

Predictors of COVID-19 Vaccine Acceptability Among Health Professions Students in Vietnam

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Abstract

Background: The COVID-19 vaccine hesitancy or refusal has actually been a threat to global health. In the current situation, health profession students are at risk for SARS-CoV-2 infection during their internship at healthcare facilities. Furthermore, those future healthcare workers will advise people to accept the COVID-19 vaccination. Therefore, the attitude of students towards vaccine acceptance and the predicting factors needs to be elucidated. This study applied the Health Belief Model to determine predictors of COVID-19 vaccine acceptability among health professions students.

Methods: 911 students participated in a cross-sectional online survey in Vietnam. Multinomial logistic regression model determined predictors of the COVID-19 vaccine acceptability.

Results: The overall vaccine acceptance, hesitancy, and refusal rates were 58% (95% CI: 54.7% - 61.3%), 40.4% (95% CI: 37.2% - 43.7%) and 1.5% (95% CI: 0.8% - 2.6%), respectively. Regarding vaccination hesitancy, a predictor such as "Receiving recent flu shots" had a negative correlation, whereas "Vaccines have little efficacy & serious adverse effects" (Perceived barriers), nationality, and majors were positive correlates. For refusal, "Unvaccinated students feasibly infected COVID-19 during hospital internship" (Perceived susceptibility) was a negative correlate. For both hesitancy and refusal, "Mass media appreciating effectiveness and safety of vaccines" (Cues to action), and "Health professions students get serious complications of COVID-19 if not vaccinated" (Perceived severity) had a negative correlation. In contrast, "Manufacturers do not disclose adverse effects of vaccines" (Cues to action), and "Adverse effect causes death" (Perceived barrier) were positive correlates. Strong Health Belief Model predictors of vaccine refusal were "Manufacturers do not disclose adverse effects of vaccines" (Cues to action) (OR= 5.299, 95% CI: 1.687-16.641, p= 0.004), and "Adverse effect causes death" (Perceived barrier) (OR= 10.255, 95% CI = 3.528-29.814, p= 0.0005).

Conclusion: Perceived susceptibility to and severity of COVID-19 might lead to vaccination acceptance among students. However, concerns of vaccine effectiveness and safety may still affect the choice of refusal or hesitancy in vaccination. Health information from mass media and transparency of vaccine effectiveness and safety could improve COVID-19 vaccine acceptance.

Background

The COVID-19 pandemic has spread worldwide with 206 million infected cases and 4.3 million deaths as of mid-August 2021 [1] and has severely affected the population's health and national economies [2]. Mass vaccination campaigns can be considered an effective way to limit the spread of SARS-CoV-2 along with preventive measures including social distancing, quarantining, face-covering, ventilation of indoor spaces, and other hygienic behaviors. As of August 14, 2021, 4.6 billion vaccine doses have been administered globally [1]. Although the COVID-19 vaccines have been available, the success of COVID-19 vaccine coverage depends heavily on the vaccine acceptability of individuals. Achieving herd immunity to significantly prevent the spread of COVID-19 requires a critical immunity threshold of 67% in the general

