



Research article

Social media and COVID-19 vaccination hesitancy: mediating role of the COVID-19 vaccine perception

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ABSTRACT

Individuals' COVID-19 vaccination behaviors were examined when the government introduced a new vaccine into the immunization program. The purpose of this study is to thoroughly examine the effects of COVID-19 risk perception (CR), COVID-19 vaccination perception (VC), and Social Media (SO) on COVID-19 vaccine hesitancy (HE) in Vietnam. Three hundred fifty samples were collected regarding a reluctance to vaccinate against COVID-19 from 6/2021 to 7/2021. This is when immunizations are administered and injected in Vietnam; hence, hesitation regarding injection is rather prevalent. Multivariate regression analysis is conducted on a dataset of 350 Vietnamese respondents using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach. The main results indicated that the Perception Vaccine functions as a link between VC and HE. CR has a positive effect on both HE and VC; whereas VC has a negative impact on HE. Simultaneously, the study illustrates the detrimental effect of SO on immunity by comparing it to the influence of social media. The study's findings also demonstrated the critical role of protection motivational theory (PMT) and information theory in promoting vaccination efforts in Vietnam.

1. Introduction

The COVID-19 pandemic broke out worldwide in December 2019 in Wuhan, China. The outbreak of COVID-19 has negatively impacted economic and social activities and people's health [1, 2, 3]. Up to now, there have been 211,730,035 confirmed cases of COVID-19 in the world, including 4,430,697 deaths [4]. One year after the outbreak, countries have taken epidemic measures such as social distancing, travel restrictions, wearing masks, practicing hygiene, and other practices at work and in public places [5]. However, these measures may lead to adverse outcomes for people's psychology, physical health, and a global recession if COVID-19 is not entirely resolved [6, 7, 8]. At the same time, the measures of the above countries are only short-term actions to limit the spread of the disease when there is no vaccine to vaccinate against [5].

Vaccines are considered the most effective long-term measure taken to control and combat COVID-19 [9]. There is a general perception that vaccines are suitable for individuals and communities against certain diseases [10]. Therefore, countries are seeking to vaccinate their citizens to prevent sickness. 4,619,976,274 vaccine doses had been delivered as of August 22, 2021. However, such as lack of vaccine sources, preservation mechanisms, awareness about vaccines and especially people's hesitation

problems when injecting the COVID-19 vaccine [5]. The COVID-19 vaccines have been studied and implemented as an intervention against the pandemic since the end of 2020. However, there are many doubts about the effectiveness and safety of these vaccines [11]. With new vaccines for diseases of worldwide concern (pandemic), people learn to monitor the effectiveness and safety of each drug [11]. Individuals will make different decisions about which vaccine they should receive or apply for [11]. Thus, they know that they should get vaccinated as soon as possible, the negative information makes them more hesitant to get a COVID-19 vaccine [11, 12]. Individuals feel hesitant about vaccinating when concerned about potential problems or side effects [12].

According to Neumann-Böhme et al. [11], up to 55% of respondents said they feel hesitant about getting a COVID-19 vaccine. Meanwhile, in France, it was found that 26% refused to receive the vaccine against COVID-19 when there was doubt about its effectiveness. People still have certain hesitations when deciding to vaccinate against the COVID-19 vaccine. Studies on hesitancy to vaccinate against COVID-19 have been started since the vaccine was introduced at the end of 2020. Hesitation to vaccinate may be due to the perception of risk about the possibility of individual vaccination infection [13, 14, 15]. In addition, the perceived benefits of the trade-off between reducing the risk of infection and the

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risk of side effects from injection are also factors that make individuals hesitant to vaccinate [14]. Vietnam is new to the use of COVID-19 vaccine injections for people starting from June 2021 [16]. Emerging death cases because of the COVID-19 vaccine raise mixed information regarding the impact and side effects of the vaccine. At the same time, information on social networks can positively or negatively affect people's vaccination. Studying the factors influencing COVID-19 vaccine reluctance will lead to effective policies that improve access to and dissemination of vaccination programs [10]. Therefore, this study was conducted to determine the effects of COVID-19 risk perception, vaccine perception, social media, and vaccine hesitancy. The study will make a significant theoretical contribution to risk perception or protective motivation theory (PMT) and signaling theory in Vietnam's context of COVID-19 vaccination.

