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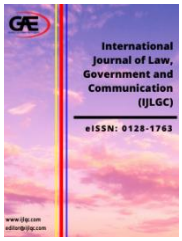

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A STUDY ON PERCEIVED KNOWLEDGE, ATTITUDE AND BEHAVIOUR TOWARDS ACCEPTANCE OF THE COVID-19 VACCINE AMONG THE PEOPLE OF SABAH

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Abstract:

The Malaysian government vaccination drive to curb the Covid-19 virus has received with mixed responses from the citizen. To manage the vaccination drive, the government urge the people to register their interest using a mobile apps called *MySejahtera*. However, in Sabah, the state located in Borneo Island the response was very slow. Therefore, this study aims to uncover the perceived knowledge, attitude, and behaviour among the people in Sabah toward the Covid-19 vaccine. It also aimed to find out the proportion of people who accept, refuse and indecisive in getting the vaccine. A survey was administered to 985 respondents inclusive of citizen and the undocumented from Sabah's three largest urban centres. Both data collection procedures were conducted throughout March 2021.The result shows the overall perceived knowledge, attitudes and perceived behaviour among respondents were positive towards the vaccine. Information seeking and sharing behaviour about vaccines among the respondent are on the high side. Only 50.3% of the respondents indicated that they are willing to receive the vaccine, 27% are indecisive and 22.7% indicated refuse. Female respondents are more positive towards the vaccines. There is no significant difference between age group as well as between the economic background. The study implies that there was a need to have an additional key message on the content, development and how the vaccines work. Specific key messages for the undocumented need to be formulated to increase their overall experience with the vaccine. An investment in Interpersonal communication network was needed in engaging the fence-sitter.

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Introduction

This study was conducted to find out the perceived knowledge, attitude, and behaviour among people in Sabah in relation to acceptance of the Covid-19 vaccine. Malaysia rolled out the National Covid-19 Immunisation Programme (NIP) on February 24, 2021, a week before a questionnaire for this study was administered in March. As of May 23, a total of 1.55 million people in Malaysia have been vaccinated against Covid-19, out of the 10.57 million who registered. As of the same date, Sabah's registration rate stood at 17.3% (507,333 registrations) and vaccinations numbered 116,970 (3.99%). All these data were cited from a website maintained by the Ministry of Health, Malaysia (http://www.covidnow.moh.gov.my, accessed on 23rd May 2021)

The Special Committee for Ensuring Access to Covid-19 Supply (JKJAV) in its website (www.mosti.gov.my/en/citf/) states 80% of the Malaysian population needs to be vaccinated for herd immunity and overall protection of society. Through the NIP, the government's strategy is to ensure as many residents in Malaysia as possible will receive the vaccine to save lives in the fastest possible time. The committee is also targeting a whole-of-government and whole-of-society approach to ensure the programme reaches its target.

Malaysia has since the 1950s given 11 types of vaccines to prevent 13 types of VPDs and administers the Meningococcal vaccine as a compulsory requirement for Malaysians performing the hajj and *umrah* or minor pilgrimage (Faridah, 2017). The Special *Muzakarah* of the National Council for Islamic Religious Affairs has decided the use of the Covid-19 vaccine is *Harus* or permissible. ("FT Mufti: Covid-19 Vaccine permissible for Muslim", 2021)

Vaccines used in Malaysia's programme have fulfilled criteria of relevant laws: Poisons Act 1952 (Act 366), Sale of Drugs Act 1952 (Act 368), Drugs and Cosmetic Control Regulations 1984 and Infectious Disease Prevention and Control Act (Act 342). According to the JKJAV (www.mosti.gov.my/en/citf/) the vaccine distribution strategy is to first vaccinate front liners especially from the health sector so that it can operate optimally, second to reduce the burden of diseases for those in high-risk groups, and reduce load on the public health system, and third to control the pandemic by carrying out vaccination in high-risk areas through risk assessment.

