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# Factors influencing the third COVID-19 vaccine booster dose acceptance among older adults in northern Thailand

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## Abstract

**Background** Coronavirus disease 2019 (COVID-19) causes more deaths in older adults than in younger adults. Older adults are a vulnerable group with a high need for coronavirus vaccines to decrease the severity of the disease. The aim of this analytical cross-sectional study was to determine the factors influencing third COVID-19 vaccine booster dose acceptance among older adults in northern Thailand.

**Methods** The study samples were composed of 2,155 older adults living in Kamphaeng Phet Province, northern Thailand. They were randomly selected by multistage random sampling. Data were collected in a self-administered questionnaire consisting of 7 parts: (1) personal factors, (2) knowledge about COVID-19, (3) perceived susceptibility to COVID-19 infection, (4) perceived severity of COVID-19, (5) perceived benefits of the third COVID-19 vaccine booster dose, (6) perceived barriers to the third COVID-19 vaccine booster dose vaccination, and (7) the third COVID-19 vaccine booster dose acceptance. Data were analyzed via frequency, percentage, mean, standard deviation, and binary logistic regression. All the significance levels were set to 0.05.

**Results** The results indicated that only 28.5% of older adults accepted the third COVID-19 vaccine booster dose. The factors influencing third COVID-19 vaccine booster dose acceptance among older adults included 5 variables. The participants aged  $\geq 70$  years was 1.37 times (95%CI = 1.12–1.69) greater than those aged  $< 70$  years who accepted the vaccine. Participants who were married were more likely to accept the vaccine by 1.39 times (95%CI = 1.09–1.79) compared with single individuals. Those with underlying diseases tended to accept the vaccine by 1.56 times (95%CI = 1.26–1.92) more than those without underlying diseases. Those who had high perceived benefit from the COVID-19 vaccine possibly accepted the vaccine by 1.50 times (95%CI = 1.10–2.04) more than those with low perceived benefit, and those who had a low perceived barrier to the third COVID-19 booster dose vaccination seemed to accept the vaccine by 1.29 times (95%CI = 1.01–1.52) more than those with a high perceived benefit.

**Conclusion** Older adults should receive health education regarding the perceived benefit of the COVID-19 vaccine and the perceived barrier to COVID-19 vaccination, especially older adults aged  $< 70$  years, those who are single, and those who are free of underlying diseases.

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**Keywords** Third booster dose, COVID-19 vaccine, Acceptance, Older adults, Thailand

## Background

Coronavirus disease 2019 (COVID-19) is a respiratory infection caused by a coronavirus. The pathogen that causes COVID-19 is SARS-CoV-2 [1]. COVID-19 is spread by droplets from a patient's respiratory system. If the body inhales COVID-19 into the respiratory system, it can cause disease. The first case of COVID-19 was reported in December 2019 in Wuhan, the capital of Hubei Province located in Central China. In Thailand, the first case of COVID-19 was reported on January 13, 2020. It was hypothesized that this virus may have originated from a Chinese individual infected with the virus traveling to Thailand. As a result, the virus has spread in Thailand, the second country after China to experience the disease. The morbidity rate in Thailand has decreased, resulting in a reduction in the number of infections [2].

The possible effects when people are infected with coronavirus are related to their physical health. Almost all infected people have mild to moderate symptoms, and some of them can recover from this disease on their own without any special treatment. However, some patients may become seriously ill and require hospitalization [3]. Infection from COVID-19 has led to many deaths. Furthermore, after recovery from the disease, some patients may experience post-COVID-19 conditions or long-term COVID-19. These conditions appear in patients with COVID-19 after completing treatment and becoming infection-free. However, some symptoms continue after COVID-19 infection. There is no clear cause for long COVID-19; this may be caused by a decrease in the immune system of the body. COVID-19 infection leads to immune stimulation mechanisms and inflammation in the body. When a patient eliminates the infection, immunity and inflammation may still not be restored because of the side effects of treatment. For this reason, patients may require a long stay in the hospital, especially in the intensive care unit (ICU) [4]. The incidence of long COVID-19 is approximately 40–80%, and the symptoms appear to vary from person to person. The most commonly affected individuals with long COVID-19 are older adults aged 60 years and over since this age group mostly suffers from underlying diseases such as chronic respiratory disease, cardiovascular disease, chronic kidney disease, stroke, obesity, cancer, and diabetes [5]. Therefore, when older adults are infected by COVID-19, they are more likely to have severe symptoms [6]. In addition, patients over 60 years of age who do not have a history of vaccination have a 78.7% higher death rate than those under 60 years of age [7].

