Knowledge, Acceptance, and Perceptions Towards the Use of COVID-19 Vaccines Among Malaysians: A Web-Based Survey

Shyang Jiun Sim[1*], Aaron Chung Ngieng Ting[1]

[1]*Pharmacy Department, Bintulu Hospital, Sarawak*

Correspondence to: Shyang Jiun SIM (shyangjiun@hotmail.com)

ABSTRACT

Introduction:

Coronavirus disease 2019 (COVID-19), a highly contagious viral illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has had a catastrophic effect around the world's population. Despite the proven efficacy of COVID-19 vaccines and extensive promotion through mass media, some individuals still doubt their effectiveness and choose not to get vaccinated. This study aimed to determine the knowledge, acceptance and perception of Malaysian adults regarding the COVID-19 vaccine.

Methods:

We conducted an online survey for one month in March 2022. A bilingual questionnaire distributed via Google Forms, and shared on social media platforms such as Facebook, Instagram, WhatsApp, Twitter, Telegram, and WeChat. The questionnaire consisted of questions on knowledge, acceptance, and perception of the COVID-19 vaccine. The association between demographic factors and scores on knowledge about the COVID-19 vaccine was analyzed using independent samples t-tests and ANOVA.

Results:

A total of 386 respondents participated, with a mean age of 34.43 ±10.14 years, and among them, 210 (54.4%) were male. Sixty-one percent of respondents had goodknowledge about the COVID-19 vaccine. Social media and Ministry of Health were the most sought platform for information about COVID-19. 92.3% were willing to get a COVID-19 vaccine. Ninety-three percent of respondents had received their first booster dose. High knowledge scores were associated with living with someone who is at higher risk of getting severe COVID-19, having family members or friends with a history of COVID-19 infections, and being from a younger age group. About 67.4% perceived that they were able to spread the virus to other people and 77.7% of the respondents perceived that they were susceptible to get severe COVID-19 infection.

Conclusion:

This study offers early insights into the knowledge, acceptance, and perception of COVID-19 vaccines among the Malaysian population.These findings can assist the MOH in planning future efforts to increase vaccine uptake, especially regarding second booster doses, which may ultimately lead to herd immunity against SARS-CoV-2.

Keywords:

Public perception, Covid-19, Covid-19 vaccine

INTRODUCTION

COVID-19 is caused by a newly discovered coronavirus known as SARS-CoV-2. This infection is believed to have emerged from Wuhan City, Hubei Province, China, in December 2019. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic.[1] Until early June 2021, this emergent disease had infected more than 170 million people worldwide and caused more than 3 million deaths.[1] The rate of infection has not seemed to slow down in the majority of the affected countries, and varying degrees of lockdowns have been issued in an effort to contain the spread of the virus. Globally, as of May 17, 2023, there have been 766,440,796 confirmed cases of COVID-19, including 6,932,591 deaths, reported to the WHO. As of May 15, 2023, a total of 13,352,935,288 vaccine doses have been administered.[2]

Currently, there are five COVID-19 vaccine candidates available in Malaysia: Comirnaty® by Pfizer-BioNTech, CoronaVac® by Sinovac, ChAdOx1-S [recombinant] by Oxford-AstraZeneca, Ad26.COV2-S [Recombinant] by Janssen, and Convidecia® by CanSinoBio. Malaysia has secured 66.7 million doses of COVID-19 vaccine, covering 109.65% of the total population in Malaysia, through the COVID-19 Global Vaccine Access Facility (COVAX) and direct purchases from five vaccine manufacturers.[3] The Drug Control Authority and the National Pharmaceutical Regulatory Agency also play important roles in governing the quality of the vaccines before they reach the end-user. Comirnaty® by Pfizer-BioNTech uses mRNA messenger cells to enter the human body and produce specific virus proteins, stimulating the human immune system to recognise the targeted virus proteins. Additionally, ChAdOx1-S, Ad26.COV2-S, and Convidecia® use viral vector technology, where a modified safe vector virus is delivered through the vaccine to stimulate the human immune response to produce targeted proteins against the vector virus. However, CoronaVac® is the only vaccine that uses inactivated virus, where COVID-19 viruses are killed using high heat, chemicals, or radiation, stimulating the human immune response to produce targeted proteins.