The Demographic Statistics for Malaysia (Fourth Quarter 2020) published by the Department of Statistics Malaysia shows the country has a population of 32.73 million (29.85 million citizens and 2.87 million non-citizens) (www.dosm.gov.my; accessed on, 03rd February 2021). Sabah's population is 3.9 million but there are no details of how many are citizens and non-citizens. The same source shows 28.2% of the Malaysian population is aged under 18 years. The Malaysian government initially does not plan to vaccinate children under 18 years until there is sufficient evidence that it is safe to do so. This would mean the country needs to step up its vaccination drive efforts, as the remaining adult population would need to receive vaccination to achieve herd immunity. For Sabah, the number of children under 18 is 29.4% of the population, also making it crucial to get all those above 18 inoculated (www.dosm.gov.my,

International Journal of Law, Government and Communication
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Volume 7 Issue 29 (September 2022) PP. 410-425
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accessed on 3rd February 2021) However, this also depends on vaccine procurement and availability of stock.

Literature Review

Increasing awareness on the need for vaccination against Covid-19 is essential in fighting this pandemic. However, the public's acceptance of vaccines may be influenced by misinformation spread through propaganda against vaccines for this virus. While we do not know the exact impact of the anti-vaccine propaganda in relation to the public's decision to accept vaccines, the risk of even a minority segment of the population being hesitant or flatly rejecting vaccination can severely undermine Malaysia's effort to establish herd immunity against Covid-19.

The re-emergence of polio in Sabah in 2019, a vaccine-preventable disease (VPD), is a clear example of probable impact of the anti-vaccine propaganda. Casual checking on the anti-vaccine propaganda on social media seems to both support and contradict findings in a paper published by the Ministry of Health's Institute for Health Behavioural Research in 2018 that had suggested vaccine hesitancy among parents in Malaysia is caused by (i) low awareness about the benefit of vaccinations; (ii) availability, accessibility, and affordability; (iii) misconception and concern about side effects of vaccines; and (iv) preference for alternative medicines.

Therefore, it is timely, amid the global euphoria for Covid-19 vaccines, that a study be conducted to determine the level of perceived knowledge, attitude and behaviour of people in Sabah on their acceptance of inoculation against the virus.

Haris Zainul (2020) suggested that the classification of the public and their stand on vaccines as done by Professor Kasisomayajula Viswanath (2019) should be taken as a rough guide. The classification divides the society into three groups when it comes to vaccines: (i) a minority of staunch opponents of vaccination who are unlikely to shift their opinion; (ii) a larger group of people who have been persuaded of the importance of vaccines and are just as unlikely to shift their opinion; and (iii) those in the middle, who are trying to do the right thing but they have doubts and questions, and could be vulnerable to anti-vaccination messages.

However, what is missing is the proportion of each of the three groups. Therefore, this study does not only measure perceived knowledge, attitude and behaviour levels, but also aims to identifies the proportion of those who support and do not support taking Covid-19 vaccines, and those who are undecided.

Vaccine Hesitancy

Acceptance of vaccination is an outcome behavior resulting from a complex decision-making process that can be potentially influenced by a wide range of factor (Noni, 2015). Since it was a result of a complex decision-making process, there was discussion on which model best to describe the phenomenon of vaccine hesitancy. One such model that was first proposed to the WHO EURO Vaccine Communications Working Group in 2011 highlights three categories: complacency, convenience, and confidence.

Noni (2015) further explained that in the "3 Cs" model, confidence is defined as trust in (i) the effectiveness and safety of vaccines; (ii) the system that delivers them, including the reliability

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and competence of the health services and health professionals and (iii) the motivations of policymakers who decide on the needed vaccines.

Vaccination complacency exists where perceived risks of vaccine-preventable diseases are low, and vaccination is not deemed a necessary preventive action. Complacency about a particular vaccine or about vaccination in general is influenced by many factors, including other life/health responsibilities that may be seen to be more important at that point in time. Immunization program success may, paradoxically, result in complacency and ultimately, hesitancy, as individuals weigh risks of vaccination with a particular vaccine against risks of the disease the vaccine prevents that disease is no longer common.

Self-efficacy (the self-perceived or real ability of an individual to act to be vaccinated) also influences the degree to which complacency determines hesitancy. Vaccination convenience is a significant factor when physical availability, affordability and willingness-to-pay, geographical accessibility, ability to understand (language and health literacy) and appeal of immunization services affect uptake. The quality of the service (real and/or perceived) and the degree to which vaccination services are delivered at a time and place and in a cultural context that is convenient and comfortable also affect the decision to be vaccinated and could lead to vaccine hesitancy.