2. Literature review

2.1. COVID-19 risk perception, COVID-19 vaccine perception and COVID-19 vaccine hesitancy

The perceived risk of COVID-19 is the perception of possible vulnerability to being infected with COVID-19 [2,3,17,18]. According to PMT, individuals with potential risks will increase their actions to protect themselves [19]. In addition to the usual protective actions such as wearing a mask, limiting contact, washing hands, etc., the more sustainable self-protection action to be considered is vaccination against COVID-19 [9]. However, there are risks associated with vaccination, and individuals are well aware of the dangers. As a result, they often seek vaccine-related information to address the risks of vaccination scientifically. They make trade-offs between the risks of COVID-19 infection and the risks of vaccination side effects [20].

According to the PMT theory, when individuals perceive risk (in this case, infection with COVID-19), they expect to be vaccinated when they see a significant risk from COVID-19 infection [7, 21]. The higher the perception of health risks for COVID-19 by individuals, the more determined they are about vaccination [19]. Perceived risk associated with COVID-19 is measured regarding the likelihood and severity of contracting COVID-19 [13,22]. When individuals think they are less likely to get the disease or consider the possible symptoms of illness to be mild, they may be more hesitant to get vaccinated [21, 23, 24]. In contrast, people concerned about the COVID-19 pandemic and the dangers of infection are less likely to hesitate to get vaccinated [13, 25, 26].

The issue of the perceived safety of the vaccine is also an essential factor in the decision to vaccinate [27]. Due to limited information regarding the effectiveness or safety of each COVID-19 vaccine, there are mixed opinions about the COVID-19 vaccination [13]. If individuals have an upbeat assessment of the efficacy and safety of the vaccine, they will tend to be less hesitant to vaccinate [24, 27]. Thus, it can be seen that when people have a high awareness of the risk of COVID-19, they will be less hesitant to vaccinate. Furthermore, being aware of the threats also makes them more knowledgeable and mindful of the importance of vaccines. At the same time, when individuals understand the vaccines' vital role and effectiveness and safety, they will be less hesitant about their decision to vaccinate. Therefore, the following hypotheses are given:

- H1. CR has a positive impact on VC
- H2. CR has a negative impact on HE
- H3. VC has a negative impact on HE
- H4. VC mediates the relationship between CR and HE

2.2. Social media and COVID-19 vaccine hesitancy

Social media (SO) is increasingly essential in transmitting information and sharing personal views on social networks [28]. Several studies indicate the positive effects of social media on individuals' behavior [29].

Although information on social networks is considered valuable and reliable for individuals, however, with headline-based details for advertising purposes or public opinion orientation, it may bring false information (fake news) and affect the reception of data by social network users [30, 31]. The misinformation about the COVID-19 vaccine makes people have harmful misunderstandings about the vaccine. The fact that fake news is spread on social networks to oppose vaccines or increase hesitancy about vaccination [32]. At the same time, the news about severe and widespread side effects of the COVID-19 vaccine is also widely spread by bad media, making the host worried and scared [33]. However, in Vietnam, the control and sanctions against those who post information that confuse people about COVID-19 and the COVID-19 vaccine are implemented very closely. Fake news has been dramatically restricted. Instead, more official information delivered by the government and scientists is posted to gain the proper awareness about the vaccine and the safety of the COVID-19 vaccine from society. Official and reliable information from reputable organizations may reduce people's hesitation to vaccinate. Therefore, the hypothesis is given:

- H5. SO has a negative impact on HE

The research model in Figure 1.

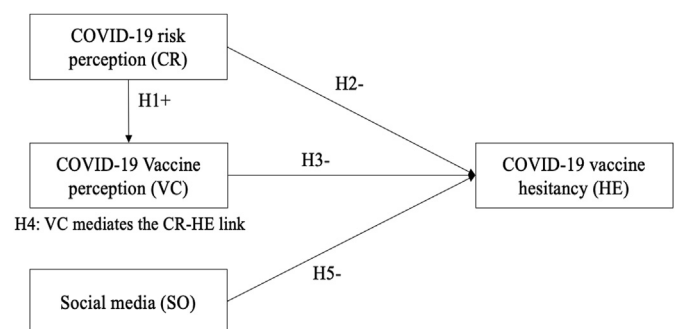


Figure 1. Research model.

