




Knowledge About COVID-19, Beliefs and Vaccination Acceptance Against COVID-19 Among High-Risk People in Ho Chi Minh City, Vietnam

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Background: Vaccination is one of the best ways to control a pandemic such as COVID-19. However, identifying community apprehensions towards vaccination needs to be understood in detail. This study aims to determine the factors that can predict the acceptance of the COVID-19 vaccine.

Methods: A cross-sectional study was considered by systematic random sampling of 425 adults with chronic illnesses in Ho Chi Minh City. Data were collected between December 2020 and January 2021 via a self-administered, structured questionnaire. The main outcome was the acceptance of future COVID-19 vaccinations.

Results: A total of 425 eligible adults responded to the survey, whose mean age was 52.9 ±15.6 years; 67.8% of them were women, more than a half of them had high school education level or higher (57.4%) and received COVID-19 information mainly via television and social media accounted for 82.4% and 58.1%, respectively. Overall, knowledge of COVID-19 was reported as relatively good, with a mean score of 7.11 ± 1.77 (0–9). Determinants of vaccination acceptance were knowledge and cues to action. Accordingly, there was a 1.2-fold increase in the odds of acceptance of COVID-19 vaccination for a 1-unit increase in “the total knowledge score” (AOR 1.2, 95% CI: 1.1–1.3, p<0.05), and there was a 3.2-fold increase in the odds of vaccination acceptance for a 1-unit increase in “cues to action” (AOR 3.2, 95% CI: 1.7–5.8, p<0.001).

Conclusion: Determinants that influence the intention to have the COVID-19 vaccination are identified, which can be applied to future health education interventions that should focus on enhanced knowledge towards COVID-19 via mass media messages and cues to action from healthcare workers’ recommendations to promote vaccine acceptance.

Keywords: beliefs, COVID-19, health belief model, knowledge, vaccination

Introduction

The Coronavirus Disease 2019 (COVID-19), which is caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has continued to adversely affect almost every country around the world.¹ As of 4 April 2021, globally, cases have surpassed 130 million confirmed cases, of which over 2.8 million cases resulted in the death of the patient, which includes the Americas and Europe, which have been reported as high infection zones for COVID-19.² Until now, Vietnam has successfully dealt with COVID-19 by pooling and utilizing

domestic resources and manpower to track the possible source of all infections. Also, timely and effective communication relating to COVID-19 has been widely conveyed and seen on mass media, websites, mobile applications, and automatic SMS notifications, which increased the awareness of the community towards symptoms and prevention, such as social distancing, regular washing of hands, avoiding crowded places and wearing of face masks.^{3,4} In Vietnam, a total of 2,631 confirmed cases have been recorded and deaths are stable at just 35.⁵ Symptoms of COVID-19 are reported as a non-specific range from asymptomatic (approximately 40% to 45%) to severe pneumonia and death.⁶ The typical signs and symptoms were recorded, including fever (87.9%), dry cough (67.7%), fatigue (38.1%), sputum production (33.4%), and shortness of breath (18.6%).⁷ Based on the CDC's recommendation, the average incubation period is 5–6 days, with the virus being active from 2–14 days after exposure, so the time applied internationally for monitoring and restricting the movement of healthy individuals has been set at a minimum of 14 days.⁸ People who are at high risk of serious infection or death include elderly people and adults with underlying health conditions such as acute cardiac injury, heart failure, hypertension, arrhythmia, coronary artery disease and cardiovascular disease.⁹ Notably, asymptomatic carriers could be responsible for transmitting the virus during the incubation period. To date, although some clinically significant treatments have been urgently approved by FDA and WHO, the number of deaths continue to increase across the globe.^{10,11} In this context, it is hoped that the COVID-19 pandemic will be controlled after the emergence of safe and effective vaccines, similar to vaccines that played a role in arresting or eradicating previous infectious diseases such as polio, smallpox, rabies, influenza pandemic, and so on in the twentieth century.¹² Several vaccines for COVID-19 are currently being urgently developed in many countries including Vietnam.^{13,14} It is important to start investigating individuals' acceptability of a COVID-19 vaccine to be able to plan to have available a sufficient health system capacity, as well as strategies to enhance the trust of the community in the vaccine. The Health Belief Model (HBM) has been widely considered as a framework to predict acceptance and uptake of vaccinations in many previous studies.^{15,16} Recently, we have developed and validated a scale toward beliefs for COVID-19 vaccines with Cronbach's alpha of 0.765 and acceptable validity between a four-factor model including Perceived