The recommendation of the World Health Organization [8] to prevent the disease is important to maintain

a safe distance from others and to wear a mask in public, especially when in a closed area or if he/she is unable to maintain a safe distance. The WHO also suggested staying in an open, well-ventilated area, opening windows when in enclosed spaces, and washing hands frequently with soap or alcohol. Moreover, receiving a vaccine is crucial for preventing the severity of the disease in older adults. Vaccines have been administered to the Thai population, including those developed by Pfizer-BioNTech, Moderna, AstraZeneca, and Sinovac [9].

The Department of Disease Control, Ministry of Public Health [10], reported that the Thai population received more than 146,758,556 doses of the COVID-19 vaccine. The first, second, and third doses were administered to 57,610,698, 54,140,475, and 27,340,004 individuals, accounting for 82.8%, 77.8%, and 39.3% of the population, respectively. Vaccination among older adults aged 60 years and over accounted for 80% of all older adults. The first, second, and third doses were administered to 10,750,047, 10,052,726, and 5,067,497 individuals, accounting for 80.4%, 75.2%, and 37.9% of adults aged 60 years and over, respectively. A proportion of older adults received fewer COVID-19 vaccines compared with other age groups. However, according to previous reports, older adults have the highest rates of illness and death from COVID-19. In addition, approximately three million older adults are considered to be at high risk of infection and death from COVID-19. In Thailand, the vaccine policy for the third dose of vaccination is voluntary, and the government provides enough vaccines for older adults and every age group [6]. Therefore, a third COVID-19 vaccine booster dose is needed to increase immunity in the body after receiving the second dose of the COVID-19 vaccine since the immune system decreases over time after vaccination [9].

A review of the literature revealed that factors related to third-party COVID-19 vaccine booster dose acceptance among older adults included sex, age, education level, marital status, family characteristics, health conditions, knowledge about COVID-19, perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefits of COVID-19 prevention, and perceived barriers to COVID-19 vaccination [11–14].

Although some previous studies have assessed the factors influencing the third COVID-19 vaccine booster dose acceptance among older adults, there is little information about this topic in northern Thailand. The related factors and acceptance of the third COVID-19 vaccine booster dose among older adults from the previous studies in this region was unclear. Even the COVID-19 was

not in the crisis condition when we conducted the study, the incidence of the disease still occur overtime. The proportion of severity cases and deaths was found higher in older adults than other age groups. Further, proportion of older adults in northern Thailand is higher than those in other regions in Thailand.

Therefore, our study focused on the third COVID-19 vaccine booster dose acceptance since it can increase immune in the body and can reduce the infection, prevent severity and deaths in older adults, especially those who have chronic diseases. In addition, WHO recommended the older adults should receive at least 3 doses of COVID-19 vaccination. This study applied the theory of the health belief model [15] to identify factors influencing third COVID-19 vaccine booster dose acceptance among older adults in northern Thailand. This theory suggests that if older adults have perceived susceptibility, perceived severity of the disease, perceived benefits, and perceived barriers to preventing disease, they will change their health behaviors to receive the third COVID-19 vaccine booster dose [16]. The results of this study can be used as guidelines for planning activities or programs to encourage older adults to receive the COVID-19 vaccine booster dose. Consequently, the rates of morbidity and mortality from COVID-19 are reduced in older adults.