As effective vaccines become widely available, addressing vaccine hesitancy emerges as a critical challenge. Vaccine hesitancy, recognized as one of the ten most significant current health threats, refers to the reluctance or refusal to vaccinate despite vaccine availability.[4] A population-based study conducted by Wong et al. in Hong Kong utilized the Health Belief Model (HBM) to examine COVID-19 vaccine acceptance.[5] The study identified factors such as perceived severity, perceived vaccine

benefits, cues to action, self-reported health outcomes, and trust as positive predictors of vaccine acceptance. In contrast, perceived vulnerability to infection showed no significant association with acceptance, while perceived barriers to access and concerns about potential harm were negative predictors.[5] Furthermore, a separate community-based study revealed a dramatic decline in the willingness to get vaccinated during the pandemic, with over half of the population expressing hesitancy or unwillingness to receive the vaccine.[6]

The proliferation of misinformation and unsubstantiated rumors about COVID-19 vaccines on social media has exacerbated hesitancy, even before the release of effective vaccines.[7] Misleading claims, such as the erroneous assertion that mRNA-based vaccines can alter human DNA, have fueled scepticism.[8] Additionally, the rapid development of COVID-19 vaccines has raised concerns about their safety and long-term effects, even among healthcare professionals.[9] Alarmingly, studies among healthcare workers indicate that a small percentage do not intend to receive the COVID-19 vaccine.[10,11]

Rafidah et al. conducted a survey revealing a high acceptance rate of the COVID-19 vaccine among Malaysians, with approximately 83.3% of respondents expressing willingness to receive it. [12] This corresponds to other studies conducted with Asian and Western populations. One study conducted among healthcare workers in China showed high acceptance of the vaccine as compared to the general population. Studies conducted in Saudi Arabia, Indonesia, the European Union, and the United States among the general population showed a high degree of acceptance of the COVID-19 vaccine.[13,14,15,16]

We embarked on this study to determine the knowledge, acceptance and perception of the COVID-19 vaccine among the Malaysian adult population. The findings from this study will provide data and crucial information for the government to find strategies to increase public understanding and the uptake of COVID-19 vaccine in future.

METHODS
Study Design
This cross-sectional, online population-based survey was conducted from 1st to 30th March 2022 using convenience sampling. The study sample size was estimated using the Raosoft sample size calculator.[17] A minimum of 385 respondents were required with a margin of error of 5%, a 95% confidence interval (CI), and a population size of 32.6 million, assuming a 50% response distribution.

A questionnaire was adopted from Reiter et al. [18], and distributed via Google Forms. The original questionnaire was developed in English and translated into the Malay version using forward and back translation. Both English and Malay versions were pre-tested on the general population in a pilot study involving 50 respondents to ensure the questions were clearly written, easily understood

and unambiguous. Cronbach's alpha values for knowledge, perceived barriers, and perceived benefits were 0.716, 0.742, and 0.877, respectively, for the English version.Whereas the Cronbach's alpha values for the Malay version were 0.821, 0.803, and 0.772, respectively.

The access link was shared via online platforms, including Facebook, Instagram, WhatsApp, Twitter, Telegram, and WeChat by all project members, theirfamily members, friends, colleagues, and acquaintances. This study included those aged 18 years and older and understand either the Malay or English language. Respondents completed the survey without time restrictions.

Data Collection
The questionnaire consists of four sections: Section A covers demographic information and COVID-19 status, Section B focuses on knowledge of the COVID-19 vaccine, Section C addresses acceptance of the COVID-19 vaccine, and Section D explores perceptions based on HBM.