Susceptibility and Severity (4 items), Perceived Benefits (3 items), Barriers to Vaccination (3 items), and Cues to Action (2 items). Meanwhile, several studies found that the acceptance of a vaccine differed according to demographics and geographical disparities, such as the prevalence acceptance of COVID-19 vaccines was between 67% and 93.3% among adults in China, the USA and Indonesia, as well as a global survey, reported by Lazarus et al, which showed that the likelihood of vaccine acceptance in 19 countries ranged from nearly 90% (in China) to fewer than 55% (in Russia).^{17–20} In recent research, we identified that a rate of willingness to get vaccinated against COVID-19 among healthcare workers in Vietnam was relatively high (76.1%).²¹ Aside from healthcare workers, people with chronic conditions are also at high risk of COVID-19, and having been identified as a priority group for vaccination, so we considered this group to be a vital community group for this study to identify future challenges and opportunities to ensure the effectiveness of vaccination.

Methods

Participants and Survey Design

A cross-sectional survey was carried out using a systematic random sampling total of 425 adults with chronic diseases, attending two hospitals in Ho Chi Minh City, Vietnam. A sample size was based on the estimated prevalence of willingness to get vaccinated at 76.1% with a power of 0.8 and an alpha of 5%.²¹ Taking into consideration about 10% of incomplete data in the Vaccination Beliefs Questionnaire, the minimum sample size was 350. Data was gathered between December 2020 and January 2021. All participants were informed that their participation was voluntary and completed the consent form before taking part in the study.

Data Collection

A self-administered, structured questionnaire was created and used to collect data that assessed 1) the demographic characteristics of participants, 2) COVID-19 Knowledge via 9 items taken from our preliminary study among people with chronic conditions,²² 3) Vaccination Beliefs relating to COVID-19, through the 12-item scale based on four dimensions of the HBM, including Perceived Susceptibility and Severity (4 items), Perceived Benefits (3 items) and Barriers to Vaccination (3 items), and Cues to Action (2 items), which were measured for the

reliability and validity of the content in our previous study,^{16,21} and 4) the acceptability of a future COVID-19 vaccination via one item. Data were collected when subjects attended the outpatient departments at the two hospitals.

Statistical Methods

In relation to COVID-19 knowledge, each correct response was awarded one point, with an overall knowledge score obtained from the nine questions, with higher scores indicating higher/good knowledge. For assessing the 12-item vaccination beliefs, responses to items were recorded on 5-point-Likert scales with one point anchored at strongly disagree and 5 points for strongly agree. Higher values indicated greater agreement with the statements. The acceptance of vaccination was measured using one item with “yes” or “no” options, responses to “yes” were considered as acceptance to receive a vaccination, and the reverse was applied for a “no” response.

All analyses were performed using STATA 14.0 software. The frequency (percentages) and mean scores (standard deviation) were reported in the descriptive analysis.

To identify determinants of acceptance to vaccinate against COVID-19, a multivariable logistic regression analysis was performed to calculate adjusted odds ratios (AOR) with 95% confidence intervals (95% CI) for all variables with a p-value <0.2 in the univariate analyses. A p-value of less than 0.05 was considered statistically significant.

Ethics Approval

Our research complied with the Declaration of Helsinki. All participants agreed and gave informed consent before participating. The protocol of the study was approved by the Ethics Council - University of Medicine and Pharmacy at Ho Chi Minh City (protocol number 27/UMP-BOARD).

Results

Demographic Characteristics of Participants

The sample consisted of 425 adult participants whose mean age was 52.9±15.6 years, the majority of whom were female (67.8%), with almost half were housewives or retired (52.4%) and with a high school education level or higher (57.4%). The

Table 1 Demographics and COVID-19 Vaccine Acceptance (N=425)

