

ORIGINAL ARTICLES

## COVID-19 vaccination acceptance among health science students in Vietnam, 2021

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### ABSTRACT

**Objective:** Health science students (HSS) are among the group of frontline healthcare providers who are likely to be exposed to SARS-CoV-2 by working with infected patients. With vaccines being one of the most crucial solutions to stop the pandemic, high COVID-19 vaccination coverage must be achieved in this group as soon as the vaccines are available. This research aimed to assess the COVID-19 vaccination acceptance rate and its associated factors among health science students in Vietnam.

**Methods:** This was a cross-sectional study, which surveyed online 8873 students in six health science universities in Vietnam, following the Health Belief Model (HBM) framework.

**Results:** In this study, 84.3% of students accepting the COVID-19 vaccines, 14.7% of students being undecided for vaccination, and 1% of students not accepting vaccination. Determinants of COVID-19 vaccination acceptance included their school year, self-reported health status, allergy histories, susceptibility in risk perception, and factors of the HBM model included perceived benefits and cues to action ( $p < 0.01$ ). In contrast, perceived barriers had a negative association with the probability of vaccine acceptance ( $p < 0.01$ ). These results should be used as scientific evidence to support the development of planning strategies to optimize vaccination uptake and success in vaccination campaigns for both health science students and the general population.

**Conclusion:** Health science students participating in the study had a high rate of COVID-19 vaccination acceptance. The theoretical framework recognized factors that influence vaccine acceptance. These are considered evidence for the development of planning strategies to optimize the vaccination uptake and offer success in vaccination campaigns for both health science students and the general population.

**Keywords:** COVID-19 vaccine, health science students, vaccine acceptance, Vietnam.

## INTRODUCTION

Since its first confirmed case in December 2019, the coronavirus disease 2019 COVID-19

pandemic has caused an unprecedented public health crisis and the disruption of healthcare systems and economies globally (1). The emergence of new variants, such



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as the Delta Variant, has demonstrated the highly infectious nature of the virus and has prolonged the pandemic around the world (2). As of 7 November 2021, over 250 million confirmed cases have been reported, with over 5.0 million deaths globally (3). South-East Asia has continuously reported high case numbers of COVID-19, with about 33 million cases and 466,989 deaths. In Vietnam, there were 946,043 confirmed cases with 22,342 deaths by 7<sup>th</sup> November 2021 (4).

Currently, there is no specific treatment for COVID-19, with some chemotherapeutics or biological therapies having been used to support patients (5, 6). At the beginning of the pandemic, numerous prevention measures have been applied to control the spread of COVID-19, including restrictions like lockdowns, school or factory closures, and adherence to several preventive measures such as washing hands, wearing masks, avoiding public places, and social distancing (7). The emergence of vaccines has offered hope in controlling the rapid spread of the COVID-19 pandemic. Some vaccine brands have shown high efficacy and have been approved for emergency use in many countries. These brands include Pfizer-BioNTech, Moderna, and AstraZeneca (8). Nevertheless, vaccination hesitancy is one of the major obstacles to achieving herd immunity, with several factors having been identified such as trust in the benefits of the vaccine and the ability of access to the vaccine (9). A study among US medical students reported that 23% were unwilling to get vaccinated despite having a high risk of exposure to the virus (10). Vietnam began its fourth wave of the pandemic in June 2021 and medical students have been an important source of support in health communications, taking samples, conducting contact tracing, etc. for front-line health workers. They are also future health workers, providing health

services to the communities, and are in the recommended vaccination group. Given this, this research aimed to investigate the acceptance of COVID-19 vaccination among health science students and to determine the factors and barriers affecting the decision to receive a COVID-19 vaccine. The information obtained will help identify potential concerns that need to be addressed to ensure adequate uptake among these groups and to inform the development of educational programs that equip these students with the skills to provide vaccine recommendations and counsel vaccine-hesitant patients.

## METHODS

**Study design:** This was a cross-sectional study.

### Study participant

Participants were full-time students from six health science universities in the Northern, Middle and Southern regions of Vietnam (i.e. Hanoi University of Public Health, Thai Nguyen Medicine and Pharmacy, Hue University of Medicine and Pharmacy, The University of Danang – School of Medicine and Pharmacy, Pham Ngoc Thach University of Medicine, Ho Chi Minh City University of Medicine and Pharmacy). This survey was collected from June 15<sup>th</sup> to July 10<sup>th</sup>, 2021.

