Journal of Sustainability Science and Management
Volume 17 Number 5, May 2022: 1-12
eISSN: 2672-7226

ACCEPTANCE, CONCERNS AND KNOWLEDGE OF COVID-19 VACCINE: AN EARLY BATTLE AGAINST THE PANDEMIC

SHAHRINA ISMAIL[1]*, SHARIFAH FAIRUZ SYED MOHAMAD[1], SHARIFAH NAJWA SYED MOHAMAD[2] AND FATIN AHZA ROSLI[3]

[1]Faculty of Science and Technology, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800, Nilai, Negeri Sembilan, Malaysia. [2]Department of Primary Care Medicine, Faculty of Medicine and Health Sciences, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800, Nilai, Negeri Sembilan, Malaysia. [3]Faculty of Science and Technology, Universiti Putra Malaysia, Serdang, 43400, Sri Kembangan, Selangor, Malaysia.

**Corresponding author: shahrinaismail@usim.edu.my*
Submitted final draft: 10 December 2021 Accepted: 24 February 2022 http://doi.org/10.46754/jssm.2022.05.001

Abstract: Many COVID-19 vaccine candidates were clinically tested in response to the coronavirus pandemic. This study aims to determine the acceptance rate of, main concerns about and knowledge of COVID-19 vaccination among the Malaysian population based on different sociodemographic characteristics during the early stages of vaccine arrival in Malaysia. A cross-sectional online survey was performed between January 25, 2021 and February 1, 2021 using descriptive statistics, Likert scale analysis, hypothesis testing, correlation and regression. These statistics assessed the correlation between sociodemographic characteristics, exposure to COVID-19 vaccine information, as well as the perceived risk of infection and acceptance towards COVID-19 vaccines. There exist significant differences across sociodemographic variables. More than half of the respondents (58.85%) voted safety as their primary concern. Moreover, a medium correlation exists between knowledge and acceptance, $r = 0.444$, $N = 2051$, $p<0.01$. The linear regression equation of acceptance predicted by knowledge was Acceptance = 2.873 + 0.981 (Knowledge). This study's findings can help the government design the best way to execute COVID-19 vaccination campaigns in Malaysia, for example, the National COVID-19 Immunisation Programme. It also demonstrates that online questionnaires are appropriate for assessing health literacy skills and attitudes towards vaccination during infectious disease epidemics. It can also aid in the adaptation of medical communication tactics to better comprehend vaccination values.

Keywords: COVID-19, vaccine, vaccination, acceptance, knowledge.

Introduction

As at June 29th, 2020, the World Health Organisation (WHO) has announced 17 COVID-19 vaccine candidates in clinical trials (WHO, 2020). The journey of a vaccine cold chain is depicted in Figure 1. Vaccines are kept at the proper temperature during the long voyage from the manufacturing line to the syringe thanks to a global network of freezers, cool rooms, refrigerators, carriers, as well as cold boxes. These vaccine candidates could be the answer to this pandemic, particularly since a COVID-19 vaccine requires careful balance. Furthermore, since many of COVID-19's severe symtpoms are connected to immunological processes, activating a protective immune response without causing immune-mediated lung damage is vital. Based on prior work on SARS-CoV and SARS-CoV-2, this view intends to set essential concepts in assessing current vaccine candidates and developing new vaccines.

Recent studies focused on understanding, acceptability of and hesitation in taking COVID-19 vaccination (Biasio, 2020; Harapan, 2020; Barello, 2020; Salali & Uysal, 2020). At first, people were concerened about the COVID-19 vaccines and immunisation was not popular. Generally, due to its predicted benefits, many people may opt for COVID-19 immunisation. However, there are doubts about the safety of these vaccinations in terms of adverse effects, whether they are safe for pregnant and nursing mothers or if the elderly should be