## Methods

### Study design

An analytical cross-sectional study was conducted between December 2023 and March 2024 to identify factors influencing the third COVID-19 vaccine booster dose among older adults in northern Thailand.

### Settings

We randomly selected one province (Kamphaeng Phet) from 17 provinces located in northern Thailand via simple random sampling. One district was then selected, followed by 1 subdistrict, were selected via simple random sampling. We recruited all 8 villages under the selected sub-district into this study in order to cover the total number of sample size. Finally, the participants from each village were selected via systematic random sampling based on the population size. Regarding geographic context, 80% of the area is flat land, and 20% is highland. The flatland is used for growing rice and corn. The highlands are utilized for growing fruits, forests, and other crops. Almost all the people in this area are Thai, and they believe in Buddhism. The study area selected represents the geographic and social contexts in northern Thailand.

### Participants

The study population in this study included 33,106 older adults aged  $\geq 60$  years and over living in Kamphaeng Phet Province, northern Thailand [17]. The study samples

included 2,155 older adults. We calculated the sample size via the formula for estimating the proportion of a known population [18] using n4studies application. We used 33,106 people (N), the proportion of those who received the COVID-19 vaccine booster (p) was 0.40 [10], the standard error (d) was 0.02, and the alpha ( $\alpha$ ) was 0.05. The inclusion criteria for the study subjects were as follows: (1) living in the study area for at least 1 year, (2) being literate in the Thai language, and (3) being willing to participate in the research. The exclusion criteria for the study subjects included (1) having severe illness on the date of data collection, (2) being unable to complete the questionnaire, and (3) moving to live in another province before the study began. Multistage random sampling was employed to select the participants. We used the population list of older adults from the health centers in the study areas since they have the list of older adults who received COVID-19 vaccine in the past. This population list included those who completed the first, second, and third doses, with <5% of them completing more than 3 doses.

### Research tool

A self-administered questionnaire was used for data collection. We developed a questionnaire based on the literature review and related theory for this study [11, 13, 15]. The questionnaire consisted of 7 parts: (1) personal factors, (2) knowledge about COVID-19, (3) perceived susceptibility to COVID-19 infection, (4) perceived severity of COVID-19, (5) perceived benefit of the third COVID-19 vaccine booster dose, (6) perceived barrier to the third COVID-19 booster dose vaccination, and (7) acceptance of the third COVID-19 vaccine booster dose. The personal factors consisted of 7 items regarding general participant data (age, sex, marital status, education level, family patterns, underlying disease, and history of COVID-19 infection). Underlying diseases are common chronic diseases in older adults, such as hypertension, diabetes, heart disease, and kidney problems. Knowledge questions were evaluated through 10 yes/no questions, including negative and positive statements. This part was divided into 3 groups using a sum score [19]: good (scores of 8–10), average (scores of 6–7), and low (scores of 0–5). The perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefit of the third COVID-19 vaccine booster dose, and perceived barrier to COVID-19 booster dose vaccination contained 5 5-level rating questions ranging from strongly agree to strongly disagree. We used mean scores to categorize the perceptions into 3 levels [20]: high (3.68–5.00), average (2.34–3.67), and low (1.00–2.33). The third COVID-19 vaccine booster dose acceptance was 1 yes–no question, where 1 represents “received” and 2 represents “did not receive” the COVID-19 vaccine booster dose. The

validity of the questionnaire was verified by 3 experts in infectious diseases, vaccines, and older adults. The validity of the questionnaire was tested by an item-objective congruence (IOC) index. All the questions had an IOC greater than 0.5, meaning that they met the standard criteria of the validity test. Furthermore, the reliability of the questionnaire was assessed among 30 older adults who were not involved in this research. The Cronbach's alpha coefficients were utilized for the reliability test of perceptions, whereas knowledge was evaluated by the Kuder–Richardson 20 or KR-20. The reliability scores of knowledge about COVID-19, perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefit of the third COVID-19 vaccine booster dose, and perceived barrier to the third COVID-19 booster dose vaccination were 0.77, 0.82, 0.78, 0.83, and 0.82, respectively.

