Original Research Article

COVID-19 Vaccine Acceptance Among Healthcare Students in Vietnam, Based on Health Belief Model

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Abstract

Introduction: Healthcare students have a high risk of acquiring COVID-19 while practicing in medical facilities, and their health-related decisions might considerably impact the people around them. In the circumstance of many people refusing vaccination, the delay in accepting the COVID-19 vaccine by this group could be a barrier to providing effective immunity to the entire population against the COVID-19 pandemic.

Objective: The study aimed to assess the prevalence of vaccination acceptance and the factors influencing COVID-19 vaccine acceptance among Vietnamese healthcare students.

Methods: A web-based cross-sectional study was conducted among 384 respondents. The chi-square, Fisher's exact, and Mann–Whitney tests were used to assess the association between independent and dependent variables. Binary logistic regression analysis was used to identify the potential determinants of COVID-19 vaccine acceptance. Variables with p values of less than .05 at the 95% confidence interval were considered significant variables.

Results: Out of 384 participants, 91.7% accepted COVID-19 vaccination. Nurse and midwife (odds ratio [OR] = 6.81, confidence interval [CI] = 2.02–22.94, $p < .01$), perceived normal health status (OR = 15.22, CI = 2.74–84.66, $p < .001$), perceived good health status (OR = 149.00, CI = 11.08–2003.42, $p < .01$), COVID-19 infection among relatives or friends (OR = 4.19, CI = 1.77–9.95, $p < .01$) were predictors for the COVID-19 vaccine acceptance. Participants were less likely to accept COVID-19 vaccination if they reported greater perceived barriers (OR = 0.80, CI = 0.69–0.93, $p < .01$).

Conclusion: The current study offers helpful information on the factors influencing vaccine acceptance based on the Health Belief Model. The findings could benefit policymakers in establishing effective campaigns to improve the acceptance rate of the COVID-19 vaccine among healthcare students and shorten the time required to achieve herd immunity.

Keywords

COVID-19, vaccine acceptance, Health Belief Model, healthcare students, Vietnam

Introduction

The Coronavirus disease-2019 (COVID-19) pandemic has spread worldwide, causing noticeable burdens on society, education, and the economy globally (World Health Organization, 2021). The World Health Organization recommended vaccination against COVID-19 as the most effective and proactive measure to prevent the spread of COVID-19 (World Health Organization, 2020).

Vaccine hesitancy refers to the delay in acceptance or refusal of vaccination despite the availability of immunization services. Vaccine hesitancy is increasing, evidenced by the resurgence of previously preventable infectious diseases such as measles and whooping cough (MacDonald, 2015; Sallam, 2021). Research on COVID-19 vaccination acceptance shows that COVID-19 vaccine hesitancy still poses a problem. A meta-analysis study demonstrated that vaccine acceptance varied globally (Xiao & Wong, 2020). The acceptance rate was different, ranging from 55.8% to 86.1% (Baccolini et al., 2021; Barello, Nania, Dellafiore,

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Graffigna & Caruso, 2020; Lucia, Kelekar & Afonso, 2021; Raja, Osman, Musa, Hussien & Yusuf, 2022). Many people hesitate to decide on vaccination due to confusion, insecurity, and fears (Dubé et al., 2013).

In Vietnam, while most studies regarding COVID-19 vaccine acceptance were conducted on the general population and healthcare workers, information regarding healthcare students' COVID-19 vaccination acceptance is limited. Healthcare students are vital in supporting healthcare workers during the COVID-19 pandemic. Healthcare students are also considered trusted sources of information on COVID-19 and the COVID-19 vaccine among their family members, relatives, friends, and acquaintances. Consequently, their attitudes and opinions regarding the COVID-19 vaccine may influence the decision of those in their social groups to accept versus refuse the COVID-19 vaccine. Therefore, the study aimed to investigate the prevalence of vaccination acceptance and the factors influencing COVID-19 vaccine acceptance among Vietnamese healthcare students.