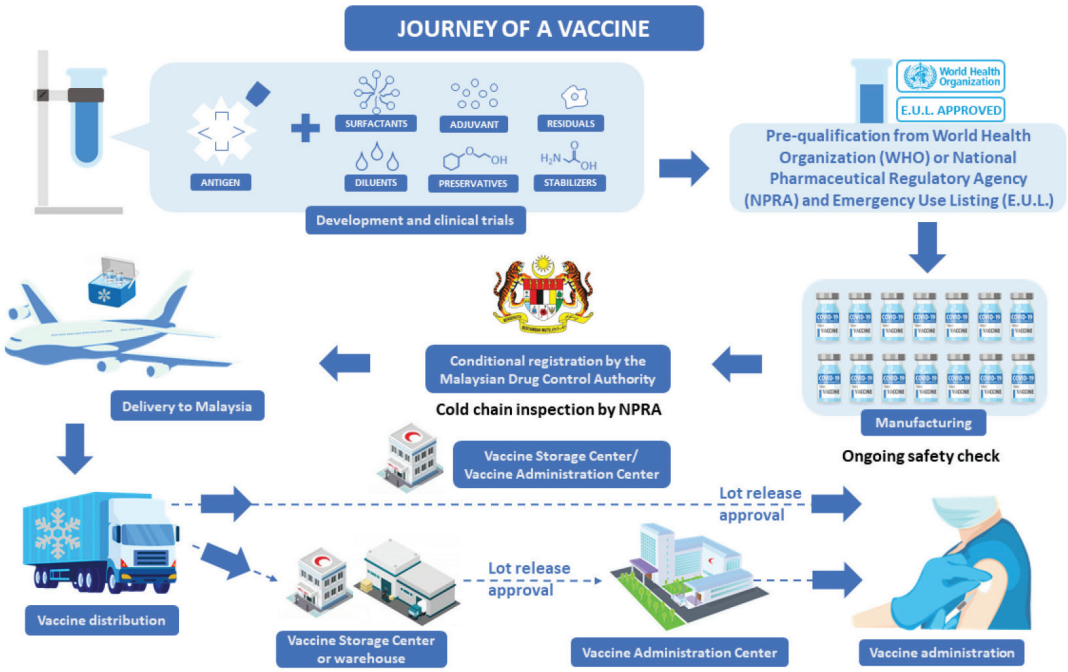

Figure 1: The vaccine cold chain (The Ministry of Health, 2021)

considered as recipients. This study intends to investigate the rates of acceptance, primary concerns and knowledge about COVID-19 vaccination among Malaysians based on different sociodemographic characteristics. The outcome of this study may provide valuable direction for personalised strategies to promote COVID-19 vaccination uptake. Promotional advertisements may frame vaccination benefits and emerging vaccine safety concerns to boost vaccine uptake among Malaysians. We hypothesise that the acceptance rate will be low at the early stage of the vaccine implementation. Moreover, we anticipate that the younger generation will score higher than the other age groups. In terms of concerns, a higher concern level will be shown towards the safety and side effects of COVID-19 vaccines.

Many studies have been conducted to analyse the knowledge of, concerns about, acceptability of and reluctance to receive COVID-19 vaccination worldwide. For instance, Harapan *et al.* (2020) examined the adoption of a hypothetical COVID-19 vaccination among Indonesia's general population. Here, the vaccine's baseline efficacy greatly affected acceptance. Another study by Biasio *et al.* (2020) tested COVID-19 vaccination literacy with a pilot online survey, which revealed that web surveys are useful for evaluating and tracking attitudes during infectious illness outbreaks and assessing the public's vaccine health literacy.

Furthermore, during the COVID-19 pandemic, Barello *et al.* (2020) assessed vaccination hesitation among Italian students. The research indicated that knowing students' viewpoint on vaccination and supporting their health commitment are important in designing suitable responses and diverse educational techniques. Besides, Salali and Uysal (2020) studied COVID-19 vaccination reluctance and its connection with coronavirus beliefs. They found that there is a high level of COVID-19 vaccination hesitation in Turkey, suggesting that broader engagement with the public may facilitate future initiatives to tackle COVID-19 vaccination hesitation.

In addition, Dror *et al.* (2020) studied Israeli public acceptability rates for

COVID-19 immunisation based on different sociodemographic factors. They found that healthcare workers with COVID-19-positive patients were more likely to consent to COVID-19 immunisation if it is accessible. However, those not caring for COVID-19-positive patients indicated higher degrees of vaccination hesitation. In China, Dong *et al.* (2020) evaluated the factors linked to vaccination features that may impact public choice for COVID-19. The results give policymakers vital information on determining optimal immunisation strategies. Apart from that, Mohamed *et al.* (2021) examined knowledge, acceptance and perception of COVID-19 vaccines among Malaysians. Here, they discovered that high knowledge scores are linked to those who have a higher academic background, higher income bracket, and those who live with someone who is more at risk to be infected with severe COVID-19. In addition, they found that Malaysians under 65, who had a greater level of education, and females were more eager to get vaccinated. Compared with Mohamed *et al.* (2021), our study included concerns as it is a crucial variable to be studied to determine the factors behind the every participants' attitudes towards vaccination. Furthermore, the study was conducted in December 2020, whereas our study was conducted at the end of January 2021, which is much closer to the arrival date of the COVID-19 vaccines in Malaysia, which is February 21, 2021 (The Star, 2021).

