency.

Statistical analysis

Once the data was collected, the questionnaires were coded. Data was entered into Microsoft Excel and exported into Statistical Package for Social Science (SPSS) version 25.0 for statistical analysis. The sociodemographic factors of the participants were

analyzed using descriptive statistics such as mean, median, standard deviation, and percentages when appropriate.

Descriptive statistic was utilized for analyzing the categorical variables, which are the socio-demographic, vaccination status of the students, and their KAPC towards COVID-19 Vaccines.

The correlation between sociodemographic factors and KAPC toward COVID-19 vaccines was determined using the Chi-square test. A p-value of <0.05 will be considered statistically significant.

RESULTS

Personal Details

We originally intended to recruit 297 IMU students. However, we received 304 responses, 150 students were from the Preclinical phase, and 154 students were from the clinical phase (Table 1), Males occupied 53%, and females occupied 47%,

Vaccination status and their opinion

Most of the students received both doses at the date of the questionnaire given. 54% of Preclinical students and only 44% of clinical students think the COVID-19 vaccine is legally mandatory in their opinion. The number of clinical phase students who answered it is not mandatory 51.9% more than preclinical 34.6% (Table 1). There are some similarities in their opinion regarding the people eligible to take the vaccine. Almost a similar number of students think infants < 1 year of age are not eligible, while children and adolescents < 18 years of age are eligible. Both clinical and preclinical students agreed that adults > 18 , pregnant and lactating mothers, Patients with chronic disease, and persons recovered from COVID-19 are eligible. However, an immune-compromised patient is hesitant, 78 (52%) preclinical students say no, while only 49 (31.8%) students from clinical say NO. 116 (77.3%) of preclinical students and 134 (87%) of clinical students strongly disagree with the statement as shown in Table 2.

Table 1: Students' numbers, and Vaccinations status

	Preclinical	Clinical	Total
Number	150(49.3%)	154(50.7%)	304
Have you received the COVID-19 vaccine?			
First dose	5	0	5
Second dose	145	154	299
Is it legally mandatory to take the COVID-19 vaccine?			
Yes	82(54%)	68(44.1%)	150
No	52(34.6%)	80(51.9%)	132
Don't know	16	6	22

Table 2: people who may or may not be eligible for taking COVID-19 vaccine.

		Preclinical	Clinical
Infants <1 years of age	eligible	4	3
	Not eligible	118	133
	Don't know	28	18
Children and adolescents <18 years of age	eligible	132	145
	Not eligible	6	6
	Don't know	12	3
Adults ≥18 years	eligible	149	153
	Not eligible	1	1
	Don't know	0	0
Pregnant ladies and lactating mothers	eligible	121	137
	Not eligible	19	6
	Don't know	10	11
Patients with chronic diseases like diabetes, hypertension and heart diseases	eligible	121	164
	Not eligible	15	5
	Don't know	14	4
Persons with active COVID-19 infection	eligible	47	36
	Not eligible	77	94
	Don't know	26	24
Persons recovered from COVID-19 infection	eligible	137	143
	Not eligible	9	6
	Don't know	4	5
Persons allergic to food items/ drugs	eligible	69	105
	Not eligible	45	34
	Don't know	35	15
Immunocompromised patients	eligible	32	89
	Not eligible	78	49
	Don't know	40	16

Awareness of different types of vaccines

Almost all students from either group are aware of Pfizer, AstraZeneca, and Sinovac. However, only a quarter of students are aware of Covishield. Students from the clinical phase appeared to have more awareness of the fact that a significantly higher percentage of students are heard of Sinopharm and Johnson & Johnson Vaccines compared to Preclinical students. One-fifth of both groups think the vaccine will cause a positive result on polymerase chain reaction (PCR) or antigen test, half of the students say no, while the remaining remain unsure (Table 3).