Review of Literature

Besides healthcare workers, healthcare students are essential in providing healthcare services to patients and promoting community health. They play a vital role in supporting medical staff in the community, particularly in the context of the shortage of medical workers in Vietnam. Additionally, their knowledge and attitude on COVID-19 vaccination may influence the thinking and behavior of their family members, friends, and community (Gao et al., 2022). Hence, vaccine hesitancy among healthcare students is a barrier to providing effective immunity for the community in the fight against COVID-19 (Fakhroo, Al Thani & Yassine, 2020).

A review of studies on COVID-19 vaccine acceptance among healthcare students in other countries showed that the rate of COVID-19 vaccine acceptance among healthcare students remains suboptimal. An investigation among U.S. medical students indicated that only 53.5% would participate in the vaccine trial. In addition, 23% revealed uncertainty about getting the vaccination, despite answering that they understand the risk of exposure to COVID-19 infection. Factors contributing to this group's low acceptance rate include concerns about possible vaccine side effects and vaccine efficacy. For instance, some students mentioned that the rapid vaccine development process is a source of vaccine safety concerns (Lucia et al., 2021).

Another cross-sectional study in Sudan revealed that the rate of COVID-19 vaccine acceptance among medical students was 55.8%, and vaccine hesitancy was 44.2%. The common reasons for accepting vaccines were to protect themselves and others, whereas vaccine safety and vaccine efficacy concerns contributed to vaccine hesitancy (Raja et al., 2022).

The Health Belief Model (HBM) is a psychological model of improving or changing health behaviors through attitudes, beliefs, and intentions. It was developed by social scientists at the US Public Health Service in the early 1950s to explain and predict people's health behavior (Janz & Becker, 1984). The model consists of six components: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived barriers, cue to action, and self-efficacy. Many previous studies have identified HBM factors as significant predictors of the decision to receive vaccination for hepatitis B, measles, and other infections (Khodaveisi, Salehi Khah, Bashirian, Karami & Khodaveisi, 2018; Wagner et al., 2017).

Health Belief Model was recently considered a comprehensive framework to assess the decision to get the COVID-19 vaccine (Limbu, Gautam & Pham, 2022). This model was applied in studies conducted among healthcare workers (Huynh, Tran, Nguyen & Pham, 2021), high-risk individuals (Huynh et al., 2021), medical students (Nguyen, Nguyen, Le, Nguyen & Huynh, 2021), and the general public (Shmueli, 2021; Wong, Alias, Wong, Lee & AbuBakar, 2020). In Vietnam, this framework was applied to examine vaccination behavior among healthcare students in previous studies. Most studies were conducted in southern Vietnam, mainly on medical and public health students, and showed variable results. While a study conducted by Nguyen and colleagues showed that the four key constructs of HBM are predictors of COVID-19 vaccine acceptance (Nguyen et al., 2021), another study concluded that just perceived benefits and cues to action influence vaccine acceptance (Le An, Nguyen, Nguyen, Vo & Huynh, 2021).

Healthcare students play an essential role in supporting healthcare workers and providing healthcare services for patients due to the shortage of healthcare personnel during the COVID-19 pandemic. Understanding the factors that influence healthcare students' decision to accept the COVID-19 vaccine is a necessary and beneficial step toward increasing the COVID-19 vaccine acceptance rate.

Research Questions

1. What is the prevalence of COVID-19 vaccine acceptance among healthcare students in Vietnam?
2. What factors influence COVID-19 vaccine acceptance among healthcare students in Vietnam?

Methods

Study Design

A cross-sectional study was conducted at a university in Vietnam.

