

Understanding COVID-19 Vaccine Hesitancy among Tertiary Level Students in Malaysia Using the 5C Model - A Short Survey

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ABSTRACT

OBJECTIVE: To explore the attitudes of the tertiary level students in Malaysia towards COVID-19 vaccines to analyze the leading cause of vaccine hesitancy among this group.

METHODOLOGY: A cross-sectional study was conducted from January to February 2021 among undergraduates from 5 different private tertiary institutions across Malaysia. The data was obtained through an online survey using Google Forms and analyzed using Smart PLS 3 software.

RESULTS: The validity of the measurement model led to the structural model after bootstrapping. From the data analysis, it was confirmed that Collective Responsibility and Confidence had a significant positive relationship with vaccine hesitancy, while complacency, constraints and calculation did not seem to contribute to vaccine hesitancy

CONCLUSION: Most respondents have good knowledge about the vaccines and generally have a positive attitude towards COVID-19. The respondents were hesitant to get the COVID-19 vaccines because they were concerned about the safety and efficacy of the COVID-19 vaccines as they are new and rapidly developed.

KEYWORDS: COVID-19, vaccine hesitancy, tertiary level students, Malaysia

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INTRODUCTION

World Health Organization (WHO) has categorized vaccine hesitancy as one of the top 10 threats in the world of health despite all the significant advances in vaccination¹. Vaccine hesitancy is defined as the refusal or the delay in accepting vaccines even though the services to get vaccinated are available². Various factors appear to influence people to be hesitant against vaccinating, such as confidence, complacency, collective responsibility, constraints, and calculation. These factors are correlated to the physical concepts, which involve attitude, perceived status of an individual's health and invulnerability, self-control, deliberation preference, and communal orientation³.

Vaccine hesitancy can also result from the proliferation and dissemination of anti-vaccination misinformation through social media⁴. The influence of social media also comes with additional compounding factors, such as easy access for an individual to create and share content globally without editorial mistakes or verification of content accuracy with the potential of spreading harmful misinformation through various networks. This can fuel vaccine hesitancy as it provides an unprecedented capacity for the public to

give their opinions which can alter the public perception on vaccines^{5,6}.

The COVID-19 pandemic has been challenging for everyone worldwide, including university students. Most governments closed their educational institutions for almost two years and are just beginning to open their doors to students again. Students in tertiary institutions can be regarded as highly knowledgeable because they tend to be open-minded, educated, and expected to react rapidly to issues pertaining to public health⁷. Through this survey, we explored the attitudes of the tertiary level students in Malaysia towards COVID-19 vaccines and analyzed the leading cause of vaccine hesitancy among tertiary level students. Understanding the student's point of view, health engagement, and consciousness of the COVID-19 vaccine may be helpful in planning strategies to overcome vaccine hesitancy in the post-pandemic period⁸.

METHODOLOGY

Study Design and Target Identification

A quantitative, cross-sectional perception survey was done using the online survey tool Google Forms from January to February 2021. Ethical approval was obtained before the commencement of the study (INTI/UEC/2018/001). Google forms were distributed as a link via social media such as WhatsApp, Facebook and email to tertiary level students from four

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universities in Malaysia. The personal information provided by the participants was kept strictly confidential.

Survey Tool

The survey questions, structured using the 5C model, were based on similar studies by Betsch et al. (2018)³, therefore, were not validated. This survey form had 42 questions initially (Table I). Still, some indicators with low outer loadings were removed during the data analysis to increase the composite reliability and

average variance extracted (AVE). Furthermore, the qualitative-based questions (CT5, CL1, and CL7) were modified into quantitative-based questions. The questions, which were in English, were separated into three parts: the introduction, general information (demographics, health status, and COVID-19 experience), and the questionnaire, which was further divided into five parts (confidence, complacency, constraints, calculation and collective responsibility). A 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree) was employed in this survey.

TABLE I: SURVEY QUESTIONS USED AS MEASUREMENT ITEMS (adapted from Betsch et al., 2018)

