

The effects of COVID-19 information sources and knowledge, attitudes, and behavior on vaccination acceptance



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ABSTRACT

This study aimed to assess the impact of COVID-19 information-related sources and people's knowledge, attitude, and behavior concerning vaccine acceptance, hesitancy, and refusal in a single vaccination site in Jambi, Indonesia. We conducted a cross-sectional study with total sampling in Puskesmas Putri Ayu, Jambi. The inclusion criteria were adults (>18 years) vaccinated with CoronaVac. Our exclusion criteria were refusal to participate in the study for any reason, contraindicated to COVID-19 vaccine administration, and receiving the second vaccine jab. We included 245 respondents with a slight female predominance (53.5%). The majority were in the age group of 26-35 years old (20.8%). In the multivariate analysis, having a family member with ≥ 2 comorbidities was almost 6 times more likely (OR 5.99, 95%CI: 1.84-19.54; p -value = 0.003) to put a respondent in the vaccine hesitance and refusal group. Respondents who trust in friends or family are 2.25 times more likely (95%CI: 1-5.04; p -value = 0.048) to be in the vaccine hesitance and refusal group. Respondents who trust the internet are 0.45 times more likely to be in the vaccine hesitance and refusal group (95%CI: 0.21-0.96; p -value = 0.04). Lastly, respondents with poor knowledge are 0.58 times more likely (95%CI 0.38-0.88; p -value = 0.011) to belong to the vaccine hesitance and refusal group. This finding will be relevant to increasing vaccination uptake by targeting family members with comorbidities and devising a strategy to make their peers trust the COVID-19 vaccine to increase the uptake.

Keywords: Indonesia, information channel, knowledge, attitude, behavior.

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INTRODUCTION

Nowadays, information can spread throughout the world like wildfire in minutes. One of the catalysts for this quick information sharing is the increased Internet penetration, especially in Indonesia. Between 2021 and 2022, Internet users in Indonesia increased by 2.1 million. Indonesia's Internet penetration rate is 73.7%, a 1% increase from last year.¹ The increase in Internet penetration also increases time spent on mobile devices or other gadgets. Indonesians spend their time mainly on the Internet (8 hours and 36 minutes) and social media (3 hours and 17 minutes) as compared to watching television (2 hours and 50 minutes), online and physically printed press media (1 hour and 47 minutes) and radio (37 minutes).¹ The shift in users' Internet and social media habits means that the way users consume the news is also

changing. As a result, conventional print media stopped publishing and switched to online-based press media.² In 2018, only 8.78% of Indonesians read the morning newspapers.³ Unsurprisingly, more Indonesians are getting their news online.⁴

However, one adverse effect that springs up from the rapid spread of information during the pandemic is the rise of false information, named the "info-demic" by the World Health Organization (WHO). This term refers to false, redundant, or invented information, photos, and videos that travel quickly among the general audience.⁵ Misinformation concerning COVID-19 has been rapidly created out of 'thin air' or as an illusion, then distributed and disseminated as facts. This is a significant factor in the high worldwide prevalence of COVID-19 vaccination hesitancy and refusal.^{6,7}

As the world's second least literate country, Indonesia struggles to handle

COVID-19 misinformation.⁸ One of the common themes in Indonesia is a hoax that spreads uncontrollably, sometimes taking lives with them by causing unnecessary casualties.⁹ Another manifestation of COVID-19 misinformation in Indonesia is the low uptake of COVID-19 vaccines. The government aimed to have vaccinated roughly 67 percent of Indonesians by the end of 2021.¹⁰ Only 60% of Indonesians have completed vaccination as of June 7th, 2022, and Indonesia is projected to achieve a 70% of vaccination rate roughly by August 2nd, 2022.¹¹ Although misinformation contributes to vaccine hesitancy and refusal, it is not the sole contributing factor. In remote areas, there is a shortage of qualified medical workers, psychological concerns, cold-chain storage and delivery challenges, and budgetary constraints.^{12,13} Another critical factor is the people's knowledge, attitude, and behavior toward COVID-19 vaccination.