### Data collection

Data collection was performed by the researchers. Data were separately collected from the 8 selected villages via a self-administered questionnaire. Data collection was conducted from the older adults in general population in each village via a systematic random sampling. We recruited participants who were willing to be involved in this research and met the inclusion criteria. The selected participants were subsequently invited to complete the questionnaire themselves. The participants responded to

**Table 1** Personal factors of the participants ( $n=2,155$ )

Variables	<i>n</i> (%)
<b>Sex</b>	
Male	919 (42.6)
Female	1,236 (57.4)
<b>Age</b>	
< 70 years	1,508 (70.0)
≥ 70 years	647 (30.0)
(mean = 66.14, S.D.=11.02)	
<b>Marital status</b>	
Single	506 (23.5)
Married	1,230 (57.1)
Divorced, separated	419 (19.4)
<b>Education level</b>	
< high school	1,756 (81.5)
≥ high school	399 (18.5)
<b>Family pattern</b>	
Single family	1,595 (74.0)
Extended family	560 (26.0)
<b>Underlying diseases</b>	
No	824 (38.2)
Yes	1,331 (61.8)
<b>History of COVID-19 infection</b>	
No	1,114 (48.3)
Yes	1,041 (51.7)

the questionnaire for approximately 40 min. Data collection was performed by the researchers, and all the questions were checked by the researchers for quality control. All completed questionnaires were subsequently utilized for data analysis.

### Statistical analysis

A statistical software program (Jamovi) was used for data analysis. Frequencies, percentages, means and standard deviations were employed to describe personal factors, knowledge about COVID-19, perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefit of the third COVID-19 vaccine booster dose, perceived barrier to the third COVID-19 booster dose vaccination, and third COVID-19 vaccine booster dose acceptance. Binary logistic regression was used to identify factors influencing third-party COVID-19 vaccine booster dose acceptance. Crude and adjusted odds ratios (ORs) with 95% confidence (95% CIs) are presented for the univariate and multivariate analyses, respectively. A *p* value less than 0.05 was considered statistically significant.

## Results

### Personal factors of the participants

This study was carried out between December 2023 and March 2024. Among the 2,155 participants, 57.4% were female. 70% were aged less than 70 years (mean=66.14, S.D.=11.02), 57.1% were married, and 81.5% had not graduated high school. The majority of them (74.0%) were single families, 61.8% had underlying diseases, and 51.7% had been infected by COVID-19 (Table 1).

### Knowledge about COVID-19, perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefit of the third COVID-19 vaccine booster dose, perceived barrier to the COVID-19 booster dose vaccination, and third COVID-19 vaccine booster dose acceptance

The results indicated that 35.5% of the participants knew about COVID-19, with a mean of 6.82 (S.D. = 1.71). The perceived susceptibility, perceived severity, and perceived benefit of the third COVID-19 vaccine booster dose were high (92.0%, 90.5%, and 85.2%, respectively), with means of 4.35 (S.D. = 0.49), 4.37 (S.D. = 0.50), and 4.36 (S.D. = 0.62), respectively. However, their perceived barrier to the third COVID-19 booster dose vaccination was average (48.8%), with a mean of 3.56 (S.D. = 0.84). Finally, only 28.5% of the participants agreed with the third COVID-19 vaccine booster dose (Table 2).

