# COVID-19 Vaccine Acceptance from the Perspective of People Living in Northern Thailand: A Mixed Methods Research

# การยอมรับวัคซีนโควิด 19 จากมุมมองของประชาชนในพื้นที่ภาคเหนือตอนบน: การวิจัยแบบผสมผสาน


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| ยุพเรศ | พญาพรหม* | Yupares | Payaprom* |
| หัสญา | ตันติพงศ์** | Hutsaya | Tantipong** |
| พรพรรณ | มนสัจจกุล*** | Pornpun | Manasatchakun*** |
| ศรินญาภรณ์ | จันทร์ดีแก้วสกุล*** | Sarinyaporn | Chandeekeawchakool*** |
| ทรงยศ | คำชัย**** | Songyos | Khamchai**** |



## Abstract

This research aimed to determine the acceptance rate of the COVID-19 vaccine and its associated factors. A mixed method research study was conducted with the quantitative study comprised of 2,200 adults aged 18 or older. Participants were recruited from households in 25 districts in Chiang Mai province, with a multi-stage cluster sampling method. Data were collected using a questionnaire based on the Health Belief Model (HBM). Binary logistic regression analysis was performed to identify factors associated with COVID-19 vaccine acceptance rates. For the qualitative portion of the study, a purposive sampling approach was utilized to recruit 40 adults aged 18 or older. Focus group discussions were conducted, and qualitative content analysis was applied to analyze data.

The research results indicated that the COVID-19 vaccine acceptance rate was 41.1%. The factors associated with the acceptance of COVID-19 vaccines were sociodemographic characteristics including education level, employment status, influenza vaccination history, having good knowledge about COVID-19, perceived risk of contracting COVID-19, perceived benefits of the vaccine, and receiving cues to action, such as being encouraged by community members or recommendations from healthcare professionals. The focus groups also revealed that participants' decisions in relation to the acceptance of COVID-19 vaccines were based on several factors including salience of risk, efficacy and safety of the COVID-19 vaccine, Information needs and sources of information, and influence of others.

These findings emphasize the importance of considering and understanding the factors that affect people's vaccination decisions in order to develop effective public health initiatives to increase COVID-19 vaccination uptake.



**Keywords:** Vaccine acceptance, Mixed methods approach, COVID-19 vaccine, HBM



* Corresponding Author, Lecturer, Boromarajonani College of Nursing, Chiang Mai;
e-mail: yupares66@gmail.com

** Internist, Department of Medicine, Chonburi Regional Hospital

*** Lecturer, Boromarajonani College of Nursing, Chiang Mai

**** Chief, Division of Communicable Disease Control, Chiang Mai Provincial Public Health Office



Received 25 May 2022; Revised 14 June 2022; Accepted 17 June 2022

**บทคัดย่อ**

การศึกษาวิจัยแบบผสมผสานครั้งนี้ มีวัตถุประสงค์เพื่อประเมินการยอมรับวัคซีนป้องกันโรคโควิด 19 และศึกษาปัจจัยที่เกี่ยวข้องกับการยอมรับวัคซีนของประชาชน โดยในขั้นตอนการวิจัยเชิงปริมาณ กลุ่มตัวอย่างประกอบด้วยประชาชนอายุ 18 ปีขึ้นไป จำนวน 2,200 คน คัดเลือกกลุ่มตัวอย่างจาก 25 อำเภอในจังหวัดเชียงใหม่ โดยใช้วิธีการสุ่มแบบกลุ่มหลายขั้นตอน เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามซึ่งสร้างขึ้นตามแนวคิดและองค์ประกอบของแบบแผนความเชื่อด้านสุขภาพ วิเคราะห์ปัจจัยที่เกี่ยวข้องกับการยอมรับวัคซีนโควิด 19 โดยใช้ Binary logistic regression analysis การรวบรวมข้อมูลเชิงคุณภาพ คัดเลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจง จากผู้ที่อายุตั้งแต่ 18 ปี ขึ้นไป ได้กลุ่มตัวอย่างจำนวน 40 คน เก็บรวบรวมข้อมูลโดยการสนทนากลุ่ม วิเคราะห์ข้อมูลโดยใช้การวิเคราะห์เนื้อหา