population [3]. However, a recent global survey on COVID-19 vaccine acceptability presented a challenge to achieve this threshold, finding that nearly 30% of participants would refuse or hesitate to use the COVID-19 vaccine [4]. The World Health Organization recommends that strategies are in place to prevent vaccine hesitancy and build confidence in vaccines to develop the maximum effectiveness of available immunization programs [5]. So any vaccination program requires an understanding of the reasons behind COVID-19 vaccine hesitancy as well as strategies to overcome this procrastination [6]. Vaccine refusal or hesitancy has many contributing factors and is present worldwide [7, 8]. A study in the United States showed that access to health information was a positive predictor of vaccine acceptance [9]. Another study conducted among American medical students found that COVID-19 vaccine acceptability was related to concerns about the efficacy and safety of vaccines [10]. The low acceptability of the COVID-19 vaccine use can be influenced by factors such as confidence in the efficacy of the vaccine, fear of side effects [11], and trust levels on the government, public health officials, vaccine developers, and administrators [12]. Lower economic status and lower educational attainment have also been associated with vaccine refusal [13]. In fact, the acceptance of vaccine use has been explained by different health behavior models in which the Health Belief Model (HBM) has been applied to predict preventive health behaviors [14]. Many studies have explored the HBM constructs influencing COVID-19 vaccination, which are crucial for targeted interventions to improve vaccine acceptance [15–18]. According to this model, individuals' beliefs about health and health status play a role in determining health-related behaviors. Five key factors influencing behavior change include: (a) Barriers that may hinder behavior change (Perceived barriers), (b) Benefit to be received from engaging in behavioral changes (Perceived benefits), (c) How susceptible to illness that each individual think of (perceived susceptibility), (d) What everyone thinks the consequences will be of becoming sick (Perceived severity), and (e) Exposure to information that prompts individuals to act (Cues to actions) [19]. Later, the concept of self-efficacy (Confidence in everyone's ability to succeed) was added to HBM [20]. Self-efficacy is rarely included in studies on the effectiveness of health belief model variables in predicting behavior [21]. Therefore, the original HBM (including 5 key factors) was used in the present study to determine the predictors of acceptability of COVID-19 vaccine use among health professions (HP) students. In Vietnam, health professions students were likely to be exposed to COVID-19 patients because they were mobilized to collect clinical specimens for COVID-19 testing due to a lack of health staff [22]. Furthermore, HP students are future healthcare providers on the front lines of the fight against SARS-CoV-2. They can influence the community through advice and persuasion over vaccines - hesitant people. Moreover, no study to date has explored the acceptability of COVID-19 vaccines among Vietnamese health professions college students. Therefore, this study aimed to assess the acceptability of novel COVID-19 vaccine use as well as to determine predictors among HP students. The results obtained will identify potential barriers that need to be addressed to ensure adequate vaccine coverage among HP students and enable the development of health promotion counseling on vaccine-hesitant people.

Methods

The present study was a cross-sectional online survey conducted among HP domestic and foreign students in Dong Thap province, Vietnam. In the study, we collaborated with deans and teachers to encourage students to participate in this survey. Study participants who met the following criteria included: (a) HP undergraduate students; (b) able to access the internet; (c) and submitting informed consent online. All study subjects were informed of the purpose of the study. Anonymity and voluntary participation were guaranteed. The target audience was students of medical laboratory technology, pharmacy, nursing, and physiotherapy. The sample size accounted for one-third of the HP undergraduate population of Dong Thap Medical College, equivalent to 1,000 students selected by the snowball sampling method.