3. Methods

3.1. Measurement scales

From previous studies, the authors synthesize and provide appropriate scales for the research context in Vietnam. The COVID-19 risk perception scales are referenced from the study of Tan et al. [2] and Karlsson et al. [13] with six items: (1) The COVID-19 pandemic has a high mortality rate; (2) worrying about yourself, relatives, and colleagues who may be infected with COVID-19; (3) recognizing the possibility of a COVID-19 pandemic breaking out in the area where you live and work; (4) risk Perception of infection during concentrated isolation; (5) risk Perception of infection during self-isolation; (6) risk perception of distance guidance during self-isolation. The COVID-19 vaccination perception is referenced from the studies [13, 34, 35] with six items: (1) perceive that getting vaccinated against COVID-19 is safety related to side effects; (2) perceive that getting vaccinated against COVID-19 reduces the risk of the disease; (3) perceive that vaccination against COVID-19 is required to prevent disease outbreaks; (4) perceive that vaccination against COVID-19 is good for the community; (5) perceive that vaccination against COVID-19 helps economic and social activities return to normal soon; (6) research on a COVID-19 vaccine is needed in the context of many new variants; research on a COVID-19 vaccine is needed in the context of many new variants. Social media is referenced from the study of Soares et al. [34]; Trent et al. [35]; Wardha et al. [36] with three items as: (1) regularly find out information about the COVID-19 vaccine on social networks; (2) refer to the information shared from people who have received the COVID-19 vaccine on social

Table 1. Demographic information of respondents ($n = 350$).

	Freq.	Percent
Gender		
Female	156	44.57
Male	194	55.43
Income		
<10 mil	54	15.43
10-15mil	172	49.14
16-20 mil	45	12.86
>20 mil	79	22.57
Job		
Private office staff	163	46.57
Public Officials	28	8
Self-employed	56	16
Industrial workers	8	2.29
Other	95	27.14
Potential exposure		
No	175	50
Yes	175	50
Marital status		
Others	243	69.43
Married	107	30.57
Education		
High school and below	23	6.57
University graduate	248	70.86
Master	49	14
Doctor	30	8.57
Age		
<35	262	74.86
35-45	71	20.29
46-65	17	4.86
Dead		
No	342	97.71
Yes	8	2.29

networks; (3) social networks bring much helpful information to you about the COVID-19 vaccine. The COVID-19 vaccine hesitancy factor referenced from the Lane et al. [37] and Wagner et al. [38] study is measured through 5 items: (1) concerned that the new type of COVID-19 vaccine is riskier than the old one already tested; (2) Concerned about side effects of the COVID-19 vaccine; (3) Concerns about the underlying disease when receiving the COVID-19 vaccine; (4) Worried about getting infected with the COVID-19 when getting vaccinated against the COVID-19; (5) concerned about vaccination against the COVID-19. The detailed questionnaire is presented in Appendix A.

3.2. Sampling and collecting data

With the fourth outbreak of COVID-19 in June 2021 in Vietnam, a convenient method of online data collection is considered feasible. The data was collected via Gmail, Facebook platforms. To target the suitable subjects to vaccinate during this period, the study uses a filter question about age and areas affected by COVID-19. Because this is a new study in the context of Vietnam, the questionnaire was surveyed in two phases: The first phase, the research surveyed on ten individuals to evaluate the understandable and logical level of the questionnaire. After collecting these opinions, the authors made appropriate contextual adjustments and conducted them in the second phase. Phase 2, the study was officially collected: Survey data from June to July 2021, 350 questionnaires were collected about hesitancy to vaccinate against COVID-19. This period is when vaccines are given and injected in Vietnam, so the behaviors of hesitation about injection are pretty prominent.

3.3. Data analysis

The evaluation procedures deployed to test the reliability and validity of the measures are referred to as measurement models. Three measurements proposed by Hair et al. [41] were considered as follows: (1) indicator loadings and internal consistency reliability; (2) convergent validity; and (3) discriminant validity.