In Section B (knowledge), respondents were provided with three options: 'Yes', 'No', and 'Do not know'. One mark was awarded for each correct answer, while incorrect and 'do not know' responses received 0 marks. The maximum knowledge score was 10, and respondents scoring above the median of the total score (6 and above) were categorized as having good knowledge.[18] The sources of information regarding the COVID-19 vaccine were also explored.

Section C includes questions on vaccine acceptance, willingness to pay for vaccination, and factors influencing their decision to be vaccinated. Respondents can choose from 'strongly disagree' to 'agree' for vaccine acceptance.

For Section D, which includes questions on perceived severity, perceived susceptibility, perceived barriers, perceived benefits and cues to action, respondents were presented with five response options: 'strongly agree', 'agree', 'neutral', 'disagree', and 'strongly disagree'.

Data Analysis
All data were entered into a Microsoft Excel spreadsheet and analysed using Statistical Package for Social Sciences (SPSS) version 27 software. Descriptive statistics summarised the demographic variables. The association between demographic factors and knowledge scores regarding the COVID-19 vaccine was analysed using independent samples t-tests, and ANOVA. Statistical significance was defined at $P < 0.05$.

RESULTS
Demographic Data
A total of 386 respondents participated in this online survey. The mean age was 34.43 ± 10.14 years (range = 18–78), with 210 (54.4%) of the respondents being male. The detailed characteristics of the respondents are shown in Table 1.

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Table 1. Socio-demographic characteristics (n=386)

Background Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
Mean ± SD	34.43 ± 10.14	
18-29	155	40.1
30-39	144	37.3
40-49	51	13.2
50-59	53	5.9
60 and above	13	3.5
Gender		
Male	210	54.4
Female	176	45.6
Educational level		
No formal education	3	0.8
Primary school	4	1.0
Secondary school	100	25.9
Diploma	57	14.8
Bachelor's degree	215	55.7
Master's degree/ PhD	7	1.8
Income category		
<RM1500	27	7.0
RM1500-RM2500	25	6.5
RM2500-RM3500	50	13.0
RM3500-RM4500	80	20.7
>RM4500	204	52.8
Co morbidities*		
None	232	60.1
Diabetes mellitus	21	5.5
Hypertension	85	22.0
Dyslipidemia	54	13.9
Chronic lung disease (asthma, obstructive airway disease)	14	3.6
Chronic kidney disease	8	2.1
Cardiovascular disease	27	7.0
Malignancy	2	0.5

*This question allows multiple responses

Knowledge Regarding COVID-19 Vaccine

A total of 234 respondents (61.0%) demonstrated good knowledge about the COVID-19 vaccine. The statement "COVID-19 vaccines will be given via injection" had the highest percentage of correct responses (85.8%). Conversely, the statement "COVID-19 vaccination may protect other people who do not receive the vaccine" had the lowest percentage of correct responses, with only 53.1% of respondents answered correctly. Table 2 displays the knowledge questions and scores for each statement. This study found that electronic media and social media, including the MOH website, were the most sought-after platforms for information regarding the COVID-19 vaccine (Figure 1).

Table 2. Knowledge about COVID-19 vaccine (n=386)

Items	n (%)		
	True	False	I don't know
COVID-19 vaccines use inactivated coronavirus as the antigen.	**279 (72.3)**	20 (5.2)	87 (22.5)
COVID-19 vaccines use genetic material from coronavirus as the active ingredient.	**248 (64.2)**	41 (10.7)	97 (25.1)
COVID-19 vaccine stimulates our body to produce antibody, T cells and memory cells to combat COVID-19 infection.	**265 (68.7)**	15 (3.9)	106 (27.4)
COVID-19 vaccine protects the receiver from getting COVID-19 infection.	**249 (64.5)**	66 (17.1)	71 (18.4)
COVID-19 vaccination may protect other people who do not receive vaccine.	**205 (53.1)**	74 (19.2)	107 (27.7)
Vaccine production involves animal study, 3 phases of clinical trials that cover thousands of people and evaluated by the authority to ensure the vaccine efficacy and safety.	**237 (61.4)**	13 (3.4)	136 (35.2)
COVID-19 vaccines will be given via injection.	**331 (85.8)**	6 (1.5)	49 (12.7)
COVID-19 vaccines do not have adverse effects.	158 (40.9)	**158 (40.9)**	90 (23.3)
Everyone including children can receive COVID-19 vaccination.	**223 (57.8)**	55 (14.2)	108 (28.0)
COVID-19 vaccine can also protect us from influenza.	69 (17.9)	**107 (27.7)**	210 (54.4)