Measures

The structural questionnaire based on HBM was designed and pretested by the researchers after extensive literature. It consisted of 4 parts and 26 items. Part I included 6 demographic and health-related items (age, gender, nationality, majors, self-assessment of own health status, and seasonal influenza vaccination). Part II (5 items) focused on the knowledge about name, types, storage, recommended dosage, and adverse effects of the current vaccine used in Vietnam (1 point for 1 item with correct responses). Part III (15 items) was designed based on 5 HBM constructs. (1) Firstly, the perceived susceptibility consisted of 4 items: (a) unvaccinated HP students have a viable coronavirus infection during their hospital internship; (b) the possibility of spreading COVID-19 to their family and other members of the community from HP students, (c) the ease with which healthcare workers get COVID-19 from patient care; (d) feasible occurrence of adverse effect of the COVID-19 vaccine. (2) Perceived severity had 2 items: (a) those with chronic illnesses will die without the COVID-19 vaccine; (b) HP students develop serious complications from coronavirus infection if they are not vaccinated. (3) The perceived barrier included four items: (a) unsafe vaccines due to rapid research; (b) difficult access to a COVID-19 vaccine if it is not free; (c) fatal vaccine adverse effects; (d) current vaccines have little efficacy and serious adverse effects. (4) The perceived benefits included 2 items: (a) vaccines to prevent the spread of SARS-CoV-2 virus in the community; (b) immunizations protect me from getting coronavirus. (5) Lastly, cues to action had two positive items: (a) health authorities and medical doctors ensure the safety and effectiveness of vaccines; (b) the mass media highly appreciate the effectiveness and safety of vaccines; and a negative item: vaccine manufacturers do not disclose information about adverse effects of vaccines. Each item in HBM constructs was rated using a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Part IV: the last item (outcome variable) was the acceptability of the COVID-19 vaccine use with 3 categories: acceptance, hesitancy, and refusal. In addition, a pilot study was conducted on a sample of 30 health professions students to test the internal reliability of 5 HBM constructs, where the overall Cronbach's alpha was 0.816. Based on a cut-off point of 0.7 [23], it indicated high internal consistency reliability for HBM constructs scales. The content validity of questionnaires of knowledge about COVID-19 vaccines and HBM constructs was assessed by three experts through the Content Validity Index to be 0.93 and 0.95, respectively. Data were collected between 1st April and 30th June 2021 when Vietnam faced a strong fourth wave of COVID-19. Due to the

risk of COVID-19 infection, an online questionnaire was designed on Google Forms, a survey management software provided by Google.

Data analysis

Student feedback was sent to an Excel spreadsheet and then converted to SPSS version 20 data. Before analysis, data was cleaned and outliers were removed. Descriptive statistics were reported for variables related to demography (i.e., age, gender, race/ethnicity, majors), seasonal influenza vaccination, self-perception of own health status, knowledge about current COVID-19 vaccines, HBM factors, and acceptability of COVID-19 vaccine use. This result showed the frequency, percentage of qualitative variables (variables in parts I except age, part III, and part IV), and the mean, and standard deviation of quantitative variables (age, and variables in parts II). Regarding inferential statistics, the outcome variable (Acceptability of COVID-19 vaccination) had 3 categories (acceptance, hesitancy, and refusal) that were not in order. Therefore, multinomial logistic analysis with the stepwise method and forward entry was used to determine predictors of the acceptability of COVID-19 vaccination according to 2 multinomial logit models such as “Hesitancy versus Acceptance” and “Refusal versus Acceptance”.

Results

A total of 911 HP students completed the self-administered questionnaires from 1,000 registered students, giving a response rate of 91.1%. As shown in table 1, the mean age was 20.78 years old and the majority were female (75.4%), pharmaceutical students (62.7%), and Vietnamese students (94.6%). About 50% of students self-rated their health status from good (29.4%) to very good (20.9%). Nearly 60% of students have received a seasonal influenza shot in the past 6 months. In terms of knowledge about the COVID-19 vaccine being used in Vietnam (AstraZeneca), less than 50% of HP students knew the time interval between 2 doses of vaccine (42.8%) and the dangerous adverse effects (36.5%). In summary, 72.4% of students achieved the level of good knowledge (average scores ≥ 3 points out of 5 points).

As seen in Table 2, more than 50% of HP students agreed on beliefs about the susceptibility to COVID-19 infection and vaccine side effects, as well as the benefits of vaccination. More than 40% of HP students agree with their beliefs about the severity of COVID-19. Agreements on beliefs about barriers ranged from 20% to 40%. In cues to action, about 60% of HP students agreed on confirmation of the effectiveness and safety of the COVID-19 vaccine from the government and the media. The proportion of HP students who would accept, hesitate and refuse COVID-19 vaccination was 58.0% (95% CI: 54.7% - 61.3%), 40.4% (95% CI: 37.2% - 43.7%), and 1.5% (95% CI: 0.8% - 2.6%), respectively.

