

ORIGINAL ARTICLE

KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS COVID-19 VACCINATION AMONG MEDICAL STUDENTS AT A PRIVATE UNIVERSITY IN MALAYSIA

Wong Jian Yao, Louis Tan Tze Yue, Chiu Ing Pin, Phoo Kai Ling, Tan Chun Yoong and Mohamed Hashim bin Mohamed Hassan

Faculty of Medicine and Health Sciences, UCSI University, 21600 Marang, Terengganu Darul Iman, Malaysia.

Corresponding author: Wong Jian Yao
Email: nicholas_jianyao97@hotmail.com

ABSTRACT

Malaysia has a nationwide COVID-19 vaccination programme to curb the COVID-19 pandemic. Medical students must help provide information about COVID-19 vaccination to the public. This study assessed the knowledge, attitude, and hesitancy towards COVID-19 vaccination among medical students. An online-based study was conducted involving 156 medical students at a local private university. Sociodemographic characteristics, knowledge, attitude, and vaccination hesitancy were collected. Vaccine hesitancy was considered in respondents who were not registered yet for COVID-19 vaccination and based on the uncertainty of their likelihood to register in future. Our research findings highlighted that insufficient knowledge and negative attitude may lead to COVID-19 vaccine hesitancy/refusal. 25% of our study population who were COVID-19 vaccine hesitant/refusal demonstrated insufficient knowledge (69.2%) and negative attitude (64.1%) towards COVID-19 vaccination. Nevertheless, 75% of the students have registered for COVID-19 vaccination, and most of them have good knowledge (59.8%) and showed positive attitude (58.1%) towards COVID-19 vaccination. Vaccination educational programmes focused on improving knowledge and cultivating positive attitude, should be conducted to maximise vaccine acceptance among medical students.

Keywords: COVID-19 Vaccine, Knowledge, Attitude, Hesitancy, Medical Students

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has adversely affected the world. Malaysia has rolled out its three-phased National COVID-19 Immunisation Programme since February 2021¹. As of April 2021, only about one-third of the Malaysian adult population have registered for COVID-19 vaccination². Furthermore, the registration for COVID-19 vaccination has plateaued at half of the national population as of 7 June 2021³. These could indicate that vaccine hesitancy may be a major factor in the general population, which may ultimately jeopardise the government's efforts in limiting the spread of COVID-19. Vaccine hesitancy is a common global phenomenon and has been listed by WHO as one of the top ten threats to global health in 2019⁴. It is defined as 'delay in acceptance or refusal of vaccine despite availability of vaccination services'⁵. Attributed to the newness of COVID-19 vaccine, resources about vaccine hesitancy among medical students remained limited.

Weigel et al. noted on a significant correlation of healthcare providers' attitude with higher vaccination coverage rates⁶. Medical students as future healthcare providers are knowledgeable on vaccination as an important public health measure in controlling communicable diseases like COVID-19. Medical students' acceptance of COVID-19 vaccination could be a key to realising effective risk communication and health

education to their family, friends, and relatives, and thus building public trust⁷. A research group has recently studied 2133 participants from five medical colleges in Egypt, nearly half of their study population was vaccine hesitant⁸. Another recent study at a Southeast Michigan medical school has shown that most medical students acknowledged the importance of vaccination, but however about one quarter of the study population was hesitant in receiving COVID-19 vaccination⁹.

This study aimed to assess the knowledge, attitude, and hesitancy towards COVID-19 vaccination among medical students in Malaysia. The outcome of this study could potentially help informing key stakeholders in performing necessary reviews on the on-going nationwide COVID-19 vaccination programme and in developing more comprehensive vaccination education for medical students.

METHODOLOGY

This is a descriptive cross-sectional study involving all current medical students at a private university in Malaysia. Universal sampling was used. A total of 202 medical students (pre-clinical and clinical) were targeted, of which the student researchers of the present study had been excluded to avoid potential bias. Students were asked to complete a self-administered online questionnaire.

Study Instrument

The study used a set of pretested and face validated questionnaire that was constructed based on previous studies^{10,11} and resources from local¹ and international^{12,13} health authorities, and that was contextualised for respondents in Malaysia. The questionnaire comprised four sections, which are (1) sociodemographic profile, (2) knowledge about, (3) attitude towards, and (4) registration status of, COVID-19 vaccination.