Al-Mohaithef and Padhi (2020) analysed Saudi Arabia's acceptance of COVID-19 vaccines and its factors. The results of their study indicated that targeting sociodemographic variables for COVID-19 vaccination may boost the worldwide immunisation programme to prevent future pandemics. In addition, Y. Lin *et al.* (2020) examined COVID-19 vaccine hesitation and demand by willingness-to-pay (WTP) and analysed public intention. They highlighted the necessity of relevant recommendations for personalised interventions to promote COVID-19 vaccination adoption once accessible. Kreps *et al.* (2020) also evaluated the parameters for selecting and getting COVID-19 vaccines. Vaccine-related traits and political characteristics were associated with self-reported preferences for COVID-19 vaccine selection and self-reported readiness to accept immunisation, according to scholars. Furthermore, Lazarus *et al.* (2020) identified prospective acceptance rates and variables impacting COVID-19 vaccination acceptance, indicating that respondents who expressed greater levels of confidence in government information were highly likely to receive the vaccination.

In addition, Wang *et al.* (2020) reviewed China's acceptability of COVID-19 vaccines, suggesting appropriate immunisation tactics. For example, logistic regression demonstrates that being a married man, having been vaccinated against influenza in the previous season, believing in the effectiveness of COVID-19 vaccination, appreciating a doctor's advice and trusting in the effectiveness of COVID-19 vaccination all increase the probability of one receiving COVID-19 vaccination. However, convenience or vaccine price may obstruct prompt vaccination.

Compared with previous studies, the current study contains additional variables, which is concern, apart from Malaysians' knowledge of and acceptance towards COVID-19 vaccines. Moreover, we managed to cover a broader population and conducted the study at time frame that is much closer to the arrival date of COVID-19 vaccines in Malaysia. Acceptance is a crucial variable to measure because we observed significant acceptance levels in other countries mentioned in previous studies (Harapan *et al.,* 2020; Salali & Uysal, 2020; Al-Mohaithef & Padhi, 2020; Wang *et al.,* 2020). Thus, we want to determine if the same scenario occured in Malaysia. The variable of knowledge was also measured in our study because COVID-19 vaccine development is a recent and new event in the public eye. Hence, with little or limited knowledge being disseminated, we would like to gauge Malaysians' level of knowledge with regards to the vaccines. Apart from that,

we decided to measure their concerns about COVID-19 vaccines. Different people have different issues they are worried about, such as side effects, or even an overload of information on social media.

Materials and Methods

Study Design and Setting

Following institutional ethical cleareance, this online cross-sectional survey study based on a questionnaire (quantitative study) was conducted using the non-probability sampling method. The data were collected using Google Form disseminated through various platforms, including social media (Facebook, Instagram, Telegram groups on vaccine discussions, WhatsApp and authors' networks) to maximise the number of respondents despite the Movement Control Order. Here, a set of questionnaires was given to the respondents on concerns about, knowledge of and acceptance towards COVID-19 vaccines (Appendix 1). This set of questionnaires was adapted from the WHO, Wang *et al.* (2020) and Dror *et al.* (2020). It was first pilot tested with the participation of 30 respondents and the data gained from the pilot were analysed for reliability. The Cronbach's alpha for the questions on acceptance and knowledge were acceptable at 0.732 and 0.615, respectively. A total of 2,051 respondents voluntarily participated in the online survey from January 25, 2021 to February 1, 2021.

Statistical Analysis

Using statistical analysis, the influence of sociodemographic factors on each dependent variables of knowledge and acceptance was studied. The analysis aimed to assess each independent variable's main effect and assess any interaction between knowledge and acceptance. For hypothesis testing, to determine any significance between the sociodemographic variables, a one-way analysis of variance (ANOVA) and an independent-sample t-test were utilised.