Constructs	Items	Questions
Confidence (CD)	CD1	I am familiar with the term "vaccines".
	CD2	The COVID-19 vaccines will be able to protect my body from the COVID-19 virus.
	CD3	The COVID-19 vaccine can modify my DNA.
	CD4	After vaccination, the COVID-19 vaccines pose a risk of infecting me.
	CD5	Good hygiene and proper nutrition would be a better option to reduce the spread of the COVID-19 virus rather than taking the vaccine.
	CD6	I have previously experienced serious side effects with any of my previous vaccinations.
	CD7	If I have experienced serious side effects from previous vaccinations, this will discourage me from getting the COVID-19 vaccine. Strongly agree
	CD8	I have encountered a situation where my doctor has discouraged me from being vaccinated.
	CD9	I am worried about the safety of a rapidly-developed vaccine like the COVID-19 vaccine.
	CD10	I am concerned about where the COVID-19 vaccine is made.
	CD11	Vaccines made in Europe or America are better than those made in other countries.
	CD12	I have refused a vaccine before because you thought it had porcine or other animal-derived ingredients (non-halal) in it.
	CD13	I am concerned about the safety and efficacy of the COVID-19 vaccines.
	CD14	Having public figures taking the COVID-19 vaccine helps in increasing my confidence to take this vaccine.
	CD15	I am willing to take the COVID-19 vaccine even when many people have not taken it yet.
	CD16	I prefer this mode of vaccine administration for the COVID-19 vaccine (you may choose more than one option)
	CD17	The delivery mode of the COVID-19 vaccine can affect my decision to get this vaccine.
	CD18	I think the pharmaceutical companies are producing the COVID-19 vaccine solely for profit and not because they are concerned about public health.
	CD19	I have heard about the adverse effects that occurred in the volunteers in the clinical trials after taking the COVID-19 vaccine.
Complacency (CP)	CP1	I am at risk of being infected with the COVID-19 virus.
	CP2	COVID-19 is dangerous to my health and safety.
	CP3	The COVID-19 vaccine can help in overcoming the COVID-19 pandemic.
	CP4	Having the COVID-19 vaccine makes me less worried about the COVID-19 pandemic.
	CP5	There is a better way to prevent me from getting Covid-19 other than taking the vaccine.
Constraints (CT)	CT1	The price of the COVID-19 vaccine will affect my decision to take this vaccine.
	CT2	I agree with some global leaders and influencers on not administering the COVID-19 as circulated via social media.
	CT3	The travelling distance to the healthcare facility and the waiting period at the facility will be a hindrance to me to be vaccinated.
	CT4	I plan on getting the Covid-19 vaccine when it is widely available.
	CT5	I am not willing to get the COVID-19 vaccine because of the possible side effects and because the vaccine is still new.

Calculation (CL)	CL1	I obtain information regarding the COVID-19 vaccine from news, Facebook, or other social media platforms.
	CL2	The information regarding the safety and efficacy of the COVID-19 vaccine on social media is reliable.
	CL3	I am aware of the reported side effects of the COVID-19 vaccines.
	CL4	I am interested in the various information regarding vaccine complications in the media.
	CL5	I am worried about the quality and validity of the information circulated in the media regarding the COVID-19 vaccine.
	CL6	The negative social media posts influence my opinion on the safety of the COVID-19 vaccine.
	CL7	I will handle the information concerning the side effects of the COVID-19 vaccines by (You may choose more than one option)
Collective responsibility (CR)	CR1	It is important for everyone to be vaccinated against COVID-19.
	CR2	I know of friends/family members/others who have advised me not to take the COVID-19 vaccine.
	CR3	The opinions of my friends and family influenced me against being vaccinated for COVID-19.

Statistical Analysis

The data obtained from the Google forms were analyzed using SmartPLS3 software. PLS3 showed the hypothesized relationships among the variables. PLS output R Square, F Square, Average Variance Extracted (AVE), Composite Reliability (CR), Cronbach's Alpha (CA), Discriminant Validity (DV), Collinearity Statistic (VIF), and could estimate a complex model and to relax the data requirements to determine how well the model explained the target of interest.

RESULTS

Demographic Characterization of Participants

A total of 209 undergraduate students from tertiary institutions in Malaysia participated in this online survey. The participants' demographic characteristics are summarized in **Table II**. The participants consisted of more of female participants (63.2%, n= 132) compared to male participants (36.8%, n= 77). Out of the 209 participants, most were aged between 18 to 25 years (96.7%, n= 202), while some were aged between 25 to 40 years old (3.3%, n= 7). Almost 60% of the participants were from a Science course (n= 123). The participants were comprised of Chinese students (58.9%, n= 123), Indian students (23.4%, n= 49), Malay students (8.6%, n= 18), and international students (9.1%, n= 19) who were studying in Malaysian universities from various countries including Syria, Indonesia, Bangladesh, and others.

Out of 209 respondents, only one person had an existing chronic disease. Most respondents (66.5%, n= 139) did not know friends, neighbours, family members, or colleagues infected with COVID-19, while the other respondents (33.5%, n= 70) were acquainted with someone who had been infected with COVID-19.