Taking from the above background, this study aims to further develop our understanding on vaccine, particularly the covid-19 vaccine acceptance or refusal, from the perspective of Sabahan. This is due to the fact as mentioned earlier that the number of registrations for the vaccine in Sabah was still very low compared to the other states. The researcher believes that all those factors explaining vaccine hesitancy such as complacency, convenience and confidence can be further understood by examining the perceived knowledge, attitudes, and perceived behavior towards the Covid-19 vaccine among the respondents. Therefore, the research project aims to answer the following research questions.

Research Questions

RQ1: What is the perceived knowledge towards Covid-19 vaccines among the people in Sabah?

RQ2: What are the attitudes towards Covid-19 vaccines among the people in Sabah?

RQ3: What are the perceived behaviours towards Covid-19 vaccines among the people in Sabah?

RQ4: What is the proportion of people in Sabah who agree to take the Covid-19 vaccine, who are indecisive and who refuse to take the Covid-19 vaccine?

Research Method

Research Instrument

The research employed both online and offline methods of data collection through a newly developed questionnaire, in both Bahasa Malaysia and English. The questionnaire must be newly developed to specifically addressed the needs of the research which is to understand the perceived knowledge, attitude, and perceived behaviours towards the Covid-19 vaccine. The questionnaire was divided into five sections. For sections A to C, and for specific statements

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
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in Section D, respondents were asked to indicate their agreement or disagreement based on a 5-point Likert scale. This scale is a psychometric response scale in which respondents specify their level of agreement or disagreement to a statement in five points: (1) Strongly Disagree; (2) Disagree; (3) Unsure; (4) Agree; and (5) Strongly Agree.

Section A which measured the perceived knowledge of respondents towards Covid-19 vaccines contained seven statements, while Section B to measure the attitude of respondents towards Covid-19 vaccines had six statements. Section C of the questionnaire was to measure the behaviour or practice of respondents towards Covid-19 vaccines. There were 6 proxy-indicators statements of behaviour here. Section D was divided into three parts. In this section, respondents were asked to indicate their inclination towards three questions: will not take the vaccine, considering taking the vaccine and will take the vaccine, and each question further had three specific statements. The final part of the questionnaire, Section E, was centred around getting details on the demographic information of respondents.

Validation And Reliability Of Research Instrument

The questionnaire went through two levels of validation before it was finalised. First was through face validation, where each researcher in the team administered the questionnaire to at least two respondents. Feedback including further clarifications on some statements were noted. The research team then met to discuss all feedback gathered through this face validation exercise and to reframe some statements and further improve the questionnaire.

The second level was through an expert validation process to validate the contents and to scrutinise the relevancy as well as the clarity of each statement from the point of experts. A total of 10 experts were sought to validate the questionnaires and the research team received feedback from eight. Experts were mainly researchers with experience ranging from five to over 20 years in conducting research in social sciences. The following Table 1 is the score of the expert validation process:

Table 1: Expert Validation Score

Type of measurement	Score
S-CVI/Ave	0.95
I-CVI/UA	0.79

Polit et al., (2007) proposed that for a scale to be judged as having excellent content validity, it would be composed of items that had I-CVI/UA of 0.78 or higher and an S-CVI/Ave of 0.90 or higher (p.18). The above table shows that the score obtained for the questionnaire used in this research surpassed the minimum threshold required for expert validation. Therefore, it can be concluded that the questionnaire used for this study is valid.

A reliability test was conducted to the instrument. The following Table 2 shows that the instrument scored a Cronbach's Alpha of 0.768 which is deemed as having good reliability.

International Journal of Law, Government and Communication
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Volume 7 Issue 29 (September 2022) PP. 410-425
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Table 2: Reliability Score of The Instrument

Reliability Statistics

Cronbach's Alpha	N of Items
.768	31

Data Collection Mechanism and Sampling Size and Procedures

As mentioned above, the research employed both online and offline data collection methodology using the same set of questionnaires. The online method employed a Google form and the link to the questionnaires was posted randomly through WhatsApp as well as through the Facebook page of the UMS-UNICEF C4D Research Unit. Both online and offline survey was conducted throughout the month of March 2021 simultaneously.