Results and Discussion

Demographic Characteristics

The demographic characteristics of the 2,051 respondents from all over Malaysia who participated in this study were analysed (Appendix 2). A total of 63.87% of the respondents were females. Respondents between the ages of 31 and 40 were overrepresented (31.89%). A total of 28.04% of the respondents were professional workers and 16.67% were unemployed. A great majority had a bachelor's degree (43.49%) and only a fraction of them only had primary school education (0.98%). Also, more than half of the respondents were identified to be married (65.43%). Those who have a monthly income of RM2,000.00 and below (36.52%) made up the highest proportion of participants, followed by those earning RM2,001.00 to RM4,000.00 (25.16%) and those earning more than RM10,000.00 (3.61%).

Based on the respondents' health backgrounds with regards to COVID-19 vaccines, only a few of the respondents had been infected by COVID-19 (1.27%) while 11.95% were suffering from a chronic disease (see Figure 2). Also, more than half of them prefer domestic-made vaccines (62.65%) upon availability. Note that 11.21% of the participants were already registered as for the COVID-19 vaccine, 43.54% were still considering registration and the rest did not intend to register.

Figure 3 depicts the sources of information for COVID-19 vaccine preferred by Malaysians. Social media (36.62%) was the most popular source of information, followed by the Internet (31.64%) and media, such as television news (21.06%). Most respondents preferred social media as information are disseminated swiftly on those platforms and they are easy to use. However, those who use this platform can get false information and fake news regarding anti-vaccination content and may affect vaccine hesitancy among citizens (Burki, 2019; Wilson & Wiysonge, 2020). The second most preferred information source was the Internet, such as the Ministry of Health's portal. As for the media, official announcements from the prime minister

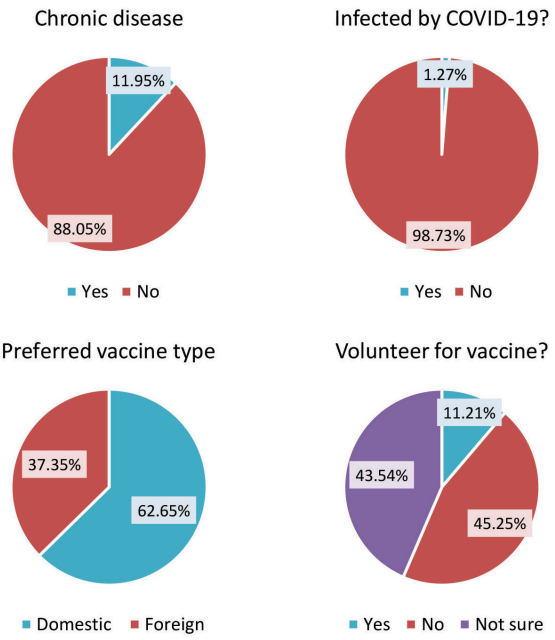

Figure 2: Respondents' health background with regards to COVID-19 vaccines

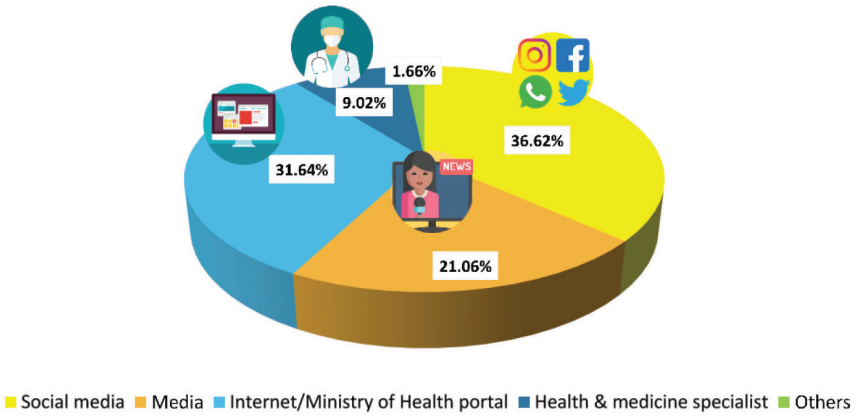

Figure 3: Preferred sources of information on COVID-19 vaccine

and National Security Council are usually broadcast live via television, providing people with accurate information.