Understanding COVID-19 awareness and behavior, as well as readiness to receive the COVID-19 vaccine, and examining the factors that influence these outcomes may aid health authorities in developing successful preventative interventions.^{14,15}

The WHO, the Republic of Indonesia's Ministry of Health, and the United Nations Children's Fund (UNICEF) released a report in November 2020. According to the findings, 64.8 percent of the 112,888 Indonesians surveyed were willing to be vaccinated, 7.6% refused all vaccines, and 27.6% were indecisive.¹⁶ As a result, it is critical to analyze the reasons contributing to the high rate of vaccine hesitancy and refusal. Indonesia could raise its vaccination rate by converting those hesitant to be vaccinated.¹⁷ Therefore, this study aimed to assess the impact of COVID-19 information-related sources and people's knowledge, attitude, and behavior concerning vaccine acceptance, vaccine hesitancy, and vaccine refusal in a single vaccination site in Jambi, Indonesia.

METHODS

We conducted a cross-sectional study with total sampling. Primary data from respondents were collected directly through a structured questionnaire. The Ethics Committee of the Faculty of Medicine, Universitas Pelita Harapan, approved this study (155/L-LKJ/ETIK/VI/2021). Age, sex, ethnicity, religion, marital status, comorbidities, highest education attained, income, health insurance, history of mental problems, and smoking status were all included in the questionnaire. COVID-19-related questions included previous exposure or close contact with COVID-19 patients, the impact of COVID-19 on income, whether respondents had experienced COVID-19-related symptoms, and any COVID-19 tests done previously. After filling out the questionnaire, we recorded data on height and weight before administering vaccines to calculate body mass index (BMI) and blood pressure to screen for hypertension. The WHO Asia-Pacific classification of BMI was used to classify BMI.¹⁸

Respondents were included if they were adults (>18 years) who were vaccinated with CoronaVac (Sinovac Life Sciences, Beijing, China) in Puskesmas

Putri Ayu, one of the biggest Puskesmas in Jambi City, Indonesia. Puskesmas are government-run community health clinics in Indonesia promoting primary prevention. Puskesmas was chosen for our study because it was the first and only place where COVID-19 vaccines were given out. The data were collected between March 15th and June 3rd, 2021. COVID-19 vaccines were administered in Indonesia in four phases. Our study fell in the middle of the second period, where the target population was public service personnel and the elderly (over 60 years old).¹⁹ However, we experienced many unused doses in the field for various reasons, such as refusal, not showing up, or being contraindicated for the jab. Residents around the Puskesmas were approached to acquire the vaccine jab to reduce the number of doses that could potentially go to waste.

Our exclusion criteria were broadly categorized into three groups: refusal to participate in the study for any reason, contraindicated to COVID-19 vaccine administration and receiving the second vaccine jab. We initially followed the advice of the Indonesian Society of Internal Medicine (released on March 18th, 2021), which was the first to recommend who should be vaccinated.²⁰ As a result, pregnant women and children were excluded from this study because vaccine guidelines for these groups were issued on June 22nd, 2021, and November 2nd, 2021, respectively.^{21,22} Respondents with primary immunodeficiency, acute and active infections (including SARS-CoV-2 infection or three months post-infection), blood pressure of 180/110 mmHg, unstable or uncontrolled chronic conditions, such as diabetes mellitus or heart failure, and those with a Fatigue, Resistance, Ambulation, Illness, and Loss of weight (FRAIL) score of >2 were all considered contraindicated to receive the COVID-19 vaccination.²⁰

Income was classified into five categories by the Indonesian Ministry of Health. Poor people had monthly household expenses of less than Rp 1,416,000 (\$99); vulnerable people had monthly household expenses of between Rp 1,416,000 and Rp 2,128,000 (\$99–\$148); aspiring middle-class people had monthly household

expenses of between Rp 2,128,001 and Rp 4,800,000 (\$148 to \$334); middle-class people had monthly household expenses of between Rp 4,800,001 and Rp 24,800,000 (\$334 to \$1671), and upper-class people had monthly household expenses above Rp 24,000,000 (~\$1671).²³ Respondents were divided into groups according to their stance on COVID-19 immunization. Respondents were grouped as “vaccine acceptance” if they replied yes to the question “Are you sure that you are ready to be vaccinated before arriving at Puskesmas Putri Ayu?”, “vaccine refusal” if they answered no, and “vaccine hesitance” if they answered maybe.¹² Respondents' information consumption was measured, including the following options: Newspapers, television, radio, social media (Instagram, Twitter, WhatsApp, or Facebook), doctors, healthcare professionals, government, the Internet, and friends or family members. We assessed how frequent they use the included media using a four-point Likert Scale (1 = Never, 2 = Rarely, 3 = Sometimes, and 4 = High). We also assessed how much the respondents trusted the said media using a four-point Likert Scale (1 = Low, 2 = A Little, 3 = Some, and 4 = High).

