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Prevalence and factors associated with belief in COVID−19 vaccine efficacy in Indonesia: A cross−sectional study

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ABSTRACT

Objective: To investigate the prevalence of belief in COVID-19 vaccine efficacy and its associated factors.

Methods: Due to mobility restriction, this study was conducted cross-sectionally *via* online platforms. The included factors were age, gender, religious identity, marital status, education level, occupation, and living with health workers. Logistic regression was used to assess the association between belief in COVID-19 vaccine with the predictors.

Results: A total of 5 397 responses were taken into analysis. The prevalence of belief in COVID-19 vaccine efficacy was 62.3%. Whereas factors associated with belief in COVID-19 vaccines were being in the age of 45-54 (a*OR* 1.767; 95% *CI* 1.219-2.562), 55-64 (a*OR* 1.703; 95% *CI* 1.219-2.562), and >64 (a*OR* 2.136; 95% *CI* 1.128-4.047), completing education until the secondary level (a*OR* 1.354; 95% *CI* 1.111-1.650), working as health practitioners (a*OR* 2,353; 95% *CI* 1.655-3.344), and living with health workers (a*OR* 1.278, 95% *CI* 1.079-1.514). All religious identities including Muslim (a*OR* 2.447; 95% *CI* 1.183-5.062), Protestant (a*OR* 3.615; 95% *CI* 1.703-7.677), Catholic (a*OR* 4.486; 95% *CI* 2.015-9.987), and Hindu (a*OR* 3.286; 95% *CI* 1.410-7.655) showed significant association with belief in COVID-19 vaccine efficacy.

Conclusions: A high prevalence of belief in COVID-19 vaccine efficacy was evident. Since vaccine compliance is determined by an individual's risk-benefit perception, this study emphasizes the need of raising awareness of the benefits of COVID-19 immunization.

KEYWORDS: COVID-19; Belief; Vaccine; Efficacy; Muslim

1. Introduction

COVID-19 was first reported in December 2019[1]. Since then, it rapidly spread out around the globe and urged the World Health Organization (WHO) to declare the disease a world pandemic[2].

Indonesia is one of the Asian countries which is heavily affected by COVID-19. In January 2021, the infection number reached one million[2]. The Indonesia case fatality rate was 8.9% which is much higher than the People's Republic of China's case fatality rate of 4%[3]. In the Southeast Asia, Indonesia had the most death toll due to the COVID-19 pandemic. The reported fatalities reached 19 248 in December 2020 which was the highest among the ASEAN nations[4]. The healthcare system in Indonesia was not yet prepared to face COVID-19. The high incidence of COVID-19 cases was purportedly caused by regional disparities within the Indonesian healthcare system[4–6].

The Indonesian government tried to suppress the spread of COVID-19 transmission by issuing a partial lockdown policy due to economic reasons. However, this policy seemed to be ineffective considering the continued high mobility of Indonesia's population in several regions[4]. In January 2021, soon after the COVID-19 vaccine

Significance

Although Muslim identity is associated with lowered vaccine uptake, this study demonstrates a high prevalence of belief in COVID-19 vaccine efficacy in Indonesia, the country with the world's largest Muslim community. Vaccination for most populations is essential to suppress virus transmission. This study provides information regarding factors associated with belief in COVID-19 vaccine efficacy and thus facilitates informed decision-making by the Indonesian government to enhance vaccine uptake.

was invented, the government issued a mandatory vaccination policy. The launch of the vaccination policy was marked by the COVID-19 immunization of Indonesian President Joko Widodo on 13 January 2021 which was live-broadcasted across the nation.

Vaccination for most of the population is urgently needed to suppress the spread of COVID-19 and return to normalcy. However, several challenges were identified that hindered the COVID-19 vaccine uptake. Aside from the logistical challenges of vaccine distribution, there is also the problem of persuading billions of people of the efficacy and safety of a breakthrough COVID-19 vaccine[7]. The difference in efficacy levels between different vaccine manufacturers and the emergence of adverse events after the COVID-19 immunization has sorted individuals into those who agreed to participate in vaccination, those who hesitated, and those who refused. The group that hesitated, however, tended to reject the COVID-19 vaccine because of the false news that was widely spread in the media as a result of the inferiority of the official information from the Indonesian government. Besides, vaccine rejection on the religious ground should also be anticipated. Indonesia is a country with the largest Muslim community and thus Muslim views on vaccines are essential for vaccination success. Since Muslim identity is linked to reduced vaccine uptake, vaccination has typically been a challenging problem in the majority of Islamic nations[8,9].