**Table 2** Knowledge about COVID-19, perceived susceptibility to COVID-19 infection, perceived severity of COVID-19, perceived benefit of the third COVID-19 vaccine booster dose, perceived barrier to third COVID-19 booster dose vaccination, and third COVID-19 vaccine booster dose acceptance ( $n=2,155$ )

Variables	n (%)
<b>Knowledge about COVID-19</b>	
Low (scores of 0–5)	626 (29.1)
Average (scores of 6–7)	763 (35.4)
High (scores $\geq 8$ )	766 (35.5)
(Mean = 6.82, S.D. = 1.71)	
<b>Perceived susceptibility to COVID-19 infection</b>	
Average (2.34–3.67)	173 (8.0)
High (3.68–5.00)	1,982 (92.0)
(Mean = 4.35, S.D. = 0.49)	
<b>Perceived severity of COVID-19</b>	
Average (2.34–3.67)	205 (9.5)
High (3.68–5.00)	1,950 (90.5)
(Mean = 4.37, S.D. = 0.50)	
<b>Perceived benefit of the third COVID-19 vaccine booster dose</b>	
Average (2.34–3.67)	320 (14.8)
High (3.68–5.00)	1,835 (85.2)
(Mean = 4.36, S.D. = 0.62)	
<b>Perceived barrier to the third COVID-19 booster dose vaccination</b>	
Low (1.00–2.33)	190 (8.8)
Average (2.34–3.67)	1,050 (48.8)
High (3.68–5.00)	915 (42.4)
(Mean = 3.56, S.D. = 0.84)	
<b>The third COVID-19 vaccine booster dose acceptance</b>	
No	1,541 (71.5)
Yes	614 (28.5)

### Factors influencing access to a third-party COVID-19 vaccine booster among older adults in northern Thailand

Binary logistic regression was used to identify factors influencing third-party COVID-19 vaccine booster dose acceptance among older adults. Twelve variables were assessed via univariate analysis, and 6 potential factors significantly influencing the third dose of the COVID-19 vaccine booster acceptance were selected for multivariate analysis (Table 3). The results revealed that after controlling for these 6 variables, 5 variables significantly influenced the third COVID-19 vaccine booster dose acceptance. The participants aged  $\geq 70$  years was 1.37 times (95%CI=1.12–1.69) greater than those aged  $< 70$  years who accepted the vaccine. Participants who were married were more likely to accept the vaccine by 1.39 times (95%CI=1.09–1.79) compared with single individuals. Those with underlying diseases tended to accept the vaccine by 1.56 times (95%CI=1.26–1.92) more than those without underlying diseases. Those who had high perceived benefit from the COVID-19 vaccine possibly accepted the vaccine by 1.50 times (95%CI=1.10–2.04) more than those with low perceived benefit, and those who had a low perceived barrier to the third COVID-19 booster dose vaccination seemed to accept the vaccine

by 1.29 times (95%CI=1.01–1.52) more than those with a high perceived benefit.

### Discussion

Our study aimed to identify factors influencing third-party COVID-19 vaccine booster dose acceptance among older adults in northern Thailand. The significant ( $p$  value  $< 0.05$ ) factors included being aged  $\geq 70$  years, being married, having underlying diseases, having a high perceived benefit of the COVID-19 vaccine, and having a low perceived barrier to COVID-19 vaccination. We found that there were 2 factors (perceived susceptibility and perceived severity) under the health belief model were not associated with the vaccine acceptance. This might be due to more than 90% of older adults had perceived susceptibility and perceived severity to COVID-19 infection at a high level, 92.0% and 90.5%, respectively.

The present study indicated that participants aged  $\geq 70$  years were more likely to accept the third COVID-19 vaccine booster dose compared with those aged  $< 70$  years. This finding was in accordance with a previous study [21], which reported that more middle-aged and older individuals tended to receive the third COVID-19 vaccine booster dose compared with younger individuals. A previous study was conducted among older adults with

**Table 3** Factors influencing third COVID-19 vaccine booster dose acceptance among older adults ( $n=2,155$ ) (binary logistic regression)