Note: Responses in bold denote the correct answers.
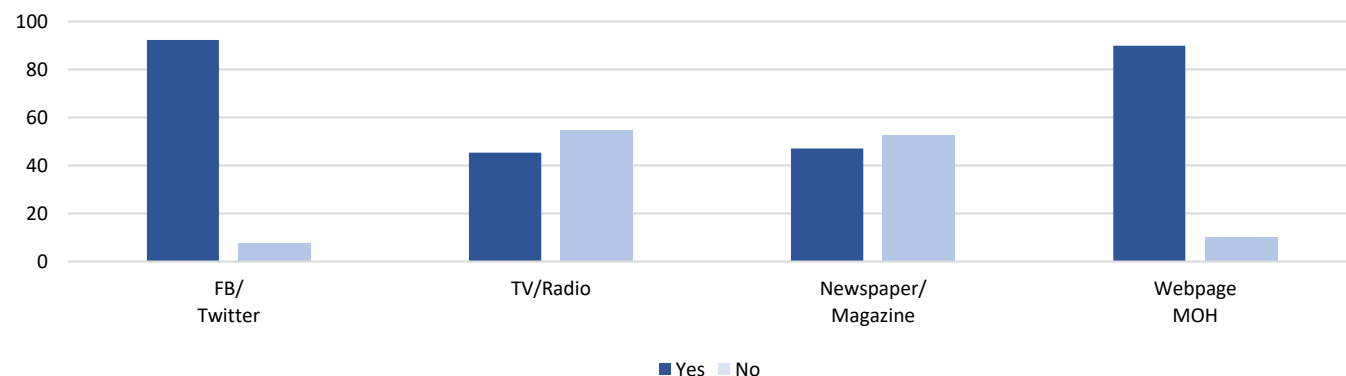

Figure 1: Sources of COVID-19 information

Table 3 illustrates the association between demographic factors and knowledge scores. High knowledge scores were associated with living with individuals at higher risk of severe COVID-19, having family members or friends with a history of COVID-19 infections, and being in a younger age group.

Acceptance towards COVID-19 Vaccine
From our study, approximately 92.3% of the respondents were willing to be vaccinated (Table 3). Ninety-three percent of respondents had received their first booster dose during the study period. The majority of the respondents agreed that the government should provide free COVID-19 vaccines to high-risk groups. Most of them would only be willing to pay less than RM 50 for the vaccine if required. The effectiveness of the vaccines and the number of positive COVID-19 cases were the factors most commonly influencing their decision to be vaccinated (Table 4).

Table 5 shows the acceptance of the COVID-19 vaccine. Notably, all respondents aged 50 and above (n=36) in this study were open to receiving the COVID-19 vaccine. In contrast, those who expressed disagreement or neutrality toward vaccination were from younger age groups. Similarly, respondents with no formal education or only primary school education were more likely to agree to vaccination, whereas a higher proportion of respondents who expressed a neutral stance had education levels beyond primary school.