Respondents' knowledge, attitude, and behavior were also assessed. Each question for each domain is listed in Supplementary Table 1. There are five questions for the knowledge domain, with each correct answer given 1 point, while the wrong one was given 0 points. The attitude domain consists of two questions, with 1 point for each supportive attitude towards COVID-19 vaccination. Lastly, the behavior domain consists of six questions, five of them were recorded using a five-point Likert Scale (5 = Strongly Agree; 4 = Agree; 3 = Neutral; 2 = Disagree; and 1 = Strongly disagree), while one question was recorded using a two-point Likert scale (Yes = 2, No = 1).

IBM SPSS 26.0 (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA, 2019) was used for statistical analysis. The Kolmogorov–Smirnov test was performed to determine normality, and the data had a normal distribution if the *p*-value was larger than 0.05. The mean and standard deviation (SD) implied the data were regularly distributed, while the

median and range implied that the data were not. Bivariate analysis was done using the chi-square test, independent t-test when data distribution was normal, and Mann-Whitney when data distribution was abnormal. Multivariate logistic regression analysis was performed to find a prediction model with the fewest confoundings. The receiver operating curve (ROC) was used to compute the area under the curve (AUC). An AUC of 1.0 corresponds to a perfect result, >0.9 to a high level of accuracy, 0.7-0.9 to a moderate level of accuracy, 0.5-0.7 to a low level of accuracy, and 0.5 to a chance result.²⁴ A *p*-value of >0.05 from the Hosmer-Lemeshow test would indicate a good calibration.²⁵

RESULTS

Of 3,916 people who came to Puskesmas to be vaccinated, 245 respondents filled the entire questionnaire (Figure 1). There is a slight female predominance (53.5%), and the majority is in the age group of 26-35 years old (20.8%). The median age group of the whole participants is 41 (18-64) years old. Most respondents are overweight (36.7%), with a median BMI of 23.52 (15.96-36.21). The majority of respondents are married (67.8%), work as entrepreneurs (33%), and have a Chinese ethnicity (35.1%). Income-wise, most respondents fall into the aspiring middle-class (39.6%). Respondents are mostly Muslims (57.1%), with a minimum of a bachelor's degree (56.7%). Only 33.9% of respondents obtained permission to be vaccinated. Regarding COVID-19 experience, 78.8% of respondents have no known positive COVID-19 tests amongst close contacts, 51.8% have not done any COVID-19 tests, and 93.9% did not ever experience COVID-19-related symptoms. Amongst the respondents, 8.2% have one comorbid, while 2.4% have at least two comorbidities. Of their family members, 13.1% have one comorbid, while 7.3% have two or more comorbidities. As many as 222 respondents (90.6%) belong to the vaccine acceptance group (Table 1).

In terms of frequency of accessing vaccine-related news, respondents chose social media (60.8%), television (46.5%), and the internet (44.9%) as their top three most visited sources, respectively

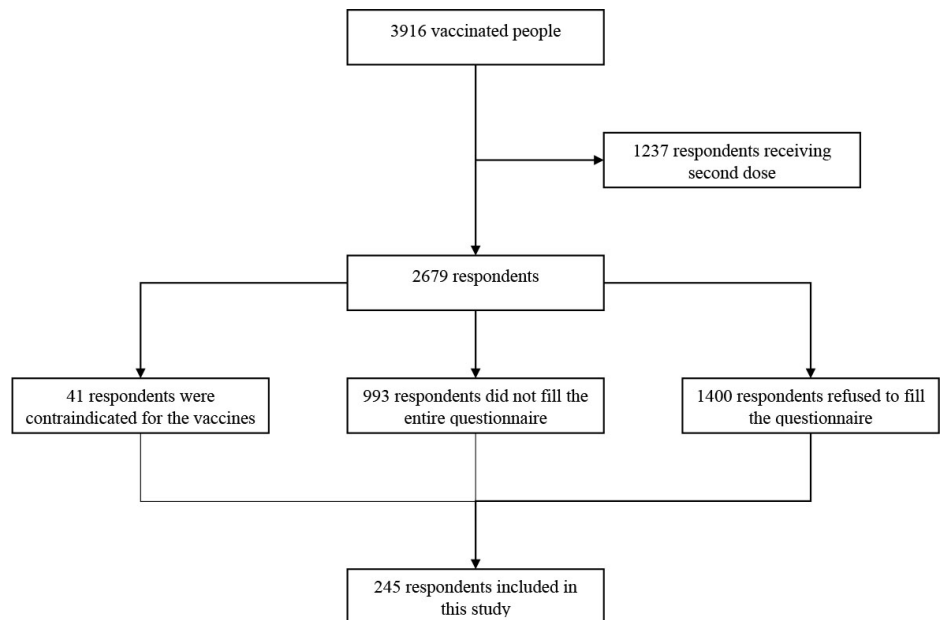


Figure 1. Flow chart of respondent selection.