Both knowledge and attitude were assessed using 10-item questionnaire, respectively. Under knowledge section, each item was given 3 options Yes/No/Not sure, and only correct answer was awarded 1 point. For attitude section, a 3-point Likert scale with options Strongly disagree/Neutral/Strongly agree was used. Responses which encourage COVID-19 vaccination (positive attitude) were awarded 3 points; neutral responses were given 2 points; and responses

which discourage COVID-19 vaccination (negative attitude) were given 1 point. The range of total scores were 0-10 points for knowledge and 10-30 points for attitude. Then, respective mean scores were generated and respondents who scored above the mean score were considered as having good knowledge/positive attitude and below the mean score as insufficient knowledge/negative attitude. An additional 5 items regarding factors (social media, mandate, cultural belief, parents, peers) influencing respondents' COVID-19 vaccine uptake were incorporated under attitude section and questioned using 3-point Likert scale.

Registration status was assessed by two filter questions whether the respondents and their parents have registered for COVID-19 vaccination, respectively. No/Not sure responses would have to answer a subsequent question. Vaccine acceptance, hesitancy and refusal were then operationalised based on the responses, as stated in Table 1.

Table 1 Operationalisation of vaccine acceptance, hesitancy and refusal.

	1. *Are you registered for Malaysia's National COVID-19 Vaccination Programme? (Yes/No)	2. Will you register for Malaysia's National COVID-19 Vaccination Programme? (Yes/No/Not sure)
Vaccine Acceptance	Yes	-
Vaccine Hesitancy	No	Yes/Not sure
Vaccine Refusal	No	No

*Filter question

Data Analysis

Data was collected using online Google form that was made available from 27 to 31 March 2021. The Google form link was shared to WhatsApp group chats and daily reminders were given. Google account sign-in was required to avoid repeated entries. SPSS software version 27.0.1.0 was used to analyse data. Descriptive statistics (frequency and percentage for categorical variables and mean (SD) for continuous variables) were used to find out population characteristics, knowledge, attitude, and hesitancy towards COVID-19 vaccination. Pearson's chi-squared test was used for analysis and *p* values below 0.05 were considered statistically significant.

Ethics Approval

The university's Institutional Ethics Committee approved the study (reference code: IEC-2021-FMHS-021). Participants' informed consent was obtained, and they were given the liberty to refuse consent to participate or to pull out from the study any time. All information from the questionnaire was kept confidential.

RESULTS

Out of 202 medical students, we collected 156 responses with a response rate of 77.23%. Table 2

shows the sociodemographic profile of the respondents. The study population was predominated by females (64.7%) and with mean age of 22.56 ($\sigma=2.00$). Majority of the respondents were Malaysian (84.0%), Chinese race (53.2%) and were currently in their clinical years of study (64.1%).

Our study showed that three quarter (n=117, 75.0%) of the medical students have registered for Malaysia's national COVID-19 vaccination programme, of which we considered as definite vaccine acceptance (Figure 1). Meanwhile, one-fifth (n=32, 20.5%) exhibited vaccine hesitancy for they either had the intention but not registered yet for COVID-19 vaccination, or they were unsure of registering or not. A minority (n=7, 4.5%) of medical students indicated that they did not register for COVID-19 vaccination and would not do so in the future, were grouped under definite vaccine refusal.

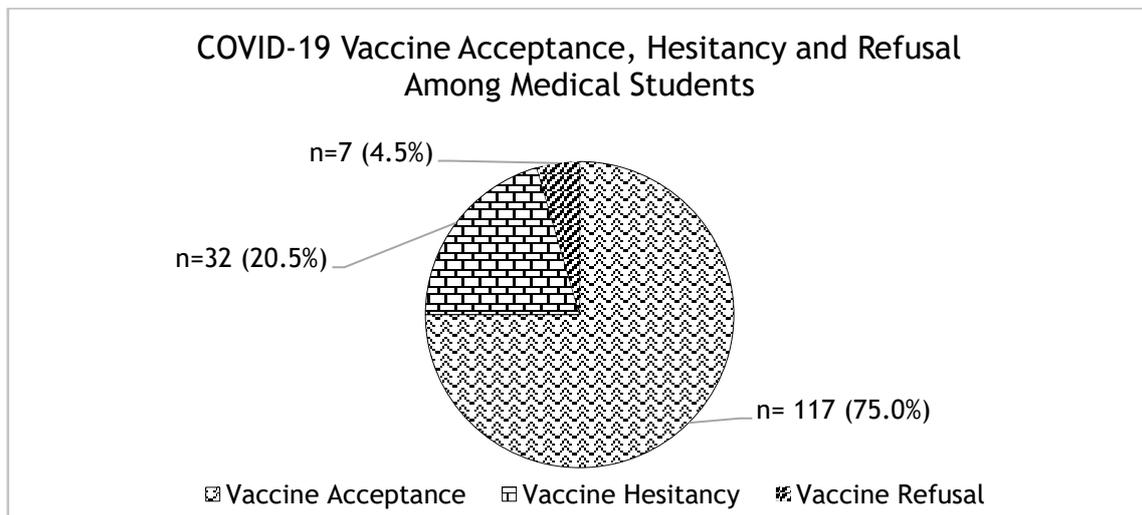
From the above result, we expanded our analysis based on two groups - vaccine acceptance (VA) and vaccine hesitancy/refusal (VH/R) - for a more convenient interpretation. Table 3 shows a list of correct responses for knowledge about COVID-19 vaccination and positive responses for attitude towards COVID-19 vaccination.