Table 3. Association between demographic factors and knowledge score (n=386)

Variables	Mean (SD)	Mean difference (95% CI)	t-statistics *(df)*/ F-statistics*(df)*	*P*-value
Age group (years)				
18-29	5.17 (2.45)			
30-39	5.99 (2.21)			
40-49	5.65 (2.06)		2.75 (4,381)	0.049[c]*
50-59	5.65 (1.95)			
60 and above	4.85 (1.34)			
Gender				
Male	5.52 (2.26)	-0.09 (-0.55, 0.37)	-0.38 (384)	0.706[a]
Female	5.61 (2.36)			
Education				
No formal	4.67 (3.22)			
Primary school	3.25 (2.99)			
Secondary school	5.69 (1.82)		1.64 (5, 380)	0.149[b]
Diploma	5.12 (2.31)			
Bachelor's degree	5.64 (2.47)			
Master's degree/ PhD	6.43 (1.40)			
Income Category				
<RM 1500	5.44 (2.36)			
RM 1500-RM 2500	4.88 (2.32)			
RM 2500-RM 3500	5.34 (2.57)		0.89 (4, 381)	0.467[b]
RM 3500-RM 4500	5.78 (2.04)			
>RM 4500	5.63 (2.32)			
Chronic disease				
Yes	5.57 (2.16)	0.02 (-0.46, 0.49)	0.06 (384)	0.384[a]
No	5.55 (2.40)			
Been infected with Covid-19				
Yes	5.44 (2.26)	-0.38(-0.87, 0.12)	-1.49 (384)	0.136[a]
No	5.82 (2.38)			
Family members or friends been infected with Covid-19				
Yes	5.85 (2.17)	1.34 (0.80, 1.89)	4.84 (384)	0.014[a]*
No	4.51 (2.48)			
Live with someone who is at higher risks of getting severe Covid-19				
Yes	5.85 (2.15)	0.56 (0.10, 1.02)	2.42 (384)	0.040[a]*
No	5.28 (2.41)			

Two-sample independent *t*-test
[b]One-way ANOVA test
[c]Group 18-29 and group 30-39 mean scores are significantly different by post-hoc test (Scheffe procedure)
*Significant at *P* <0.05

Table 4. Acceptance towards COVID-19 vaccines and the factors influencing it (n=386)

No	Statements	Responses	n (%)
1.	Are you open to receiving the COVID-19 vaccine?	Strongly disagree	4 (1.0)
		Disagree	2 (0.5)
		Neutral	24 (6.2)
		Agree	157 (40.7)
		Strongly agree	199 (51.6)
2.	In your opinion, should the government provide free COVID-19 vaccine to the high-risk groups	Yes	380 (98.4)
		No	6 (1.6)
3.	What is the most you would pay out of pocket to get the COVID-19 vaccine?	Less than RM 50	196 (51.0)
		RM 50-RM 100	36 (9.4)
		RM 101-RM 150	17 (4.4)
		More than RM 150	29 (7.6)
4.	What are the factors that influence your decision to take the COVID-19 vaccine?*	I don't mind any cost	84 (21.9)
		I can't afford to pay at all	22 (5.7)
		Effectiveness	320 (82.9)
		Number of positive COVID-19 cases	220 (57.0)
		Adverse effects	136 (35.2)
		Suggestion from doctors or Ministry of Health	124 (32.1)
		Number of deaths due to COVID-19	106 (27.5)
		Health status	99 (25.6)
		Duration of protection	87 (22.5)
		Age	63 (16.3)
		Type of vaccine	59 (15.3)
		Number of vaccine doses	55 (14.2)
		Country that produces the vaccine	50 (12.9)
		Cost	30 (7.8)
		Suggestion from friends and family	26 (6.7)
		Others	15 (3.9)

*The question allows multiple responses.