Population (N= 3203)	Percentage	Sample size (n=384)
Medicine (N=817)	25.5%	Medicine (n=98)
Nurse and midwife (N=1,076)	33.6%	Nurse and midwife (n=129)
Pharmacy (N=717)	22.4%	Pharmacy (n=86)
Laboratory medicine (N=218)	6.8%	Laboratory medicine (n=26)
Physiotherapy (N=151)	4.7%	Physiotherapy (n=18)
Public health (N=32)	1.0%	Public health (n=4)
Radiology (N=192)	6.0%	Radiology (n=23)

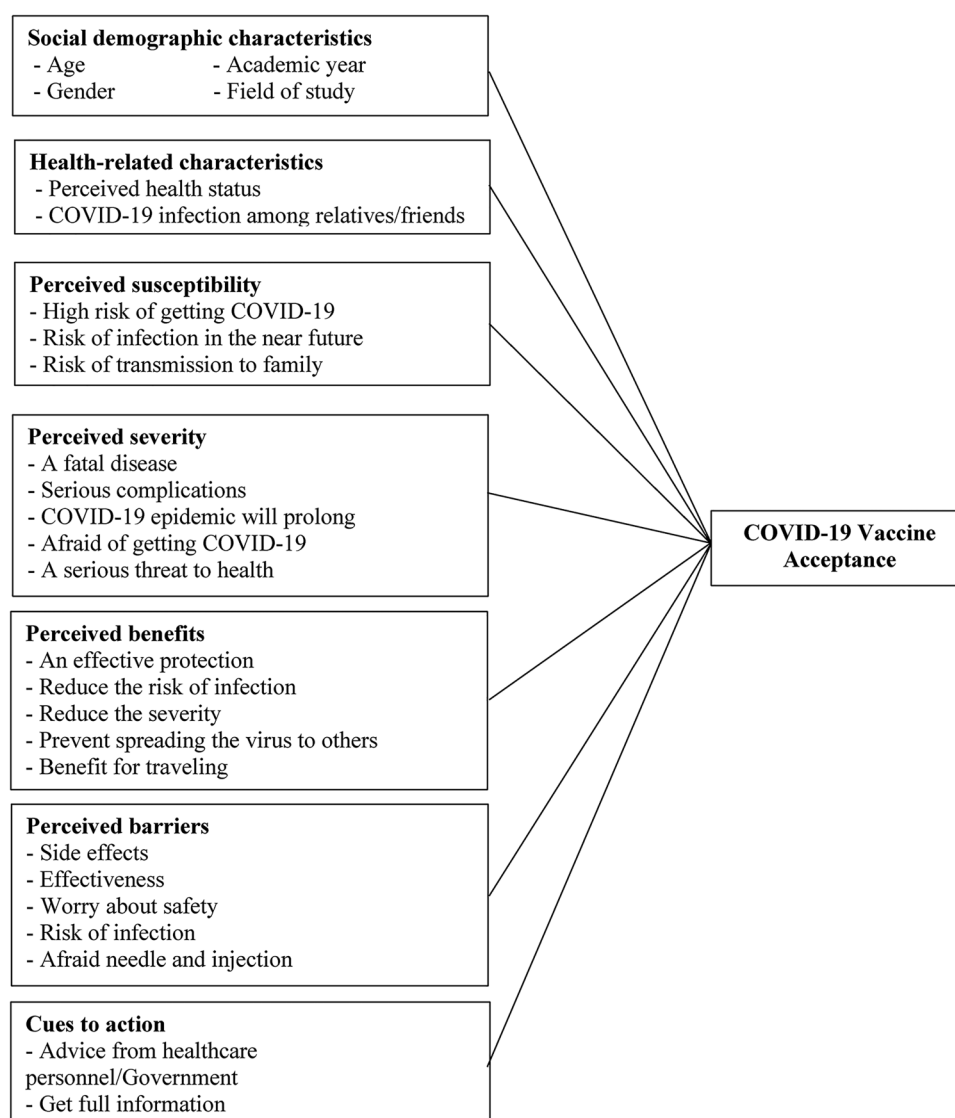**Figure 1.** Sample size for each field of study.

Sample

The correspondents were recruited from 3,203 university healthcare students from seven fields of study, including medicine, nurse and midwife, pharmacy, public health, physiotherapy, radiology, and laboratory medicine. The minimum sample size calculated was 384, according to the formula:

$$n = (z)^2 p (1 - p) / d^2$$

n = sample size; z = 1.96 (Z-score for 95% confidence interval); p = .50 (prevalence of acceptance COVID-19 vaccination, estimate for 50%); d = 0.05 (significant error at 5%).