Table 3: Awareness of different Vaccines

		Preclinical	Clinical
Pfizer/BioNTech Comirnaty	Yes	150	154
	No	0	0
SII/Covi Shield	Yes	34	37
	No	116	117
AstraZeneca	Yes	146	152
	No	4	2
Johnson & Johnson	Yes	106	125
	No	44	29
Moderna	Yes	118	130
	No	32	24
Sinopharm	Yes	66	94
	No	84	60
Sinovac - CoronaVac	Yes	143	150
	No	7	4
Can the COVID-19 vaccine cause a positive test result for the disease, such as for a PCR or antigen test?			
	Yes	30	33
	NO	75	91
	Not Sure	44	30

Knowledge regarding the COVID-19 vaccine

Four-fifths of students from both groups, said inactivated virus vector vaccines generate an immune response by the weakened virus, which is the correct answer, while the remaining students answered wrongly. However, for other options of the mechanism of action 26% of preclinical students, and only 18.8% of clinical students answered correctly. Almost all students from both categories say Over-the-counter pain medicine can be used after taking the COVID-19 vaccine, and people can still get infected after taking the vaccine. On the other hand, long-term side effects are not common, and the vaccine can be introduced to pregnant mothers, in their opinion (Table 4).

Table 4: Mechanism of actions of different Vaccines

		Preclinical	Clinical
Inactivated virus vaccines generate immune response by			
A form of inactivated/weakened virus.		112	124
using harmless fragments of proteins or protein shells mimicking the COVID-19 virus		13	12
using a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins		10	8
using genetically engineered RNA or DNA to generate antibodies		3	6
Not sure		12	4
Viral vector vaccines generate immune responses by:			
a form of inactivated/weakened virus.		6	9
using harmless fragments of proteins or protein shells mimicking the COVID-19 virus		67	85
using a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins		45	29
using genetically engineered RNA or DNA to generate antibodies		11	16
Not sure		21	15
You can take over-the-counter pain medicine after you get a COVID-19 vaccine			
	True	131	142
	False	6	6
	Not Sure	12	6
Long-term side effects of COVID-19 vaccines are common.			

Preclinical Not Sure 12	Clinical 6	True	21	8
		False	100	114
		Not Sure	29	32
You can still get COVID-19 even if you've received a COVID-19 vaccine				
		True	146	154
		False	2	0
		Not Sure	2	0
COVID-19 vaccines are not recommended for pregnant people.				
		True	14	13
		False	117	120
		Not Sure	19	21
Pfizer/BioNTech Comirnaty is a ----vaccine				
		Viral Vector	9	6
		mRNA	125	138
		Inactivated Virus	16	10

Sources of information and their opinion

Preclinical students were influenced by the news from TV/ Radio and social media such as Facebook, Instagram, and other applications more than the Clinical students group. Many students are willing and ready to receive the COVID-19 vaccine when their turn arrives. For students who choose to disagree or firmly, the reason given is fear of adverse effects and unavailability. Most students from both groups strongly disagreed with acquiring immunity against COVID-19 naturally without taking the vaccine, and they are even willing to pay for the vaccine if needed. Almost all students agreed that they would recommend their family and friends to get vaccinated (Table 5).

Table 5: Sources of information that influenced opinion regarding vaccination.

		Preclinical	Clinical
News from TV/Radio	Insignificant	13	25
	Somewhat significant	71	100
	Very significant	66	29
Government agencies	Insignificant	6	10
	Somewhat significant	67	76
	Very significant	77	68
Social media (Facebook, Instagram, WhatsApp)	Insignificant	10	25
	Somewhat significant	54	66
	Very significant	86	63
Discussion amongst friends and family	Insignificant	24	30
	Somewhat significant	81	95
	Very significant	45	29
Medical literature	Insignificant	5	3
	Somewhat significant	32	35
	Very significant	113	116
Healthcare provider	Insignificant	7	3
	Somewhat significant	37	42
	Very significant	106	109
Others (e.g., NGO)	Insignificant	32	30
	Somewhat significant	87	106
	Very significant	31	18

Reasons behind taking the vaccine

A significantly large number of students agree that there is no harm in taking the vaccine; they believe that it will help protect them from infection, and they are aware of the free vaccine. Twenty-two preclinical and 34 clinical students remained neutral when they were asked if they were being recommended by their doctors, while the rest of the students agreed. Similar percentages of preclinical and clinical students think the benefits outweigh the risks, taking the vaccine is a social responsibility, and sufficient data shows vaccines are safe (Table 6). Furthermore, they agree that many people are taking the vaccine around them, and students agree that getting the vaccination will help eradicate COVID-19 infection globally. On the other hand, 13% of preclinical and 10% of clinical students disagree that role models, political leaders, and senior doctors have taken the vaccine, 22% and 17.5% of preclinical, and clinical students respectively remain neutral, while the rest agree.

