

Determinants of the willingness to receive the COVID-19 vaccination among students of Pattimura University, Indonesia

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ABSTRACT

High coverage of COVID-19 vaccination is claimed to be the most effective intervention to prevent the transmission of coronavirus disease. This study aimed to analyze the factors associated with willingness to accept COVID-19 vaccination among students of the Universitas Pattimura, Ambon, Indonesia. This cross-sectional study collected information using an online questionnaire distributed to students at Universitas Pattimura in January 2021, when the COVID-19 vaccination program was initiated in Indonesia. Guided by the Health Belief Model, potential predictors in this analysis were categorized as follows: (1) sociodemographic characteristics; (2) predisposing factors; (3) perceived susceptibility; (4) perceived benefits; and (5) perceived barriers. Data were analyzed using multivariate logistic regression analysis. We found that only 42.1% of the students were willing to receive the COVID-19 vaccine. The odds of students' willingness to receive COVID-19 vaccination decreased by 52% in students who did not perceive themselves to be at risk of contracting COVID-19 (adjusted odds ratio [aOR]=0.48, 95% confidence interval [CI]: 0.34–0.68). The odds also decreased by 97% in those who strongly disagreed that the COVID-19 vaccine was safe and effective (aOR=0.03, 95% CI: 0.01–0.08), and by 45% in those who were neutral towards the statement if COVID-19 vaccination is the solution to end the pandemic (aOR=0.55, 95% CI: 0.36–0.84). However, the odds of willingness to receive COVID-19 vaccination increased by 53% in students showing neutrality toward fear of needles (aOR=1.53, 95% CI: 1.04–2.25). The odds of willingness to receive COVID-19 vaccination in students who were neutral towards the side effects of vaccination were >3 times higher than those who were concerned about the side effects of vaccination (aOR=4.05, 95% CI: 2.61–6.26). Health promotion strategies should be accompanied by efforts to reduce the harmful effects of rumors that may hinder students' willingness to participate in COVID-19 vaccination programs.

Key words:

COVID-19 vaccination; students; Pattimura University

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INTRODUCTION

At the end of 2019, a new case of pneumonia was reported in the City of Wuhan, China.¹ The World Health Organization (WHO) officially announced that coronavirus disease 2019, commonly called COVID-19, was caused by the Severe Acute Respiratory Syndrome Coronavirus-2.² In January 2020, the WHO declared COVID-19 a public health emergency of international concern.² In December 2022, the number of COVID-19 cases reached 209 million globally.³

In 2022, there were >160,000 deaths from 6,702,132 COVID-19 cases in Indonesia.³ In Maluku province, one of the largest archipelagic provinces of Indonesia, 301 of 18,798 COVID-19 cases reported in December 2022 died.^{4,5}

Indonesia's COVID-19 vaccination program began in 2021. Its high coverage has been claimed to be *the most* effective intervention for preventing COVID-19 transmission.^{6,7} The COVID-19 vaccination is expected to reduce morbidity and mortality and protect the community from becoming socially and financially unproductive.^{8,9}

In 2020, an online survey conducted by the Indonesian Ministry of Health, WHO, the Indonesian Technical Advisory Group on Immunization, and the United Nations Children's Fund found that a high percentage of individuals in the Maluku province hesitated to receive COVID-19 vaccination.⁸ Reported reasons included vaccine safety, uncertainty about vaccine effectiveness, fear of side effects, and religious beliefs.^{10,11}

At the beginning of the implementation of the COVID-19 vaccination program in January 2021, the Universitas Pattimura collaborated with the Universitas Padjadjaran, Syiah Kuala University, Mataram University, and Network for Education and Support for

Immunization (NESI), University of Antwerp, and conducted a cross-sectional study using a collaborative online survey to assess knowledge, attitudes, and behaviors related to COVID-19 vaccination in some areas in Indonesia, including Ambon city.¹² University students, as agents of change, are expected to help the government educate the community and promote the coverage of COVID-19 vaccination. Therefore, students were selected as the target population of this study. In Ambon city, this study involved students of the Universitas Pattimura, the only state university in Maluku province. Using data from this survey, this analysis aimed to examine factors associated with the willingness to accept COVID-19 vaccination among students of the Universitas Pattimura, Ambon, Indonesia.

METHODS

Data source and survey design

Data were derived from an online survey that assessed knowledge, attitudes, and behaviors related to COVID-19 vaccination among the students of Universitas Pattimura, Ambon. The survey was carried out in January 2021 by the Faculty of Medicine, Universitas Pattimura, in collaboration with three faculties of medicine in Indonesia: i.e., the Universitas Padjadjaran, Universitas Syiah Kuala, and Universitas Mataram, and the NESI, University of Antwerp, Belgium.