(Table 2). Amongst all the sources, only television (*p*-value = 0.032) and social media (*p*-value = 0.014) have significant differences when compared to the vaccine acceptance and vaccine hesitancy and refusal group (Figure 2). In terms of the respondents' trust, most trust doctors (43.7%), and the government (42.4%). However, none of the sources significantly differ between the two groups (Figure 3). There are no numerical differences between the two groups' knowledge and attitude sectors, with a median of 3 (0-5) and 2 (0-2), respectively. In the behavior section, the vaccine acceptance group has a median of 18 (7-27), while the vaccine hesitancy and refusal group has 18 (9-26). Only attitude significantly differs between the two groups (*p*-value = 0.013) (Figure 4).

In the multivariate analysis, the odds of having a family member with ≥ 2 comorbidities are almost 6 times more likely (OR 5.99, 95%CI: 1.84-19.54; *p*-value = 0.003) to put a respondent in the vaccine hesitancy and refusal group. Respondents who trust in friends or family have 2.25 times more likely odds (95%CI: 1-5.04; *p*-value = 0.048) of being in the vaccine hesitancy and refusal group. The respondents who trust the internet have 0.45 times less likely odds to be in the vaccine hesitancy and refusal group (95%CI: 0.21-0.96; *p*-value = 0.04).

Lastly, respondents with poor knowledge have 0.58 times less likely odds (95%CI: 0.38-0.88; *p*-value = 0.011) of being in the vaccine hesitancy and refusal group (Table 3). This model has an AUC of 0.782 (95%CI: 0.666-0.897) with a *p*-value of <0.0001. The Hosmer-Lemeshow test indicated a *p*-value of 0.012, indicating this model's good calibration (Figure 5).

DISCUSSION

Without discrediting other external and internal factors that contribute to low inoculation, vaccine hesitancy and refusal are still some of the most significant barriers to a nation with specific targets for vaccination rate.²⁶ Widespread use of social media and rampant false facts distribution contribute to vaccine hesitancy since vaccination is now linked to conspiracy theories²⁷ and political beliefs.²⁸

In our study, social media, television, and the internet dominate usage frequency to access vaccine-related news, respectively. One study done by Reuters Institute in 2021 found that online media (89%), social media (64%), and television (58%) are the most frequently accessed news sources in Indonesia.⁴ Another survey found that 63.6% of Indonesians surveyed used mobile devices to obtain news and information.²⁹ This finding is similar to our findings and confirms that although social media is currently taking

the lead for news sources, television is still a popular choice for those who choose not to be active online.

When news outlets are assessed regarding users' trust, the top three news media that are most accessed are nowhere to be found. Indeed, the same survey from Reuters found that only 31% of their respondents believed in news on social media, and only 39% believed in news overall.⁴ Instead, our respondents believe doctors, other healthcare professionals, and the government for vaccine-related news. Other studies have confirmed this finding as well. One systematic review found that trust in authorities and healthcare professionals is paramount for vaccine acceptance.³⁰ Even amongst healthcare professionals, trust in the government is still essential for vaccine uptake.³¹

When our study was conducted, the effect of comorbidities on willingness to be inoculated with the COVID-19 vaccine was still largely unknown.³² Since then; studies have shown conflicting results. Some research suggests that people with comorbidities are more willing to be vaccinated³³⁻³⁶, while some suggest otherwise.^{31,37,38} However, family members with comorbidities are not a frequently studied variable in determining vaccine acceptance. After multivariate analysis, having a family member with ≥ 2 comorbidities is the strongest predictor for vaccine hesitancy and refusal. Fear was linked to perceived dangers for family members and health anxiety during the COVID-19 pandemic.³⁹ However, one study did not find trust in friends or family significantly affecting COVID-19 vaccine uptake.⁴⁰ There are several reasons behind this phenomenon. Our respondents may take extreme precautions toward contracting COVID-19 by isolating themselves in their own houses to protect their loved ones.³⁷ The elderly with specific comorbidities were not allowed to be vaccinated when our study was conducted.²⁰ Hence, individuals with family members who suffer from comorbidities may choose not to be vaccinated to "protect" their family members. Another plausible explanation can be attributed to psychological factors. One study has shown that psychological mentality may affect vaccine uptake in

Indonesia.^{12,41} Low levels of altruism have been shown to affect vaccine acceptance negatively.⁴²

Trust in friends and family is the second strongest predictor of vaccine hesitancy and refusal. The impact of

Table 1. Respondents' Characteristics (N=245).