It is imperative for public health policymakers in each country to anticipate and overcome barriers related to the perception of vaccine acceptance among their citizens because the high prevalence of vaccine rejection in any country will reduce the speed of infection control. In addition to sociodemographic factors, prior studies found that attitude and belief in the vaccine efficacy and benefits were significant predictors of vaccine acceptance[7,10–12]. In regard to the above, this study aims to analyze belief in COVID-19 vaccine efficacy and related factors in Indonesia.

2. Materials and methods

2.1. Data collection

Due to the COVID-19 pandemic and the mobility restriction policy by the Indonesian government, the data for this cross-sectional study were collected through an online survey in 34 provinces in Indonesia. The questionnaire was shared through online media such as WhatsApp, Facebook, Twitter, and Telegram. The population of this study was all Indonesian citizens aged 18 years old and above. The time frame for the data collection was set to one month (April 23-May 22, 2021). The sample size was 4 096 respondents that were calculated by following the proportion sampling method with a 95% confidence level, 5% margin of error, and 50% of the estimated proportion. To anticipate dropout participants, the sample size was increased to 10% and thus the final sample size for this study was 4 510 respondents.

A total of 5 654 responses were collected after the data collection closed on May 22, 2021. The data was then cleaned for duplication

and incomplete responses. The duplicate responses were identified based on IP address, name, and region. The cleaning stage yielded 5 397 observations to be taken into analysis.

2.2. Variables

The outcome variable of this study was the belief in COVID-19 vaccine efficacy. The outcome variable was assessed through the following question, "Do you believe in the efficacy of COVID-19 vaccines?". The answer to this question was dichotomous "yes" or "no". Code "1" was assigned to "yes" responses whereas code "0" was used for "no" responses.

The dependent variables used in this study were age, gender, religious identity, marital status, education level, occupation, and living with health workers. The age was grouped into six categories, namely 18-24, 25-34, 35-44, 45-54, 55-64, and >64. Gender consisted of two categories, "male" and "female". Religious identity consisted of five categories: Muslim, Protestant, Catholic, Hindu, and others. Marital status consisted of three categories, namely "never married", "married", and "divorced/widowed". Education level was the respondent's recognition of the level of education attained. Education level consisted of three categories, namely "primary" (nine years), "secondary" (12 years), and "higher" (more than 12 years).

The study classified occupation into seven groups: "unemployed", "public servants/army/police", "health workers", "entrepreneurs", "private sector employee", "farmer/fisherman", and "others". Lastly, "living with health workers" is the respondent's acknowledgment of living at home or boarding house with health workers (doctors, nurses, midwives, *etc.*). Living with health workers consisted of two categories "no" and "yes".

2.3. Analysis

Prior to the analysis, a multicollinearity test was conducted to verify that there were no collinearity issues in the data set. The researchers then employed *Chi*-square in the bivariate stage to assess the correlation between the outcome variable and each dependent variable. Factors that showed significant correlation with the outcome variable were taken into multivariable binary logistic regression. SPSS 22 was used for all statistical analyses.

2.4. Ethical approval

The ethical approval for this study was granted by the National Health Ethics Commission, Ministry of Health Republic of Indonesia under approval number LB.02.01/2/KE.194/2021. Respondents provided written consent prior to their participation in the study.

3. Results

The data cleaning stage yielded 5 397 responses to be taken into

analysis (119.7% response rate). The multicollinearity test results revealed that the variance inflation factor did not exceed the threshold values. Therefore, no collinearity issues were found in the data set (Table 1).

Table 1. Results of the multicollinearity test between variables (*n*=5 397).

Variable	Collinearity statistics	
	Tolerance	VIF
Age	0.819	1.221
Religious identity	0.981	1.020
Gender	0.987	1.013
Marital status	0.832	1.201
Education level	0.942	1.061
Occupation	0.932	1.072
Living with health workers	0.989	1.011

Dependent variable: belief in COVID-19 vaccine efficacy. VIF: variance inflation factor.