In table 3, the multinomial logistic regression model predicted HP students into one of three categories of COVID-19 vaccine acceptability. By default, SPSS uses the highest-numbered category as the reference category. Therefore, vaccine acceptance with the highest number (525 cases) was used as a reference group [24]. For 2 multinomial logit models, the first for “Vaccine hesitancy” relative to “Vaccine acceptance” included 8 statistically significant predictors ($p < 0.05$). The second for “Vaccine refusal” relative to “Vaccine acceptance” consisted of 5 statistically significant predictors ($p < 0.05$). The

regression coefficients of these predictors were statistically different from zero ($p < 0.05$). In this study, no predictive value was found by the multinomial logistic regression models between COVID-19 vaccine acceptability and some demographic and personal factors such as age, gender, health status, and knowledge about COVID-19 vaccines ($p > 0.05$).

In the first model for "Vaccine hesitancy" versus "Vaccine acceptance", 2 regression coefficients (B) or log-odds of "Mass media appreciating effectiveness and safety of vaccines", and "HP students get serious complications of COVID-19 if not vaccinated" were negative such as -0.657, and - 0.294. If an HP student increased the agreement of these statements by one point, the multinomial log-odds of choosing "Hesitancy" over "Acceptance" would be expected to decrease by 0.657, and 0.294 units, respectively. For recent seasonal influenza shots ($B = - 0.484$), HP students who recently received a flu shot were less likely to hesitate about COVID-19 vaccination than to accept it. These predicting variables had odds ratio (OR) less than one ($OR < 1$) to be suitable for a negative regression coefficient. For "Mass media appreciating effectiveness and safety of vaccines" with $OR = 0.518$, HP students were 0.518 times less likely to choose hesitancy of vaccination than acceptance. Similarly, for the belief of "HP students get serious complications of COVID-19 if not vaccinated", it would be 0.745 times less likely to select hesitancy of vaccination than acceptance. Then, HP students having a recent flu shot were 0.616 times less likely to choose "Hesitancy of COVID-19 vaccination" than students not getting a flu shot. Three remaining variables in the first model, which had positive regression coefficients, were "Manufacturers not disclosing adverse effects of vaccines", "Vaccines having little efficacy & serious adverse effects", and "Adverse effect causing death". If the agreement scales were increased by one point, the multinomial log-odds of selecting "Hesitancy" versus "Acceptance" would be expected to increase by 0.330, 0.671, and 0.504 units, respectively. Interpreting with the odds ratio (OR), if the agreement scales of these perceptions were increased, the probability of hesitancy of vaccination would be 1,390, 1,957, and 1,656 times higher than acceptance of vaccination, respectively. For demographic variables like nationality, and majors, Vietnamese and pharmaceutical students were 5.22 times and 2.21 times more likely to choose "Hesitancy" over "Acceptance" compared to Laos and physiotherapy students, respectively. Students of nursing and medical laboratory technology were not predictive of "Vaccine hesitancy".

In the second model for "Refusal" versus "Vaccine acceptance", a cue to actions such as "Manufacturers not disclosing adverse effect of a vaccine" and a perceived barrier like "Adverse effect causing death" with positive log-odds (B) were 5.29 times and 10.25 times more likely to choose "Refusal" than "Acceptance", respectively. Other predictors with negative log-odds such as "Mass media appreciating effectiveness and safety of vaccines", "Unvaccinated HP students feasibly infected by coronavirus during hospital internship", and "HP students get serious complications of COVID-19 if not vaccinated" were 0.33, 0.34, and 0.43 times less likely to select "Refusal" than "Acceptance", respectively. In general, the rate of "acceptance of the vaccine" among HP students was determined with the highest correct rate (78.3%) compared with the correct rate of hesitation (65%) and refusal (30.8%).