Variables	n (%)	p-value
Gender		
Male	114 (46.5)	0.334
Female	131 (53.5)	
Age - Median (range)	41 (18-64)	
>65	31 (12.7)	0.532
56-65	30 (12.2)	
46-55	45 (18.3)	
36-45	44 (18)	
26-35	51 (20.8)	
18-25	44 (18)	
BMI- Median (range)	23.52 (15.96-36.21)	
Normal	84 (34.3)	0.970
Obese	52 (21.2)	
Overweight	90 (36.7)	
Underweight	19 (7.8)	
Marriage status		
Married	166 (67.8)	1
Not Married	79 (32.2)	
Occupation		
Entrepreneur	81 (33)	0.289
Government Worker	22 (9)	
Healthcare worker	13 (5.3)	
Housewife	24 (9.8)	
Religious leader	9 (3.7)	
Student/Jobless/Retired	59 (24.1)	
Teaching staff	33 (13.5)	
Others	4 (1.6)	
Ethnicity		
Batakese	15 (6.1)	0.470
Javanese	46 (18.8)	
Melayu	69 (28.2)	
Minangkabau	16 (6.5)	
Chinese	86 (35.1)	
Others	13 (5.3)	
Permission from workplace/school to be vaccinated today		
No	162 (66.1)	0.21
Yes	83 (33.9)	
Monthly expenses		
< Rp. 1,416,000	37 (15.1)	0.285
Rp. 1,416,001-2,128,000	53 (21.6)	
Rp. 2,128,001-4,800,000	97 (39.6)	
Rp. 4,800,001-24,000,000	56 (22.9)	
> Rp. 24,000,000	2 (0.8)	
Religion		
Buddhist	58 (23.7)	0.295
Muslim	140 (57.1)	
Catholic	6 (2.4)	
Kong Hu Chu	7 (2.9)	
Christian	34 (13.9)	

friends and family in influencing non-COVID-19-vaccine uptake has been proven.⁴²⁻⁴⁴ Findings of this variable on COVID-19 vaccine uptake are conflicting. Some studies suggest that friends and family are the most common⁴⁵⁻⁴⁷ and most trusted^{45,47} sources of COVID-19 information. In contrast, other studies suggest that friends and family are the least trusted sources⁴⁰ or do not impact COVID-19 vaccine uptake.⁴⁸ Through a discrete choice experiment, one study found that in the case of a minor epidemic, assuming that all bodies (including friends and family) recommended vaccination, the expected inoculation uptake increased by 32 percentage points.⁴⁹ One theory that can explain the influence of friends and family is the Health Belief Model (HBM). This model commonly targets perceived barriers, advantages, self-efficacy, and threats, resulting in optimal behavior change.⁵⁰ One study showed that HBM explains vaccine acceptance in Bangladesh.⁵¹

Conversely, our respondents who trust the internet are significantly more likely to be vaccine-acceptant. Generally, trust is an essential factor for COVID-19 vaccine acceptance. Being honest about the downsides of the vaccines upfront will hurt inoculation uptake in a short while but will be more beneficial in the long run.^{48,52} During the pandemic, the press media reported heavily on the development of COVID-19 vaccines via traditional press or online. Therefore, it is plausible that our respondents trust the information they are receiving as the press media are not just the government's "mouthpiece." One study finds that social media channels play a role in educating those who are vaccine-hesitant.⁵³

Our last finding is that respondents with poorer knowledge than the others are more likely to be vaccine acceptants. This finding contradicts other studies that found that good knowledge about COVID-19 acceptance is associated with vaccine acceptance, directly or indirectly.⁵⁴⁻⁵⁶ However, one study in Bangladesh finds that inadequate knowledge and positive attitudes towards COVID-19 vaccination are associated with vaccine uptake.⁵⁷ In our bivariate analysis but not multivariate analysis, attitude is significantly associated