Study sites and respondents

Universitas Pattimura, the only state university in Maluku province, was established in 1962. In 2022, 57 study programs were divided into nine faculties, with 11,786 students and 1,143 teaching staff. The Faculty of Medicine was the latest faculty added to the Universitas Pattimura, established in 2008.

Respondents were active students enrolled during the 2020/2021 academic year.

The minimum number of student respondents expected from the Universitas Pattimura was 150. The inclusion criterion was active students enrolled in the 2020/2021 academic year. Using probability sampling, 944 active students of the Universitas Pattimura voluntarily completed the questionnaire.

Instruments

The survey used an online questionnaire on the Survey Monkey platform. The questionnaire was administered in Bahasa Indonesia, the national language of Indonesia, and it covered several topics, including students' sociodemographic characteristics, awareness of COVID-19 and its vaccination, perceived risk of contracting COVID-19, perceived benefits of COVID-19 vaccines, fear of needles and the side effects of vaccination, and access to vaccines. Before data collection, the questionnaire was piloted with 48 students and lecturers from the Universitas Padjadjaran, Bandung, for assessment.¹² No significant modifications were required.

Data collection procedure

Field activities were started by obtaining research permits from the Rector and Vice Rector of Academic Affairs and Dean of each faculty at the Universitas Pattimura. Each dean assigned a faculty staff member to distribute the questionnaire link to students at their respective faculties. The research team at the Faculty of Medicine, Universitas Padjadjaran, Bandung, monitored all data submitted by

the respondents. Quality data assurance and checks were performed weekly by the researchers during the data collection.

Variables

Dependent variable in this analysis was students' willingness to accept the COVID-19 vaccination. This variable was constructed based on the question, "Are you willing to receive the COVID-19 vaccine when it is officially released?" When the respondents answered "yes," they were coded as 1, and 0 if they answered otherwise.

We adapted the Health Belief Model¹³ to select and classify independent variables. In total, there were 11 independent variables used, which were categorized into five main groups: (1) **sociodemographic characteristics** (gender and religion); (2) **predisposing factor** (awareness about COVID-19 and its vaccination); (3) **perceived susceptibility** (risk of contracting COVID-19 and risk of COVID-19 infection); (4) **perceived benefits** (whether vaccination is the solution to end the COVID-19 pandemic and perception about the safety and effectiveness of the COVID-19 vaccine); and (5) **perceived barriers** (fear of needles, concerns about the side effects of the COVID-19 vaccine, and perception about the price of the COVID-19 vaccine when it would be available) (Figure 1). Questions about perceived susceptibility, benefits, and barriers consisted of five options (strongly agree, agree, neutral, disagree, and strongly disagree), and were grouped into three categories: agree, neutral, and disagree.

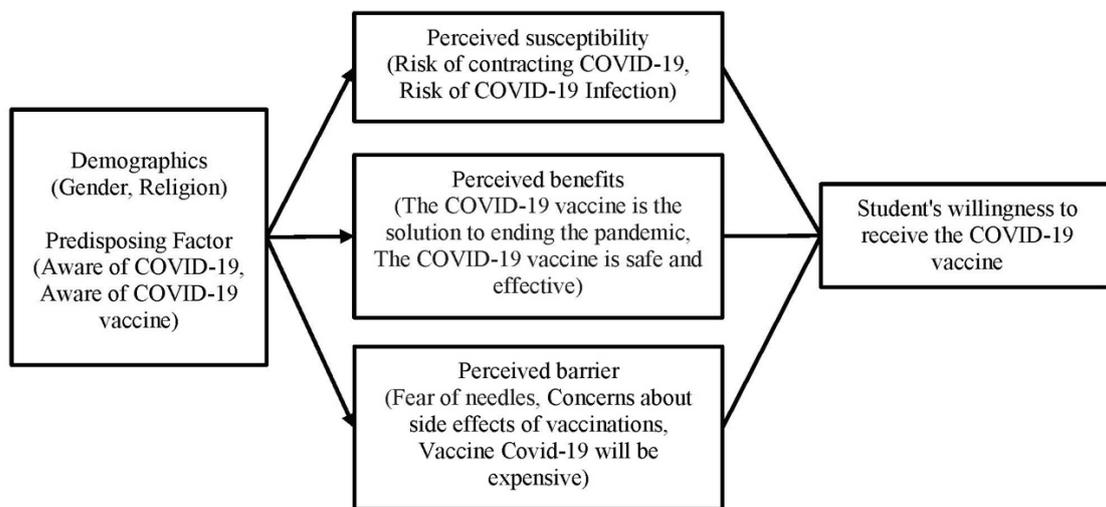


Figure 1. The analytical framework for factors associated with willingness to receive the COVID-19 vaccination in students of Universitas Pattimura, Ambon, 2021

