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[1]Department of Internal Medicine, Faculty of Medicine, Universitas Pelita Harapan, Karawaci, Tangerang, Banten, Indonesia.
[2]Putri Ayu Public Health Center, Jambi, Indonesia.

*Correspondence to: raldostvn@gmail.com

Demographical risk factors of adverse events following immunisation of CoronaVac in Jambi, Indonesia

Rivaldo Steven Heriyanto[1], Theo Audi Yanto[1], Gilbert Sterling Octavius[1], Haviza Nisa[2], Catherine Ienawi[2], H. Emildan Pasai[2]

ABSTRACT

Background and purpose: Slow uptake of COVID-19 vaccination might be associated with the adverse events after vaccination. This study aims to evaluate the association between demographical factors and COVID-19 vaccine adverse events in Jambi, Indonesia

Methods: We conducted a cross-sectional study with a total population sampling. Data were collected with a structured questionnaire. We included adults vaccinated for the first dose with CoronaVac in Putri Ayu Public Health Center between March 15th and June 3rd, 2021, accounted for 522 persons. Statistical analysis was done using IBM SPSS 26.0. Multivariate logistic regression analysis was used to analyze the predictive models.

Results: This Out of 522 respondents included, immune reactions (34.1%) were the most common adverse effects reported by the respondents. Multivariate analysis showed that respondents with no family members or friends exposed to COVID-19 are less likely to experience puncture site reaction with an OR of 0.28 (95%CI: 0.09-0.92; p=0.036). Those with no history of mental disorders were also less likely to experience the adverse event with an OR of 0.12 (95%CI: 0.024-0.62; p=0.011). As for other reactions, those in the 26-35 years old category are more likely to experience other adverse event reactions with an OR of 11.62 (95%CI: 1.5-89.92; p=0.019).

Conclusion: Based Younger respondents tend to experience more other reaction of COVID-19 vaccine adverse events than the older groups. We also found that those with no family or friends who contracted COVID-19 and no history of mental disorders are less likely to experience puncture site reaction adverse events.

Keywords: COVID-19 vaccine, adverse event following immunization, vaccine reaction, Indonesia

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) outbreak has created challenges to global health systems.[1] It has disrupted the provision of numerous services, delays in diagnosis, and increased severity and morbidity of previous significant killers, such as diabetes, heart diseases, and chronic respiratory diseases, even to this day.[2-4] Vaccination has been the primary modality in controlling this new disease internationally, including in Indonesia.[5]

By February 6th, 2022, only 47% of Indonesians are fully vaccinated against COVID-19. Meanwhile, the United Arab Emirates is currently first amongst other nations in terms of fully vaccinated people, with 94% of people already receiving complete vaccination.[6] The Indonesian government has set a goal to vaccinate around 67% of Indonesians by the end of 2021.[7] However, by December 31st, 2021, only 41.26% received the full dose, and 58.57% received at least one shot.[8] Although it is well known that vaccines are highly effective and safe, one possible explanation for this low number is the adverse events following immunisation (AEFI), even minor ones, can increase vaccine hesitancy levels and reducing vaccine uptake.[9]

Adverse events following immunisation are divided into two categories, local and systemic. Local adverse events include pain, redness, and swelling on the injection site, while systemic adverse events include fatigue, muscle pain, fever, and nausea.[10] Adverse events such as pain, headache, and fatigue are classified into very common AEFI, meaning more than 10% of vaccine recievers will experience this AEFI. In contrast, burning feeling at the injection site, vomiting, edema, and dizziness are uncommon, emerging in 0.1%-1% vaccine receivers.[11]