The offline survey was administered with the help of enumerators and managed to get a total of 500 respondents as projected, at three major urban centres in Sabah: Kota Kinabalu on the west coast, and Sandakan and Tawau on the east coast. On the other hand, the online survey resulted in 485 responses, 15 short of the projected 500 responses before the link was closed.

The research team decided to do face-to-face or offline survey to gather feedback from non-Malaysians as well as Malaysian who has no access to the internet. This study was also interested in finding out the acceptance of non-citizens in Sabah towards vaccination. It is assumed one in three of the population in Sabah is a non-citizen, making it crucial to also find out the level of perceived knowledge, attitude, and behaviour among this group towards the Covid-19 vaccine.

The Malaysian Government has given its assurance that non-citizens will also be inoculated for free under the NIP. While the target was to get feedback from 300 non-citizens, Covid-19 related movement restrictions saw the team gathering responses from 185 individuals or 18.8% of overall respondents. However, data gathered allows this study to make preliminary recommendations in tackling vaccine acceptance among non-citizens in Sabah.

The sampling size of 1,000 was statistically significant following the Morgan & Krejcie (1970) sampling method whereby for a population over 300,000 a minimum sample size of 384 is deemed sufficient with 95% sampling confidence and 5% margin of error.

Data Analysis

All the data was recorded into SPSS software and analysed using the same software package. Descriptive statistics was employed to understand the distribution of the data.

Findings

Demographic of Respondents

As shown in the following Table 3, the age group of this survey has covered from as young as 18 and up to 70 years old of respondents. 27% of them are from the 18-23 years old category. In terms of occupation, the survey has managed to cover quite a range of diverse profession whereby, 25% of the total respondents are students, followed by public sector employees at 24%. The B40 group form most respondents in terms of income. The no income group are

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
DOI 10.35631/IJLGC.729029

mainly students and the unemployed. In terms of highest education attainment, majority of the respondents at 36% managed to at least complete secondary school. More than two third or 81% of the respondents are Malaysian citizen while the remaining 19% are non-Malaysian. More than half or 58% of the respondents are females.

Table 3: Distribution of Respondents' Profile (n=985)

Variables	Categories	Frequency	Percentage
Age Group	18 – 23 years	267	27.1
	24 – 29 years	201	20.4
	30 – 35 years	154	15.6
	36 – 41 years	115	11.7
	42 – 47 years	113	11.5
	48 – 53 years	82	8.3
	54 – 69 years	52	5.3
	70 years and above	1	0.1
Occupation	Public Sector	237	24.1
	Private Sector	213	21.6
	Self-employed	135	13.7
	Student	249	25.3
	Housewives	79	8.0
	Unemployed	72	7.3
Income Group	No income	348	35.3
	B40	493	50.1
	M40	129	13.1
	T20	14	1.4
Highest Education Attainment	No formal education	152	15.4
	Primary school	5	0.5
	Secondary school	361	36.6
	Diploma	133	13.5
	Bachelor's degree	220	22.3
	Master's degree	97	9.8
	PhD	17	1.7
Citizenship status	Malaysian	800	81.2
	Non-Malaysian	185	18.8
Sex	Male	414	42
	Female	571	58

Perceived Knowledge Towards Covid-19 Vaccines Among the People in Sabah

The first research question is to determine perceived knowledge on Covid-19 vaccines among the respondents. Statements were related to knowledge on contents, functions, development and benefit of vaccines, and on the perception of vaccines in general having side effects. It also aimed to find out knowledge on the role of the Covid-19 vaccine in forming herd immunity and to assess if respondents were aware that vaccines to curb the Covid-19 virus are available in Malaysia.

The overall mean score of knowledge towards Covid-19 vaccine, as shown in the Table 4, was 3.63. The highest score was on vaccine availability in Malaysia, followed by its role in forming

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
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herd immunity and side effects related to vaccines in general. Respondents were unsure about contents of the vaccines, how vaccines function and how these were developed. There was a better understanding on the benefits of vaccines.