Statistical analysis

In the first stage, we employed descriptive statistics to examine the distribution of all variables in the analysis. In the second stage, bivariate logistic regression was performed to obtain unadjusted odds ratios (OR) for each potential predictor, serving as an estimated measure of the association between the dependent and independent variables. Finally, a multivariate logistic regression analysis was performed to obtain adjusted OR (aOR) using the backward elimination method. Only variables significantly related to students' willingness to receive the COVID-19 vaccination were retained in the final model (significance level of 0.05). All analyses were performed using STATA/MP version 17.0.

Ethics clearance

Ethics clearance for the analysis was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Pattimura (No. 143/FK-KOM.ETIK/VIII/2022). All the respondents were requested to complete an informed consent form before participating in the survey.

RESULTS

Using information collected from 944 students at the Universitas Pattimura, our analysis showed that less than half of the students were willing to receive the COVID-19 vaccine (42.1%) (Table 1). The distribution of variables according to the students' willingness to receive the COVID-19 vaccination is shown in Table 1.

Table 1. Sociodemographic characteristics of variables analyzed in this study and the willingness to receive the COVID-19 vaccination

Variable	n	(%)	Willing to receive the Covid-19 vaccine	
			n	(%)
Willingness to receive the COVID-19 vaccine				
Yes	393	41.81		
No	547	58.19		
Sociodemographic Characteristics				
Gender				
Male	252	(26.69)	112	44.44
Female	687	(72.78)	279	40.61
Religion				
Islam	393	(41.63)	160	40.71
Catholic	36	(3.81)	20	55.56
Protestan	515	(54.56)	213	41.36
Predisposing Factor				
Aware of COVID-19				
Yes	933	(98.83)	391	41.91
None	10	(1.06)	2	20.00
Aware of COVID-19 vaccine				
Yes	854	(90.47)	368	43.09
None	87	(9.22)	23	26.44
Perceived susceptibility				
Risk of contracting Covid-19				
Yes	438	(46.40)	227	51.83
None	500	(52.97)	164	32.80
Risk of Covid-19 Infection				
Yes	16	(1.69)	11	68.75
None	922	(97.67)	379	41.11
Perceived benefits				
The COVID-19 vaccine is the solution to ending the pandemic				
Agree	293	(31.04)	190	64.85
Neutral	414	(43.86)	142	34.30
Disagree	141	(14.94)	33	23.40
The COVID-19 vaccine is safe and effective				
Agree	226	(23.94)	178	78.76
Neutral	508	(53.81)	179	35.24
Disagree	112	(11.86)	7	6.25
Perceived barriers				
Fear of needles				
Worried	341	(36.12)	112	32.84
Neutral	337	(35.70)	168	49.85
Not worry	166	(17.58)	85	51.20
Concerns about side effects of vaccinations				
Worried	639	(67.69)	220	34.43

Variable	n	(%)	Willing to receive the Covid-19 vaccine	
			n	(%)
Neutral	181	(19.17)	130	71.82
Not worry	24	(2.54)	14	58.33
Vaccine Covid-19 will be expensive				
Agree	247	(26.17)	93	37.65
Neutral	408	(43.22)	175	42.89
Disagree	184	(19.49)	98	53.26

Factors associated with the willingness to receive COVID-19 vaccines among students at the Universitas Pattimura are presented in Table 2. The odds decreased by 52% in students who did not perceive themselves as at risk of contracting COVID-19 (aOR=0.48, 95% confidence interval [CI]: 0.34–0.68, $p<0.001$). The odds also decreased significantly by 45% in respondents who were ‘neutral’ towards the statement that “COVID-19 vaccination is the solution to end the pandemic” (aOR=0.55, 95% CI: 0.36–0.84, $p<0.001$). The perception of vaccine safety and effectiveness has emerged as an essential factor. The odds of students' willingness to receive the COVID-19 decreased by 79% in students

who showed neutrality (aOR=0.21, 95% CI: 0.13–0.33, $p<0.001$) and by 79% in those who disagreed (aOR=0.03, 95% CI: 0.01–0.08, $p<0.001$) compared to those who agreed that the COVID-19 vaccine is safe and effective. However, the odds of the willingness to receive COVID-19 vaccination increased by 53% in students showing neutrality towards the fear of needles (aOR=1.53, 95% CI: 1.04–2.25, $p=0.028$). The odds of the willingness to receive COVID-19 vaccination in students who were neutral towards the side effects of vaccination were >3 times higher than those who were concerned about the side effects of vaccination (aOR=4.05, 95% CI: 2.61–6.26, $p<0.001$) (Table 2).