3.1. Descriptive results

The analysis results indicated that 62.3% of people in Indonesia claimed to believe in the COVID-19 vaccine efficacy. Most of the respondents were aged 25-34 years old, female, Muslim, married, with higher education levels, working as public servants, and not living with health workers. Table 2 shows the descriptive statistics of respondents' demographic characteristics regarding the belief in COVID-19 vaccine efficacy in Indonesia.

3.2. Multivariate regression analysis

Table 3 shows the results of binary logistic regression between the belief in COVID-19 vaccine efficacy in Indonesia and all the predicting factors.

Respondents in the age of 45-54, 55-64, and >64 were significantly associated with belief in the COVID-19 vaccine efficacy. All religious identities including Muslim, Protestant, Catholic, and Hindu showed significant association with belief in COVID-19 vaccine efficacy.

Within the education category, Table 3 shows secondary education

Table 2. Descriptive statistics of sociodemographic characteristics of respondents of the belief in COVID-19 vaccine efficacy in Indonesia (*n*=5 397).

Variable	*n* (%)	Belief in COVID-19 vaccine efficacy		*P*
		No, *n*=2 035, Freq (%)	Yes, *n*=3 362, Freq (%)	
Age, years				<0.001
18-24	164 (3.04)	65 (39.63)	99 (60.37)	
25-34	2 178 (40.36)	962 (44.17)	1 216 (55.83)	
35-44	1 358 (25.16)	513 (37.78)	845 (62.22)	
45-54	1 222 (22.64)	359 (29.38)	863 (70.62)	
55-64	395 (7.32)	118 (29.87)	277 (70.13)	
>64	80 (1.48)	18 (22.50)	62 (77.50)	
Gender				0.378
Male	2 576 (47.73)	987 (38.32)	1 589 (61.68)	
Female	2 821 (52.27)	1 048 (37.15)	1 773 (62.85)	
Religious identity				<0.001
Muslim	4 642 (86.01)	1 806 (38.91)	2 836 (61.09)	
Protestant	433 (8.02)	133 (30.72)	300 (69.28)	
Catholic	183 (3.39)	45 (24.59)	138 (75.41)	
Hindu	98 (1.82)	30 (30.61)	68 (69.39)	
Others	41 (0.76)	21 (51.22)	20 (48.78)	
Marital status				0.012
Divorced/widowed	187 (3.46)	64 (34.22)	123 (65.78)	
Never married	1 008 (18.68)	420 (41.67)	588 (58.33)	
Married	4 202 (77.86)	1 551 (36.91)	2 651 (63.09)	
Education level				0.005
Higher	4 563 (84.55)	1 762 (38.61)	2 801 (61.39)	
Secondary	765 (14.17)	252 (32.94)	513 (67.06)	
Primary	69 (1.28)	21 (30.43)	48 (69.57)	
Occupation				<0.001
Unemployed	339 (6.28)	122 (35.99)	217 (64.01)	
Public servants/army/police	3 509 (65.02)	1 388 (39.56)	2 121 (60.44)	
Health workers	412 (7.63)	95 (23.06)	317 (76.94)	
Entrepreneurs	159 (2.95)	60 (37.74)	99 (62.26)	
Private sector employee	671 (12.43)	250 (37.26)	421 (62.74)	
Farmer/fisherman	40 (0.74)	15 (37.50)	25 (62.50)	
Others	267 (4.95)	105 (39.33)	162 (60.67)	
Living with health worker				<0.001
No	4 592 (85.08)	1 793 (39.05)	2 799 (60.95)	
Yes	805 (14.92)	242 (30.06)	563 (69.94)	

CI: confidence interval; Freq: frequency.

was significantly associated with the outcome variable. Whereas primary education appeared to be insignificantly associated with belief in the COVID-19 vaccine efficacy.

According to occupation, "health workers" were 2.353 times more likely than "unemployed" category to believe in COVID-19 vaccine efficacy. On the other hand, all other occupations were statistically insignificant. Finally, within the "living with health workers" category, respondents who lived with health workers were significantly associated with belief in the COVID-19 vaccine efficacy.

Table 3. Binary logistic regression of belief in COVID-19 vaccine efficacy in Indonesia (*n*=5 397).