Variables	Overall n (%)	Acceptance COVID-19 Vaccination		p
		Yes, n (%) 357(84.0%)	No, n (%) 68 (16.0%)	
Age (Mean±SD)	52.9 ± 15.6	53.49 ± 16.87	50.35 ± 15.29	0.141
Gender				
Male	137 (32.2)	120 (87.6)	17 (12.4)	0.164
Female	288 (67.8)	237 (82.3)	51 (17.7)	
Education				
Primary	51 (12.0)	45 (88.2)	6 (11.8)	0.403
Secondary school	130 (30.6)	105 (80.8)	25 (19.2)	
High school and higher	244 (57.4)	207 (84.8)	37 (15.2)	
Occupation				
Housewives/Retired	223 (52.4)	193 (86.6)	30 (13.4)	0.280
Officer/Business	115 (27.1)	92 (80.0)	23 (20.0)	
Worker	87 (20.5)	72 (82.8)	15 (17.2)	
Source of COVID-19 information				
Television	350 (82.4)	293 (83.7)	57 (16.3)	0.730
Social media	247 (58.1)	212 (85.8)	35 (14.2)	0.230
Relatives	164 (38.6)	136 (82.9)	28 (17.1)	0.630
Website of Hospital/Ministry of Health	90 (21.2)	74 (82.2)	16 (17.8)	0.602

majority of participants reported that they received COVID-19 information, mainly, via television and social media (82.4% and 58.1%, respectively). Their acceptance to take a COVID-19 vaccination was fairly high (84.0%). There was no significant difference between vaccination acceptance and the characteristics of participants (Table 1).

Knowledge of COVID-19

The total knowledge was reported as being relatively good with a mean score of 7.11 ± 1.77 (0–9), with over 80% responding correctly to the questions about the pathogen of SARS-CoV2 (85.2%), transmission (92.2%), common symptoms (83.1%), isolation period if suspected infection (88.0%), and the dangers of COVID-19 (93.2%). A slightly lower level of knowledge was reported, 74.6% and 76.0%, in relation to COVID-19 preventive measures and people with chronic illness at high risk of infection, respectively. There were far fewer respondents that

answered correctly to these two items: the vaccine is not available for all people and no specific treatment (identified by 41.6% and 40.0%, respectively). Participants who had high knowledge about the pathogen, treatment, preventive measures, severity of COVID-19, as well as total knowledge score, were more likely to have an acceptance of the vaccination, with all $p < 0.05$ (Table 2).

Vaccination Beliefs in Relation to COVID-19

Most of the participants had positive beliefs in relation to the COVID-19 vaccination, with the high mean score for the Perceived Susceptibility and Severity (3.33 ± 0.74) and Cues to Action (3.96 ± 0.51), but a slightly lower score, 2.78 ± 0.83 , acknowledged the Benefits of Vaccination. However, the item of Barriers to Vaccination also reported a fairly high score (3.63 ± 0.56) (Table 3).

Table 2 Associated Factors Between Knowledge and Acceptance COVID-19 Vaccine (N=425)

Knowledge	Correct Knowledge No. (%)	Acceptance COVID-19 Vaccine		p
		Yes n (%)	No n (%)	
Pathogen (virus) Yes	362 (85.2)	310 (85.6)	52 (14.4)	0.027
Transmission by close contact with an infected person				
Yes	392 (92.2)	331 (84.4)	61 (15.6)	0.395
Common sign/symptoms (Fever or Cough or fatigue or sputum production or shortness of breath)				
Yes	353 (83.1)	301 (85.3)	52 (14.7)	0.114
The isolation period at health facilities is 14 days				
Yes	374 (88.0)	316 (84.5)	58 (15.5)	0.454
Vaccine is available for all people in Vietnam				
No	177 (41.6)	153 (86.4)	24 (13.6)	0.246
Specific treatment				
No	170 (40.0)	134 (78.8)	36 (21.2)	0.017
Prevention of transmission (Wear facemask, hand washing, surfaces cleaning, keep distance from others)				
Yes	317 (74.6)	273 (86.1)	44 (13.9)	0.041
People with chronic illness at high risk of infection				
Yes	323 (76.0)	277 (85.8)	46 (14.2)	0.078
COVID-19 can be fatal				
Yes	396 (93.2)	339 (85.6)	57 (14.4)	0.001
Overall knowledge score (mean ±SD)	7.11 ± 1.77	7.2 ± 1.6	6.6 ± 2.3	0.005

Table 3 Beliefs Toward COVID-19 Vaccination of Participants (N=425)