ผลการศึกษาพบว่าอัตราการยอมรับวัคซีนป้องกันโรคโควิด 19 ของประชาชนคิดเป็นร้อยละ 41.1 ปัจจัยที่เกี่ยวข้องกับการยอมรับวัคซีนของประชาชน ได้แก่ ลักษณะทางประชากรและสังคมของบุคคล ได้แก่ ระดับการศึกษา สถานภาพการจ้างงาน ประวัติการได้รับวัคซีนไข้หวัดใหญ่ ความรู้เกี่ยวกับโรคโควิด 19 การรับรู้ความเสี่ยงต่อการติดเชื้อ การรับรู้ประโยชน์ของการฉีดวัคซีน การกระตุ้นให้เกิดการปฏิบัติ เช่น การสนับสนุนจากคนในชุมชน และการได้รับคำแนะนำจากบุคลากรทางการแพทย์ ผลจากการสนทนากลุ่มพบว่าการตัดสินใจยอมรับวัคซีนป้องกันโรคโควิด 19 ของกลุ่มตัวอย่างขึ้นกับหลายปัจจัยได้แก่ ความเสี่ยงต่อการติดเชื้อ ประสิทธิผลและความปลอดภัยของวัคซีน การได้รับข้อมูลและแหล่งของข้อมูล และอิทธิพลจากบุคคลอื่น

ผลการวิจัย เน้นให้เห็นถึงความสำคัญของการพิจารณาและเข้าใจปัจจัยที่มีผลต่อการตัดสินใจฉีดวัคซีนของประชาชน เพื่อที่จะพัฒนาโครงการด้านสาธารณสุขที่มีประสิทธิภาพ ที่จะช่วยเพิ่มการรับบริการในการฉีดวัคซีนป้องกันโรคโควิด 19

**คำสำคัญ:** การยอมรับวัคซีน การวิจัยแบบผสมผสาน วัคซีนโควิด 19 แบบแผนความเชื่อด้านสุขภาพ

* ผู้เขียนหลัก, อาจารย์ วิทยาลัยพยาบาลบรมราชชนนีเชียงใหม่; e-mail: yupares66@gmail.com
** อายุรแพทย์ โรงพยาบาลชลบุรี จังหวัดชลบุรี
*** อาจารย์ วิทยาลัยพยาบาลบรมราชชนนีเชียงใหม่
**** หัวหน้ากลุ่มงานควบคุมโรคติดต่อ สำนักงานสาธารณสุขจังหวัดเชียงใหม่

วันที่รับบทความ 25 พฤษภาคม 2565 วันที่แก้ไขบทความ 14 มิถุนายน 2565 วันที่ตอบรับบทความ 17 มิถุนายน 2565

## Background and Significance

The current global pandemic of the coronavirus disease 2019 (COVID-19) is caused by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SAR-CoV-2). The first known outbreak of COVID-19 was reported in November 2019 in Wuhan, Hubei, China. Since then, the SARS-CoV-2 virus has spread quickly and affected individuals worldwide. As of 5 March 2022, the World Health Organization (WHO) has confirmed more than 440 million cases and almost 6 million deaths because of the disease in 224 nations and territories (WHO, 2022a). In Thailand, since January 2020, there have been 3,004,814 COVID-19 cases, with 23,176 deaths (WHO, 2022b). According to the WHO, there have been five SARS-CoV-2 variants of concern that have emerged, and spread around the globe: Alpha, Beta, Gamma, Delta, and Omicron. The COVID-19 pandemic is now accelerating due to the spread of the new variant of SARS-CoV-2, Omicron (B.1.1.529). The Omicron variant is less virulent and more transmissible than the Delta variant. However, it can result in hospitalization and death, especially in older people, those who are unvaccinated, and those with underlying chronic diseases (WHO, 2022c). COVID-19 vaccines are primarily used to protect against severe illness from COVID-19, hospitalization, and death (WHO, 2022d). They also reduce the risk of SARS-CoV-2 infection (Wilder-Smith, 2022). More recently, a case-control study conducted in India showed that the effectiveness of the COVID-19 vaccine in preventing SARS CoV-2 infection was estimated to be 83 percent for full vaccination (Singh et al., 2021).