Analysis Using SmartPLS3

PLS software was used to form a relationship between

the indicators and their five constructs to determine the level of vaccine hesitancy among tertiary-level students in Malaysia. The independent variables used in this study were confidence (CD), constraints (CT), complacency (CP), calculations (CL), and collective responsibility. In contrast, the dependent variable used in this study was vaccine hesitancy (VH). Factor loadings, which were the values of the indicators, were used to determine the reliability of the variables. The analysis proceeded with generating the composite reliability. In **Table II**, the Composite Reliability (CR) values ranged from 0.162 to 0.774, while the Cronbach's Alpha values ranged from -0.078 to 0.572. This means that not all the values extracted were within the acceptable range to conclude good internal consistency reliability. To measure the convergent validity, the importance of AVE was expected to be 0.50 and above to be assumed as satisfactory. AVE was used, and after the data analysis using the PLS software, the results ranged from 0.256 to 0.605, meaning that not all values were within the range.

Regarding Fornell and Larcker's discriminant validity⁹, the outer loading of an indicator on the related construct should have greater values than all of its other loadings. According to **Table III**, each construct from all five variables (in bold highlight: 0.615, 0.673, 0.738, 0.506, 0.731 and 0.778) satisfied the Fornell and Larcker's theory requirement to have sufficient discriminant validity. This is because each construct's AVE value was more significant than the correlation with other constructs.

The measurement model's validity led to the structural model's subsequent generation after bootstrapping. The R square value, which is the coefficient of determination, was to see if the hypotheses were supported or not. The R² value in this study was 0.488, meaning that the independent variables explained 48.8% of the total variance in the dependent variable.

TABLE II: SUMMARY OF PARTICIPANTS' DEMOGRAPHIC CHARACTERISTICS

Characteristics		Number (n= 209)	Percentage (%)
Age	18-25	202	96.7
	25-30	4	1.9
	30-40	3	1.4
Gender	Male	77	36.8
	Female	132	63.2
Ethnicity	Chinese	123	58.9
	Indian	49	23.4
	Malay	18	8.6
	International	19	9.1
Religion	Islam	28	13.4
	Hindu	44	21
	Buddhist	108	51.7
	Christian	25	12
	Others	4	1.91
Educational level	Science	123	58.9
	Non-science	82	39.2
	Unknown	4	1.9
Chronic Disease	Yes	1	0.5
	No	208	99.5
Know someone who has been infected with COVID-19	Yes	70	33.5
	No	139	66.5
Total		209	

TABLE III: CONSTRUCT RELIABILITY AND VALIDITY

	Cronbach's Alpha	Composite Reliability	Average Variance (AVE)	Discriminant Validity
Calculation	0.521	0.635	0.378	0.615
Collective Responsibility	0.378	0.708	0.453	0.673
Complacency	0.536	0.745	0.545	0.738
Confidence	-0.078	0.162	0.256	0.506
Constraints	0.572	0.774	0.535	0.731
Vaccine Hesitancy	0.350	0.753	0.605	0.778

TABLE IV: HYPOTHESIS, ORIGINAL SAMPLE, SAMPLE MEAN, STANDARD DEVIATION, T-STATISTICS, P VALUES, AND DECISION HYPOTHESIZED

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation	T Statistics	P Values	Decision
H1; There is no significant positive relationship between calculation and vaccine hesitancy. (Not Supported)	-0.100	-0.110	0.083	1.204	0.229	Unsupported
H2; There is a significant positive relationship between collective responsibility and vaccine hesitancy. (Supported)	0.156	0.151	0.076	2.045	0.041	Supported
H3; There is no significant positive relationship between complacency and vaccine hesitancy. (Not Supported)	0.027	0.030	0.058	0.463	0.644	Unsupported
H4; There is a significant positive relationship between confidence and vaccine hesitancy. (Supported)	-0.503	-0.510	0.067	7.493	0.000	Supported
H5; There is no significant positive relationship between constraints and vaccine hesitancy. (Not Supported)	0.117	0.120	0.064	1.816	0.069	Unsupported

The data analysis confirmed that collective responsibility factors significantly influence vaccine hesitancy as it has P values of 0.041 and T statistics of 2.045. Therefore, collective responsibility was supported. Confident factors also influenced the vaccine hesitancy among the tertiary level students as it has P values of 0.000 and T-statistics of 7.493. Therefore, confidence was also considered as supported. Unfortunately, calculation, complacency, and constraints were unsupported as their P values were not less than 0.05, and except for conditions, the value of their T-statistics was also not within the range. The summary of the results obtained for the structural model is available in **Table IV**.

DISCUSSION

Vaccine hesitancy should be fought on the internet battlefield as social networks play a significant role in spreading information about vaccination. This issue is further exacerbated by conspiracy theories regarding the COVID-19 vaccines and the pharmaceutical companies, which have further contributed to vaccine hesitancy in many countries^{10,11}.