Variables	n (%)	p-value
Education		
D3 or equivalent	15 (6.1)	
Bachelor's/Master's/Doctoral degree	139 (56.7)	
Primary school or equivalent	12 (4.9)	0.837
Secondary school or equivalent	61 (24.9)	
High school or equivalent	10 (4.1)	
Did not finish primary school	8 (3.3)	
COVID-19 impact on income		
Increased income	5 (2)	
Decreased income	60 (24.5)	0.049
No impact (or does not have a job, to begin with)	180 (73.5)	
Insurance		
Own an Insurance	217 (88.6)	
Does not have an Insurance	28 (11.4)	0.437
Whom do you live with?		
Alone	30 (12.2)	0.648
With other people	215 (87.8)	
Are you living with children/grandchildren in your house?		
No	117 (47.8)	0.821
Yes	128 (52.2)	
Known positive COVID-19 tests amongst close contacts		
No	193 (78.8)	
Not sure	29 (11.8)	0.067
Yes	23 (9.4)	
Have you ever done a COVID-19 test?		
No	127 (51.8)	0.288
Yes	118 (48.2)	
Ever experience COVID-19 symptoms (fever, malaise, cough)		
No	230 (93.9)	0.056
Yes	15 (6.1)	
Who registered you for a COVID-19 vaccine appointment?		
Myself	144 (58.8)	0.056
Others	101 (41.2)	
Comorbidity		
≥2 Comorbidities	6 (2.4)	
1 Comorbid	20 (8.2)	0.123
None	219 (89.4)	
Comorbidity amongst family members		
≥2 Comorbidities	18 (7.3)	
1 Comorbid	32 (13.1)	0.03
None	195 (79.6)	
History of mental disorders		
No	241 (98.4)	1
Yes	4 (1.6)	
Smoking status		
No	227 (92.7)	0.129
Yes	18 (7.3)	
Vaccination stance		
Vaccine acceptance	222 (90.6)	-
Vaccine hesitance and refusal	23 (9.4)	

Table 2. Description of COVID-19 information from different sources.

Variable	Frequency of accessing the sources (n%)				Level of trust in vaccine information from source n(%)			
	Never	Rarely	Sometimes	High	Low	A Little	Some	High
Newspaper	33 (13.5)	100 (40.8)	64 (26.1)	48 (19.6)	11 (4.5)	93 (38)	83 (33.9)	58 (23.6)
Television	6 (2.5)	64 (26.1)	61 (24.9)	114 (46.5)	4 (1.6)	69 (28.2)	73 (29.8)	99 (40.4)
Radio	62 (25.3)	95 (38.8)	53 (21.6)	35 (14.3)	28 (11.4)	109 (44.5)	64 (26.1)	44 (18)
Social Media	5 (2)	44 (18)	47 (19.2)	149 (60.8)	4 (1.6)	81 (33.1)	88 (35.9)	72 (29.4)
Doctors	12 (4.9)	104 (42.4)	47 (19.2)	82 (33.5)	2 (0.8)	60 (24.5)	50 (20.4)	133 (54.3)
Healthcare professionals	22 (9)	92 (37.6)	49 (20)	82 (33.5)	4 (1.6)	82 (33.5)	52 (21.2)	107 (43.7)
Government	8 (3.3)	75 (30.6)	76 (31)	86 (35.1)	3 (1.2)	69 (28.2)	69 (28.2)	104 (42.4)
Internet	4 (1.7)	64 (26.1)	67 (27.3)	110 (44.9)	4 (1.6)	85 (34.7)	85(34.7)	71 (29)
Friends or family members	8 (3.3)	83 (33.9)	76 (31)	78 (31.8)	6 (2.4)	84 (34.3)	89 (36.3)	66 (26.9)