Without a doubt, vaccines remain a vital tool in the fight against pandemics and are crucial for halting the COVID-19 pandemic. The WHO has set a goal for 70% of the global population to be immunized against COVID-19 by the middle of 2022 (WHO, 2022e). However, vaccination acceptability is complex and context-specific. It often varies by time, geography, vaccine type, public perception, and culture (Al-Mohaithef & Padhi, 2020; Solís Arce et al., 2021). A global survey conducted in 19 countries revealed that China had a high rate of vaccine acceptance at 90%, while Russia had a lower rate of 55% (Lazarus et al., 2021). Similarly, Tran et al. (2021) found that COVID-19 vaccination acceptability was significantly low among Russian adults (41.7%). The acceptance of COVID-19 vaccines is influenced by many factors which include prior infection with SARS-CoV-2, perceived health status, socio-demographic characteristics, perception of COVID-19 as a serious disease, trust in the healthcare system, and vaccine-related concerns such as the vaccine's safety and efficacy, as well as the benefits of vaccination (Tran et al., 2021; Wong et al., 2021). Additionally, a recent study from Malaysia examined COVID-19 vaccine acceptance and its predictors using the Health Belief Model (HBM) as a theoretical framework, and found that the perceived benefits of COVID-19 vaccination including the belief that immunization reduces the likelihood of developing COVID-19 (OR = 2.51, 95% CI 1.19–5.26), and that immunization against COVID-19 helps to reduce worry about the coronavirus infection (OR = 2.19, 95% CI 1.03-4.65) were strongly correlated with intention to get a vaccine against COVID-19 (Wong, Alias, Wong, Lee, & Abubakar, 2020). These factors provide a good explanation of vaccine acceptance

and hesitancy. Moreover, they are amenable to intervention. However, in Thailand, very few studies to date have examined this issue in detail, and this includes Chiang Mai province. Thus, it is crucial to identify factors related to the acceptance of COVID-19 vaccines among Thai adults. The study findings can be used to inform the development of an intervention program designed to increase COVID-19 vaccine acceptance and uptake in Chiang Mai province, Thailand, as well as other provinces with similar contexts.

## Objectives

This study aimed to determine the acceptance rate for the COVID-19 vaccine and to identify the factors related to COVID-19 vaccine acceptability among Thai adults.

## Conceptual Framework

The Health Belief Model (HBM) served as the conceptual framework for examining the factors related to COVID-19 vaccine acceptance in this study (Becker, 1974). This model can be used to explain why people would or would not accept the COVID-19 vaccine. According to the HBM, an individual's vaccine decision-making is determined by his or her perception of the risk and severity of COVID-19 infection, as well as the perception of the benefits and obstacles to vaccination. The decision to accept COVID-19 vaccination can also be triggered by cues to action such as receiving sufficient information about COVID-19 vaccines and recommendations from healthcare providers. Additionally, demographic factors are thought to influence the acceptance of COVID-19 vaccines. These variables were explored in this study.

## Methodology

This mixed methods research used both quantitative (cross-sectional study) and qualitative (focus group) methods. These methods provided complementary insights into people's perceptions underlying COVID-19 vaccine acceptance and the factors that impact it.

### Population and Sample

This study was carried out among Thai adults aged 18 years or older who were healthy, and those with chronic diseases such as chronic respiratory diseases, cancers, cardiovascular diseases, chronic kidney diseases, obesity, and diabetes. Participants were chosen from households in 25 districts in Chiang Mai province. The sample size was determined by the following formula: N adjust = $Z^2_{\alpha/2}\, p\,(1-p)/e^2)$ x deff, with a 3% margin of error (e), 95% confidence interval, a 50% vaccine acceptability (hypothesized vaccine acceptance rate = 50%) and design effect (deff) = 2 (Alimohamadi & Sepandi, 2019; Wayne, 1995). Accordingly, a minimum sample size of at least 2,135 participants were required for the present study. A total of 2,200 samples were selected. A multi-stage cluster sampling method was utilized for the quantitative section, and a purposive sampling approach was used to recruit 40 samples for the qualitative section.