Variable	a*OR*	Belief in the COVID-19 vaccine efficacy, 95% *CI*		*P*
		Lower	Upper	
Age, years				
18-24 (Ref.)	-	-	-	-
25-34	0.964	0.680	1.365	0.836
35-44	1.196	0.830	1.722	0.337
45-54	1.767	1.219	2.562	0.003
55-64	1.703	1.126	2.575	0.012
>64	2.136	1.128	4.047	0.020
Religious identity				
Other (Ref.)	-	-	-	-
Muslim	2.447	1.183	5.062	0.016
Protestant	3.615	1.703	7.677	0.001
Catholic	4.486	2.015	9.987	<0.001
Hindu	3.286	1.410	7.655	0.006
Marital status				
Divorced/Widowed (Ref.)	-	-	-	-
Never married	1.082	0.763	1.534	0.660
Married	1.056	0.770	1.449	0.736
Education level				
Higher (Ref.)	-	-	-	-
Secondary	1.354	1.111	1.650	0.003
Primary	1.585	0.914	2.749	0.101
Occupation				
Unemployed (Ref.)	-	-	-	-
Public servants/army/police	1.174	0.897	1.536	0.242
Health workers	2.353	1.655	3.344	<0.001
Entrepreneurs	1.085	0.727	1.618	0.691
Private sector employee	1.240	0.931	1.653	0.141
Farmer/fisherman	1.083	0.544	2.156	0.821
Others	1.111	0.786	1.570	0.552
Living with a health worker				
No (Ref.)	-	-	-	-
Yes	1.278	1.079	1.514	0.004

CI: confidence interval; a*OR*: adjusted odds ratio; Ref.: reference.

4. Discussion

This study demonstrated a higher prevalence of respondents who believe in COVID-19 vaccine efficacy (62.3%) as compared to those who did not believe (37.7%). This finding is similar to the findings of other studies conducted in Malaysia, Israel, and the United States that showed a high prevalence of belief in the efficacy and positive attitudes toward COVID-19 vaccines[10,13,14]. The analysis result

revealed significant positive association between belief in COVID-19 vaccine efficacy with respondents in the age of 45-54 (*P*<0.05; a*OR* 1.767; 95% *CI* 1.219-2.562), 55-64 (*P*<0.05; a*OR* 1.703; 95% *CI* 1.219-2.562), and >64 (*P*<0.05; a*OR* 2.136; 95% *CI* 1.128-4.047). This finding showed that the older age group had higher odds to believe in COVID-19 vaccine efficacy in Indonesia compared to the younger age groups (18-24, 25-34, 35-44). This result is probably because people of old age are a vulnerable group who have a higher risk of COVID-19 infection and mortality. Thus, the fear of this disease leads to a good attitude and acceptance of the COVID-19 vaccines. This result corroborates the findings of previous studies conducted in the United Kingdom, United States, United Arab Emirates, Greece, and Saudi Arabia that suggested a better attitude and acceptance of vaccines among older age respondents[15–19].

This study discovered that most of religious groups in Indonesia including Muslim (*P*<0.05; a*OR* 2.447; 95% *CI* 1.183-5.062), Protestant (*P*<0.05; a*OR* 3.615; 95% *CI* 1.703-7.677), Catholic (*P*<0.001; a*OR* 4.486; 95% *CI* 2.015-9.987), and Hindu (*P*<0.05; a*OR* 3.286; 95% *CI* 1.410-7.655), were significantly associated with belief in the efficacy of the COVID-19 vaccines. The finding that indicated a good attitude of religious believers toward the COVID-19 vaccines is coherent with the results of the studies conducted in Malaysia and Bangladesh[12,20]. Similarly, studies in Uganda and Pakistan found that the immunization coverage among Protestants, Catholics, and Muslims was better than among the population that did not affiliate themselves with any religion[21,22]. However, earlier research in Indonesia suggested that, as the country with the world's largest Muslim community, one of the factors contributing to immunization reluctance was the religious reason[23,24]. Moreover, a recent study regarding the COVID-19 vaccination intent in Southeast Asia indicated that religion had no significant correlation with a positive attitude and the intent to take the COVID-19 vaccines[25]. The inconsistent findings from the previous studies are evidence that individuals' attitudes towards immunization and decision to get vaccinated or not vaccinated are not merely influenced by religious affiliations[26]. In the context of the COVID-19 vaccination in Indonesia, the public's attitude and the level of acceptance of the COVID-19 vaccines among religious believers might have been influenced by the time of the study. In that perspective, this research was conducted in the middle of the pandemic when the national COVID-19 vaccination campaign had been intensively carried out. Extensive official releases by the government regarding the advantages of immunization may contribute to the increasing knowledge about the benefits of taking COVID-19 vaccines among respondents in Indonesia. Although immunization reluctance was suspected to still exist in conservative Muslim societies, the halal certificate that was granted by the Indonesia Ulama Council (MUI) to Sinovac had helped to alleviate vaccine hesitancy on religious grounds.