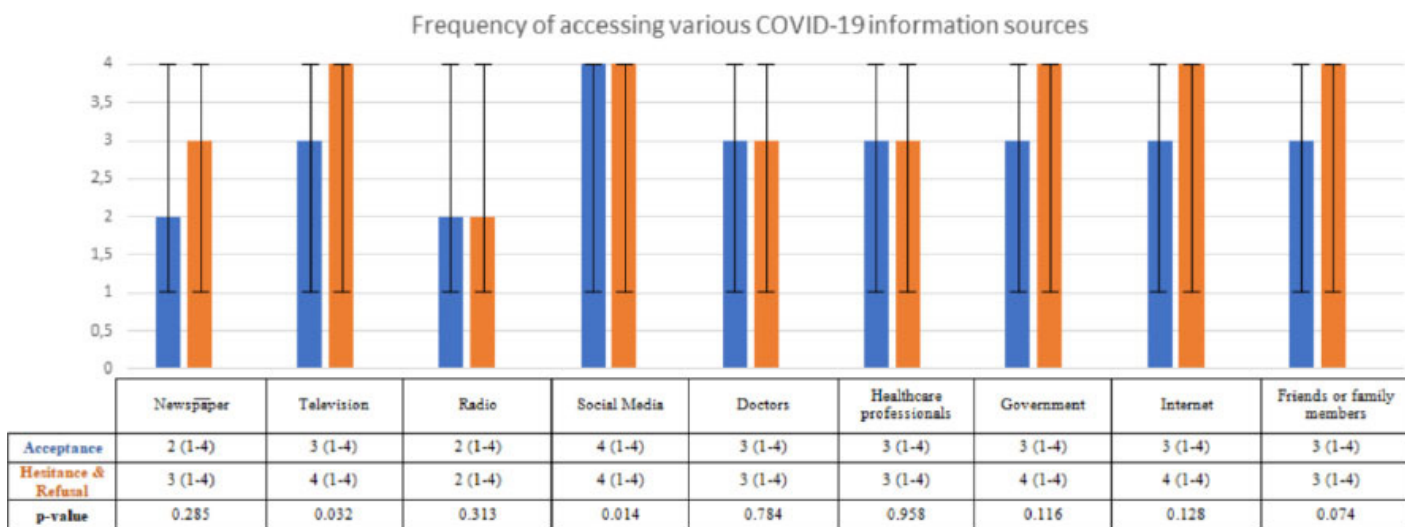


Figure 2. Frequency of accessing various information sources for the acceptance (blue) and hesitance group (orange). Scaling on the y-axis indicates the frequency of accessing the sources.

with vaccine acceptance. Therefore, it is likely that a good attitude is just confounding to poor knowledge that affects vaccine acceptance in our study. A different study conducted in India also found that vaccine acceptance is high amongst the studied cohort despite poor COVID-19 vaccination knowledge.⁵⁸ Another study in Ethiopia, which also found that poor knowledge is associated with vaccine acceptance, argued that those with better knowledge about COVID-19 are more hesitant about the vaccine due to fear.⁵⁹

There are several limitations to our study. The response rate was relatively low, which may introduce non-response bias.⁶⁰ Our study may also suffer from collider bias and may cause some variables to be significantly associated with vaccine uptakes.⁶¹ We did not probe deeper into respondents’ trust in the news they received or whether their information

was accurate. This information is essential because it may be a mediator that affects sources of information and vaccine uptake. However, our study has its merits as well. Our study is one of the first to examine the effects of COVID-19 news sources and their impact on vaccine acceptance in Indonesia. We also assessed the impact of knowledge, attitude, and behavior on people’s willingness to be vaccinated. Overall, this study’s results will benefit relevant stakeholders, healthcare professionals, and the government to strategize for a higher rate of COVID-19 vaccine uptake.

CONCLUSIONS

Our findings show that respondents are more willing to be vaccinated if they have more trust in the internet and have poorer knowledge, possibly with concordance to a good attitude. Meanwhile, respondents who have a family member with ≥2

comorbidities and those who trust in family or friends are more likely to belong to the vaccine hesitancy and refusal group. This finding will be relevant to increasing vaccination uptake since the government will have to focus on those respondents who are more likely to be vaccine-hesitant. Strategic planning to target the vaccine hesitant will be more beneficial since counseling and focusing on this group will be more beneficial than targeting those who refuse the vaccines.

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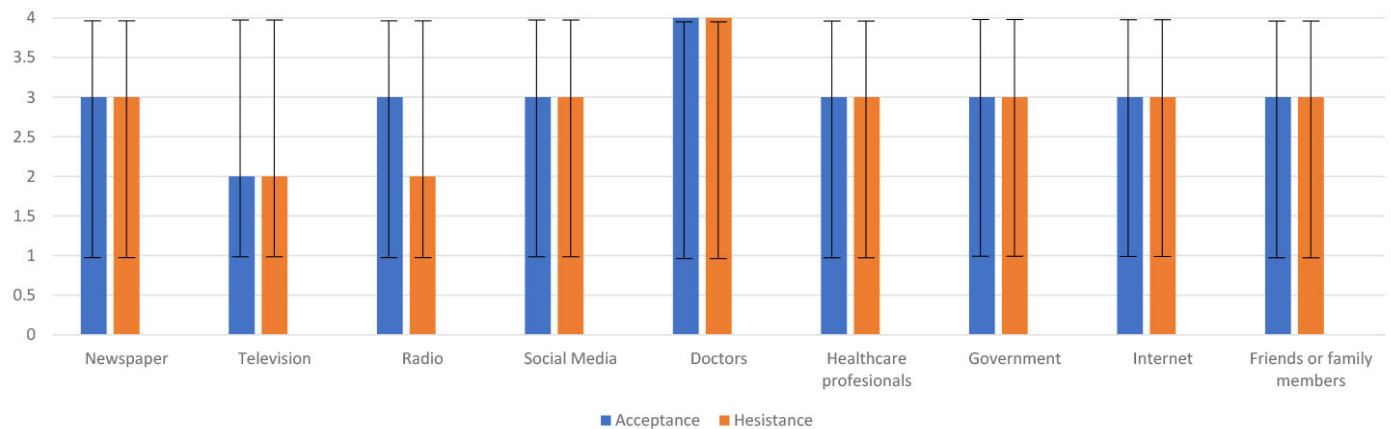
FUNDING STATEMENT