The sample recruiting process was conducted in two steps to achieve a representative sample. Firstly, the sample size for each field of study was calculated using probability proportional to size sampling (Figure 1). Then, a convenience sampling strategy was used to recruit the participants from each field of study based on the calculated sample size. A

Social demographic characteristics
- Age   - Academic year
- Gender   - Field of study

Health-related characteristics
- Perceived health status
- COVID-19 infection among relatives/friends

Perceived susceptibility
- High risk of getting COVID-19
- Risk of infection in the near future
- Risk of transmission to family

Perceived severity
- A fatal disease
- Serious complications
- COVID-19 epidemic will prolong
- Afraid of getting COVID-19
- A serious threat to health

Perceived benefits
- An effective protection
- Reduce the risk of infection
- Reduce the severity
- Prevent spreading the virus to others
- Benefit for traveling

Perceived barriers
- Side effects
- Effectiveness
- Worry about safety
- Risk of infection
- Afraid needle and injection

Cues to action
- Advice from healthcare personnel/Government
- Get full information

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Figure 2. Conceptual framework of the study.

total of 384 completed responses were collected. The response rate for the study was 63%.

Inclusion and Exclusion Criteria

Inclusion Criteria
   - Participants must be full-time students.
   Exclusion Criteria
   - Participants with contraindications to COVID-19 vaccination (e.g., a history of anaphylaxis to any vaccine component, anaphylaxis to a previous dose of COVID-19 vaccine).

Measurements

A questionnaire was developed by researchers and consisted of three sections:
   The first section focused on social-demographic and health-related data, including gender, age, academic year, field of study, perceived health status, and COVID-19 infection among relatives/friends.
   The second section was developed based on HBM to assess the perception and attitude of participants to COVID-19 vaccination, including perceived susceptibility (three items), perceived severity (five items), perceived benefits (five items), perceived barriers (five items), and cues to action (five items). Items in the HBM were measured on a five-point Likert scale from 1 (totally disagree) to 5 (totally agree) (Figure 2). The total score was calculated by summing all item scores. The higher score reflected the greater perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. The content validity of the questionnaire was assessed by a committee of five professionals in medical education. As a result, the content validity index of the questionnaire was 0.99. The Cronbach alpha of 30 samples was 0.62 for perceived susceptibility, 0.78 for perceived severity, 0.84 for perceived benefits, 0.71 for perceived barriers, and 0.77 for cues to action.
   The third section was to assess the acceptance of COVID-19 vaccination. The vaccination acceptance was measured using a one-item question on a three-point scale ("Definitely not," "Not sure," and "Definitely yes"). The variable of COVID-19 vaccine acceptance was then transformed to a binary variable (1 = "Definitely yes" and 2 = "No/Not sure") due to a small number of students stating that they definitely did not get the vaccine.

Data Collection Procedures

A Google Form was sent to participants via email. The purpose and procedure of research were mentioned on the Google Form. The informed consent was collected by asking, "Are you willing to join the study?" If the answer was "Yes," the consent was established, and the participants could answer the questionnaire. The questionnaire took approximately 15 min to answer. All questionnaires were

checked to ensure data completeness. Data were collected from February to March 2022.

Statistical Analysis

Data processing and analysis were performed using the Statistical Package for Social Sciences software (SPSS) version 22.0. Descriptive statistics were used to describe the characteristics of the participants, the perception toward COVID-19 vaccination, and the COVID-19 vaccine acceptance. The Chi-square, Fisher's exact, and Mann–Whitney U tests were used to examine the association between independent and dependent variables.
   A binary logistic regression was used to investigate the predictors of COVID-19 vaccination acceptance, and only variables found to be significantly associated with the dependent variable (COVID-19 vaccine acceptance) at $p < .05$ were included in a binary logistic regression. Odds ratios (ORs), 95% confidence intervals (95% CIs), and p-values were calculated for each independent variable. A p-value of less than .05 was considered statistically significant.