Table 4: Mean Score for Perceived Knowledge

Particular	Minimum Score	Standard Deviation
Knowledge	3.63	0.71260

Table 5: Mean Score for Each Item Measuring the Perceived Knowledge on Covid-19 Vaccine

Statements	Minimum Score	Standard Deviation
I know the contents of this vaccine	3.10	1.080
I know how this vaccine works	3.35	1.063
I know how this vaccine is developed	3.01	1.072
I know the benefits of this vaccine	3.73	1.026
All vaccines will have side effects	3.82	.986
I know that taking this vaccine is required to create herd immunity	3.93	.961
The Covid-19 vaccine is available In Malaysia	4.51	.742

The Attitudes Towards Covid19 Vaccines

The second research question is concerned with the attitude of respondents towards Covid-19 vaccines. There are six items used to measure the attitudes of respondents. The first was if respondents are prepared to take the vaccine, and the second and third were on trusting information from the government and the World Health Organisation (WHO). The fourth question was to measure whether the respondents believed that the Covid-19 vaccines could halt the virus transmission. The fifth question asked whether respondents were willing to pay to get the vaccine and the final statement was to measure if respondents would take the vaccine as a responsibility to the community.

As shown in Table 6 below, the overall mean score under the attitudes was 3.65 which can be interpreted as leaning towards more favourable attitudes towards the Covid-19 vaccines.

Table 6: Mean Score for Attitudes towards Covid-19 Vaccines

	Mean Score	Standard Deviation
Attitudes towards covid-19 vaccines	3.65	0.98044

Table 7: Mean Score for Each Item Measuring the Attitudes towards Covid-19 Vaccine

	Mean Score	Standard Deviation
I am prepared to take this vaccine	3.75	1.198
I trust information from the Malaysian government with regard to this vaccine	3.89	0.972
I trust information from the World Health Organization (WHO) with regard to this vaccine	3.86	1.009

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
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I believe this vaccine will curb the transmission of the Covid- 19 virus	3.86	0.970
I am willing to pay for this vaccine	2.75	1.198
I will take this vaccine as my responsibility to the community	3.83	1.14

Perceived Behaviour Towards Covid-19 Vaccines

The third research question is to find out the perceived behaviour towards Covid-19 vaccines among the people in Sabah. Behaviour was measured based on the proxy activities to indicate behavioural inclination towards Covid-19 vaccines: these are information seeking, sharing, verification, and discussing issues about vaccines with others as well as whether the respondents had registered to receive the vaccine and had done the same for their dependents.

The overall mean score of perceived behaviour towards Covid-19 vaccine is 3.52 and could be interpreted as positive behaviour inclination towards the vaccine. The following Table 8 shows the mean score for each items respondent were asked. The highest score is information seeking behaviour at 3.67 (almost 4). However, the standard deviation is also on the high side, which means that the responses deviated far from the mean score. Verification of information among respondents also recorded a high score of 3.66. It is worth noting that respondents were unsure whether they should register their dependents to get the vaccine.

Since most of the standard deviations of each item are on the high side, it is essential to investigate the distribution of responses for each item as shown in the following Figure 1.

Table 8: Mean Score For Each Item Measuring The Perceived Behaviour Towards The Covid-19 Vaccine

Behaviour	Mean Score	Standard Deviation
I search for information about this vaccine	3.67	1.091
I verify sources of information that I receive about this vaccine	3.66	1.055
I have registered myself to take this vaccine	3.56	1.435
I actively discuss about this vaccine with my close contacts	3.52	1.136
I share news articles about this vaccine with my close contacts	3.55	1.137
I have registered my dependent/s to take this vaccine	3.21	1.348
OVERALL	3.52	.93700

(1- Strongly Disagree; 2 – Disagree; 3- Unsure; 4 – Agree; 5 - Strongly Agree)

The following Table 9 shows the proportion of responses towards each of the questions asked regarding the perceived behaviour of respondents towards Covid-19 vaccines. It is worth noting that over 60% of respondents indicated that they are actively seeking information about vaccines. This is indeed a good proxy behaviour indicator. It shows that respondents are actively looking for information that is related to Covid-19 vaccine. However, what is not known about this is whether the respondents were looking for the right information about vaccines or not. Active information seeking behaviour could also mean that the respondents

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
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are looking for information about the side effects of vaccines and this may influence their decision whether to accept or not to accept the vaccines.