None.

CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

Trust level of various COVID-19 information sources



	Newspaper	Television	Radio	Social Media	Doctors	Healthcare professionals	Government	Internet	Friends or family members
Acceptance	3 (1-4)	3 (1-4)	2 (1-4)	3 (1-4)	4 (1-4)	3 (1-4)	3 (1-4)	3 (1-4)	3 (1-4)
Hesitance & Refusal	3 (1-4)	3 (1-4)	2 (1-4)	3 (1-4)	4 (1-4)	3 (1-4)	3 (1-4)	3 (1-4)	3 (1-4)
p-value	0.679	0.746	0.884	0.065	0.967	0.923	0.971	0.839	0.089

Figure 3. Trust level of various information sources for the acceptance (blue) and hesitance group (orange). Scaling on the y-axis indicates the level of trust.



	Knowledge	Attitude	Behavior
Acceptance	3 (0-5)	2 (0-2)	18 (7-27)
Hesitance & Refusal	3 (0-5)	2 (0-2)	18 (9-26)
p-value	0.097	0.013	0.84

Figure 4. Knowledge, Attitude, and Behavior towards COVID-19 and its vaccination. A higher score indicates better Knowledge regarding COVID-19 and its vaccine and a better attitude towards it. A higher score in the Behavior domain indicates worse behavior toward COVID-19 and its vaccine.

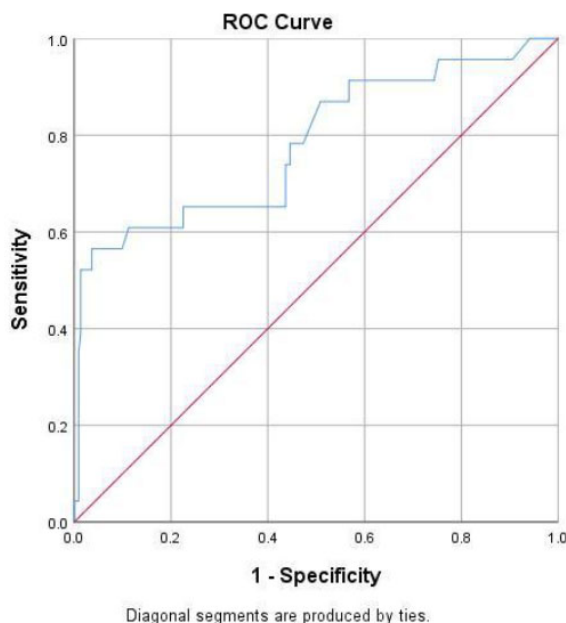
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Table 3. Multivariate analysis of demographical factors towards vaccine acceptance and hesitance.

Variable	Multivariate Logistic Analysis	
	OR (95% CI)	p-value
Demographic data		
Permission	0.37 (0.14 - 1)	0.05
Previous COVID-19 Symptoms	0.27 (0.06 - 1.15)	0.076
1 Family Comorbid	2.49 (0.44-14.06)	0.301
≥2 Family Comorbid	5.99 (1.84 - 19.54)	0.003
Source of information		
Television as a source of information	1.84 (0.94-3.6)	0.074
Trust in Internet	0.45 (0.21 -0.96)	0.04
Trust in Friends or Family	2.25 (1-5.04)	0.048
Knowledge, Attitude, Behavior		
Poor knowledge	0.58 (0.38-0.88)	0.011

CI, confidence interval; OR, odds ratio.



Area (95% Confidence interval)	Standard Error	p-value
0.782 (0.666-0.897)	0.059	<0.0001

Figure 5. Receiver operating curve to assess the discrimination of the model.

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