Table 2 Sociodemographic profile of medical students (N=156).

Variables	Frequency	Percentage (%)
Age*	22.56 (2.00)	
Gender		
Male	55	35.3
Female	101	64.7
Race		
Chinese	83	53.2
Indian	29	18.6
Malay	15	9.6
Others	29	18.6
Religion		
Buddhism	50	32.1
Christian	40	25.6
Islam	39	25.0
Hindu	21	13.5
Others	6	3.8
Nationality		
Malaysian	131	84.0
International	25	16.0
Current posting		
Preclinical (Year 1,2)	56	35.9
Clinical (Year 3,4,5)	100	64.1

*Mean (Standard Deviation)

Figure 1 COVID-19 vaccine acceptance, hesitancy and refusal among medical students (N=156).



Majority (71.8 - 94.0%) of respondents from both VA and VH/R answered correctly regarding the knowledge about COVID-19 vaccination. Most respondents strongly agreed that COVID-19 vaccination is generally important to stop the spread of the disease (VA=84.6%, VH/R=66.7%) and is important for them as medical students

(VA=87.2%, VH/R=64.1%). More than half (53.8 - 66.7%) of the respondents in VA strongly disagreed that they were influenced by external influences like mandate, cultural beliefs, family or peers. Less than half from both VA (47%) and VH/R (17.9%) strongly disagreed that their decisions on vaccine uptake were influenced by social media.

Table 3 Correct responses for knowledge about COVID-19 vaccination and positive responses for attitude towards COVID-19 vaccination between vaccine acceptance (n=117) and vaccine hesitancy/refusal (n=39).

	Vaccine Acceptance n (%)	Vaccine Hesitancy/Refusal n (%)
Knowledge about COVID-19 vaccination		
There are different types of COVID-19 vaccine acquired by the Malaysian government (e.g. Pfizer, AstraZeneca, Sinovac, CanSinoBio, Sputnik V). [True]	107 (91.5)	28 (71.8)
There are vaccines other than the COVID-19 vaccine (such as BCG vaccine) that help protect me from COVID-19. [False]	71 (60.7)	13 (33.3)
COVID-19 vaccine can make me infected with COVID-19. [False]	87 (74.3)	23 (59.0)
After getting a COVID-19 vaccine, I will be tested positive for COVID-19 on a viral antigen and PCR test. [False]	60 (51.3)	17 (43.6)
COVID-19 vaccines interact with the immune system to produce an immune response similar to that produced by the natural infection, but they do not subject the recipient to the disease and its potential complications. [True]	106 (90.6)	29 (74.4)
Some side effects of the COVID-19 vaccine that have been reported are fever, pain/swelling/redness at the injection site, tiredness, headache and chills. [True]	110 (94.0)	34 (87.2)
I still need a COVID-19 test if I experience COVID-19 symptoms even after being vaccinated. [True]	87 (74.4)	24 (61.5)
Intramuscular (IM) injection is the recommended route for COVID-19 vaccines. [True]	87 (74.4)	30 (76.9)
The currently authorized COVID-19 vaccines may provide protection only against certain COVID-19 viral strains. [True]	91 (77.8)	22 (56.4)
Effectiveness of the COVID-19 vaccine in producing herd immunity depends on how many people get vaccinated. [True]	104 (88.9)	30 (76.9)
Attitude towards COVID-19 vaccination		
I trust the information I am receiving about the COVID-19 vaccine from the current Malaysian government.	79 (67.5)	18 (46.2)
I think that the COVID-19 vaccination is generally important to stop the spread of the disease.	99 (84.6)	26 (66.7)
COVID-19 vaccination is important for me as a medical student.	102 (87.2)	25 (64.1)
*I am concerned that a COVID-19 vaccination may not be effective.	24 (20.5)	4 (10.3)
*I am concerned about the serious side effects from a COVID-19 vaccination.	24 (20.5)	0 (0)
*I think that the COVID-19 vaccine made in Europe or America is safer than those made in other countries.	31 (26.5)	6 (15.4)
*I have my own preference for a specific type of COVID-19 vaccine (e.g. Pfizer, AstraZeneca, Sinovac, CanSinoBio, Sputnik V).	22 (18.8)	4 (10.3)
*I am concerned about the long-term genetic effects of COVID-19 vaccination.	31 (26.5)	3 (7.7)
I need more information about the COVID-19 vaccination.	82 (70.1)	29 (74.4)
I am willing to receive any type of COVID-19 vaccine offered by the Malaysian government.	61 (52.1)	10 (25.6)
External Influences		
*Social media influences my decision to take any COVID-19 vaccination.	55 (47.0)	7 (17.9)
*I will only take the COVID-19 vaccination if it is made compulsory by my university or the Malaysian government.	65 (55.6)	14 (35.9)
*My cultural beliefs influence my decision to take any COVID-19 vaccination.	78 (66.7)	25 (64.1)
*My parents influence my decision to take any COVID-19 vaccination.	63 (53.8)	11 (28.2)
*My peers/friends influence my decision to take any COVID-19 vaccination.	72 (61.5)	14 (35.9)