Results

Characteristics of Participants and COVID-19 Vaccine Acceptance

In this study, the mean age of the respondents was 20.51 ± 1.55 years. Females accounted for 81.3%. Additionally, nearly a quarter of the respondents were second-year students (23.4%). Nurse and midwife students accounted for 33.6% of the respondents. The majority of respondents (71.4%) perceived good health status. More than half of respondents (55.2%) stated that they had relatives or friends who had a history of COVID-19 infection. 91.7% of 384 participants declared they would accept the COVID-19 vaccine.

Factors Associated with COVID-19 Vaccine Acceptance

Table 1 presents the relationships between COVID-19 vaccine acceptance with the field of study ($p < .05$), perceived health status ($p < .001$), and COVID-19 infection among relatives or friends ($p < .01$). There were no associations between COVID-19 vaccine acceptance with age, gender, and academic years ($p > .05$).
   Perceived barriers significantly correlated with COVID-19 vaccine acceptance ($p < .05$). There was no correlation between COVID-19 vaccine acceptance with perceived susceptibility, perceived severity, perceived benefits, and cues to action ($p > .05$) (Table 2).

Table 1. Acceptance of COVID-19 Vaccination by the Characteristics of Participants ($N = 384$).

Variables		COVID-19 vaccine acceptance		
		Yes n = 352)	No/Not sure (n = 32)	p
Age (Median, IQR)		20 (19–22)		>.05[a]
Gender	Male	68	04	>.05[b]
	Female	284	28	
Academic year	1st year	80	06	>.05[c]
	2nd year	82	08	
	3rd year	74	07	
	4th year	79	06	
	5th year and higher	37	05	
Field of study	Medicine	85	13	**<.05[c]**
	Pharmacy	75	11	
	Nurse & Midwife	124	05	
	Others	68	03	
Perceived health status	Excellent	95	05	**<.001[c]**
	Good	252	22	
	Not good	05	05	
COVID-19 infection among relatives or friends	Yes	202	10	**<.01[c]**
	No	150	22	

[a]Mann–Whitney U test.
[b]Fisher's exact test.
[c]Chi-square test.

Table 2. Univariate Analysis of HBM Factors Associated with COVID-19 Vaccine Acceptance.

	COVID-19 vaccine acceptance		
HBM variables	Yes (Mean ± SD)	No/Not sure (Mean ± SD)	P
Perceived susceptibility	11.93 ± 1.79	11.34 ± 1.86	>.05
Perceived severity	19.67 ± 2,69	19.44 ± 2.77	>.05
Perceived benefits	20.48 ± 2.61	19.75 ± 2.55	>.05
Perceived barriers	14.53 ± 2.58	15.97 ± 2.24	**<.01**
Cues to action	17.95 ± 3.13	17.13 ± 2.35	>.05

Table 3. Binominal Logistic Regression Predicting COVID-19 Vaccine Acceptance.

	COVID-19 vaccine acceptance	
Variables	OR (95% CI)	p
Fields of study		
Medicine	Reference	
Pharmacy	1.13 (0.43-2.94)	.519
Nurse & Midwife	6.81 (2.02-22.94)	.001*
Others	5.04 (1.24-20.55)	.027*
Perceived health status		
Not good	Reference	
Good	15.22 (2.74-84.66)	.001*
Excellent	149.00 (11.08-2003.42)	.001*
COVID-19 infection among relatives or friends		
No	Reference	
Yes	4.19 (1.77–9.95)	.003*
Perceived barriers	0.80 (0.69–0.93)	.001*

*$p < .05$.
Hosmer–Lemeshow test, chi-square: 9.008, p-value: .342, Nagelkerke $R^2 = 0.279$.