**Research Instruments**

The research team developed a questionnaire based on the HBM which consisted of items assessing COVID-19 risk perceptions (6 items), severity of COVID-19 infection (5 items), perceived benefits of vaccination (4 items), barriers to receiving the vaccine (5 items), and cues to action (4 items). Responses for HBM-based items were "strongly agree", "agree", "disagree", or "strongly disagree". The questionnaire was examined by three experts and had a Content Validity Index (CVI) of 0.88. Cronbach's alpha coefficients were satisfactory for all the HBM constructs (risk perception = 0.82, severity = 0.75, perceived benefits = 0.81, perceived barriers = 0.76, and cues to action = 0.84).

Participant demographics and COVID-19 disease-related questions were added. Six questions were used to assess general COVID-19 knowledge about contagiousness, modes of transmission, infection sources, common signs and symptoms of COVID-19, and the duration of the quarantine period. The response options were "yes", "no", or "don't know". The correct answer was scored as 1, while an incorrect answer or "don't know" was scored as 0. Participants that had a score of 80% or more were considered to have "good" knowledge, while those with a score of less than 80% were regarded to have "poor" knowledge. In addition, participants were asked about their current health status, pre-existing chronic conditions, and prior influenza vaccination history based on the responses "yes" or "no". The question "Would you take a COVID-19 vaccine if it was available?" was utilized to assess COVID-19 vaccine acceptability, and the possible responses were "yes", "no (refuse)", and "undecided". The percentage of respondents who answered "yes" was used to define vaccine acceptability.

The discussion guide contains open-ended questions to elicit participants' views on COVID-19 vaccination and the factors influencing their acceptance of COVID-19 vaccines. Key questions include "What have you heard about COVID-19 vaccines (benefits and drawbacks)?", "What concerns do you have about receiving the COVID-19 vaccines?" and "Which will help you decide whether you will get a COVID-19 shot?", and "Will you get the COVID-19 shot if it is available?". A focus group discussion guide was pilot tested prior to the study.

**Ethical Considerations**

Both the quantitative and qualitative studies were approved by the institutional research ethics committee, Boromarajonani College of Nursing Chiang Mai (Ethics reference: BCNC-T05/2564). The study was conducted between March and April, 2021 in Chiang Mai province. Village health volunteers from each district approached potential participants and asked them whether they would be willing to take part in the study. Before collecting data, those who agreed to participate in the study were given information regarding the objectives of the research and their written informed consent was acquired. The questionnaires did not contain the names of the respondents or their identities. The confidentiality of the completed questionnaires was maintained.

**Data Collection**

After signing the informed consent, participants were asked to complete the questionnaire. A total of 2,200 questionnaires were completed and used for data analysis.

A focus group discussion (FGD) was carried out. Each focus group discussion consisted of 10 participants. Two focus groups were carried out with a total of twenty healthy individuals. The other two focus groups had a total of twenty people with chronic medical conditions. The moderators asked the participants open-ended questions from a discussion guide created by the research team to enable participants to express their perspectives on COVID-19 immunization and the factors that may influence their acceptance or rejection of the COVID-19 vaccine. Each focus group lasted between 45 and 60 minutes and was tape-recorded with the participants' permission. The focus group discussions were transcribed and qualitatively analyzed.

**Data Analysis**

Descriptive statistics including frequency, mean, and standard deviation were used to summarize the quantitative data. Binary logistic regression analysis was then performed to identify factors related to COVID-19 vaccine acceptability. Vaccine acceptance was used as the dependent variable. The variables with *p*-values of less than 0.2 in the univariate analyses were entered into the multivariate analysis. The odds ratios (OR), 95% confidence intervals (95% CI), and *p*-values were computed for each independent variable.