### Sample size and sampling

An online survey by convenience sampling was conducted. Out of a total of 16,300 students from 6 universities, 11,379 students answered, and 8873 participants completed the question. The response rate for this study was 70%. The inclusion criteria were full-time students from first-year students to sixth-year students of the six universities, who have not been vaccinated against COVID-19, and submitted the questionnaire within the

timeframe of the survey. Students who did not complete the survey, or missed any questions, were excluded from the study.

## Measurements

The questionnaire was comprised of 40 items and was structured into four dimensions: (1) Student demographics; (2) Perceived risk of COVID-19 infection with a ten-item survey that assessed perceived susceptibility, perceived severity, and controllability; (3) The HBM used to assess the attitudes regarding vaccination consisted of 17 items, which were used to assess the perceived benefits of a COVID-19 vaccine, perceived barriers to vaccine uptake, and cues to action; (4) Vaccination acceptance. Perceived risk of COVID-19 infection and HBM used a 5-point Likert scale with responses ranging from strongly disagree through strongly agree.. The survey evaluated participants' intentions to undergo vaccination using one question: 'If a vaccine against COVID-19 infection is available in the community and free, would you take it?', with responses yes or no being available.

## Data collection

Data were collected from June to July 2021 during the fourth wave of the COVID-19 pandemic in Vietnam. This form was designed in REDCap and sent to the coordination of the six universities' administration (Department of Student Affairs and Training Department assigned for data collection). The participants received an online form via email. No identification number was assigned in the questionnaire. If participants approved the consent form and agreed to participate, the questionnaire would appear.

## Data analysis and statistical method

Statistical analysis was performed using IBM SPSS v20.0. Continuous variables were described by means, standard deviation, median, and range, while categorical variables were presented by using frequency and percentage. The variate analysis was performed using Chi-square or Fisher's exact test for categorical variables and Mann-Whitney test for continuous variables. Multivariate logistic regression was applied to predict factors affecting vaccine acceptance among respondents. The adopted significance level is  $p < 0.05$ .

## Ethics approval

The research protocol has been reviewed and approved by the Institutional Review Board of the Hanoi University of Public Health under Decision number 289/2021/YTCC-HD3 on 3<sup>rd</sup> June 2021. Participants could stop at any time of study if they did not want to continue to answer the questionnaire.

## RESULTS

### General characteristics of research participants

Overall, 8,873 students, ranging from first to sixth-year had completed the questionnaire with more than half being females (69.0%), of Kinh ethnicity (88.1%), and non-religious (80.3%). Their field of education included general medicine (55.4%), and 73.9% of participants planned to pursue clinical studies in the next school year. Regarding health status, most respondents had no allergy history (91.7%) and had never smoked (97.6%). Only 2.3% of people reported poor health status. Other key characteristics of study participants are described in Table 1.

**Table 1. Characteristics of study participants (n=8873)**

Characteristics		Frequency	Percentage
Gender	Female	<b>6118</b>	<b>69.0</b>
	Male	2755	31.0
Ethnicity	Kinh	<b>7814</b>	<b>88.1</b>
	Others	1059	11.9
Religion	Non-religious	<b>7128</b>	<b>80.3</b>
	Yes (Buddhism or other religions)	1745	19.7
Area	North region	1471	16.6
	Central region	2247	25.3
	South region	<b>5155</b>	<b>58.1</b>
Education fields	Doctor	<b>4916</b>	<b>55.4</b>
	Pharmacist	652	7.3
	Others	3305	37.2
Year in program	Fist & second year	<b>4524</b>	<b>51.0</b>
	Third, fourth, five, & sixth year	4349	49.0
Smoking status	Never smoked	<b>8662</b>	<b>97.6</b>
	Former smoker	160	1.8
	Current smoker	51	0.6
Allergic history	No	<b>8138</b>	<b>91.7</b>
	Yes	735	8.3
Planning to pursue clinical studies in the next school year	Yes	<b>6559</b>	<b>73.9</b>
	No	2314	26.1
Self-reported health status	Poor	<b>206</b>	<b>2.3</b>
	Normal	5734	64.6
	Good	2933	33.1