Concerns about COVID-19 Vaccines

Figure 4 shows the main concerns that Malaysians have about COVID-19 vaccines, which might influence vaccine hesitancy and acceptance. Based on the categories, safety was the top main concern among respondents, at 58.85%. The same pattern was found in a previous study (Dror *et al.,* 2020). This is due to the high number of respondents (39.44%) voting for side effects as their main concern. As for the quality category, the respondents expressed that they needed more information on the vaccines. As for beliefs, despite being the category with the lowest percentage, a large number of respondents were concerned about the halal status of COVID-19 vaccines, as a large part of the Malaysian population are Muslims. Only a small number of respondents voted pregnancy

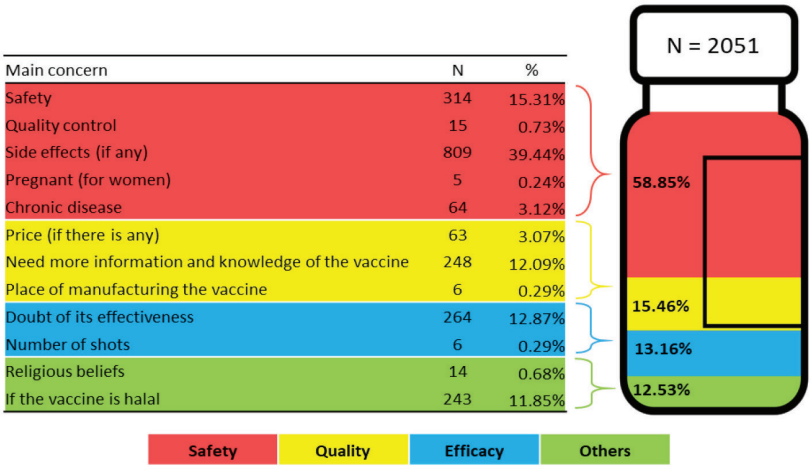

Figure 4: Main concerns about COVID-19 vaccines among Malaysians

as their main concern. This is in line with previous studies that show low levels of vaccine hesitancy among pregnant women (Kalok *et al.,* 2020).

One-way ANOVA between Groups and Independent Samples T-test

Acceptance of COVID-19 Vaccine

The mean scores across gender, age, occupation, and type of vaccine preferred have shown a significant difference with a p-value <0.05 for COVID-19 vaccine acceptance. The mean acceptance score for females (9.97 ± 2.42) is significantly higher than males (9.65±2.91), with a very small effect size of 0.003, which is similar to what was previously reported by Lazarus *et al.* (2020). Those who chose foreign-made vaccines tend to have higher acceptance of COVID-19 vaccines; however, its effect size is small (0.045). Those who are 21 to 30 years old (7.07 ± 1.22) significantly score lower in COVID-19 vaccine acceptance compared with senior citizens above 50 (7.08 ± 1.22) and those 31 to 40 years old (7.18 ± 1.16), which also has a very small effect size of 0.008. This is supported by Khan *et al.* (2021), who found higher levels of vaccine hesitancy among the younger generation in Japan. Another significant difference with a small effect size (0.007) was found between students (7.00 ± 1.16) and merchants (7.00 ± 1.29). More than 50% of the respondents from all over Malaysia agree to receive the COVID-19 vaccine shots immediately, except for those in Perlis (40%), Kedah (40.64%), Sabah (41.09%), Perak (43.18%) and Negeri Sembilan (48.03%) (Appendix 3).

Knowledge of COVID-19 Vaccines

The mean score for knowledge among females (7.16 ± 1.15) was significantly higher than males (7.03 ± 1.24), which contradicted a previous study in Italy (Biasio *et al.,* 2020) and Bangladesh. Those who preferred foreign-made vaccines (6.97 ± 1.28) had a significantly lower knowledge score than those who favoured domestic-made vaccines (7.36 ± 0.95). The younger generation, specifically those who are 20 years old and below (6.78 ± 1.34) had a lower knowledge score than respondents who are 31 to 40 years old (7.18 ± 1.16) and 41 to 50 years old (7.18 ± 1.11). Similarly, previous studies by Azlan *et al.* (2020) and Cao *et al.* (2020) demonstrated that the elderly had a greater risk perception of the side effects and complications of the disease. Respondents who earn RM2,000.00 or less a month (7.00 ± 1.23) scored lower in knowledge than those with a monthly income of RM6,000.00 (7.26 ± 1.11). However, these significant differences have a small effect size. Here, the knowledge scores of individuals with a low monthly income were one of the lowest. This might suggest a lack of

reliable and up-to-date information regarding the virus. This disparity in knowledge levels could represent the country's existing COVID-19 information landscape.