A qualitative content analysis as proposed by Graneheim and Lundman (2004) was applied for data analysis. The transcripts were read thoroughly several times to obtain a general insight. Then, the transcripts were condensed and abstracted into codes. The codes were compared for similarities and differences, and these codes were further grouped into sub-categories and categories constituting the manifest content. To increase reliability, two researchers (Y. P. and P. M.) coded each transcript in Thai. The discrepancies in coding were discussed by the research team and resolved through discussion. In addition, two participants were requested to review and provide feedback on a transcript.

## Results

**1.Quantitative study**

**1.1 Demographic characteristics**

The majority of participants were aged 40 and older (75.5%), females (61.5%), and married (61.2 %). More than half had completed primary school education (55.4%). Many participants were self-employed (36.4%) and wage workers (33.1%). The majority of participants perceived their current health status to be either very good or good (69.1%), approximately 30% of respondents reported that they had previously received an influenza vaccine. In addition, the majority of participants had good general knowledge about COVID-19 (85.3%), and the most often cited source of information regarding COVID-19 was television (84.0%), followed by the internet (53.6%), and healthcare professionals (40.7%).

### 1.2 Acceptance of the COVID-19 vaccine and related factors

Nine hundred and five out of 2200 respondents (41.14%) indicated their plan to get vaccinated if a COVID-19 vaccine became available. Univariable analysis found that most of the HBM variables were shown to significantly predict vaccine acceptance, with the exception of perceived barriers to vaccination. In the multivariate analysis, after adjusting for confounding factors, secondary-level education, self-employment, individuals working in private services, those who were immunized against influenza last year, and those with good knowledge of COVID-19 were significantly associated with vaccination acceptance. Among the HBM constructs, perceived risk of getting infected with coronavirus, perceived vaccine benefits, and receiving cues to action were the predictors of COVID-19 vaccine acceptance among our participants (Table 1), but the perceived severity of COVID-19 and perceived barriers to vaccination were not.

**Table 1** Factors associated with COVID-19 vaccine acceptability

| Variable | | | | Univariate analysis | | Multivariate analysis | |
|---|---|---|---|---|---|---|---|
| | Overall N= 2,200 (%) | Yes (%) | No/ undecided (%) | Unadjusted OR (95%CI) | *p*-value | Adjusted OR (95%CI) | *P*-value |
| Level of education | | | | | | | |
| Primary | 1,219 (55.4) | 424 (34.8) | 795 (65.2) | Ref | | | |
| Secondary | 535 (24.3) | 272 (50.8) | 263 (49.2) | 1.9 (1.6-2.4) | <.001 | 1.7 (1.3-2.2) | <.00 |
| Tertiary | 446 (20.3) | 209 (46.9) | 237 (53.1) | 1.6 (1.3-2.1) | <.001 | 1.3 (0.9-1.7) | .120 |
| Occupation | | | | | | | |
| Unemployed | 390 (17.7) | 111 (28.5) | 279 (71.5) | Ref | | | |
| Self-employed | 801 (36.4) | 353 (44.1) | 448 (55.9) | 2 (1.5-2.6) | <.001 | 1.7 (1.3-2.4) | .001 |
| Wage worker | 729 (33.1) | 303 (41.6) | 426 (58.4) | 1.8 (1.4-2.3) | <.001 | 1.19 (0.9-1.6) | .269 |
| Private services | 122 (5.5) | 65 (53.3) | 57 (46.7) | 2.9 (1.9-4.3) | <.001 | 2.0 (1.2-3.4) | .006 |
| Government services | 122 (5.5) | 61 (50.0) | 61 (50.0) | 2.5 (1.6-3.8) | <.001 | 1.6 (0.9-2.7) | .072 |
| Student | 36 (1.6) | 12 (33.3) | 24 (66.7) | 1.3 (0.6-2.6) | .54 | 0.8 (0.3-1.8) | .558 |
| Received influenza vaccine in the previous year | | | | | | | |
| No | 1,538 (69.9) | 587 (38.2) | 951 (61.8) | Ref | | | |
| Yes | 662 (30.1) | 318 (48.0) | 344 (52.0) | 1.5 (1.2-1.8) | <.001 | 1.3 (1.1-1.7) | .009 |
| General knowledge about COVID-19 | | | | | | | |
| Poor knowledge | 324 (14.7) | 99 (30.6) | 225 (69.4) | Ref | | | |
| Good knowledge | 1,876 (85.3) | 806 (43.0) | 1070 | 1.7 (1.3-2.2) | <.001 | 1.5 (1.1-2.0) | .012 |