Predictors of COVID-19 Vaccine Acceptance

Multinomial logistic regression was conducted to investigate the predictors of COVID-19 vaccine acceptance (Table 3). Only variables significant at the univariate analysis level were included in the regression model. Results showed that the predictive model explained 27.9% of the variance in COVID-19 vaccine acceptance ($R^2 = 0.279$). In the model, the field of study, perceived health status, COVID-19 infection among relatives or friends, and perceived barriers were significant predictors. Nurse and midwife (OR = 6.81, CI = 2.02–22.94, $p < .01$) and other fields of study include public health, physiotherapy, radiology, and laboratory medicine (OR = 5.04, CI = 1.24–20.55, $p < .05$) were more likely to express acceptance of COVID-19 vaccine compared to

medical students. Participants who perceived health status "Good" (OR = 15.22, CI = 2.74–84.66, $p < .001$) and "Excellent" (OR = 149.00, CI = 11.08–2003.42, $p < .01$) were more willing to accept COVID-19 vaccination than those with perceived health status "Not good." In addition, participants who had relatives or friends infected with COVID-19 were more likely to accept the COVID-19

vaccine (OR = 4.19, CI = 1.77–9.95, $p < .01$). Participants who perceived high barriers to vaccination were less likely to accept the COVID-19 vaccine (OR = 0.80, CI = 0.69–0.93, $p < .01$).

Discussion

This cross-sectional study investigated COVID-19 vaccine acceptance among healthcare students in Vietnam and corresponding determinant factors. Results of the study indicated a high level of COVID-19 vaccine acceptance among healthcare students (91.70%). Our findings align with previous studies conducted in communities in China, Indonesia, and Malaysia, which rates ranging from 91.3% to 94.3% (Sallam, 2021). In addition, the COVID-19 vaccine acceptance in this study is higher than in previous studies conducted among Vietnamese healthcare students (77.10%) (Le An et al., 2021), healthcare workers (76.10%) (Huynh et al., 2021), and high-risk population (84.0%) (Huynh et al., 2021). Notably, this study demonstrated that COVID-19 vaccination acceptance is higher among healthcare students in Vietnam than that among healthcare students in countries such as India (63.8%) (Jain et al., 2021), Sudan (55.8%) (Raja et al., 2022), and Italy (76.4%–81.2%) (Baccolini et al., 2021). One possible attributing factor to the higher COVID-19 vaccine acceptance among healthcare students in Vietnam may be Vietnam's COVID-19 vaccination campaign.

Moreover, these findings indicated a diversity in acceptance rates of the COVID-19 vaccine among students. This difference may be due to time, population, social-economic status, attitude, beliefs, and many other factors (Sallam, 2021).

Although the current study indicated that the majority of participants were willing to accept vaccination, 8.3% hesitated to make the decision to accept or refuse COVID-19 vaccine. This finding could be explained by lingering concerns about the efficacy, safety, and side effects of the COVID-19 vaccine. Although the effectiveness of the COVID-19 vaccine has been confirmed in several studies, the rapid development of COVID-19 vaccine remains a source of concern (Sugawara, Yasui-Furukori, Fukushima & Shimoda, 2021; Voysey et al., 2021; Wong et al., 2021).

In this study, perceived health status positively predicted COVID-19 vaccine acceptance. Similar to previous studies (Shmueli, 2021; Wong et al., 2021), participants were more likely to accept COVID-19 vaccination if they perceived having "Good" or "Excellent" health status. It is possible that participants with perceived "Poor" health status are concerned that receiving the COVID-19 vaccine could lead to more serious adverse effects and potentially worsen their current health status. However, studies have shown that individuals with serious health conditions are more susceptible to contracting COVID-19 and more vulnerable to having a higher risk of morbidity and mortality due to COVID-19 infection (Fakhroo et al., 2020). Hence, further study of

barriers regarding receiving the COVID-19 vaccine, such as individuals' experiences during and after receiving the COVID-19 vaccine, is needed to tailor strategies to further reduce COVID-19 vaccine hesitancy.