*Question which only positive responses (those who strongly disagreed) are reported.

Mean scores for knowledge and attitude were 7.42 ($\sigma=2.12$) and 22.67 ($\sigma=2.96$), respectively. Categorisation of responses based on the mean scores are shown in Table 4. Most students under vaccine hesitant/refusal group were found to

have insufficient knowledge ($n=27$, 69.2%) and exhibited negative attitude ($n=25$, 64.1%), while most students who accepted COVID-19 vaccination owned good knowledge ($n=70$, 59.8%) and exhibited positive attitude ($n=68$, 58.1%).

Table 4 Knowledge and attitude towards COVID-19 vaccination (VA, $n=117$; VH/R, $n=39$).

		Vaccine Acceptance n (%)	Vaccine Hesitancy/Refusal n (%)	p value
Knowledge on COVID-19 vaccination	Good	70 (59.8)	12 (30.8)	0.007
	Insufficient	47 (40.2)	27 (69.2)	
Attitude towards COVID-19 vaccination	Positive	68 (58.1)	14 (35.9)	<0.001
	Negative	49 (41.9)	25 (64.1)	

Lastly, we asked with interest whether parents of the Malaysian respondents were registered for Malaysia's national COVID-19 vaccination programme. Table 5 shows significant result in which most parents of VA (79.8%) were registered

for COVID-19 vaccination, while most respondents in VH/R (59.3%) reported that either their parents were not registered, or the respondents were simply unsure.

Table 5 COVID-19 vaccination registration among parents to Malaysian respondents (N=131; VA, $n=104$; VH/R, $n=27$).

		Vaccine Acceptance n (%)	Vaccine Hesitancy/Refusal n (%)	p value
1. *Are your parents registered for Malaysia's National COVID-19 Vaccination Programme?	Yes	83 (79.8)	11 (40.7)	<0.001
	No/Not sure	21 (21.2)	16 (59.3)	
2. Will you help or convince your parents to register for Malaysia's National COVID-19 Vaccination Programme?	Yes	10 (36.4)	5 (28.6)	0.604
	No/Not sure	11 (63.6)	11 (71.4)	

*Filter question

DISCUSSION

The knowledge, attitude, and practice (KAP) theory has been used to describe the progressive relationship among knowledge and an affirmative attitude may ultimately lead a positive behavioural change¹⁴. This explained our findings in which majority who were vaccine hesitant/refusal towards COVID-19 vaccination had insufficient knowledge and negative attitude. Conversely, most of them who accepted COVID-19 vaccination portrayed good knowledge and showed positive attitude. Our study findings were in line with other KAP studies¹⁵⁻¹⁷. This phenomenon suggested that COVID-19 vaccination educational programmes should focus on aspects to help improving vaccination knowledge and to cultivate positive attitude.