**Table 1** Factors associated with COVID-19 vaccine acceptability (continued)

| Variable | Overall N (%) | Yes (%) | No/ undecided (%) | Univariate analysis Unadjusted OR (95%CI) | *p*-value | Multivariate analysis Adjusted OR (95%CI) | *P*-value |
|---|---|---|---|---|---|---|---|
| Perceived susceptibility | | | | | | | |
| If other people in my community contact COVID-19, I am likely to catch it. | | | | | | | |
| Disagree/strongly disagree | 883 (40.1) | 282 (31.9) | 601 (68.1) | Ref | | | |
| Strongly agree/agree | 1317 (59.9) | 623 (47.3) | 694 (52.7) | 1.91(1.6-2.9) | <.001 | 1.3 (1.1-1.7) | .015 |
| Perceived benefits | | | | | | | |
| Getting a vaccine makes me less afraid of catching COVID-19 | | | | | | | |
| Disagree/strongly disagree | 1,537 (69.9) | 523 (34.0) | 1014 (66.0) | Ref | | | |
| Strongly agree/agree | 663 (30.1) | 382 (57.6) | 281 (42.4) | 2.64 (2.1-3.2) | <.001 | 1.3 (1.1-1.7) | .043 |
| Cues to action | | | | | | | |
| I will get vaccinated against COVID-19 if health care professionals say I should. | | | | | | | |
| Disagree/strongly disagree | 1,215 (55.2) | 325 (26.7) | 890 (73.3) | Ref | | | |
| Strongly agree/agree | 985 (44.8) | 580 (58.9) | 405 (41.1) | 3.92 (3.2-4.7) | <.001 | 1.6 (1.2-2.1) | .001 |
| I will get a COVID-19 vaccine if I have enough information. | | | | | | | |
| Disagree/strongly disagree | 1,043 (47.4) | 250 (24.0) | 793 (76.0) | Ref | | | |
| Strongly agree/agree | 1157 (52.6) | 655 (56.6) | 502 (43.4) | 4.14 (3.4-4.9) | <.001 | 1.5 (1.1-2.0) | .007 |
| I will receive a vaccine if many community members do. | | | | | | | |
| Disagree/strongly disagree | 1,174 (53.4) | 289 (24.6) | 885 (75.4) | Ref | | | |
| Strongly agree/agree | 1026 (46.6) | 616 (60.0) | 410 (40.0) | 4.60 (3.8-5.5) | <.001 | 2.1 (1.4-3.0) | <.001 |

**1.3 Key findings from the qualitative study**

In this study, data obtained from focus groups were supplemented and triangulated to gain a better understanding of the factors that influence vaccine acceptability among Thai adults living in the community. Four sub-categories emerged from the analysis of FGDs.

**Information needs and sources of information**

Several participants stated that they would consider vaccination if they had additional information about the efficacy and adverse effects of COVID-19 immunization. One participant mentioned that "*I wouldn't dare take the risk either. It's a new vaccine that hasn't been used before. I need more information before I decide to inject*" (ID 2, Female, 52 years).

The majority of participants had heard about the COVID-19 vaccine via public media and the internet. Several participants also mentioned that the information posted on social media had sparked concerns and fears regarding the safety of COVID-19 vaccines. For example:

"*There is some bad news [about COVID-19 vaccine] that people were very afraid of. Some people died a few days after they were injected.*" (ID 37, Female, 64 years)

Additionally, some participants also pointed out that information about the COVID-19 vaccine should be targeted and tailored to those with chronic medical conditions.