Another factor influencing COVID-19 vaccine acceptance was the history of COVID-19 infection among relatives or friends. In the present study, participants whose relatives or friends had a history of COVID-19 infection were more likely to vaccinate than those whose relatives or friends did not have COVID-19. A study in Pakistan revealed similar results, in which individuals whose family or friends had a history of COVID-19 infection were more willing to accept vaccination (Patelarou et al., 2021). This result may stem from the students' desire to protect their family members and friends from infections and/or reinfections of COVID-19, given that healthcare students are at high risk of COVID-19 infection due to their presence at medical schools, clinics, and hospitals. Therefore, having a close relative or friend with a previous COVID-19 infection may be a motivating factor in healthcare students' decision to accept the COVID-19 vaccine.

The current study applied the HBM to understand completely the factors that influence the acceptance of COVID-19 vaccination. The Binominal logistic regression showed that perceived barriers to vaccination negatively influence participants' decision to vaccinate against COVID-19. The greater the perceived barrier, the more hesitant the participants in making decisions about COVID-19 vaccination. Previous studies indicated that side effects, safety, risk of infection, and efficacy were the barriers to COVID-19 vaccination and were likely to reduce the acceptance of vaccination (Nguyen et al., 2021; Patelarou et al., 2021; Saied, Saied, Kabbash & Abdo, 2021).

Although perceived susceptibility, perceived severity, perceived benefits, and cue to action play a vital role in the vaccination behavior of an individual based on the HBM, our study found no association between these factors and COVID-19 vaccine acceptance. Previous studies also showed that perceived susceptibility and severity are unrelated to COVID-19 vaccine acceptance (Huynh et al., 2021; Le An et al., 2021). These results may be explained by the subject of the study, in this case, healthcare students. Healthcare students may consider themselves to have lower risk of contracting COVID-19 and developing less severe symptoms of COVID-19 infections than other individuals. In addition, medical students are more likely to have access to up-to-date information on COVID-19 and prefer to make decisions independently. Therefore, these factors may not have a significant impact on healthcare students' decision to vaccinate for COVID-19.

Strengths and Limitations

The strength of the study is the application of the HBM, which is a way to frame the reasons for vaccine hesitancy.

However, the current study has some limitations. First, the study used an online self-administered questionnaire which can result in bias when collecting data. Secondly, this study may be limited in the questionnaire because it was developed by researchers, and content validity was only tested.

Implications for Practice

The findings of this study will assist public health and government leaders in developing timely solutions to increase COVID-19 vaccine acceptance among healthcare students and, eventually, the general public, with the goal to achieve herd immunity for COVID-19 in Vietnam in the near future.

Conclusions

In summary, this is one of the few studies investigating the factors related to the decision to vaccinate against COVID-19 in healthcare students based on the HBM in Vietnam. The study aimed to understand the decision to vaccinate against COVID-19 and the factors related to the decision to vaccinate against COVID-19 among healthcare students. The findings show that field of study, perceived health status, COVID-19 infection among relatives or friends, and perceived barriers to vaccination are predictors of the COVID-19 vaccine acceptance of students in health sciences. Findings from this study provide insights into factors that influence healthcare students' decision to accept versus refuse COVID-19 vaccine. They may be beneficial for future planning and development of strategies to improve COVID-19 vaccine acceptance rate in Vietnam, and ultimately, shorten the time to achieve herd immunity for COVID-19 in Vietnam.

Author Contributions

Concept – PTT, DTTM; Design – DTTM, PTT; Resources – PTT, DTTM; Materials – DTTM, PTT; Data Collection and/or Processing – DTTM, PTT.; Analysis and/ or Interpretation – DTTM, PTT; Literature Search – PTT, DTTM; Writing Manuscript – DTTM, PTT; Critical Review –PTT, DTTM.

Declaration of Conflicting Interests

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

Ethical Considerations

The study was conducted according to the Declaration of Helsinki and was improved by the Ethics Research Committee at the Da Nang University of Medical Technology and Pharmacy, date 20/ 12/2021. Participation in this study was voluntary. Participants could refuse or withdrawn from the study without any negative consequences. The privacy of participants was kept a secret when the study was published.

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