Reliability test: The reliability analysis results are shown through two indexes: Cronbach's Alpha coefficient is greater than 0.7, and composite reliability (CR) is greater than 0.7.

Convergence validity: The study also evaluates the convergence value of the constructs through the factor loading coefficient greater than 0.5 and the average variance extracted greater than 0.5. Thus, when the constructs achieve convergence and reliability, the analysis for the constructs by items will be reliable.

Discriminant validity: In addition to assessing the confidence value and the convergence value, the analysis also requires the constructs to ensure distinctiveness from each other. Two commonly used evaluation methods are: AVE's square root is greater than the corresponding correlation coefficient between the two constructs [39], and the authors also calculated the Heterotrait-Monotrait (HTMT) ratios to confirm the discriminant validity further. Discriminant validity is satisfactory when the HTMT is less than 0.85 [40]; therefore, the results confirmed hypothesized structural paths.

PLS-SEM: PLS-SEM is now part of the typical portfolio of multivariate analysis methods (Hair et al., 2014). When a questionnaire and a Likert scale are used in a study, the cause-and-effect relationship between the variables must be established; hence, PLS-SEM is regarded appropriate (Hair et al., 2014). The primary benefits of PLS-SEM include the relaxation of distributional assumptions required by the maximum likelihood method used to estimate models using covariance-based SEM (CB-SEM) and the ability of PLS-SEM to estimate much more complex models with smaller sample sizes. Therefore, PLS-SEM is applied in the present study based on the advantages previously. The PLS-SEM analysis results were used to determine the relationship between COVID-19 risk perception, COVID-19 vaccination perception, and vaccine hesitancy.

3.4. Interview

The interview conducted in this study is not intended to generate novel hypotheses or variables. It is to conduct interviews and deliberate on the quantitative findings. To further elucidate the study's findings, participants were asked about their desire to obtain the COVID-19 vaccine. The interview transcripts were gathered and analyzed to explain the study findings comprehensively.

4. Results and discussions

4.1. Descriptive

350 research samples were considered suitable for multivariate data analysis using SPSS software for statistical analysis of survey respondents [41]. The descriptive results show that the proportion of men is higher than women (194 men, accounting for 55.43%; 156 women, accounting for 44.57%). 107 married respondents account for 30.57% and 243 single/non-married or "other" account for 69.43%. Group income from 10-15 million accounts for the most significant proportion with 172 respondents accounting for 49.14%. Next is the group of over 20 million (79 people, accounting for 22.57%), at least 16 to 20 million with 45 people accounting for 12.86%. The education level of the respondents is university graduate (248 people, accounting for 70.86%), followed by 49 with a Master's degree accounting for 14% and the lowest group of 23 people accounting for 6.5%). The majority of respondents are private office staff (163 respondents, accounting for 46.57%), at least industrial workers (8 people accounting for 2.29%). The age group of respondents

Table 2. Scales' evaluation.

Scales' items/sources	Loading	AVE
COVID-19 risk perception adapted from [2, 13]; CR = 0.899, Cronbach's Alpha = 0.866		
The COVID-19 pandemic has a high mortality rate.	0.778	0.598
Worrying about yourself, relatives, and colleagues who may be infected with COVID-19.	0.787	
Recognizing the possibility of a COVID-19 pandemic breaking out in the area where you live and work.	0.766	
Risk Perception of infection during concentrated isolation.	0.787	
Risk Perception of infection during self-isolation	0.735	
Risk perception of distance guidance during self-isolation.	0.785	
COVID-19 Vaccine perception adapted from [13, 34, 35]; CR = 0.957, Cronbach's Alpha= 0.946		
Perceive that getting vaccinated against COVID-19 is safety related to side effects.	0.849	0.788
Perceive that getting vaccinated against COVID-19 reduces the risk of the disease.	0.847	
Perceive that vaccination against COVID-19 is required to prevent disease outbreaks.	0.889	
Perceive that vaccination against COVID-19 is good for the community.	0.925	
Perceive that vaccination against COVID-19 helps economic and social activities return to normal soon.	0.929	
Research on a COVID-19 vaccine is needed in the context of many new variants.	0.883	
Social media adapted from [34, 35, 36]; CR= 0.902, Cronbach's Alpha = 0.838		
Regularly find out information about the COVID-19 vaccine on social networks.	0.854	0.754
Refer to the information shared from people who have received the COVID-19 vaccine on social networks.	0.873	
Social networks bring much helpful information to you about the COVID-19 vaccine.	0.878	
COVID-19 Vaccine Hesitancy adapted from [37, 38]; CR= 0.909, Cronbach's Alpha = 0.875		
Concerned that the new type of COVID-19 vaccine is riskier than the old one that has been tested	0.832	0.668
Concerned about side effects of COVID-19 vaccine	0.854	
Concerns about the underlying disease when receiving the COVID-19 vaccine	0.811	
Worried about getting infected with COVID-19 when getting vaccinated against COVID-19	0.819	
Concerned about vaccination against COVID-19	0.765	