Table 5. Acceptance to COVID-19 vaccine by demographic groups (n=386)

Variables		Responses, n (%)				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Age group	18-29	3 (1.9)	1 (0.6)	11 (7.1)	67 (43.3)	73 (47.1)
	30-39	1 (0.7)	1 (0.7)	11 (7.6)	59 (41.0)	72 (50.0)
	40-49	0 (0.0)	0 (0.0)	2 (3.9)	15 (29.4)	34 (66.7)
	50-59	0 (0.0)	0 (0.0)	0 (0.0)	10 (43.5)	13 (56.5)
	60 and above	0 (0.0)	0 (0.0)	0 (0.0)	6 (46.2)	7 (53.8)
Gender	Male	3 (1.4)	1 (0.5)	9 (4.3)	91 (43.3)	106 (50.5)
	Female	1 (0.6)	1 (0.6)	15 (8.5)	66 (37.5)	93 (52.8)
Education	No formal education	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
	Primary school	0 (0.0)	0 (0.0)	0 (0.0)	1 (25.0)	3 (75.0)
	Secondary school	0 (0.0)	1 (1.0)	1 (1.0)	38 (38.0)	60 (60.0)
	Diploma	1 (1.7)	0 (0.0)	3 (5.3)	22 (38.6)	31 (54.4)
	Bachelor's degree	3 (1.4)	1 (0.5)	19 (8.8)	91 (42.3)	101 (47.0)
	Master's degree/ PhD	0 (0.0)	0 (0.0)	1 (14.3)	5 (71.4)	1 (14.3)
Income category	<RM 1500	0 (0.0)	0 (0.0)	3 (11.1)	10 (37.0)	14 (51.9)
	RM 1500-RM 2500	0 (0.0)	0 (0.0)	0 (0.0)	15 (60.0)	10 (40.0)
	RM 2500-RM 3500	1 (2.0)	1 (2.0)	2 (4.0)	23 (46.0)	23 (46.0)
	RM 3500-RM 4500	0 (0.0)	0 (0.0)	6 (7.5)	26 (32.5)	48 (60.0)
	>RM 4500	3 (1.5)	1 (0.5)	13 (6.4)	83 (40.6)	104 (51.0)
Chronic disease	Yes	0 (0.0)	0 (0.0)	3 (12.0)	12 (48.0)	10 (40.0)
	No	4 (1.1)	2 (0.6)	21 (5.8)	145 (40.2)	189 (52.3)
Been infected with COVID-19	Yes	3 (1.1)	2 (0.8)	14 (5.3)	106 (40.0)	140 (52.8)
	No	1 (0.8)	0 (0.0)	10 (8.3)	51 (42.1)	59 (48.8)
Family members or friends been infected with COVID-19	Yes	3 (1.0)	1 (0.3)	17 (5.6)	125 (41.3)	157 (51.8)
	No	1 (1.2)	1 (1.2)	7 (8.4)	32 (38.6)	42 (50.6)
Live with someone who is at higher risks of getting severe COVID-19	Yes	2 (1.1)	0 (0.0)	10 (5.3)	82 (43.4)	95 (50.3)
	No	2 (1.0)	2 (1.0)	14 (7.1)	75 (38.1)	104 (52.8)

Table 6. Perception on susceptibilities, severity, barriers, benefits, and cues to action with acceptance towards COVID-19 vaccine (n=386)