Table 2. Factors associated with students of Universitas Pattimura's willingness to receive the COVID-19 vaccine

Variable	Univariable				Multivariable			
	OR	(95% CI)		<i>p</i>	aOR	(95% CI)		<i>p</i>
Perceived susceptibility								
Risk of contracting Covid-19								
Yes	1.00				1.00			
None	0.45	0.35	0.59	<0.001	0.48	0.34	0.68	<0.001
Perceived benefits								
The COVID-19 vaccine is the solution to ending the pandemic								
Agree	1.00				1.00			
Neutral	0.28	0.20	0.38	<0.001	0.55	0.36	0.84	0.006
Disagree	0.16	0.10	0.25	<0.001	0.88	0.47	1.67	0.714
The COVID-19 vaccine is safe and effective								
Agree	1.00				1.00			
Neutral	0.14	0.10	0.21	<0.001	0.21	0.13	0.33	<0.001
Disagree	0.01	0.00	0.04	<0.001	0.03	0.01	0.08	<0.001

Variable	Univariable				Multivariable			
	OR	(95% CI)		p	aOR	(95% CI)		p
Perceived barriers								
Fear of needles								
Worried	1.00				1.00			
Neutral	2.06	1.51	2.82	<0.001	1.53	1.04	2.25	0.028
Not worry	2.14	1.46	3.13	<0.001	1.54	0.96	2.47	0.071
Concerns about side effects of vaccinations								
Worried	1.00				1.00			
Neutral	4.92	3.42	7.09	<0.001	4.05	2.61	6.26	<0.001
Not worry	2.65	1.15	6.07	0.021	1.59	0.54	4.70	0.399

DISCUSSION

Main findings

Our analyses showed that at the beginning of 2021, more than half of the respondents in our study, who were students of the Universitas Pattimura, did not show their willingness to receive the COVID-19 vaccination. We found that factors associated with the willingness to receive the COVID-19 vaccination were students' perceived risk of contracting COVID-19, perception of the safety and effectiveness of COVID-19 vaccines, opinion about whether COVID-19 vaccination is the solution to end the pandemic, fear of needles, and concerns about the vaccination's side effects. Although this study analyzed the conditions at the beginning of the implementation of COVID-19 vaccination, the findings could still be used by policymakers and program managers to design and implement effective interventions to accelerate not only the coverage of COVID-19 vaccination but also the uptake of other types of vaccination programs in the future, particularly among university students.

Raising awareness about the protective effect of COVID-19 vaccination

Our findings confirmed results from other studies, which show that those who perceived themselves at risk of contracting COVID-19 were more willing to receive COVID-19 vaccines.¹⁴⁻¹⁶ This demonstrates

the need for effective health promotion strategies to raise awareness about the importance of COVID-19 vaccination.¹⁷ Improving the young generation's awareness about the danger of COVID-19 and how it could impact their life is necessary.^{16,18} Students might not be aware of the danger as they perceive themselves as still young and healthy.¹⁹⁻²¹ A qualitative study conducted among students and lecturers of the Universitas Pattimura²² showed that one of the motivating factors for their participation in the COVID-19 vaccination program was the sense of protection they could provide to vulnerable individuals around them if they were vaccinated.²³ This aspect could be highlighted during health campaigns to emphasize that students who get vaccinated will help protect others around them, such as aging or vulnerable individuals who are not eligible to receive the vaccines.^{18,21,24}

As reported in another study, fear of needles also emerged as an essential factor.²⁵ Therefore, relevant authorities should communicate about vaccination procedures to reduce unnecessary fear. Moreover, involving different types of role models in health campaigns, including younger generations, will be beneficial in encouraging students to participate in the COVID-19 vaccination program.