**Risk perception about COVID-19 and attitudes toward the COVID-19 vaccination**

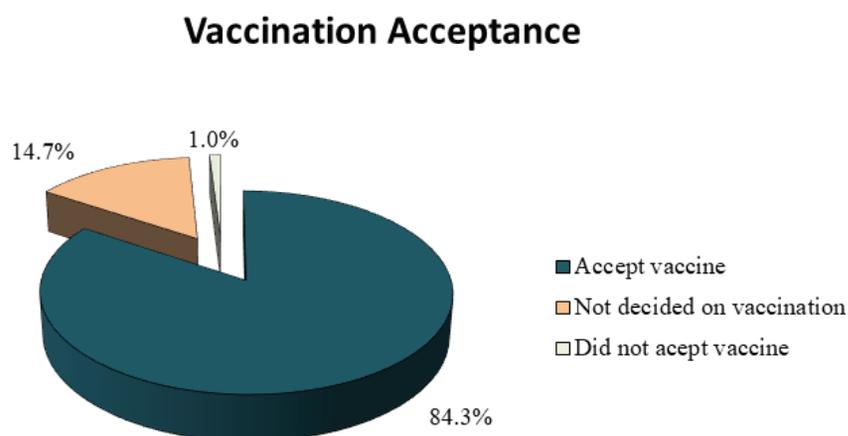
Table 2 indicates that most students had positive attitudes towards COVID-19 vaccination (the mean of each item was over 3 except for barriers of vaccination, which was less than 3). Most participants believed

that they were at risk (the mean score was  $3.2 \pm 0.7$ ) and that COVID-19 was a serious illness ( $4.3 \pm 0.6$ ). Many also believed that the benefits of vaccination outweighed the barriers of vaccination, with mean scores of  $3.8 \pm 0.5$  and  $2.7 \pm 0.4$ , respectively, and the majority of them had a high level of cues to action ( $3.8 \pm 0.6$ ) (ranging 1 to 5).

**Table 2. Risk perception about COVID-19 and attitudes toward the COVID-19 vaccination (n=8873)**

Risk perception about COVID-19 and Attitudes toward the COVID-19 vaccination		Mean ± SD Median (min-max)
Risk perception about COVID-19	Susceptibility	3.2 ± 0.7 3.3 (1-5)
	Severity	4.3 ± 0.6 4.3 (1-5)
	Controllability	3.4 ± 0.7 3.3 (1-5)
Attitudes toward the COVID-19 vaccination	Benefits of vaccination	3.8 ± 0.5 4 (1-5)
	Barriers of vaccination	2.7 ± 0.4 2.8 (1-5)
	Cues to action	3.8 ± 0.6 3.8 (1-5)

### Vaccine acceptance



**Figure 1. Proportion of respondents regarding vaccine acceptance**

Figure 1 shows the proportions of COVID-19 vaccine acceptance options: 84.3% of students would accept the COVID-19 vaccine, 14.7% of students reported that they had not decided on vaccination and 1% of students did not accept vaccination.

### Determinants of COVID-19 Vaccination Acceptance in Multivariable Logistic Analysis

Factors associated with COVID-19 vaccination acceptance in the multivariable logistic analysis are presented in Table 3, with the findings showed that year in program, allergic history, self-reported health, COVID-19 susceptibility, and attitudes toward the COVID-19 vaccination were associated with vaccine acceptance ( $p < 0.001$ ).

The results indicated that students in the 3rd to 6th years tended to get vaccine 1.5 times as much as in first and second-year students (OR = 1.5, 95% CI 1.3-1.7). Regarding allergy history, students who had allergic histories were less likely to accept vaccines than students without a history of allergies (OR= 0.5, 95% CI 0.4-0.7). At the same time, students who self-reported as being in normal/good health also tended to be more

positive about vaccination than students who reported poor health. Besides, Participants were more likely to accept vaccination if they had a positive attitude towards the susceptibility (OR = 1.5, 95% CI 1.3-1.6), benefits of vaccination (OR = 2.1, 95% CI 1.9-2.4), and cues to action (OR = 2.3, 95% CI 2-2.6), except for barriers that had a negative association with the probability of vaccine acceptance (OR = 0.1, 95% CI 0.1-0.2)