is mainly under 35 years old (262 people, accounting for 74.86%), followed by the group 45 to 45 (71 people are accounting for 20.29%) and the group from 46 to 65 only 17 people with 4.86%. In addition, the questionnaire also collects data on the possibility of having much contact with other people. The results show that the two exposure rates are similar (175 people, accounting for 50% of each group). The question about having a family member who die from COVID-19 shows the number of respondents. 8 respondents had a family member who died from COVID-19, accounting for 2.29%, the remaining 342 respondents (97.71%) had no family members who died from COVID-19. The demographic information of respondents is presented in Table 1.

4.2. Reliability test

Reliability analysis results show that Cronbach's Alpha coefficient ranges from 0.866 to 0.957 and CR is greater than 0.7. Therefore, the constructs are all satisfied in terms of reliability. At the same time, the loading factor of all items is greater than 0.5, and the AVE ranges from 0.598 to 788; hence constructs are guaranteed to converge (see Table 2).

4.3. Discriminant validity

In this study, both indexes of AVE and HTMT were applied to evaluate the discriminants of constructs. The results show that the square root of AVE is in the range of 0.773–0.888, which is larger than the corresponding correlation coefficient. At the same time, the HTMT values are all less than 0.85, indicating that all constructs have the discriminant value. The discriminant validity result is presented in Table 3.

4.4. Structural model assessment

The analysis results show that CR positively affects HE ($\beta = 0.491$, P-value <1%). Therefore, hypothesis H1 is partially accepted (H1 states that CR has a negative impact on HE). The H2 hypothesis states that CRP has a positive impact on VC. Hypothesis H2 is accepted when $\beta = 0.688$

and P-value are significant at 1% Hypothesis H3 says that VC has a negative effect on HE. Analysis results show $\beta = -0.202$ and P-value is less than 0.01. Therefore, hypothesis H3 is accepted. With hypotheses H1, H2 and H3 accepted, hypothesis H4 about the mediating role of VC between CR-HE is accepted. Hypothesis H5 states that SO has a negative effect on HE. Hypothesis H5 is partially accepted with $\beta = 0.348$ and P-value less than 0.01. The detail of PLS-SEM are shown in Table 4.

The result is presented in Figure 2.

Table 3. Discriminant validity analysis.

	HE	PRC	PV	SO
HE	0.817			
PRC	0.573 (0.654)	0.773		
PV	0.357 (0.385)	0.688 (0.758)	0.888	
SO	0.532 (0.613)	0.635 (0.743)	0.635 (0.711)	0.868

Notes: CR: COVID-19 risk perception; VC: COVID-19 vaccine perception; SO: Social media; HE: COVID-19 vaccine hesitancy; 1st value = Correlation between variables; 2nd value (italic) = HTMT ratio; Square root of AVE (bold diagonal).

4.5. Discussions

COVID-19 vaccine perception is mediating between COVID-19 risk perception and COVID-19 vaccine hesitancy. In particular, CR positively affects HE, showing that the higher the perceived risk of COVID-19 by individuals, the more hesitant they are to get vaccinated. However, CR has an indirect negative effect on HE through VC. Although this result contradicts the original hypothesis, it also opens up vaccination awareness in Vietnam. When individuals perceive a high level of risk from COVID-19, they will be very hesitant to vaccinate because there is not much information about the vaccine they will receive (how safe, how effective) [13, 42]. When new vaccines are introduced, there are risks of

Table 4. PLS-SEM results.