Correlation and Regression

The relationship between two variables, knowledge and acceptance, was investigated using the Pearson's correlation coefficient (Table 1). There is a positive medium correlation between acceptance and knowledge, r = 0.444, N = 2051, p<0.01, with a medium amount of knowledge associated with medium acceptance among respondents.

Table 1: Pearson's correlation

	Knowledge	Acceptance
Knowledge	1	.444**
Acceptance	.444**	1

** = Correlation is significant at the 0.01 level (2-tailed)

Linear regression was conducted to predict acceptance in terms of knowledge. Acceptance and knowledge were assigned as dependent and independent variables, respectively, to produce an equation using the linear regression model:

$$y_i = b_0 + b_1 x. \quad (1)$$

Based on Table 2, knowledge statistically and significantly predicted acceptance, F(1, 2049) = 503.483, p < .0005, R^2 = .197. The R^2 value is low; however, it has a statistically significant predictor. Regardless of the R^2, the result is still valuable. Shalizi (2015) thoroughly explained that R could be small for an accurate model. However, an inaccurate model can generate a greater R^2. Therefore, the linear regression equation is obtained as follows:

Acceptance =2.873 +0.981 (knowledge). (2)

Acceptance towards and Knowledge of COVID-19 Vaccines

As shown in Table 3, COVID-19 vaccination is well-accepted and well-understood by the majority of Malaysians. The scores was denoted by three different levels, excellent (70-100%),

Table 2: Linear regression

Model Summary

R	R-square	Adjusted R-square	Std. Error of the Estimate
.444[a]	.197	.197	2.341

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2758.166	1	2758.166	503.483	.000[b]
Residual	11224.775	2049	5.478		
Total	13982.941	2050			

Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.873	.315		9.112	.000
Knowledge	.981	.044	.444	22.438	.000

Table 3: Knowledge and acceptance level

	Minimum	Maximum	Mean	Std. Dev	Percent (%), N = 2051		
					Poor	Moderate	Excellent
Acceptance	.00	100.00	82.10	21.76	5.3	18.3	76.4
Knowledge	.00	100.00	88.94	14.78	1.6	7.0	91.5

moderate (40-69%) and poor (0-39%). Here, 37.6% of the respondents scored 100% while 76.4% had a high acceptance score. A mere 1.3% of the respondents obtained the lowest score among the respondents, which was zero. This implies complete rejection in accepting COVID-19 vaccination. The rest scored moderately and poorly at 18.3% and 5.3%, respectively. Note that it may be deduced that respondents had substantial COVID-19 vaccine literacy as almost all of them had an excellent score in terms of knowledge (91.5%).

Conclusion

More than a hundred vaccines are being produced worldwide, the rush to produce the first successful vaccination has fuelled the fast growth of both preclinical and contemporary vaccination techniques. There is no "one-size-fits-all" approach, as each technique has both its strengths and downsides. The findings of this research may become beneficial to the government in determining the optimum strategy to conduct COVID-19 mass vaccination campaigns in Malaysia and other Southeast Asian countries. Upon learning the major concerns, the level of knowledge and the acceptance rates between different group classifications, a campaign focusing on targeted groups, like pregnant ladies, children between 5 and 11 years old, or even teenagers, could be personalised and executed. This could be beneficial at present and if any other outbreaks of such diseases were to happen in the future. Despite great advancements in vaccine research worldwide, challenges persist. Even though this study was conducted before the vaccines arrived in Malaysia and none were vaccinated yet, it might still represent the participants' actual concerns about something uncertain. Because this study was conducted using an online questionnaire, only people who have access to the internet and social media were reachable, and it may not reflect the genuine Malaysian population, especially the less fortunate communities who lack internet access. Thus, this study's findings cannot be generalised, although it is useful to be reported. Future research can focus on acceptance of booster doses, opinions on combining different types of vaccines, as well as measuring knowledge of, acceptance towards and perceptions of children's vaccination.