*"There isn't enough information right now to say whether the vaccine is good for people with a chronic illness or not. I am afraid that the vaccine might have some effects on the disease I already have."* (ID 20, Male, 48 years)

**Salience of risk**

Several participants indicated that their acceptance of the COVID-19 vaccines were based on their perceived likelihood of contracting COVID-19. For instance:

*"I will get a vaccine to protect myself from COVID-19. I work with many people. So, I am at a high risk of getting it"* (ID 4, Female, 36 years) and *"I think everyone should be injected because there is a risk of getting COVID-19 when you go to the hospital, eat with other people, or touch public surfaces"* (ID 1, Male, 40 years)

**Vaccine efficacy and safety**

Most participants were concerned about the safety and effectiveness of COVID-19 vaccines. They lacked confidence in the efficacy of the COVID-19 immunization.

*"I'm not sure if vaccination is good or bad for our health; some people died after receiving the vaccine."* (ID 16, Female, 58 years)

Many participants preferred to observe if other people had any adverse reactions after receiving the COVID-19 vaccine before they chose to be immunized against COVID-19, and stated that the vaccines cannot be trusted now. Typical comments were:

*"I'll have to wait and see. If someone else gets a COVID-19 vaccine, and after a few months, they're fine, I'll just do the same."* (ID 24, Female, 60 years)

*"We have to wait for other people to get more injections first because it's a new vaccine. We lack confidence in safety."* (ID 35, Female, 64 years)

For participants who had chronic medical conditions, they believed that getting vaccinated may have negative effects on their pre-existing diseases. There were claims that the vaccination was lethal, had significant side effects, and may even cause death. A typical comment was:

*"I have chronic kidney disease and have been allergic to drugs. I feel scared; what if I get vaccinated, and die?"* (ID 36, Female, 65years) and *"I have heart disease. I am worried that vaccinations will exacerbate the underlying disease."* (ID 31, Female, 62 years)

**Influence of others**

Many participants indicated that they were unable to independently decide whether or not to get a COVID-19 vaccination. The most frequent reasons as to why they had to seek help from their children or other community members were as follows:

*"I must ask my daughter whether I should get vaccinated or not. Because if something happens, she is the one who takes care of me."* (ID 31, Female, 62 years); *"In our community we follow each other. When most people get the COVID-shot, I am forced to do so"* (ID 16, Female, 58 years); and *"I think they [friends] could help me decide if I should get the vaccine because we have the same health problems [chronic diseases]"* (ID 34, Male, 62 years).

Furthermore, some participants, especially those with chronic diseases, reported that their decision to obtain the COVID-19 vaccine was highly influenced by their healthcare providers, regardless of their personal preferences. *For example, "In fact, we were very afraid. But if it's recommended by the doctor or other health care workers. We must cooperate"* (ID 35, Female, 65 years).

## Discussion

1. The findings of this study revealed a COVID-19 vaccine acceptance rate of 41.1%. Similarly, another survey conducted in Thailand with 959 respondents revealed a 41.8 percent acceptance rate for COVID-19 vaccination (Kitro et al., 2021). This is a relatively low acceptance rate in comparison to other studies. Several studies conducted in Asian countries demonstrated that vaccine acceptance rates ranged between 61.2% and 93.3% (Harapan et al., 2020; Mahmud, Mohsin, Khan, Mian, & Zaman, 2021). Furthermore, a global survey revealed that the acceptance rate of COVID-vaccines ranges from 55% to 90% (Lazarus et al., 2021). The low rate of vaccine acceptability among Thai adults poses a serious challenge to policymakers in terms of achieving widespread vaccination coverage.

2. Factors associated with COVID-19 vaccine acceptance

This research demonstrated that sociodemographic characteristics, including education level, self-employment, and working in private services had an effect on COVID-19 vaccine acceptance among Thai adults. These sociodemographic characteristics were also identified as the major determinants of COVID-19 vaccine acceptability in the United States of America and Russia (Kelly et al., 2021; Tran et al., 2021). The results of this study showed that the likelihood of vaccine acceptance was higher among participants with secondary education. The association between level of education and COVID-19 vaccine acceptability varied across countries (Solís Arce et al., 2021). Additionally, the results of this study revealed that self-