Hypotheses		Model 1	Model 2	Model 3	Model 3 (with PV as the mediating variable)	
		HE	HE	HE	VC	HE
H1, H2	CR	0.588^a (13.505)			0.688^a (15.493)	0.491^a (7.591)
H3, H4	VC		0.382^a (7.808)			-0.202^a (-3.443)
H5	SO			0.534^a (10.934)		0.348^a (5.595)

Notes: CR: COVID-19 risk perception; VC: COVID-19 vaccine perception; SO: Social media; HE: COVID-19 vaccine hesitancy; numbers in brackets: t-statistic.
^a significance at 1% respectively (two-tailed t-test).

side effects or unclear effectiveness that make individuals uncertain about their vaccination decisions [13]. The more individuals feel at risk from COVID-19, the more carefully they search for information about vaccines. Then, when the information is complete, they are more likely to rate the vaccine positively [20, 42]. When they understand the value that vaccines bring, their hesitation to vaccinate will decrease [20]. In other words, the intermediary role of VC is vital in reducing people's hesitation to vaccinate in the context of the COVID-19 pandemic [42]. In our interviews related to CR and VC, the results mainly focused on injection anxiety when vaccine information is unavailable.

“I am apprehensive about the COVID-19 pandemic, my loved ones, and I may be infected with COVID-19, but I am also highly concerned about whether to vaccinate at this time.[...] The vaccine is new in Vietnam, but There have been risks of side effects seen,including some people dying from vaccinations. Therefore, I need to understand everything about the vaccine first before making. Although vaccines are essential to prevent COVID-19, I now need more information on safer and more effective vaccines.”

“The recent information about people dying from side effects after receiving the COVID-19 vaccine made me extremely worried about vaccination. If there is a vaccine with fewer side effects or is safer, I would consider vaccination. Currently, I do not desire to vaccinate because I do not feel safe. I have learned about this XXX vaccine that some European countries have hidden. In Vietnam, there is only XXX vaccine, so I have no intention of getting it at this time if I am called for an shot/jab.”

Social media has a positive effect on HE, indicating that information on social networks is a negative cause for individuals' decision to vaccinate [42]. It is expected that getting good or official information will reduce the level of hesitation of people about vaccination. However, the results show that fake news has a more substantial impact than official news on individuals about COVID-19 vaccination. Individuals in Vietnam tend to be more interested in fake news when headlines intrigue readers. This result indicates a negative impact from social media on COVID-19 and vaccines as individuals pay more attention to fake news [33]. Because fake news often negatively presents serious or untrue issues, making people more worried. Measures of official information to calm

people to obtain the most accurate assessment of vaccines probably need more attention.

“Social media brings me much information about COVID-19; however, I am more irritated with negative information from the titles of the online topic in the social network. I often keep track of information on how vaccines are administered, and whether anyone is having problems with it on Facebook. Recently, the information on social networks about people dying when receiving vaccines made me very worried about getting the COVID-19 vaccine. I find that fake news aimed at attracting attention or views, appearing and being shared frequently on Facebook, is usually negative news that makes people even more worried. Moreover, the official information often refers to numbers that people like me have difficulty understanding are determined. Regarding the effectiveness or safety of the vaccine, I do not understand how the calculation and the practical meaning are.”

5. Conclusions and implications

5.1. Conclusions

Individuals' vaccination behaviors regarding Covid-19 were studied when the government introduced a new vaccine into immunization. A dataset of 350 Vietnamese respondents was analyzed using PLS-SEM. The results indicated that the Perception Vaccine acts as a mediating role between CV and HE. CR has a positive influence on HE and VC, whereas VC has a negative effect on HE. Therefore, increasing awareness and awareness about the COVID-19 vaccine will help reduce hesitancy to vaccinate. SO has a positive impact on HE, so that the government needs to provide COVID-19 vaccine in detail and control fake news related to the COVID-19 vaccine effectively. Further, government intervention to increase vaccination uptake should focus on the perception of a vaccine on social media [43]. The study's findings support the importance of PMT and information theory in encouraging immunization efforts in Vietnam.