In our study, including the VH/R, majority of medical students acknowledged the importance of COVID-19 vaccination generally and for them as medical students, corresponding with previous studies^{8,9}. This could be partly due to the motivation for resumption of physical classes after a long period of online classes¹⁸. On the

other hand, as clinical classes resume, medical students remained as among the group of frontliners likely to encounter COVID-19 patients. Medical students are included in the third phase of the Malaysia's national COVID-19 vaccination programme¹. Necessary reviews may be needed to consider a timely vaccination for medical students in Malaysia, given that medical students bear the moral obligation alike the healthcare workers in role modelling for such preventive health measures¹⁹. Further study into the factors associated with perceived importance of COVID-19 vaccination among medical students would allow planning of interventions to achieve higher vaccination acceptance rate in this group.

The epidemiological triad can be employed to explain the factors influencing vaccine hesitancy, for which it may be a result of the complex interaction of environmental (external) factors, agent (COVID-19 vaccine) factors and the host-specific factors²⁰. Our present study shed some light that more than half of the medical students who accepted vaccination were not influenced by external factors in making their decision of COVID-19 vaccine uptake. This could be again

explained by the KAP theory¹⁴. This also pointed out medical students' role as influencers to advocate for COVID-19 vaccination. Intriguingly, both VA and VH/R showed similarly high positive response in terms of cultural belief. This suggested that cultural influences had not play an essential role in vaccine uptake in this study population, in contrast to a qualitative study which concluded on the role of cultural beliefs in contributing to vaccine hesitancy in multi-ethnic Malaysia²¹. Such situation may be attributable to the fact that medical students are well educated with science-based knowledge. Besides, the comparatively low disagreement on social media influenced medical students' decision of COVID-19 vaccine uptake, indirectly implied the high usage of social media among this group to obtain latest information. This is in line with a study that has shown Instagram preference among young adults aged 18-29²², which is similar with our study population's characteristic.

We had also observed high COVID-19 vaccination registration rate among parents to Malaysian respondents under VA group. However, the factors underpinning the phenomenon remained vague as it was beyond the scope of the current study. We would recommend further study into the association between parents' and medical students' practice of vaccination.

Despite the findings, one must be reminded the limitations of our study. Firstly, our study was conducted at a local private medical school and therefore it may affect generalisability. Secondly, our study design was unable to keep track of any future changes in decision made on vaccine uptake, given the multifaceted nature of vaccine hesitancy that varies across time, place and vaccines⁵. The third limitation is that non-respondents who may have been vaccine hesitant were not included in the study, rendering potential underestimation of true prevalence of vaccine hesitancy in the population. Lastly, the study outcomes should be interpreted with caution as our study population is medically educated and possesses different levels of medical knowledge.

CONCLUSION

High COVID-19 vaccine acceptance rate among medical students with good knowledge and positive attitude towards COVID-19 vaccination. One-fifth of the study population were vaccine hesitant, and a minority refused COVID-19 vaccine. Medical students are future healthcare providers who will be giving vaccine recommendations to their patients. Vaccination educational programmes which focus on improving knowledge and cultivating positive attitude towards COVID-19 vaccination, are required to maximise vaccine acceptance rate in this group.

ACKNOWLEDGEMENT

The authors are grateful for being allowed to conduct the self-funded study at UCSI University. We would like to extend our gratitude to Professor Dr Zulkifli bin Ahmad and Associate Professor Dr Kyu Kyu Win for their expertise and advice that have contributed to the completion of this study. We would also like to thank Assistant Professor Dr Eugenie Tan for her kind assistance in obtaining ethical clearance from the university's Institutional Ethics Committee.

Conflict of Interest

The authors have declared that no conflict of interest exists.

REFERENCES

1. The Special Committee for Ensuring Access to COVID-19 Vaccine Supply (JKJAV). National COVID-19 Immunisation Programme. Malaysia: The Special Committee for Ensuring Access to COVID-19 Vaccine Supply (JKJAV) 2021. https://www.vaksincovid.gov.my/pdf/National_COVID-19_Immunisation_Programme.pdf
2. Batumalai K. Malaysia Covid-19 Vaccine Registration Rose 3% Past Week. Code Blue. Published 2021. Accessed 7 April, 2021. <https://codeblue.galencentre.org/2021/04/02/malaysia-covid-19-vaccine-registration-rose-3-past-week/>
3. Chek N. Malaysia Covid-19 Vaccine Registrations Plateau With Half Registered. Code Blue. Published 2021. Accessed 19 June, 2021. <https://codeblue.galencentre.org/2021/06/09/malaysia-covid-19-vaccine-registrations-plateau-with-half-registered/>
4. WHO. Ten threats to global health in 2019. World Health Organization. Published 2019. Accessed 7 April, 2021. <https://www.who.int/vietnam/news/feature-stories/detail/ten-threats-to-global-health-in-2019>
5. MacDonald NE, SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. *Vaccine* 2015;33(34):4161-4164. doi: 10.1016/j.vaccine.2015.04.036
6. Weigel M, Weitmann K, Rautmann C, et al. Impact of physicians' attitude to vaccination on local vaccination coverage for pertussis and measles in Germany. *Eur J Public Health* 2014;24(6): 1009-1016. doi: 10.1093/eurpub/cku013