Close to 60% of respondents indicated that they share information about vaccines with their close contacts. Like the previous argument, while this seems a good indication for disseminating information, it should be treated with caution as we do not have information on the type of information shared by respondents.

However, there is a silver lining where over 50% of the respondents agree that they do verify information they receive about vaccines. This could help in terms of nudging the people of Sabah to practice verification of information to fight vaccine misinformation. The fact that over 50% of the respondents also agree that they discuss information they receive about vaccines with their friends and family indicates that effort to fight vaccine misinformation should continue and to focus on interpersonal communication.

Table 9:Distribution of Perceived Behaviour among Respondents Towards the Covid-19 Vaccine

Perceived Behaviour	Agree	Unsure	Disagree	Total
Registering dependent	43.8	24.1	32.1	100
Registered for the vaccines	57.8	13.6	28.7	100
Discuss about vaccines with friends	55	27.6	17.4	100
Verifying information about vaccine	56.7	32.2	11.2	100
Sharing information with close contact	59.3	21.8	18.9	100
Seeking information	63.4	22.2	14.4	100

Proportion of People Who Agree to Take the Covid-19 Vaccine, Indecisive and Refuse To Be Inoculated

To answer this research question, respondents were given an option to choose one of three statements, before answering subsequent statements related to vaccine content, side-effects, safety and effectiveness on a Likert-scale similar to that administered for the earlier three research questions. The three statements were:

(i) I will not take the vaccine (interpreted as refusal to take vaccine);
(ii) I am still considering whether to take the vaccine (interpreted as indecisive); and
(iii) I will take the vaccine (interpreted as acceptance to take vaccine).

This research question was formulated to gain a clearer understanding on the status of acceptance and refusal of the population in Sabah towards getting vaccinated against Covid-19, and to find out the number of those who are indecisive. This was prompted by the Malaysian Ministry of Health's Covid-19 Vaccine Acceptance Survey from December 21-28, 2020, which showed 67% of 212,006 respondents agreeing to take the vaccine, as compared to 17% who were unsure and 16% who disagreed. Those who agreed mainly felt it is safe and effective in preventing infection, and a smaller number said they do not have any doubts about the contents. For those who were unsure, a majority were worried about side-effects with others expressing uncertainty if it would be effective in preventing infection and had doubts over safety. Among those who disagreed to get inoculated, a majority were worried about side effects, with the rest having concerns on contents and vaccine safety.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 7 Issue 29 (September 2022) PP. 410-425
DOI 10.35631/IJLGC.729029

As this study focused on the Sabah population, we decided it would be necessary to find out local sentiments, rather than relying only on national level findings on vaccine acceptance. The finding of this Sabah centric study, as shown in the Table 10 below, found vaccine acceptance at 50.3%, with another 27% of respondents indecisive and 22.7% refusing to be inoculated against Covid-19.

However, it must be noted that the Ministry of Health conducted another survey in early April as a follow up to the one five months earlier and found that 85% of respondents were willing to get vaccinated, 10% were uncertain and five per cent disagreed with taking the jab. Our findings do not reflect this although done just a month earlier. Our findings are more consistent with the "Knowledge, Attitude and Acceptance of a Covid-19 Vaccine: A Global Cross-Sectional Study" by Green University which showed vaccine acceptance in the scale of "strongly agreed" in Malaysia was 52.67%. The Green University study was conducted online from June to September 2020, covering 60 nations.

Table 10: Proportion of Respondent Accepting, Refusing the Vaccine and Indecisive

Decision	**Frequency**	**Percentage**
Accept the vaccine	495	50.3
Indecisive	266	27
Refuse	224	22.7
Total	**985**	**100**

Vaccine Acceptance

A total of 495 respondents, or 50.3%, answered that they intend to get inoculated against Covid-19. Of this number, 62.6% were female and 37.4% male, and it is notable that 92.5% were Malaysians while the remainder were non-citizens. A quarter were in the 18-23 years age group (25.7%) followed by the 24-29 years (19.2%) group. Some 32.3% work in the public sector, followed by 25.9% who are students. Over half (51.5%) are from the B40 group but it must be noted that most respondents in this study (50.1%) fall under this income category. The findings show 37.2% have finished secondary school, and some 25.9% have a bachelor's degree.