References

Al-Mohaithef, M., & Padhi, B. K. (2020). Determinants of COVID-19 vaccine acceptance in Saudi Arabia: A Web-Based National Survey. *Journal of Multidisciplinary Healthcare*, *13*, 1657–1663. https://doi.org/10.2147/JMDH.S276771

Azlan, A. A., Hamzah, M. R., Sern, T. J., Ayub, S. H., & Mohamad, E. (2020). Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *Plos One*, *15*(5), e0233668. https://doi.org/10.1371/journal.pone.0233668

Barello, S., Nania, T., Dellafiore, F., Guendalina Graffigna, & Caruso, R. (2020). "Vaccine hesitancy" among university students in Italy during the COVID-19 pandemic. *European Journal of Epidemiology*, *35*, 781–783. https://doi.org/10.1007/s10654-020-00670-z

Biasio, L. R., Bonaccorsi, G., Lorini, C., & Pecorelli, S. (2020). Assessing COVID-19 vaccine literacy: A preliminary online survey. *Human Vaccines and Immunotherapeutics*. https://doi.org/10.1080/21645515.2020.1829315

Burki, T. (2019). Vaccine misinformation and social media. *The Lancet Digital Health*, *1*(6), e258–e259. https://doi.org/10.1016/s2589-7500(19)30136-0

Cao, J., Hu, X., Cheng, W., Yu, L., Tu, W. J., & Liu, Q. (2020). Clinical features and short-term outcomes of 18 patients with corona virus disease 2019 in intensive care unit. *Intensive Care Medicine*, *46*(5), 851-853. https://doi.org/10.1007/s00134-020-05987-7

Covid-19: All eyes on arrival of Malaysia's first batch of vaccines. (2021, February 21st). *The Star*. https://www.thestar.com.my/news/nation/2021/02/21/covid-19-all-eyes-on-arrival-of-malaysia039s-first-batch-of-vaccines-sunday-feb-21

Dong, D., Xu, R. H., Wong, E. L. yi, Hung, C. T., Feng, D., Feng, Z., Yeoh, E. kiong, & Wong, S. Y. Shan. (2020). Public preference for COVID-19 vaccines in China: A discrete choice experiment. *Health Expectations*, *23*(6), 1543–1578. https://doi.org/10.1111/hex.13140

Dror, A. A., Eisenbach, N., Taiber, S., Morozov, N. G., Mizrachi, Matti, Zigron, A., Srouji, S., & Sela, E. (2020). Vaccine hesitancy: The next challenge in the fight against COVID-19. *European Journal of Epidemiology*, *35*, 775–779. https://doi.org/10.1007/s10654-020-00671-y

Harapan, H., Wagner, A. L., Yufika, A., Winardi, W., Anwar, S., Gan, A. K., Setiawan, A. M., Rajamoorthy, Y., Sofyan, H., & Mudatsir, M. (2020). Acceptance of a COVID-19 vaccine in Southeast Asia: A cross-sectional study in Indonesia. *Frontiers in Public Health*, *8*. https://doi.org/10.3389/fpubh.2020.00381

Kalok, A., Loh, S. Y. E., Chew, K. T., Abdul Aziz, N. H., Shah, S. A., Ahmad, S., Mohamed Ismail, N. A., & Abdullah Mahdy, Z. (2020). Vaccine hesitancy towards childhood immunisation amongst urban pregnant mothers in Malaysia. *Vaccine*, *38*(9), 2183–2189. https://doi.org/10.1016/j.vaccine.2020.01.043

Khan, M. S. R., Watanapongvanich, S., & Kadoya, Y. (2021). COVID-19 vaccine hesitancy among the younger generation in Japan. *International Journal of Environmental Research and Public Health*, *18*(21), 11702. https://doi.org/10.3390/ijerph182111702

Kreps, S., Prasad, S., Brownstein, J. S., Hswen, Y., Garibaldi, B. T., Zhang, B., & Kriner, D. L. (2020). Factors associated with US adults' likelihood of accepting COVID-19 vaccination. *JAMA Network Open*, *3*(10), 2025594. https://doi.org/10.1001/jamanetworkopen.2020.25594

Lazarus, J. V, Ratzan, S. C., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., Kimball, S., & El-Mohandes, A. (2020). A global survey of potential acceptance of a COVID-19 vaccine. *Nature Medicine*. https://doi.org/10.1038/s41591-020-1124-9