Variables	Acceptance		Crude OR (95% CI)	p value	AOR (95% CI)	p value
	No	Yes				
<b>Age</b>						
< 70 years	1,117	391	Reference	< 0.001*	Reference	0.002*
≥ 70 years	424	223	1.50(1.23–1.83)		1.37(1.12–1.69)	
<b>Marital status</b>						
Single	393	113	Reference		Reference	
Married	858	372	1.51(1.181–1.92)	0.001*	1.39(1.09–1.79)	0.009*
Divorced, separated	290	129	1.55(1.15–2.08)	0.004*	1.25(0.92–1.71)	0.154
<b>Underlying diseases</b>						
No	641	183	Reference		Reference	
Yes	900	431	1.68(1.37–2.05)	< 0.001*	1.56(1.26–1.92)	< 0.001*
<b>Perceived susceptibility</b>						
Average	137	36	Reference		Reference	
High	1,404	578	1.57(1.07–2.29)	0.020*	1.42(0.96–2.12)	0.082
<b>Perceived benefit</b>						
Average	257	63	Reference		Reference	
High	1,284	551	1.75(1.31–2.35)	< 0.001*	1.50(1.10–2.04)	0.010*
<b>Perceived barrier</b>						
Low	119	71	1.37(1.03–1.72)	0.015*	1.29(1.01–1.52)	0.049*
Average	784	266	1.28(0.78–1.64)	0.056	1.38(0.98–1.92)	0.061
High	638	277	Reference		Reference	
<b>Sex</b>						
Male	668	251	Reference			
Female	873	363	1.11(0.91–1.34)			
<b>Education level</b>						
< high school	1,250	506	Reference			
≥ high school	291	108	0.92(0.72–1.17)			
<b>Family pattern</b>						
Single family	1,153	442	Reference			
Extended family	388	172	1.16(0.94–1.43)			
<b>History of COVID-19 infection</b>						
Yes	817	297	Reference			
No	724	317	1.20(0.99–1.45)			
<b>Knowledge</b>						
Low	430	196	Reference			
Average	559	204	0.80(0.63–1.01)			
High	552	214	0.85(0.68–1.07)			
<b>Perceived severity</b>						
Average	157	48	Reference			
High	1384	566	1.34(0.95–1.88)			

Note: OR=odds ratio, 95% CI=95% confidence interval, AOR=adjusted odds ratio

\*= p value < 0.05

chronic diseases. Another previous study [22] reported that more individuals in older age groups compared with younger age groups accepted the COVID-19 vaccine; this may be because older age groups are worried about COVID-19 infection. If these individuals are infected by COVID-19, they can have more severe symptoms and longer hospitalizations compared with younger individuals. Furthermore, more deaths of COVID-19 patients were reported in older age groups than in younger age

groups [6]. Additionally, the Thai government aimed to vaccinate high-risk group populations and older adults, especially middle- and late-aged older adults, during the outbreak.

The results revealed that participants who were married tended to receive a third COVID-19 vaccine booster dose at a greater rate than those who were single. This finding is consistent with previous studies [23, 24], which showed that married participants were more likely to

receive the COVID-19 vaccine compared with single participants; this may be because participants who are married live with their family members and take responsibility for taking care of their families. They are worried that if they are infected by COVID-19, they can spread the disease to their family members. In addition, if they are sick, it affects their family members in terms of money, work, and time. Compared with single participants, they may be less concerned about the infection caused by the disease since they do not live with family members. Furthermore, some single participants lived by themselves and may have no one to take them to get vaccinated [25].

This study revealed that older adults who presented with underlying disease were more likely to receive a third COVID-19 vaccine booster than those who were not. This finding was similar to that of a previous study [12]. This may be because older adults who have underlying diseases may be worried that receiving the vaccine will further complicate their current diseases and medications. The underlying disease factor could be due to their understanding/awareness of vaccine safety and the severe consequences that can occur if individuals with underlying diseases become infected. Most older adults know that COVID-19 affects their physical and mental health and their daily activities. Furthermore, COVID-19 can mutate over time and may lead to severe outcomes in older adults who have underlying diseases [26]. In our study, 68.1% of the participants suffered from underlying diseases.