**Table 3. Multivariable logistic analysis of factors associated with COVID-19 vaccine acceptance (n = 8873)**

Variables		COVID-19 vaccine acceptance		OR (95% CI)	p-value
		No, n (%) 1389 (15.7)	Yes, n (%) 7484 (84.3)		
Ethnicity	Kinh	1193 (15.3)	6621 (84.7)	Reference	0.2
	Others	196 (18.5)	863 (81.5)	0.9 (0.7-1)	
Area	North region	257 (17.5)	1214 (82.5)	Reference	0.03
	Central region	402 (17.9)	1845 (82.1)	0.8 (0.7-1.0)	
	South region	730 (14.2)	4425 (85.8)	0.9 (0.7-1.0)	
Education fields	Doctor	754 (15.3)	4162 (84.7)	Reference	0.5
	Pharmacist	138 (21.2)	514 (78.8)	0.9 (0.7-1.1)	
	Others	497 (15.0)	2808 (85.0)	1.2 (1.0-1.4)	
Year in program	First & second year	862 (19.1)	3662 (80.9)	Reference	<0.01
	Third, fourth, five, & sixth year	527 (12.1)	3822 (87.9)	1.5 (1.3-1.7)	
Allergy history	Yes	171 (23.3)	564 (76.7)	Reference	<0.01
	No	1218 (15.0)	6920 (85.0)	1.9 (1.6-2.4)	
Planning to pursue clinical studies in the next school year	No	445 (19.7)	1859 (80.3)	Reference	0.08
	Yes	934 (14.2)	5625 (85.8)	1.2 (1.0-1.3)	
Self-reported health status	Poor	67 (32.5)	139 (67.5)	Reference	<0.01
	Normal	1006 (17.5)	4728 (82.5)	1.9 (1.3-2.6)	
	Good	316 (10.8)	2617 (89.2)	2.6 (1.8-3.7)	

Variables		COVID-19 vaccine acceptance		OR (95% CI)	p-value
		No, n (%) 1389 (15.7)	Yes, n (%) 7484 (84.3)		
<b>Risk perception about COVID-19</b>	Susceptibility	3.0 ± 0.7	3.2 ± 0.7	<b>1.5 (1.3-1.6)</b>	<b>&lt;0.01</b>
	Severity	4.2 ± 0.6	4.3 ± 0.6	1 (0.9-1.1)	0.8
	Controllability	3.4 ± 0.6	3.4 ± 0.6	0.9 (0.8-1.0)	0.2
<b>Attitudes toward the COVID-19 vaccination</b>	Benefits of vaccination	3.6 ± 0.5	3.8 ± 0.5	<b>2.1 (1.9-2.4)</b>	<b>&lt;0.01</b>
	Barriers of vaccination	3.1 ± 0.5	2.7 ± 0.5	<b>0.1 (0.1-0.2)</b>	<b>&lt;0.01</b>
	Cues to action	3.5 ± 0.6	3.8 ± 0.6	<b>2.3 (2-2.6)</b>	<b>&lt;0.01</b>

## DISCUSSION

This study highlights Vietnamese health science students' acceptance of COVID-19 vaccination and its associated factors amid Vietnam's fourth wave of its COVID-19 pandemic and with the number of confirmed cases increasing daily. In the collecting data time of this study, the imported vaccines through the COVID-19 Vaccines Global Access Program (COVAX) are limited and unavailable for some groups, including health science students while Vietnam's COVID-19 vaccines are still in their clinical trials so that assessing the acceptance of vaccination and understanding the factors that influence the decision to receive or not receive the vaccination among health science students has played an important role in optimizing vaccination prevalence in the population and prioritizing high-risk subjects. Following analysis, we found that the majority of respondents (84.3%) were supportive of a COVID-19 vaccination and would take a vaccine if it was proven safe, effective and available in the community. This indicated that health science students were probably more willing to get vaccinated than other people because they have been trained in medicine and health science. Moreover, health science students

study and practice in hospitals/clinics so they were likely to be exposed to COVID-19 patients as frontline healthcare providers, so they tend to have a higher rate vaccination acceptance (11). It could be seen that the findings in our study were higher rate of COVID-19 vaccination acceptance than the study in Can Tho University in Vietnam, which reported that 77.7% of health science students would accept a vaccination (12). These findings showed predominantly positive responses to vaccine acceptance in Vietnam. Globally, some studies showed that the level of acceptance among students varied in different countries, where Asian nations tended to be strongly accepting, such as China (79.1%), while vaccine acceptance rates of less than 50% were recorded in the USA (23.0%), Egypt (35.0%) and Jordan (34.9%) (10, 13, 14). In Vietnam, at the time of data collection in this study, we were being faced with the fourth wave of the COVID-19 pandemic and the number of confirmed cases was increasing daily, especially in southern provinces and industrial zones, so students tended to be more accepting vaccination at the time of the study. Our study found that COVID-19 susceptibility is believed to be a factor influencing acceptance of the COVID-19 vaccine. Specifically, students who perceive themselves to be susceptible to