The following three statements were asked for those who responded that they accept getting inoculated:

i. I do not have any doubts about the contents of the vaccine.
ii. I am confident the vaccine is effective in stopping the spread of the virus; and
iii. I feel the vaccine is safe to use.

As shown in the following Table 11, responses to the Agree and Strongly Agree scales were calculated for each statement, resulting in scores that showed 400 respondents do not have doubts about the contents of the vaccine, 436 agreeing that the vaccine is effective in stopping the spread of the virus, and 434 stating the vaccine is safe to use.

Table 11: Reason For Accepting The Covid-19 Vaccine

Reason	**Frequency**	**Percentage**
I feel the vaccine is safe	434	87.7
Confident that vaccine can stop the virus spreading	436	88.08
No doubt about the content of vaccine	400	80.8

International Journal of Law, Government and Communication
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Volume 7 Issue 29 (September 2022) PP. 410-425
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Vaccine Refusal

Those who refuse to take the Covid-19 vaccine number 224 respondents. This study found more Malaysians compared to non-citizens refuse vaccination against Covid-19 (124 Malaysians compared to 100 non-citizens). However, given that the total non-citizen respondents in this study were 185 individuals, the number of non-citizens in this study who refused inoculation is significant (54.05%).

In terms of age group, 24.6% were aged 18-23 years followed by the 24-29 years group (21.9%). Those who are self-employed or running their own business were the highest in this category (21.9%) followed by students (21%) and private sector employees (19.2%). A majority do not have an income (47.3%) and another 44.3% are in the B40 bracket. No one in the T20 category was recorded as being against the vaccine. Those who do not have a formal education were the highest among those opting out (39.7%), followed by respondents who have secondary school education (31.3%). There were more males (53.1%) against females (46.9%) in this category. It can be inferred from these findings those who do not have formal education are mainly non-citizens and male.

The following Table 12 shows the responses to the Agree and Strongly Agree scales that were calculated for each statement, concern over side-effects involving 187 respondents, followed by doubts about contents of the vaccine (176 respondents) and vaccine safety (103 respondents).

Table 12: Reasons for Refusing the Covid-19 Vaccine

Reasons	Frequency	Percentage
Feel that the vaccine is unsafe	103	49.9
Doubt about the contents of the vaccine	176	78.5
Worried about the side-effects	187	83.5

Indecisive About Vaccination

A total of 266 respondents said they were still considering whether to take the vaccine. The findings showed 82% in this category were Malaysians. Some 32% were aged 18-23 years followed by 21.4% aged 24-29 years. A quarter of the respondents in this category were employed in the private sector (25.2%) and 21.4% are with the public sector. Students form a majority of those who are indecisive (27.8%). Over half (53%) are in the B40 group and 36.8% do not have an income. In terms of highest education, 40.2% finished secondary school while 13.5% do not have formal education. There were more females in this category (58.6%) compared to males (41.4%).

Those in the indecisive category were asked the following three statements:

i. I am worried about the side-effects of the vaccine.
ii. I am unsure if the vaccine is effective in stopping the spread of the virus; and
iii. I am unsure if the vaccine is safe to use.

Responses to the Agree and Strongly Agree scales were calculated for each statement, resulting in scores that showed concern over side-effects involving 210 respondents, uncertainty on the effectiveness of the vaccine in stopping the spread of the virus (179 respondents) and uncertainty over vaccine safety (182 respondents), as shown in the following Table 13.

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Table 13: Reason of The Being Indecisive

Reason	Frequency	Percentage
Uncertain over vaccine safety	182	68.4
Uncertain of vaccine efficacy	179	67.3
Worried about the side-effects	210	78.9

In summary, among the group that refused the vaccine, the main fears are related to side-effects and the content of vaccines, while for the indecisive group, it is mainly over side-effects and safety. The key messages for the group refusing the vaccine would need to focus on facts surrounding side-effects and contents. Key messages for the indecisive group would likely need to centre around allaying fears on side-effects.