The analysis result has also revealed that respondents with secondary education were significantly associated with belief in COVID-19 vaccine efficacy (*P*<0.05; a*OR* 1.354; 95% *CI* 1.111-1.650). This statistics result means that respondents from secondary

education level had 1.354 of odds to belief in the COVID-19 vaccine efficacy compared to participants from higher education level as the reference group. This finding is consistent with the results of surveys in Greece, Canada, Spain, and the United Kingdom that showed people with higher education level was associated with lower vaccine uptake[15,27]. This circumstance was suspected to be caused by the incessant false information about the COVID-19 pandemic that was widespread through social media. Since most of the people with higher education in Indonesia are social media users, they are most likely victimized by the COVID-19 false news[28–31]. The inability to critically appraise health-related information is an indication of a deficient health literacy level[32–34]. On the other hand, an adequate health literacy level enables people to critically assess health-related information and make desired health-related decisions[35–37]. This phenomenon is evidence that a high level of education does not necessarily be associated with an adequate health literacy level and deficient health literacy is currently underestimated public health problem.

In the occupation category, health workers were the group that was found to have a significant association with belief in COVID-19 vaccine efficacy. Health workers respondents had 2.353 of odds to believe in COVID-19 vaccine efficacy ($P<0.001$; 95% CI 1.655-3.344). This finding was expected since health workers have good knowledge about the COVID-19 virus and the benefits of the COVID-19 vaccination. Besides, health workers are a group of people at higher risk of contracting COVID-19. Previous studies have shown that attitude and acceptance of the COVID-19 vaccines increase in direct proportion to the increased risk of COVID-19 transmission[15]. Therefore, the elevated risk of contracting COVID-19 may have caused health workers to have good attitudes toward COVID-19 vaccines compared to those who work in the non-medical sector[38]. On the other hand, respondents with the occupation of civil servants/police/army were found to have an insignificant association with the belief in COVID-19 vaccine efficacy. This circumstance is a potential barrier to the COVID-19 vaccination program in Indonesia and should be anticipated.

A significant result on the belief in COVID-19 vaccine efficacy was also found for respondents who live with health workers ($P<0.05$; aOR 1.278; 95% CI 1.079-1.514). Living with health workers may have enabled people to seek information about the benefits of immunization and assistance regarding false news about COVID-19 vaccines. This finding is consistent with the results of previous studies in Indonesia and Malaysia which indicated good attitude, belief, and acceptance of COVID-19 vaccines among people who live with health workers[20,25].

This study has strengths and limitations. The strength of this study is the incorporation of a huge amount of data that was collected in all provinces of Indonesia. This study has contributed to providing information for the Ministry of Health of Indonesia and Indonesia COVID-19 task force regarding factors affecting attitudes and belief in COVID-19 vaccine efficacy and thus enabled informed decision-making to boost the COVID-19 vaccination. On the other hand, the data collection method that employed online media might have caused people who did not have Internet access to be underrepresented. Therefore, the results of this study should be interpreted with caution.

In conclusion, this study demonstrates a high prevalence (62.3%) of belief in the COVID-19 vaccine efficacy in Indonesia as the country with the largest Muslim community. Five factors were significantly associated with belief in COVID-19 vaccine efficacy. These five factors were age, religious identity, education level, occupation, and living with a health worker. This study underscores the need to enhance the dissemination of the benefits of COVID-19 vaccination since vaccination compliance is dependent on an individual's risk-benefit perception. The high prevalence of COVID-19 vaccine refusal will impede the nation's recovery.

Conflict of interest statement

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Authors' contributions

DEE, ADL and SP contributed to the study concept and design. DEE, ADL, ZKN and SP contributed to the data acquisition. DEE, ADL and ZKN performed the statistical analysis. Both DEE and ADL drafted the manuscript. DEE, ADL, ZKN and SP performed the critical revision for important intellectual content. All authors approved the final version of the manuscript for publication.

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