infection COVID-19 had a more positive bias toward vaccination acceptance (OR = 1.5, 95% CI 1.3-1.6,  $p < 0.01$ ). This finding supported Wong et al.'s observations, which showed that the perception of susceptibility influenced vaccination intention, whereby participants who viewed that they had the possibility of getting COVID-19 had greater odds of a definite intention to take the vaccine (OR = 1.36, 95% CI 1.04–1.79) (15). This was consistent with the studies of Martin C.S. Wong et al. in Hong Kong and Yulan Lin et al. in China, which have shown that perceived susceptibility contributes to a higher vaccine acceptance (16, 17). Risk perception, including disease susceptibility, was found to be a predictor of behavioural changes amid the outbreak of H1N1 influenza and SARS (18, 19).

Additionally, this study examined the attitudes toward vaccines based on the HBM, which is a social cognitive model that includes factors that may evaluate, support, determining health-related behaviours and explain the probability of accepting a vaccination, including the HBV or influenza vaccines (20). Findings in our study that positively influenced vaccination acceptance included perceived benefits of vaccination among participants (OR = 2.1, 95% CI 1, 9-2.4 and signs of action (OR = 2.3, 95% CI 2-2.6). These results were in line with Wong LP et al.'s survey, which showed that the perceived benefits of vaccination reduced the likelihood of infection (OR 2.51, 95% CI 1.19-5.26) (15). Besides the above factors, we find that barriers have a negative relationship with the probability of vaccine acceptance (OR = 0.1, 95% CI 0.1-0.2,  $p < 0.001$ ). The HBM indicates that the vaccination attitudes of individuals are impacted by the perceived threat of the illness, perceived benefits, barriers to vaccination, and cues to action (21). All of these were also found in previous studies of Myer et al. and Huynh G et al.

regarding Hepatitis B vaccination (20, 22). Furthermore, we found significant differences in COVID-19 vaccination acceptance across the year in the program, allergic history, self-reported health that were associated with vaccine acceptance. The results indicated that: Third, fourth, fifth, and sixth years in the program (OR= 1.6, 95% CI 1.3-1.8) and normal/good health status (OR = 1.9, 95% CI 1.3-2.7; OR = 2.9, 95% CI 2.1-4.2, respectively) were positively correlated with vaccine acceptance; students who had not allergic histories were more likely to accept vaccines than students with a history of allergies (OR= 1.9, 95% CI 1.6-2.4,  $p < 0.05$ ). The results in this study are similar to some studies on the acceptance of COVID-19 vaccines around the world such as in Egypt and France (14, 23).

### Limitations

First, the study results must not be extrapolated to the general population, because vaccination acceptance among health science students may be higher than in other populations. Secondly, the vaccines against COVID-19 were in clinical trials, some vaccines were emergency in use so the data on vaccines or information about them as well as the vaccination acceptance are also constantly changing. Finally, the intentions of vaccination acceptance may differ from behavior. Therefore, it is difficult to predict accurately whether people who report that they accept vaccinations will actually get vaccine or not. Further follow-up studies are needed to understand the differences between the actual vaccination rates and the intended vaccination rates previously reported.

### CONCLUSION

These findings highlighted the intention to receive a COVID-19 vaccine among health

science students, which was relatively high. Only 1% of health science students disagreed to get vaccinated and 14.7% have not decided on getting the vaccine. Demographic factors such as allergy history, school year, and self-perception of health status were also directly related to the rate of vaccination acceptance among health science students. The study found that health science students in third, fourth, fifth, and sixth years in the program; normal/good health status were positively correlated with vaccine acceptance; students who had not allergic histories were more likely to accept vaccines than students with a history of allergies. The use of HBM as the theoretical framework recognizes factors that influence vaccine acceptance, which included high Susceptibility, Benefits, Barriers and Cues to Action. These are evidence that catch the need for planning of campaigns to promote the vaccine as a priority solution for health science students

### Conflict of interest

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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