Several studies have shown an association between demographical factors such as age and gender with AEFI. Riad et al.[12] found an association between the younger age group and COVID-19 vaccine adverse events, while Hoffmann et al.[13] found that females were more likely to experience vaccine adverse events than males. There are limited studies including in Indonesia, that investigating the role of other demographic factors (family and self comorbidities, smoking status, and history of mental disorder) and their relationship with COVID-19 vaccine adverse events, especially CoronaVac as the first vaccine to be used in Indonesia.[14] Identifying these factors is essential to improve vaccination strategies, such as educating the general population that certain factors increase or decrease the risk of AEFI, increasing their understanding, thus improving vaccine acceptance.[15]

The aim of our study was to evaluate the association of various demographical factors with vaccine reactions after the administration of the first vaccine to be used in Indonesia, the CoronaVac (Sinovac Life Sciences, Beijing, China). By discovering the factors associated with vaccine adverse events, this study might provide insight into providing a pattern of vaccine adverse events.

METHODS

We conducted a cross-sectional study with total sampling. We included adults vaccinated for the first dose with CoronaVac in Putri Ayu Public Health Center (PHC) between March 15th and June 3rd, 2021, accounted for 522 persons. Primary data from respondents were collected directly through a structured questionnaire. This study extended our previous research with a longer duration of sampling and respondents.[16] 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 that were done previously.

After filling up 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 Asia-Pacific classification of BMI would be used to classify BMI.[17] After vaccination, we observed the participants for 30 minutes and asked them whether they experienced any AEFI.

Respondents were included if they were adults (>18 years) who were vaccinated with CoronaVac (Sinovac Life Sciences, Beijing, China) in Putri Ayu PHC, one of the biggest PHCs in Jambi City, Indonesia. PHCs *(puskesmas)* are government-run public health clinics in Indonesia promoting primary prevention. PHC was chosen for our study because it was the first and only place where COVID-19 vaccines were given out. The data was 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).[18] However, we experienced a lot of unused doses on the field for various reasons, such as refusal, not showing up, or being contraindicated for the jab. Residents around the PHC were approached to acquire the vaccination to reduce the number of doses that could potentially go to waste.

Our exclusion criteria were broadly categorised into three: refusal to participate in the study for any reason, contraindicated to COVID-19 vaccine administration, and receiving the second vaccination. 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.[19] 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.[20,21] 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 COVID-19 vaccination.[19] A total of 522 adults >18 years were included in the study as been shown in Figure 1.

Income was classified into five categories by the Indonesian Ministry of Health. Poor people had monthly household expenses of less than IDR 1,416,000 ($99); vulnerable people had monthly household expenses of between IDR 1,416,000 and IDR 2,128,000 ($99–$148); aspiring middle-class people had monthly household expenses of between IDR 2,128,001 and IDR 4,800,000 ($148 to $334); middle-class people had monthly household expenses of between IDR 4,800,001 and IDR 24,800,000 ($334 to $1671), and upper-class people had monthly household expenses above IDR 24,000,000 (~$1671).[22]

Respondents were divided into groups according to their stance on COVID-19 immunisation. 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 Putri Ayu PHC?", "vaccine refusal" if they answered no, and "vaccine hesitance" if they answered maybe.[16] Adverse events following immunisation were grouped into immune reaction if the participants experience any fever, myalgia, arthralgia; puncture site reaction if participants experience pain, redness, swollen, and stiffness around the injection site; vagal reaction if they experience syncope, dizziness or shortness of breath; and other reaction if they felt uncontrolled sleepiness and excessive hunger after vaccine administration.