Lin, Y., Hu, Z., Zhao, Q., Alias, H., Danaee, M., & Wong, L. P. (2020). Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLoS Neglected Tropical Diseases*, *14*(12), e0008961. https://doi.org/10.1371/journal.pntd.0008961

Mohamed, N. A., Solehan, H. M., Mohd Rani, M. D., Ithnin, M., & Che Isahak, C. I. (2021). Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. *PLoS ONE*, *16*(8), e0256110. https://doi.org/10.1371/journal.pone.0256110

Salali, G. D., & Uysal, M. S. (2020). COVID-19 vaccine hesitancy is associated with beliefs on the origin of the novel coronavirus in the UK and Turkey. *Psychological Medicine*, 41–43. https://doi.org/10.1017/S0033291720004067

Shalizi, C. (2015). Lecture 10: F-Tests, R2, and Other Distractions.

Wang, J., Jing, R., Lai, X., Zhang, H., Lyu, Y., Knoll, M. D., & Fang, H. (2020). Acceptance of COVID-19 vaccination during the COVID-19 pandemic in China. *Vaccines*, *8*(482). https://doi.org/10.3390/vaccines8030482

Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. *BMJ Global Health*, *5*(e004206), 4206. https://doi.org/10.1136/bmjgh-2020-004206

World Health Organization. (2020). Draft landscape and tracker of COVID-19 candidate vaccines. June 29th 2020, 3.

Appendix

Appendix 1: Questionnaire items

	Acceptance	Assessment (score)
A1	COVID-19 vaccination is an effective way to prevent and control COVID-19.	3-point Likert scale • Yes • Not sure • No
A2	I will accept vaccination if the COVID-19 vaccine is successfully developed and approved for listing in the future.	
A3	Doctor's or Ministry of Health recommendation is an important factor in vaccination decision-making.	
A4	Vaccine convenience (vaccination method, frequency, distance to vaccination sites, etc.) is an important factor in vaccination decision-making.	
A5	I want to receive vaccination as soon as possible when the vaccine is available.	
A6	I agree to get my children the vaccine shots in the future for prevention.	
Concern		
	Which of the following are the main concerns of receiving the COVID-19 vaccine? • If the vaccine is halal • Safety • Price (if there is any) • Quality control • Side effects (if any) • Doubt of its effectiveness • Need more information and knowledge of the vaccine • Pregnant (for women) • Place of manufacturing the vaccine	
Knowledge		
K1	There is a vaccine for COVID-19 available now.	2-point Likert scale • True • False
K2	There are three phases of clinical trials conducted to see the effectiveness COVID-19 vaccine.	
K3	Currently, two vaccines are authorised and recommended to prevent COVID-19: (Pfizer-BioNTech & Moderna's).	
K4	Vaccines can save more people lives.	
K5	Vaccines can change your DNA.	
K6	After receiving vaccine, I still need to wear mask in public.	
K7	A person's health condition and condition should be considered before obtaining COVID-19 vaccine.	
K8	There are two doses of COVID-19 vaccine shots needed to get complete immunisation.	

Appendix 2: Demographic characteristics of the study population (total population, N = 2051)

	N	%
Gender		
Male	741	36.13
Female	1310	63.87
Frontliner		
Yes	285	13.90
No	1766	86.10
Age		
20 years old and below	121	5.90
21-30 years old	477	23.26
31-40 years old	654	31.89
41-50 years old	521	25.40
More than 50 years old	278	13.55
Occupation		
Professional	575	28.04
Academician	240	11.70
Executive	338	16.48
Businessman	52	2.54
Merchant	157	7.65
Student	267	13.02
Retiree	80	3.90
Unemployed	342	16.67
Education Level		
Primary school	20	0.98
Secondary school	380	18.53
Diploma/A-level/STPM/Foundation	539	26.28
Bachelor	892	43.49
Master	181	8.82
PhD	39	1.90
Marital Status		
Single	642	31.30
Married	1342	65.43
Divorced	67	3.27
Monthly Income		
RM2,000.00 and below	749	36.52
RM2,001.00 - RM4,000.00	516	25.16
RM4,001.00 - RM6,000.00	380	18.53
RM6,001.00 - RM8,000.00	227	11.07
RM8,001.00 - RM10,000.00	105	5.12
More than RM10,000.00	74	3.61

Appendix 3: The geographical distribution of responses of the study and the percentage of respondents agreeing to accept COVID-19 vaccine as soon as possible