Table 6: Reasons for taking the vaccine.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I think there is no harm in taking COVID-19 vaccine					
Preclinical	4	1	15	54	76
Clinical	6	5	16	72	55
I believe the COVID-19 vaccine will be useful in protecting me from the COVID-19 infection					
Preclinical	3	0	3	42	102
Clinical	5	2	3	52	90
COVID-19 vaccine is available free of cost					
Preclinical	2	0	9	51	88
Clinical	4	3	7	60	80
My healthcare professional/doctor has recommended me					
Preclinical	2	1	22	51	74
Clinical	4	0	34	62	54
I feel the benefits of taking the COVID-19 vaccine outweigh the risks involved					
Preclinical	2	0	5	49	94
Clinical	4	0	7	59	84
I believe that taking the COVID-19 vaccine is a social responsibility					
Preclinical	4	0	4	39	102
Clinical	3	0	6	44	99
There is sufficient data regarding the vaccine's safety and efficacy released by the government					
Preclinical	2	4	15	58	71
Clinical	7	2	26	52	67
Many people are taking the COVID-19 vaccine					
Preclinical	2	0	8	55	85
Clinical	4	4	19	6	121

DISCUSSION

Socio-demographic of the sample size

The setting of our study covers all medical students at IMU including Semester 1 to Semester 5 students in Bukit Jalil, Semester 6 to Semester 9 in Seremban, and Semester 10 students in Batu Pahat and Kluang. 304 IMU medical students have participated in this study. Among these students, 49.34% of them are in preclinical years while 50.65% are in clinical years with all of them consenting to participate in this study.

Vaccination Status and their Opinion

98% of the study groups have received both doses of COVID-19 vaccine with 47% of them being preclinical students and 54% of them being clinical students (Table 1). This suggests a satisfactory rate of acceptance and awareness among IMU medical students as they are taking steps to get vaccinated and have consented to it, which could imply they have the knowledge and adequate information on the importance of COVID-19 vaccines in helping eradicate this infectious respiratory virus. It is a common perception to think that medical students are literate in such matters in comparison to non-medical students. Based on a study done in China to assess the knowledge of their medical students about the vaccine, 70.1% of them have satisfactory knowledge and accept COVID-19 vaccines [6]. We could postulate the fact that medical students have a better understanding of the mechanism of vaccines, as well as their efficacy and safety. Hence, the reason most medical students are completely vaccinated.

It is understood that being vaccinated as a medical student serves as a protective factor against COVID-19 infection because even if they are not a licensed medical professional yet, they still participate in ward duties and come into direct contact with patients daily. Especially those in clinical years with risks of more exposure in the clinical setting. Hence, to create a safer environment for medical practice.

Knowledge and Awareness about COVID-19 vaccines

Most of the study groups believe that taking the covid vaccine is legally mandatory while there was also a considerable number of students who thought it was not (Table 1). In September 2021, the Malaysian government was annoyed that the COVID-19 vaccination is mandatory for governmental employees, as no law disallows mandatory vaccination policies to be imposed by employers. As the COVID-19 pandemic is relatively new, there are no reported court cases on the legality of mandatory vaccination policies in Malaysia [11].

About knowledge on who is eligible to take the COVID-19 vaccine and who is not. Most students think that children and adolescents <18 years, adults >18 years, pregnant ladies and lactating mothers, patients with chronic illnesses (e.g. Diabetes, Hypertension, Heart disease), people recovered from COVID-19 infection, people allergic to food or drugs are eligible to take the vaccine while infants < 1 year of age, people with active covid 19 infection and immunocompromised patients are not (Table 2).

According to WHO, there are very few conditions that would exclude someone from being vaccinated, which include having a history of severe allergic reactions to any of the ingredients of the vaccine, having a fever over 38.5°C on the day of your vaccine appointment, and if you currently have confirmed or suspected COVID-19. Centers for Disease Control and Prevention (CDC) recommends that all children 6 months through 5 years of age should receive the vaccine [12].