Our findings showed that older adults who had a high perceived benefit from the third COVID-19 vaccine booster dose were more likely to accept the third COVID-19 vaccine booster dose than those who had a low perceived benefit. Our results are the same as those of previous studies [27, 28], which reported that the perceived benefit of the COVID-19 vaccine was the strongest predictor of COVID-19 vaccine acceptance; this may be because older adults perceive that the COVID-19 vaccine can prevent severe complications, such as disability, bedbound conditions, long COVID-19, and death, among older adults [29]. In particular, long COVID-19 not only impacts health but can also reduce quality of life and cause social and economic problems [30]. Older adults know that the COVID-19 vaccine can reduce these complications if they become infected. Therefore, older adults with a high perceived benefit of the COVID-19 vaccine were more likely to receive the vaccine to prevent severe disease and its complications than those with a low perceived benefit.

Finally, we found that participants who had a low perceived barrier were more likely to accept the third COVID-19 vaccine booster dose than those who had a high perceived barrier; this may be because nearly 40%

of the participants in our study were single, separated or divorced. These participants may face barriers to receiving the vaccine since they may have no one to take them to the health care center for vaccination. They had to wait for someone, such as their children, relatives or caregivers, to take them to the health care center to get vaccinated. In addition, some older adults may have little knowledge about the benefits of the COVID-19 booster dose. These problems are the barriers to receiving the vaccine [11].

Our study collected data from older adults who lived in the same social context as the older population in northern Thailand. The results of our study constitute the first evidence of COVID-19 vaccine booster dose acceptance among older adults in northern Thailand. The results can be used to increase the vaccination acceptance rate of COVID-19 booster doses in older adults in this area. These are the strengths of this study. Some limitations that may have affected the results are other factors that we did not explore, such as social support for the third COVID-19 booster dose vaccination, and COVID-19 prevention behaviors that might affect the acceptance of the third COVID-19 vaccine booster dose among older adults. Additionally, the study was conducted when the COVID-19 outbreak was not in a crisis state, this situation may also affect the outcomes in this study. Our study applied the health belief model to identify factors influencing the third COVID-19 vaccine booster dose in older adults. We found only 2 factors of the theory influenced the outcome, including perceived benefits and perceived barriers. However, perceived susceptibility and perceived severity did not show the relationship with the outcome. This might be due to almost of older adults perceive well that they are susceptible and severity group of COVID-19 infection. Additionally, they might frequently receive the information about these two issues from the government, healthcare providers, and village health volunteers during the outbreak.

## Conclusion

The findings of this study indicated that the acceptance rate of the third COVID-19 vaccine booster dose among older adults is relatively low compared with that among the entire country's population. The overall mean scores of knowledge were low and average. In addition, their perceived barriers were at moderate and high levels. Therefore, the Ministry of Public Health, and health care providers should take action in health education programs and strategies to educate older adults COVID-19 infection, complications, and COVID-19 vaccine benefits to increase their knowledge and perceptions. Older adults may not be up to date with current health education. In this case, providing health education alone may not be effective. Further study should explore more

studied factors and expand the targeted groups that can explain various details about the acceptance of COVID-19 vaccine. Additionally, a qualitative study should be conducted to obtain in-depth information and perspectives from the studied participants.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12879-024-09785-0>.

Supplementary Material 1

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## Author contributions

A.S., K.S. and Ch.R. wrote the main manuscript text and Th.L. and Ph.J. prepared Tables 1, 2 and 3. All authors read and approved the final manuscript.

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## Data availability

The data that support the findings of this study are available from Naresuan University Research Ethics Committee but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Naresuan University Research Ethics Committee.

## Declarations

### Ethics approval and consent to participate

Informed consent to participate was obtained from all the participants and from the legal guardian(s) of the illiterate participants. This study was approved by the Human Research Ethics Committee, Naresuan University Institutional Review Board, Thailand (P2-0063/2023). All methods were performed in accordance with the relevant guidelines and regulations.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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