Statements	Acceptance, n (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived susceptibilities					
I can spread the virus to other people	5 (1.3)	47 (12.2)	74 (19.2)	137 (35.5)	123 (31.8)
Perceived severity					
I am at risk of getting a severe COVID-19 infection.	1 (0.3)	15 (3.9)	70 (18.1)	197 (51.0)	103 (26.7)
Perceived barriers					
COVID-19 vaccine may cause infection.	58 (15.0)	132 (34.2)	158 (40.9)	33 (8.6)	5 (1.3)
COVID-19 vaccine may not be effective.	45 (11.7)	155 (40.2)	136 (35.2)	47 (12.1)	3 (0.8)
I am worried about the adverse effects of the vaccine.	64 (16.6)	123 (31.9)	133 (34.4)	59 (15.3)	7 (1.8)
I am not sure whether or not I have to get the vaccine.	84 (21.8)	159 (41.2)	117 (30.3)	24 (6.2)	2 (0.5)
I don't have time to get the vaccine	93 (24.1)	178 (46.1)	98 (25.4)	11 (2.8)	6 (1.6)
Scary information about COVID-19 vaccines is rampant on social media.	59 (15.3)	133 (34.4)	142 (36.8)	45 (11.7)	7 (1.8)
It will be difficult to get vaccine from nearby clinic due to high demand.	65 (16.8)	164 (42.5)	117 (30.3)	37 (9.6)	3 (0.8)
Perceived benefits					
Vaccine protects me from getting infected.	3 (0.8)	27 (7.0)	77 (19.9)	191 (49.5)	88 (22.8)
Vaccine also protects other people who are not vaccinated.	9 (2.3)	34 (8.8)	76 (19.7)	201 (52.1)	66 (17.1)
After vaccination, I can lead a normal lifestyle.	4 (1.0)	39 (10.1)	86 (22.3)	165 (42.8)	92 (23.8)
Cues to action					
1. Affordable cost	1 (0.3)	15 (3.9)	95 (24.6)	159 (41.2)	116 (30.0)
2. Safe	69 (17.8)	80 (20.8)	55 (14.2)	91 (23.6)	91 (23.6)
3. It is recommended by doctors and MOH	0 (0.0)	3 (0.8)	69 (17.8)	218 (56.5)	96 (24.9)
4. Good information about vaccine in the mass media	1 (0.3)	10 (2.6)	87 (22.5)	187 (48.4)	101 (26.2)

Approximately 67.4% perceived that they were able to spread the virus to other people, while 77.7% of the respondents perceived themselves as susceptible to severe COVID-19 infection. About 49.2% did not agree that the COVID-19 vaccine could cause infection. Notably, about half were not worried about the vaccine's adverse effects. The majority (72.3%) believed that the vaccine could protect both themselves and other people who are not vaccinated. About 71.3% of the respondents agreed on the vaccine's cost, while approximately 47.2% agreed on its safety. Table 6 provides details of the perception responses.

DISCUSSION

The findings indicate that more than half of the respondents had good knowledge of the COVID-19 vaccine. In comparison to a study conducted in Malaysia by Mohamad Nor et al.[19], where approximately 65% of the respondents were found to have good knowledge and attitude regarding COVID-19 prevention, our results indicate a similar trend. We observed that individuals in the younger age group, those with family members who had been infected with COVID-19, and those living with a higher risk of severe COVID-19 had better knowledge scores. This aligns with the findings of a study conducted by Mohamad Nor et al. in 2020, where the younger age group was found to have better knowledge about COVID-19. [19]

This study found that social media platforms, including Facebook/Twitter, and the MOH website were the most sought-after sources for information regarding the COVID-19 vaccine. A study by Mohamad Nor et al. in 2020 showed that the three most favoured sources used by respondents to obtain information related to COVID-19 were smart phone applications via WhatsApp and Telegram, followed by electronic media such as television and radio, and social networking media such as Facebook and Twitter.[19] Some other study also showed that most respondents acquired information regarding COVID-19 through social media (97.4%), mass media (94%), friends and family (79.3%) and healthcare workers (59.8%).[12]

The abundance of available information can be overwhelming for the general population. Therefore, targeted interventions are necessary to effectively convey relevant health education. This approach will enhance knowledge transfer, promote increased awareness, and empower individuals to make informed decisions. Transparency and reliability of information should be prioritized.