Item	Mean ± SD
Perceived susceptibility and severity	3.33 ± 0.74
I am at high risk for COVID-19 infection	3.26 ± 0.94
I think I will get COVID-19 in the near future	3.18 ± 0.94
I could be severely ill if I got COVID-19	3.36 ± 0.83
I am afraid of even thinking about getting ill with COVID-19	3.49 ± 0.89
Perceived benefits	2.78 ± 0.83
Immunization will prevent me from contracting COVID-19	3.01 ± 1.09
By being immunized and not getting COVID-19, I will protect others from COVID-19	2.99 ± 1.03
By being immunized, I feel less worried about the possibility of severe illness from getting COVID-19	2.36 ± 1.05
Perceived barriers	3.63 ± 0.56
I am afraid that the COVID-19 vaccine can cause AEFIs	3.67 ± 0.67
COVID-19 infection can be self-limiting and an unnecessary vaccination	3.71 ± 0.88
I think that the cost of COVID-19 vaccine will be expensive	3.53 ± 0.78
Cues to action	3.96 ± 0.51
I think that all people should be vaccinated to promote public health	3.96 ± 0.63
I will receive a COVID-19 vaccine if my healthcare workers recommend a vaccination	3.96 ± 0.54

Vaccination Acceptance of COVID-19

The vaccination acceptance was significantly related to the overall knowledge of participants and cues to action, but the baseline demographics were not. Accordingly, there was a 1.2 fold increase in the odds of acceptance of a COVID-19 vaccination for a 1-unit increase in “the total knowledge score” (AOR 1.2, 95% CI: 1.1–1.3, $p < 0.05$), and there was a 3.2 fold increase in the odds of vaccination acceptance for a 1-unit increase in “cues to action” (AOR 3.2, 95% CI: 1.7–5.8, $p < 0.001$) (Table 4).

Discussion

To the best of our knowledge, this is the first study investigating acceptance and beliefs of COVID-19 vaccinations

among chronically ill outpatients who were at high risk of infection in the context of a high pandemic burden on the world. For that reason, the appearance of an efficacious and safe vaccine will improve the hope of controlling this situation. At present, the imported vaccines through the COVID-19 Vaccines Global Access Program (COVAX) is limited and not available for people including chronically ill patients, while the COVID-19 vaccines have been developed by Vietnam are still in the clinical trials, thus assessing the acceptance of vaccination, and understanding the determinants that influence to receive or not to receive the vaccination, has played an important role to optimize vaccination prevalence in the population and prioritize to high-risk subjects. Also, the groundwork for public acceptance of a COVID-19 vaccine must begin well before

Table 4 Multivariable Logistic Analysis of Factors Associated with Acceptance COVID-19 Vaccine (N = 425)

Domain	Univariate Analysis		Multivariable Logistic Regression	
	OR (95% CI)	p	AOR (95% CI)	p
Age	1.01 (1.09–1.1)	0.141	1.1 (0.9–1.2)	0.438
Gender (male)	1.5 (1.1–2.7)	0.164	1.5 (0.8–2.8)	0.204
Overall knowledge score	1.2 (1.1–1.4)	0.005	1.2 (1.1–1.3)	0.025
Perceived susceptibility and severity	0.9 (0.6–1.4)	0.615	–	–
Perceived benefits	0.8 (0.5–1.1)	0.219	–	–
Perceived barriers	1.7 (0.9–2.9)	0.052	1.6 (0.9–2.6)	0.085
Cues to action	3.9 (2.1–7.2)	<0.001	3.2 (1.7–5.8)	<0.001

Note: – If multiple Logistic regression is not available.

a vaccine becomes available.²³ In this study, the sample size is adequate, and using systematic random sampling, which may be a good representation of subjects having chronic conditions. With this in mind, we found that the majority of respondents were supportive of a COVID-19 vaccine and they would take the vaccine if it were proven safe and effective, and available in the community. This is also in line with our earlier observations, which showed that 76.1% of healthcare workers intended to get the COVID-19 vaccination.²¹ These findings showed predominantly positive responses to vaccine acceptance in Vietnam. Nevertheless, some researches showed that the level of acceptance varied in different countries, where Asian nations tended to be strongly accepting and even exceeded 80%, such as China, South Korea and Singapore, while the figure of less than 55% was recorded in Russia.²⁰ The introduction of vaccines are developing, regardless of any vaccine hesitancy, which is one of the huge barriers in the uptake of a vaccine to achieve herd immunity, which is required to be between 55% and 82% of the population according to Sanche et al.²⁴ As a result, more intervention to instill public confidence in regulatory agency reviews of vaccine safety and effectiveness will be important. In terms of knowledge about COVID-19, the majority of participants had a relatively good understanding, with a mean score of 7.11 ± 1.77 , including over 80% responding correctly to the questions about the pathogen of SARS-CoV-2 (85.2%), transmission (92.2%), common symptoms (83.1%), isolation period for two weeks (88.0%), the dangers of COVID-19 (93.2%) and preventive measures (74.6%). These results were higher compared to our previous study, which indicates that patients have improved their knowledge regarding this pandemic, namely improved knowledge relating to signs and symptoms of the illness, the dangers of the disease, as well as the preventive measures and the timescale for isolation if they were suspected of having the virus.²² All improvements revealed that people had accessed effective information and adhered to guidelines to protect themselves, thus not to transmit the virus to other people, therefore, this result may add weight in explaining the success in controlling the pandemic in Vietnam to date. Nonetheless, one unanticipated finding was that there were some misconceptions about the vaccine and treatment that still exists, which was reported in this study as being 41.6% and 40.0%, respectively. Furthermore, the reported high knowledge was directly associated with the rate of vaccination acceptance (AOR 1.2, 95% CI: 1.1–1.3, $p < 0.05$).