employed participants and those engaged in the private sector were more likely to accept a COVID-19 vaccine than unemployed participants. This is probably because the majority of employed people work primarily outside the home, and some of them may work in crowded conditions and perceive a greater risk of getting COVID-19 infection. Furthermore, a significant association between a history of influenza vaccination and COVID-19 vaccine acceptability was observed in this study, which is consistent with previous studies (Sherman et al., 2021; Shmueli, 2021). This could be explained by the fact that many individuals may hold generally positive beliefs and attitudes toward immunization, which may affect their willingness to accept COVID-19 vaccination. Consistent with previous research (Kourlaba et al., 2021; Mahmud et al., 2021), respondents with a high level of COVID-19 knowledge had 1.5 times (95%CI = 1.1-2.0, $p < .05$) higher odds for accepting the COVID-19 vaccination compared to those with a low level of knowledge. A possible explanation for this finding may be that individuals with greater knowledge may have a good understanding about risk perception, contagiousness, and fatality, thereby positively affecting their acceptance of COVID-19 vaccines.

The findings of this study also provide further support for the Health Belief Model, demonstrating an important role for the perceived risk, perceived benefit, and cues to action in predicting COVID-19 vaccine acceptance rates (Al-Metwali, Al-Jumaili, Al-Alag, Sorofman, 2021; Shmueli, 2021; Tran et al., 2021; Wong et al., 2020). The results from the qualitative study also indicated that salience of risk had an impact on COVID-19 immunization decisions. Contrary to our expectations, the perceived severity of COVID-19 was not found to predict vaccine acceptability. This may be because our participants considered COVID-19 infection to be a mild disease, and they thought that the coronavirus only affected older people and individuals with chronic medical conditions. Additionally, at the time of data collection, fewer than a hundred new COVID-19 cases were recorded daily in Thailand, with a low case fatality rate (0.5 percent) (Ritchie & Beltekian, 2021). Unlike previous studies (e.g., Tran et al., 2021; Al-Metwali et al., 2021), this research failed to demonstrate the significant association between perceived barriers (vaccine's efficacy, safety and concerns about side-effects following vaccination) and acceptance of the COVID-19 vaccine. However, the findings of our qualitative study revealed that concern about vaccine effectiveness, safety, and potential side effects were prevalent and influenced participants' delay in accepting or refusing the COVID-19 vaccination. These findings may reflect a dearth of information regarding COVID-19 vaccines at the time the data were collected.

Furthermore, the quantitative study results have shown that cues to action of the HBM were significant in determining the acceptability of a COVID-19 vaccine, especially being encouraged by community members and recommendations from healthcare providers. These findings align with the collected qualitative data findings which indicated that one of the main factors influencing participants' decision to accept the vaccine was “influence of others”, and similar results have been found in other studies (e.g., Wong et al., 2021; Shmueli, 2021). To the best of our knowledge, this is the first study to combine quantitative and qualitative methodo-

logies to assess the acceptability of COVD-19 vaccines among the Thai population. The strength of this research was the use of a mixed methods approach to examine factors related to COVID-19 vaccine acceptability in a large community sample in Thailand. Nonetheless, some limitations have to be considered. The main limitation is its wider generalizability as this study was conducted in one province. Another limitation is the use of a self-reported questionnaire, which may introduce bias into the data. Despite its limitations, this research sheds light on the vaccine's acceptance and factors influencing COVID-19 vaccine acceptance in Thailand.

## Implications and recommendations

The research findings have significant policy implications for the development and implementation of effective programs to increase public acceptance of a COVID-19 vaccination in Thailand. The findings suggest that interventions should place a greater emphasis on increasing the HBM factors, including perceived susceptibility to COVID-19 infection, the perceived benefits of immunization, and cues to action (such as being encouraged by the community members, recommendations from healthcare professionals and receiving adequate information about COVID-19 vaccines). Accordingly, it is critical to provide accurate information regarding COVID-19 vaccination to the general public through a variety of channels, including traditional media (television, radio, and newspaper) and social media to dispel misinformation. Furthermore, information about COVID-19 vaccines should be tailored to an individual's health conditions and medications, particularly among those with pre-existing comorbidities in order to reassure them that COVID-19 vaccinations are safe and effective for individuals with pre-existing illnesses.

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