Raising awareness about the safety and effectiveness of COVID-19 vaccination

Our findings confirmed results from previous literature that those doubtful about

the safety and effectiveness of COVID-19 were less willing to receive COVID-19 vaccination.^{14,21,24} This issue might be related to rumors about COVID-19 vaccination.^{21,24,26} Data from the Ministry of Communication and Information Technology of Indonesia showed there were >400 hoaxes circulating regarding COVID-19 vaccination.²⁷ The infodemic and misinformation about the vaccine were claimed to be disastrous for the health sector and all other sectors, including the country's economic security.^{28,29}

This highlights the need for health authorities, the government, and other relevant sectors to disseminate information about the safety and effectiveness of the COVID-19 vaccine.^{17,24} In universities and other educational institutions, lecturers and leaders play an essential role in promoting COVID-19 vaccination.³⁰⁻³² Students, particularly medical students, should be encouraged to be involved in countering infodemic and misinformation, considering their skills and experiences in using social media.²⁹ Dissemination of information could also be conducted through different media types, including printed and electronic media.^{17,18} Social media, which is highly popular among young-age populations, could be used by health workers to counteract false information that is widely circulated using social media platforms.^{33,34}

Management of the side effects of COVID-19 vaccination

Another factor found in this analysis is the fear of the side effects of COVID-19 vaccination.^{14,18,21} Rumors were widely spread about the vaccination's side effects, including issues related to the harmful effects of the vaccines.^{21,35} This issue was also found in other populations where this cross-sectional study was conducted between 2020–2021.¹² Health authorities play an essential role in

informing the community about the potential side effects of vaccines, and most importantly, what the community could do when the side effects occur.^{17,21} Therefore, a strong commitment from the government is required to ensure that vaccination officers comply with the standard operating procedure before, during, and after the vaccination is administered.^{24,34} Health authorities should ensure the availability, accessibility, and affordability of healthcare facilities for those who develop adverse events after vaccination.

Importance of intersectoral collaboration

Previous reports showed various challenges health authorities encounter in improving COVID-19 vaccination, particularly among the population living in remote areas.⁷ This indicates that multisectoral collaboration is essentially required.³⁶ The government of Indonesia has planned and implemented various regulations and policies to increase the coverage of COVID-19 vaccination.²⁴ Thirty-four ministries in the government of Indonesia were involved in the Task Force for the Acceleration of Handling COVID-19, which mainly focused on health-related issues. Several regulations were issued by different sectors to improve the coverage of COVID-19 vaccination; for example, a regulation that all travelers need to be vaccinated was issued by the Ministry of Transportation of Indonesia.³⁶ Previous reports have shown that policies that mandate COVID-19 vaccination as one of the *conditions for traveling, school enrolment, or employment were reported to be successful*, as the national coverage of vaccination reached 87% after their implementation.^{23,27}

Additionally, the role of community and religious leaders is crucial in the COVID-19 vaccination program.^{37,38} Role models, influencers, and prominent individuals in society can improve the

attention of the young population and positively influence them. The involvement of politicians, vaccine scientists, journalists, and lawmakers is important in managing the infodemic.^{28,39} Furthermore, religious leaders also play a decisive role in Indonesia,⁴⁰ mainly when there are rumors concerning substances in the vaccine prohibited by religion.

Strengths and limitations of the study

This study has several strengths. Using a large sample enabled the analysis to provide sufficient power to examine the different predictors of students' willingness to receive the COVID-19 vaccination. Little research has been conducted among university students regarding COVID-19 vaccination, particularly in Ambon City. In contrast, students have an enormous capacity to influence the community to participate in vaccination programs. However, some limitations of this study should be noted when interpreting the results. The proportion of respondents participating in this research was not equally or proportionally distributed across faculties at the Universitas Pattimura. More students from the Faculty of Medicine completed the questionnaire. This may have led to an underestimation of students' unwillingness to be vaccinated and the estimates of the predictors found in this study. The questionnaire was distributed online, and the researchers did not validate how the respondents completed the questionnaire. There are other potential predictors of students' willingness to receive the COVID-19 vaccination that we could not analyze, as they were not available in the survey dataset, including parental education, type of residence, or access to information.

RECOMMENDATIONS

In summary, our analysis showed the importance of factors influencing students' willingness to receive COVID-19 vaccination. The perceived risk of contracting COVID-19, their perception of the safety and effectiveness of COVID-19 vaccines and vaccination as a solution to end the pandemic, fear of needles, and concerns about the side effects of vaccination were associated with their willingness to receive COVID-19 vaccination. Health promotion strategies using different communication channels or media targeting young populations, including university students, are essential. Other types of interventions should be conducted comprehensively by encouraging multi-sectoral collaboration, including creating supporting policies and regulations to encourage students to receive COVID-19 vaccinations.

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