So, infants less than 1 year of age can still get vaccinated. Since having a weak immune system puts you at higher risk of serious illness if you get COVID-19, getting vaccinated will give you some protection against this. So, it is a false statement that immunocompromised people are not eligible to take the vaccine. Immunocompromised people are recommended an mRNA vaccine (Pfizer or Moderna) for the first 2 doses and should get an additional dose after this, followed by a booster.

Almost 82% of the students strongly disagree with the fact that after getting the vaccine, they don't need to follow preventive measures such as wearing a face mask, sanitization, and social distancing. WHO recommends that even after getting vaccinated, we should keep taking precautions to protect ourselves, our family, and friends if there is still COVID-19 in our area. So, it's good that most students are aware of the consequences they might face if they don't take enough precautions to prevent themselves from getting the COVID-19 virus.

Almost all the students were aware of the Pfizer vaccine, and other COVID-19 vaccines such as AstraZeneca, Johnson & Johnson, Moderna, Sinopharm, and Sinovac-CoronaVac but were not aware of the SII/Covishield vaccine (Table 3). Around 54 % of the students believe that covid vaccine will not cause a positive result and 20% of the students think it will while the rest were not sure about it. The answer is No; the COVID-19 vaccine will not cause a positive test result for a COVID-19 PCR or antigen laboratory test. This is because the tests check for active disease and not whether an individual is immune. However, because the COVID-19 vaccine prompts an immune response, it may be possible to test positive in an antibody (serology) test that measures COVID-19 immunity in an individual.

Most of the students agreed that the inactivated virus vector vaccine generates an immune response in the form of an inactivated/weakened vaccine and the viral vector vaccine generates an immune response by using harmless fragments of proteins or protein shells mimicking the COVID-19 vaccine, which is true. According to WHO, Inactivated or weakened virus vaccines use a form of the virus that has been inactivated or weakened so it doesn't cause disease but still generates an immune response, and viral vector vaccines use a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins to generate an immune response.

Most of the study groups agreed that Pfizer/BioNtech cormirnaty is an mRNA vaccine which is true as well (Table 4).

We also assessed their knowledge of some general facts regarding the COVID-19 vaccine. Most students agreed on the fact that you can take over-the-counter pain medication after the vaccination and that you can still get COVID-19 even if you have received the vaccine while most of them disagreed on the fact that long-term side effects of the COVID-19 vaccine are common and COVID-19 vaccine is not recommended for pregnant ladies. Like with any vaccine, some people will experience mild to moderate side effects after being vaccinated against COVID-19. This is a normal sign that the body is developing protection (Table 4).

Most side effects go away within a few days on their own. More serious or long-lasting side effects are possible but extremely rare. According to WHO, it has been stated that while the vaccines are highly effective against serious illness, hospitalization, and death, no vaccine is 100% effective. As a result, some vaccinated people will get infected and may fall ill with COVID-19 despite being fully vaccinated. While there is less data available on the vaccination of pregnant people, evidence on the safety of COVID-19 vaccines during pregnancy has been growing, and no safety concerns have been identified. During pregnancy, mothers are at higher risk of serious illness caused by COVID-19. They are also at higher risk of delivering their baby prematurely if they contract COVID-19. So it has been advised to all pregnant mothers that they should get the COVID-19 vaccines unless they have any contraindications.

From the responses that we have gathered, we can conclude that most of the students have a good understanding and knowledge about the COVID-19 vaccines and are aware of the possible consequences of not taking the vaccine.

Source of Information and their Opinion

About 75% of both study groups chose medical literature as their source of information, followed by healthcare providers as the second most chosen source of information in which 71% of both groups chose this source as very significant. This is such because medical students know how and where to look for information regarding the mechanism, safety, and efficacy of COVID-19 since they have proper accessibility and a sense of familiarity with reliable and updated medical books, journals, research, and health information. They also have the IMU Library electronic Portal, which is a privilege provided by IMU to their students for academic purposes, so IMU students have easy access to digital libraries of subscribed e-books, e-journals, and medical databases. The third most chosen source of information is social media such as Instagram, Facebook, or WhatsApp which was chosen by 57.33%, and 40.9% of preclinical and clinical students respectively (Table 5). This might be because most IMU medical students belong to a younger age group and this category has a massive use of social networks.