In summary, the predictors in the "Hesitancy versus Acceptance" and "Refusal versus Acceptance" models of which positive regression coefficient (B) were statistically different from 0 ($p < 0.05$) included

"Manufacturers do not disclose adverse effects of vaccines", "Vaccines have little efficacy & serious adverse effects", "Adverse effects causing death", "Vietnamese nationality", and "Pharmacy major". In contrast, predictors with a negative regression coefficient (B) included "Mass media appreciate vaccine efficacy and safety", "Unvaccinated HP student is likely to contract COVID-19 during hospital internship", "HP students will develop serious complications of COVID-19 if not get vaccinated", and "Currently seasonal flu shot". Nationalities (Vietnamese versus Laos, OR= 5.221, 95% CI: 2.177-12.520, p=0.0005), and majors (Pharmacy versus physiotherapy, OR= 2.215, 95% CI: 1.145-4.285, p= 0.018) were the strong predictors of "vaccine hesitancy". Strong HBM predictors of vaccine refusal were "Manufacturers not disclosing adverse effects of vaccines" (OR= 5.299, 95% CI: 1.687-16.641, p= 0.004), and "Adverse effect causing death" (OR= 10.255, 95% CI = 3.528-29.814, p= 0.0005).

Discussion

The present study explored how the health belief model constructs predicted the acceptability of COVID-19 vaccination among HP students in Vietnam. Firstly, we found that the proportions of acceptance, hesitancy, and refusal of COVID-19 vaccination were 58%, 40.4%, and 1.5%, respectively. In comparison, the acceptance rate (34.9%) of Egyptian medical students is lower; however, the rate of hesitancy (46%) and refusal (19%) are higher than Vietnamese HP students [25]. Compared with the results of the study in South Carolina – USA, the acceptance and refusal rates of COVID-19 vaccination among college students were higher than our results with 60.6%, and 24.3%, respectively, except for the rate of hesitancy (15.1%) [26]. In addition to different sociodemographic factors, differences in vaccine acceptability between studies across countries could be traced back to trust in governments and health care systems in each country. The second reason might be a health literacy gap due to insufficient vaccine communication from medical literature and healthcare providers [27]. Communication should deal with anti-vaccine misinformation, change perceptions, and behaviors. In the current study's cues to action, a predictor in this HBM construct such as "Mass media appreciate the vaccine efficacy and safety" decreased the likelihood for choosing hesitancy and refusal of COVID-19 vaccination by factors 0.519, and 0.335, respectively. In contrast, another predictor such as "Manufacturers do not disclose adverse effects of vaccines" increased the likelihood of hesitant choice and refusal of the COVID-19 vaccine by factors 1.39 and 5,299, respectively. In summary, individuals would be less likely to accept the vaccination if they obtained incomplete information [28]. "Health authorities and physicians ensure that everyone is vaccinated safely and effectively" as the last predictor in cues to action was not associated with the acceptability of the COVID-19 vaccination. In this study, trust in health authorities and healthcare providers was not a driving factor in decision-making among HP students. The reason might be due to the failure of health authorities and the healthcare system in the control of COVID-19 morbidity and mortality during the 4th wave of COVID-19. The second HBM construct considered as a perceived barrier includes "Vaccines have little efficacy & serious adverse effects", and "Adverse effects cause death". These predictors were more likely to choose the COVID-19 vaccine hesitancy than acceptance among HP students. The results were consistent with the conclusion of a cross-sectional survey on student nurses in the United States. The reasons for the unwillingness to receive the vaccine among student nurses were