From the data obtained, the respondents had a high interest in looking for information about the vaccines. They always try to find the news from reliable sources

such as MOH, WHO and still find out the reliability of the data regardless of the source of information concerning the side effects of the COVID-19 vaccines because there was a high chance of one finding incorrect details on the COVID-19 vaccines in the internet. The students in Malaysia also had an increased interest in searching for information related to the vaccination and its risks of it. The respondents were aware of the reported side effects of the COVID-19 vaccines. They were interested in the information about vaccine complications in the media because they were worried about the quality and validity of the information circulated on social media. Thus, the calculation was not one of the factors on why the students were being hesitant to get vaccinated. Another reason the analysis was not the factor influencing vaccine hesitancy among our study targets was that they were exposed to current updates on COVID-19.

A study conducted by Barellos 2020⁷ stated they expected to find out that the intention to get vaccinated would be higher for healthcare students due to their more excellent knowledge of health and medical-related issues, including COVID-19. Still, when running the data analysis comparing the healthcare and non-healthcare students, no significant differences were found in responses' percentage distribution ($p = .097$). This may be because of this pandemic, the context of vaccine hesitancy has changed, and whether they were science students or not, they had to have the knowledge and be cautious about it. Another study by Saqadat et al.¹² also found a better acceptance of the COVID-19 vaccines among medical students in Pakistan. They had better knowledge of vaccines and the COVID-19 disease than non-medical students.

Our study also found that most respondents agreed that everyone should be vaccinated for other people's benefit. This was similar to the study conducted in Bangladesh, where more than 50% of the participants believed everyone should get the vaccine¹⁰. Most of the respondents also stated that the opinion of others would not influence their decision to get vaccinated.

The students in Malaysia had a high sense of risk when it came to vaccine-preventable diseases. Most respondents thought they were at risk of being infected by the virus and that COVID-19 vaccines could help overcome the COVID-19 pandemic. The COVID-19 vaccines also made them less worried about the COVID-19 pandemic. Thus, complacency was not why the students were hesitant to get

vaccinated, as they had a high sense of risk towards the vaccines. Other than that, having the public figures taking the COVID-19 vaccines also increased their confidence to take the vaccines. This is in contrast with the findings by Ogbus et al.¹³ Where there was a high degree of vaccine hesitancy among the undergraduate students of five tertiary institutions in Nigeria where they feared the potential side effects of the COVID-19 vaccines, even linking it to possible infertility in women.

Our study stated that most university students would likely take the COVID-19 vaccine when it is widely available. The acceptance rate of the COVID-19 vaccines was higher than the acceptance rate in the global (71.5%) and US samples (75.4%)¹⁴. Regarding constraints, the students did not have any issues with the affordability and willingness to pay, accessibility, or travelling distance. The price of the COVID-19 vaccine and the travelling distance to the facility would not be a hindrance for them to getting vaccinated. There were no barriers for the students in Malaysia to get vaccinated. This was similar to the previous study conducted in Indonesia, where most participants agreed to pay for the COVID-19 vaccine. In Bangladesh, 95% of the respondents reported the vaccine should be provided free of charge to the public¹⁵. The difference in the willingness to pay for the vaccines might be because of the financial condition. During the pandemic, many people lost jobs, resulting in unemployment, malnutrition, and social unrest, limiting their ability to pay for vaccines¹⁶.

CONCLUSION

From this survey, the main contributing factors to vaccine hesitancy were the lack of confidence in a vaccine produced in a concise time frame and the vaccine's reported side effects. On the other hand, calculation, complacency and constraints did not seem to contribute much to vaccine hesitancy. Most respondents had good knowledge about vaccines, whether they were science students or not. The respondents were aware of the side effects and complications caused by the COVID-19 vaccines and always tried to find reliable information from reliable sources. Most respondents will likely get the COVID-19 vaccine when it is widely available. Even though they generally had a positive attitude toward COVID-19 vaccines, they were still concerned with the safety and efficacy of the new rapidly-developed vaccines.

Currently, various actions have been taken by the Government of Malaysia, which have increased the

acceptance of COVID-19 vaccines among the students, including available information on social media on how the vaccines are being manufactured, the side effects that the new rapidly-developed vaccines could cause, and the importance of the vaccines all of which have contributed to the general acceptance of COVID-19 vaccines among students and the Malaysian population in general. The recommendations to improve this study would be to survey a longer time frame with the involvement of more institutes of higher learning. A larger sample size of respondents from more higher education institutions could also contribute to a more accurate analysis.

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AUTHOR CONTRIBUTIONS

Putri NP: Data gathering and analysis using SmartPLS, Thesis writing

Subramaniam G: Project administration, Supervision, Resources, Writing original draft, Visualization

Sivasamugham LA: Co-supervision, Resources

Gopinathan S: Analysis using SmartPLS, statistical support

Raman M: Investigation, Formal analysis

Hai ST: Writing – review and editing

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