At Norbert Wiener University (UNW) medical school in Peru, medical students often use scientific articles and audiovisual resources such as documentaries and YouTube as scientific search sources. In addition, Google was the most widely used source of scientific advice followed by Scientific Electronic Library Online (SciElo) and Google

Scholar. Another study among Peruvian medical students showed that the most consulted sources of information were university libraries (33%), SciELO (26%), and PubMed (22%) [13].

While for the students of the National University of San Marcos, Peru, the most used information engines were SciELO (72.3%), PubMed (71%), and Google Scholar (91%). On the other hand, among Paraguayan students, the most frequently used sources were Google (82%), SciELO (56%), and PubMed (31%). These findings placed Google, SciELO, and Google Scholar as the principal search sources in all academic years, coinciding with these studies [13].

Attitude Towards COVID-19 Vaccine

99% of the study groups decided to take the vaccine because it was their own decision. However, besides that, there are other influencing factors such as the opinions and thoughts of their family and friends, the Ministry of Health Malaysia (MOH), social media, and institutions. 8.7% of preclinical years and 10.4% of clinical year students chose the MOH as one of the influencing factors for them to take the vaccine.

In comparison to other studies on factors impacting the vaccination attitude, in the Philippines, at Centro Escolar University, the students strongly agreed that their school had deliberately discussed the advantages of getting vaccinated and they are equipped with basic sciences since they have obtained basic courses in clinical chemistry, microbiology, pharmacology, and immunology. Therefore, they understood the mechanism of action and were more aware of the benefits of the vaccine. Medical students or those who come from medical backgrounds showed a more favoured attitude toward vaccination. [14].

However, in our study, some students disagree with taking the COVID-19 vaccine and mostly fear the adverse effects. Some of them worry about the unavailability of the vaccine and some other reasons which are not stated. Only a couple of them disagree with the vaccine because of inaccessibility and cultural and religious reasons.

A survey involving 612 medical students from 6 universities in Wuhan, China. It was found that a total of 58.2% of medical students reported vaccine hesitancy. The most common reasons for this were worrying about the side effects of vaccines (44.4%), uncertainty about vaccine safety (40.4%), and underestimating the risk of exposure to COVID-19 (27.9%). The main factors associated with COVID-19 vaccine hesitancy among participants were their knowledge about the COVID-19 vaccine, training related to COVID-19 vaccines, family address, and education level [6].

In our questionnaire, students were asked about natural immunity which the antibody protection is produced by our bodies once we have been infected with a virus. The majority of IMU Medical Students strongly disagree with this method of acquiring immunity. Herd immunity in a natural way will result in more death, especially in vulnerable and high-risk groups, hence why herd immunity via vaccination is more supported according to the WHO.

In a study in multiple universities in Saudi Arabia from different years of medical school to explore the knowledge and attitudes of 1445 participants toward the vaccine. 79.1% (n:1143) of the medical students, agreed on the importance of developing a COVID-19 vaccine to decrease its community spread [15].

COVID-19 vaccination is free for all people living in Malaysia, including foreign workers. However, to assess the students' attitude towards the vaccines, we questioned them about their willingness to pay for the COVID-19 vaccine, and most of the students agreed to get vaccinated even though it might require them to pay. 97% of the participants were willing to recommend COVID-19 vaccines to their friends and families.

Most students believed that it was a social responsibility to take the vaccine, and 95% of them agreed that the vaccine gives us protection against COVID-19. Even though only 62% of the participants believed that there were no risks associated with taking the COVID-19 vaccine, 94% of the participants believed that the benefits of immunity acquired via administering the vaccine exceeded any potential risks involved with it (Table 6). This might perhaps be due to the profound knowledge that students have regarding vaccines and their effectiveness.

The increased knowledge regarding vaccines is likely to influence the attitude of the students towards them. Other significant reasons why participants took the COVID-19 vaccine included the fact that most of the population was being vaccinated and because it was recommended by their healthcare professionals. This further emphasizes the need to provide relevant and trustworthy sources of information to healthcare professionals, as it seems to directly influence the attitude of people towards vaccines.

CONCLUSION

Medical students have adequate knowledge, awareness, and acceptance of COVID-19 vaccines as they are also representative of medical professionals. This research can be useful to help in the management strategy for immunization programmes in the future. Medical literature is the main source of information to learn about the COVID-19 vaccine, followed by healthcare providers as the second most chosen source of information.

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