the belief that the vaccine was developed too quickly to be safe and concerns about the side effects of the vaccine [30]. Vaccine safety concerns have also been mentioned in other studies [31–33]. Such barriers to vaccine acceptance are the product of unfavorable social influences. If most students do not agree on vaccination, they will give a negative signal to others who are likely to accept [34]. Therefore, any effective means of promoting information on vaccine safety also aids in COVID-19 vaccine acceptance. If the rush towards early vaccine release is politically motivated and leads to serious adverse effects; the consequence will be the reduction of vaccine acceptance in the public [35]. All findings suggest that health education about the effectiveness and safety of the COVID-19 vaccine in the population is important for the future widespread use of vaccines [36]. Regarding the third HBM construct, the predictor of perceived susceptibility – “Unvaccinated HP students feasibly were infected by SARS-COV-2 during the hospital internship” negatively predicted the refusal of COVID-19 vaccination. This means that HP students who perceived COVID-19 risk in healthcare practice were more likely to accept COVID-19 vaccination. This is similar to the results of a study conducted in China that also showed that college students who were worried about contracting COVID-19 were more likely to receive a COVID-19 vaccine afterward [37]. In the last HBM construct (Perceived severity), we have also predicted that the explanatory variable “HP students get serious complications of COVID-19 if not get vaccinated” would affect the intent to accept vaccination. In summary, we may explain that although students were aware of the importance of the COVID-19 vaccine and accepted the vaccination, they were still hesitant due to uncertainty about the vaccine efficacy and safety.

Regarding sociodemographic characteristics, some variables might predict the acceptability of COVID-19 vaccines. The pharmaceutical students were more likely than physiotherapy students to choose vaccine hesitancy over acceptance (OR = 2.215, 95% CI: 1.145–4.285). This may be due to different perceptions about the importance of the COVID-19 vaccine in disease prevention. Among HP students, there were Cambodians and Laotians studying at Dong Thap Medical College. Because the percentage of Cambodians participating in the study was very small (0.9%), the multinomial logit model could only determine Vietnamese students as hesitant to get the COVID-19 vaccine compared to Lao students (OR = 5.221, 95% CI: 2.117–12.520). The reason might be the limit of the Vietnamese language. Thus, Lao students were less affected by negative information, anti-vaccine communication, fake news, etc. With respect to previous use of the flu vaccine, HP students who had used it in the past 6 months were less likely to hesitate about receiving the COVID-19 vaccine. The survey on factors influencing attitudes toward COVID-19 vaccination in the United States also demonstrated that vaccination history was the most important predictor of intention to vaccinate against COVID-19 [29]. Therefore, the prior usage of flu vaccines might reflect the confidence of HP students in vaccine safety.

Limitations of study

There are potential limitations to this study. First, self-reports were used to answer the questions. Reporting bias may be a limitation. Subjects can present themselves under favorable conditions. However, ensuring anonymity reduces this bias. Second, due to restrictions on the movement and gathering of people during the COVID-19 outbreak, random sampling cannot be applied. Therefore, the

snowball sampling method was adopted in this study, which may lead to selection bias, and poor representativeness. The last, study design is a cross-sectional survey. Therefore, we cannot confirm the causal relationship between predictors and the acceptability of COVID-19 vaccines.

Conclusion

The results of the study indicate that HP students in Vietnam may have made a decision to accept vaccination based on the perceived susceptibility to and severity of COVID-19. Furthermore, the role of mass media and transparency of information provided by vaccine manufacturers also influenced the acceptance of COVID-19 vaccines. However, perceived barriers, which are considered concerns of vaccine effectiveness and safety, may still affect the choice of refusal or hesitancy in vaccination. Health education integrated with training curricula at health schools could potentially improve COVID-19 vaccine acceptance among HP students. Highlighting the key role of faculties in educating and serving as a role model to their students is needed to ensure that students understand the importance of COVID-19 vaccination and address their fears and concerns.

Abbreviations

HBM: Health Belief Model; HP: Health professions

Declarations

Ethics approval and consent to participate

We confirm that all methods were performed in accordance with the relevant guidelines and regulations. The study was approved by the Institutional Review Board of Dong Thap Medical College. Informed consents were sent to all research participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed in the present study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that there is no conflict of interest

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Authors' contributions

CNL was responsible for the conception, the study design, the analysis and interpretation of the data, the development and revisions of the manuscript. UTTN and DTHD participated in the development of the online survey instrument and data management. All authors read and approved the final manuscript.

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Tables

Due to technical limitations, tables are only available as a download in the Supplemental Files section.

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