7. Vergara RJ, Sarmiento PJ, Lagman JD. Building public trust: a response to COVID-19 vaccine hesitancy predicament. *J Public Health (Oxf)* 2021. doi: 10.1093/pubmed/fdaa282
8. Saied SM, Saied EM, Kabbash IA, et al. Vaccine hesitancy: Beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *J Med Virol* 2021. doi: 10.1002/jmv.26910
9. Lucia VC, Kelekar A, Afonso NM. COVID-19 vaccine hesitancy among medical students *J Public Health (Oxf)* 2020. doi: 10.1093/pubmed/fdaa230
10. Mannan KA, Farhana KM, Mursheda K, et al. Knowledge, Attitude and Acceptance of a COVID-19 Vaccine: A Global Cross-Sectional Study. *International Research Journal of Business and Social Science* 2020;6(4). doi: 10.2139/ssrn.3763373
11. Dybsand LL, Hall KJ, Carson PJ. Immunization attitudes, opinions, and knowledge of healthcare professional students at two Midwestern universities in the United States. *BMC Med Educ* 2019;19(242). doi: 10.1186/s12909-019-1678-8
12. WHO. Coronavirus disease (COVID-19): Vaccines. World Health Organization. Published online 2021. Accessed April 18, 2021. [https://www.who.int/news-room/q-a-detail/coronavirus-disease-\(covid-19\)-vaccines](https://www.who.int/news-room/q-a-detail/coronavirus-disease-(covid-19)-vaccines)
13. CDC. Myths and Facts about COVID-19 Vaccines. Centers for Disease Control and Prevention. Published online 2021. Accessed April 18, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html>
14. Fan Y, Zhang S, Li Y, et al. Development and psychometric testing of the Knowledge, Attitudes and Practices (KAP) questionnaire among student Tuberculosis (TB) Patients (STBP-KAPQ) in China. *BMC Infect* 2018;18(213). doi: 10.1186/s12879-018-3122-9
15. Afonso N, Kavanagh M, Swanberg S. Improvement in attitudes toward influenza vaccination in medical students following an integrated curricular intervention. *Vaccine* 2014;32(4):502-6. doi: 10.1016/j.vaccine.2013.11.043
16. Liu A, Ho F, Chan L, et al. Chinese medical students' knowledge, attitude and practice towards human papillomavirus vaccination and their intention to recommend the vaccine. *J Paediatr Child Health* 2017;54(3):302-310. doi: 10.1111/jpc.13693
17. Lee M, Kang BA, You M. Knowledge, attitudes, and practices (KAP) toward COVID-19: a cross-sectional study in South Korea. *BMC Public Health* 2021;21(295). doi: 10.1186/s12889-021-10285-y
18. Jain J, Saurabh S, Goel AD, et al. COVID-19 vaccine hesitancy among undergraduate medical students: results from a nationwide survey in India. *medRxiv* 2021. doi: 10.1101/2021.03.12.21253444
19. Code Blue. Prioritise Medical Students For Covid-19 Vaccination - SMMAMS. Code Blue. Published 2021. Accessed 19 June 2021. <https://codeblue.galencentre.org/2021/04/23/prioritise-medical-students-for-covid-19-vaccination-smmams/>
20. Kumar D, Chandra R, Mathur M, et al. Vaccine hesitancy: understanding better to address better. *Isr J Health Policy Res* 2016;5(2). doi: 10.1186/s13584-016-0062-y
21. Wong LP, Wong PF, AbuBakar S. Vaccine hesitancy and the resurgence of vaccine preventable diseases: the way forward for Malaysia, a Southeast Asian country. *Hum Vaccin Immunother* 2020;16(7):1511-1520. doi: 10.1080/21645515.2019.1706935
22. Mohamad E, Tham JS, Ayub SH, et al. Relationship Between COVID-19 Information Sources and Attitudes in Battling the Pandemic Among the Malaysian Public: Cross-Sectional Survey Study. *J Med Internet Res* 2020;22(11). doi: 10.2196/23922