Discussion

This study shows lack of knowledge on what vaccines contain, how this work and how vaccines are developed This is consistent with another study conducted by Nurul Azmawati et al, (2021) who found that 62% of the respondent had poor knowledge about the covid-19 vaccine. This may be the reason why the population are rejecting the vaccine or are indecisive, which are easily swayed by misinformation or rumours. This is supported in a study by Loomba, de Figueriredo, Piatek (2021) who has established a causal link between misinformation and the lowering of intention to accept the covid-19 vaccine.

Therefore, developing the right key messages would be crucial – in relation to what is contained, how vaccines work and how these are developed. Argote et al, (2021) suggested that despite the usual messaging addressing the knowledge to the public, additional information about others' behaviour could increases vaccine acceptance. On top of that, priming social approval benefits of vaccinating also increases vaccine acceptance (Argote et al, 2021).

The attitude component of this study shows the government should continue to remain the focus or source of information in Malaysia. The government may want to assess its current messages to allay fears and with that create a more positive attitude among those who have registered, to ensure they attend their appointments. To maintain the positive attitude towards covid-19 vaccine, more experts should come forward to share about the vaccine to the public. Callaghan (2020) suggest that trust in experts has been found to be associated with the intent to pursue covid-19 vaccine.

For behaviour, while it is positive that respondents are sharing information about Covid-19, it is beyond the scope of this research to identify what type of news is being shared. It may be useful for other researchers to conduct a study on this – it can be assumed that a higher level of negative news may even swing those who had initially registered to take the vaccine to change their minds. The longer it takes for vaccines to be administered, there is a possibility for people to decide they are no longer interested in taking the vaccine after initially deciding to do so. The government may want to also keep its attention on those who have registered but are waiting for their turn. Argote et al., (2021) in their study found that reduces the waiting time to vaccinate may increase willingness to encourage others to vaccinate. In other words, shaping of social expectation significantly increases vaccine uptake.

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Recommendation and Limitation

This study found a significant difference between citizens and non-citizens in the aspect of perceived knowledge, attitude, and behaviour towards Covid-19 vaccine acceptance. Citizens in Sabah have better scores on vaccine acceptance compared to non-citizens. Therefore, further research is needed focusing on non-citizens to better understand their perspective and to design messages that would see a positive shift in their levels of knowledge, attitude, and behaviour.

Messages designed for non-citizens would need to factor in education levels, literacy and types of media that would be most effective in reaching this segment of the Sabah population. The government may need to step up its messaging that vaccines are for all living in Malaysia, and that no action related to immigration and related laws will be taken against those who are undocumented.

For those rejecting vaccines, it is important to look at non-citizens, those in the 18-29 age bracket, those who do not have a formal education, and males. Focus on the indecisive group needs to look at students and private sector employees, and again those in the 18-29 age group. We found at least a quarter of students accept taking the vaccine and they could be roped in to influence other students. This is the same scenario for the B40 income category, which is almost equal across the three groups.

Effective key messages are critical for the indecisive group to swing them towards taking the vaccine. The government may also want to consider offering incentives as a tie up with the private sector, which may appeal to students and those in the B40 income bracket. Such incentives, or freebies, are given once inoculation is completed. Dissemination of Covid-19 vaccine information should focus on Interpersonal communication as indicated in this study that more than 50% of respondents are discussing information about vaccines with their friends and family members.

Admittedly, being a cross-sectional study there is limitation to the findings. People's perception on the vaccine is dynamic. The data was collected at the very beginning of the inoculation exercise by the government, hence the proportion of indecisive as well as the refusal group was quite on the high side.

Despite the above limitation, measuring vaccine acceptance, hesitancy and refusal is crucial for the appropriate planning of strategies for increasing vaccine coverage and for monitoring. It is also important to monitor the degree and type of hesitancy because this is a dynamic process. In addition, vaccine hesitancy may be specific to one as in the case of the Covid-19 vaccine or some, but not all vaccines.

Conclusion

The research project has managed to achieve its objectives. While the findings for the first three research questions are more a less similar to that of nationwide survey conducted by the Ministry of Health, there is one interesting finding this research has that other previous research has not. This research offers an early insight into the undocumented people reaction to the covid-19 vaccine in Sabah. This is indeed a significant step because the virus did not discriminate people based on citizenship.

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