This result has not been found in Myers et al.²⁵ Knowledge is one of the elements in the HBM and it plays a crucial role in understanding pandemic threats, hence people should be updated with the latest information about COVID-19 through popular channels of information including television and social media, which is likely to have the ability to deliver faster updating of information to the community.

On the other hand, this study also examined the beliefs about vaccines based on the HBM, which is a social cognition model that includes factors that may evaluate, as well as support, determining health-related behaviors and explain the probability of accepting a vaccination, including the HBV or influenza vaccines.^{25–27} Recently, we have developed and validated a scale for beliefs relating to COVID-19 vaccines using the Cronbach's alpha of 0.765 and acceptable validity. In general, the findings showed that most of the participants had positive beliefs regarding the COVID-19 vaccination. This also accords with Wong et al's observations, which showed that the perceived benefits of vaccination reduce the likelihood of infection (OR 2.51, 95% CI 1.19–5.26) and the vaccination makes people feel less worried (OR 2.19, 95% CI 1.03–4.65).²⁸ Besides, the HBM indicates that vaccination behavior of individuals is impacted by the Perceived Threat of the illness, Perceived Benefits, Barriers to Vaccination, and Cues to Action.²¹ All of these are also found in the previous study of Myer et al and our study about Hepatitis B vaccination.^{25,27,29} Although the subjects in this survey are all chronic disease patients, who are faced with substantial economic burden paying for health care, they seem to be more concerned about possible adverse events following immunization (AEFIs) rather than the cost of the vaccine. Also, perceived barriers including finance were not associated with the acceptance of a COVID-19 vaccination ($p > 0.05$). It can thus be suggested that people are more concerned about the overall importance of the COVID-19 vaccine and not overly concerned about the price. Alternatively, Cues to Action were significantly related to the vaccine acceptance (AOR 3.2, 95% CI: 1.7–5.8, $p < 0.001$). These results may be explained by the COVID-19 pandemic, which is relatively new, being over one year old, and people have not fully comprehended all aspects of the virus, plus the vaccine is being introduced much faster than all other vaccines. This leaves the community in a situation where some information relating to the COVID-19 vaccine comes with a lack of information about the side effects, efficacy and safety,

and may not be understood thoroughly. In addition, it is noted that there is an amount of uncontrolled information circulating about COVID-19, which leads to obvious misinformation that may influence people's confidence and intentions in relation to possible vaccination. As a result, clear and detailed interventions need to focus on Cues to Action from healthcare workers' recommendation to promote vaccine acceptance, encouraging positive perception and beliefs regarding vaccination by providing comprehensive information about the safety and effectiveness of the vaccine, as well as developing strategies to improve knowledge towards COVID-19 via mass media messages. This will, no doubt, help people to obtain more information and instill personal motivation to, more likely, accept and take up the vaccination to achieve herd immunity and control the pandemic.

Limitation

Although this study has contributed to the understanding of acceptance of the COVID-19 vaccine in patients with a chronic illness in response to the current pandemic, there are some limitations. The vaccine is not yet available for people with chronic conditions in Vietnam, so the uptake of vaccination cannot be measured, and vaccine decisions are multifactorial, which can change over time.

Conclusion

Determinants that influence the intention to receive the COVID-19 vaccination are identified, which can be applied to future health education interventions that should focus on enhanced knowledge of COVID-19 and vaccine shared via mass media messages and Cues to Action from healthcare workers' recommendations to promote vaccine acceptance.

Data Sharing Statement

Available upon request to the first author

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or

critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest for this work.

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