5.2. Theoretical implications

Study using and testing PMT and signal theory in the relationship between COVID-19 risk perception, perception of vaccines, social media, and hesitancy to vaccinate. The theory of PMT has proven that when individuals feel anxious about facing a COVID-19 risk, they are more inclined to learn about possible measures against that risk (COVID-19 vaccine). At the same time, the PMT theory is also confirmed more strongly when CR has a direct positive effect on HE but a negative indirect effect on HE through VC. It can be seen that the PMT theory shows that when individuals are worried about COVID-19, they are also concerned about the risks of using vaccination when the information about the vaccine has not made them confident. Therefore, they will be more hesitant to get vaccinated at first. Because of that, they will tend to learn more about vaccines and better appreciate vaccines when they understand their role.

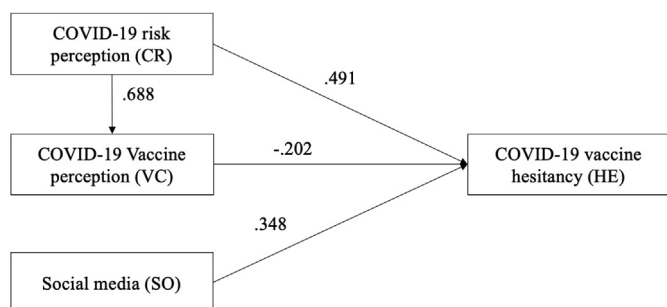


Figure 2. PLS-SEM results.

When they know more and have enough information about vaccines, they tend to be less worried about the risks of vaccination and less hesitant to get the COVID-19 vaccine. At the same time, the study also points to the role of signaling theory in the context of COVID-19. Social media related to COVID-19 is having a negative impact on vaccination strategies due to the influence of fake news. Therefore, further research demonstrates that bad news is more receptive to positive information in the COVID-19 environment in Vietnam. In addition to the effect of signaling from fake too much on social networks, individuals can actively or passively receive this information regularly, making them more hesitant to vaccinate.

5.3. Practical implications

Research results show the vital role of vaccine awareness in people's decision to vaccinate. Therefore, providing information to the people helps them understand the significance of vaccines in reducing the risk of infection and preventing the development of COVID-19. Vaccines will help bring socio-economic activities and people's actions back to normal soon. So the sooner you get vaccinated, the better. However, to make the host not hesitate to vaccinate, this information needs to be transmitted regularly in the mass media. In addition, state agencies need to have a way to convey information to the people about the vaccines that will be put into injection for the people. Indicators of safety and effectiveness need to be clearly explained so that individuals can see that the COVID-19 vaccine is safe and effective during the COVID-19 outbreak.

For the negative impact of social media on people's hesitation to vaccinate, relevant agencies need to have sanctions against sources of false information that increase people's anxiety. Control the spreading of fake news for personal purposes such as viewing views, advertising that adversely affect the government's vaccination work. At the same time, official information needs to be released on social networks more to understand vaccines and fake news better to have the proper perspective on COVID-19 vaccination.

6. Limitations and future research

Although the effect of COVID-19 risk perception was found in this study, the perceived benefit of vaccines and social media on COVID-19 vaccine hesitation was found. However, the study also has some limitations: first, with the large number of samples taken from subjects located in areas with a high number of COVID-19 infections, there may be a bias in the results. The perceptions of people in different affected areas may be different. However, this assumption is made by us. More specific and broader research is needed to reflect on the hesitancy to vaccinate against COVID-19. Second, the study focused on COVID-19-related factors and social impacts without adding work-related factors that might influence reluctance to get the COVID-19 vaccine with a job with a high risk of infection or a job that requires vaccination to be able to work. Therefore, further studies need to measure work-related factors that may lead to reluctance to vaccinate against COVID-19. Thirdly, the authors have only researched the period when the vaccine has just been introduced into Vietnam, so the awareness about the vaccine may be limited. Therefore, hesitancy may depend as much on vaccine information as on the type of vaccine. Therefore, follow-up studies can follow the phases (longitudinal studies) of the vaccine initiation and administration and close vaccination with the government target vaccination rates. Longitudinal studies will help reveal the behavioral changes of individuals overtime.

Declarations

Author contribution statement

Duy Van Nguyen: Conceived and designed the research; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Phi-Hung Nguyen: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

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