The Malaysian government has made efforts to control the spread of fake news regarding COVID-19 through the launch of an official Telegram channel authorized by the Crisis Preparedness and Response Centre, Ministry of Health Malaysia, and

the Malaysia Communications and Multimedia Commission.[20]

Vaccination is widely acknowledged as an effective strategy to reduce and eliminate the impact of COVID-19. However, the success of any vaccination program relies heavily on the population's acceptance. About 92.3% of the respondents indicated a willingness to get vaccinated. This is in line with our country's high vaccination rate, especially the first dose. The success of any vaccination program depends on vaccine acceptance and uptake rates. A study conducted in France in March 2020 showed that 26% of the respondents refused vaccination, which was more prevalent among low-income individuals, young women, and people older than 75 years old.[21] Our country's acceptance rate was almost similar to that of China (91.3%) and Indonesia (93.3%).[20,22]

The majority of the respondents agreed that the government should provide free vaccination to high-risk groups. More than 50% of the respondents indicated they would pay a minimum of RM 100 for the vaccine, with only a small proportion (5.7%) reporting not being able to afford it. This finding is consistent with a previous Malaysian study conducted in April 2020, during the early development of the COVID-19 vaccine.[23] However, cost is not an issue since our government has decided to provide free vaccination to Malaysian citizens. Hence, this might be one of the reasons for the high acceptance rate observed in our study.
The effectiveness of the vaccine and the number of positive COVID-19 cases were the factors that most strongly influenced the decision to get vaccinated. This finding agrees with a study conducted in Indonesia, where 93.3% of respondents expressed a willingness to be vaccinated if the vaccine is 95% effective. Acceptance decreased to 60.7% for a vaccine with 50% effectiveness.[13]

From the HBM perspective, perceived severity and perceived susceptibility were found to have significant association with vaccine acceptance. From our study, the majority of respondents perceived that they were able to spread the virus to other people and that they were susceptible to severe COVID-19 infection. A previous study conducted in Malaysia showed an increase in the perception of susceptibility to infection as the COVID-19 pandemic progressed.[23] Effective preventive behaviours, such as personal hygiene and social distancing, largely depend on the perceived susceptibility to infection. Perception of disease susceptibility also correlates with better health-seeking behaviour.[24] People with a higher perceived risk of COVID-19 infection are more likely to support the vaccine. A study conducted in Malaysia revealed similar outcomes based on the HBM. Additionally, it highlighted that the public prioritizes the efficacy and safety of vaccines over their cost.[23]
Cues to action are a crucial component of the HBM and have been shown to significantly influence vaccine acceptance. For the COVID-19 vaccine, however, a distinct pattern emerged:

recommendations from the government were one of the most influential cues. The majority of respondents also reported that they would seek additional information about the vaccine through the MOH webpage. This finding suggests that, rather than leaving vaccination decisions entirely to individuals or healthcare providers, governments should take a definitive and proactive stance. Governments should actively provide transparent and detailed information about the chosen vaccine manufacturers to address concerns and alleviate doubts about vaccine safety.

Most of our respondents were not worried about the vaccine's adverse effects. According to a systematic review by Kaur et al., most of the reactions reported were mild to moderate, with only a few cases of severe intensity.[25] Additionally, all reactions resolved within 3–4 days. This systematic review suggests that COVID-19 vaccines can be safe, with no serious adverse events. However, long-term post-marketing surveillance data, particularly in high-risk vulnerable populations such as the elderly, those with co-morbidities, pregnant women, and children, are warranted to ensure the safety of COVID-19 vaccines. The majority of respondents believed that the vaccine is beneficial due to recommendations by the MOH, its safety, affordability, and the availability of good information.

One limitation of this study was the use of convenience sampling via social media platforms. The distribution of respondents might not reflect the actual population, as most respondents were internet-savvy young adults. The study mainly focused on the first booster dose and may not reflect the acceptance of the respondents' perception of the second booster dose.

We suggest a larger study that includes respondents from diverse backgrounds, ethnicities, economic statuses, and locations. Multiple public platform sharings are needed to increase awareness and reach a broader audience, ensuring a more representative sample and diverse perspectives. Various data collection methods such as telephone interviews and face-to-face interviews should also be employed.

CONCLUSION
In conclusion, the respondents demonstrated good knowledge and acceptance towards the COVID-19 vaccine. Identifying perceptions, in particular the barriers that deter Malaysians from getting vaccinated is crucial, as this finding could help the MOH plan for future booster dose programs.

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