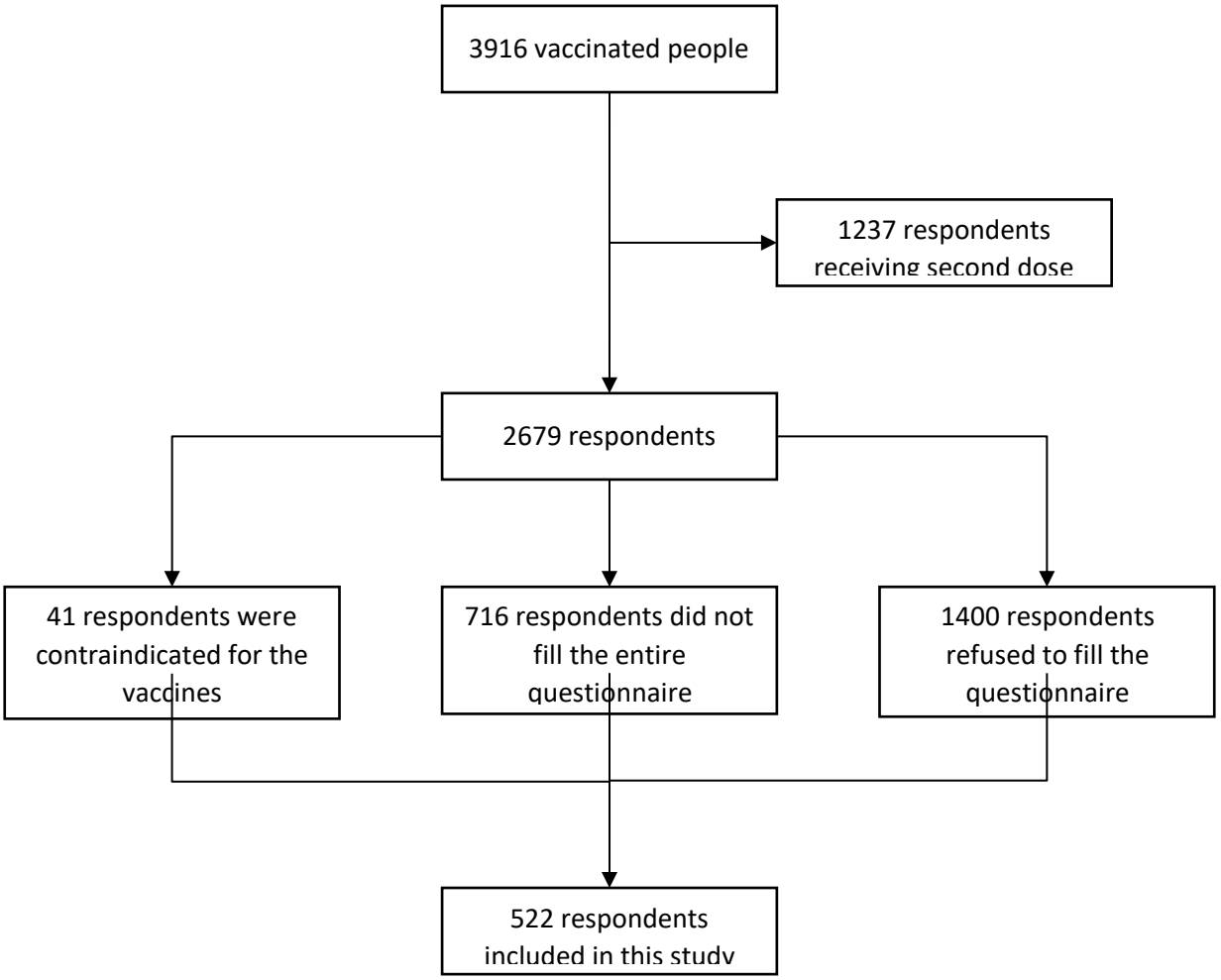


Figure 1. Flowchart of respondent selection

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, the data had a normal distribution if the p-value was larger than 0.05. The mean and standard deviation implied that the data were regularly distributed, whereas the median and range implied that the data were not. The Chi-square test was used to do bivariate analysis. Multivariate logistic regression analysis was performed to find a prediction model with the fewest confoundings. The receiver operating characteristic (ROC) curve will 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.[23] A p-value of >0.05 from the Hosmer-Lemeshow test would indicate a good calibration.[24]

The Ethics Committee of the Faculty of Medicine, Universitas Pelita Harapan, approved this study (No. 155/L-LKJ/ETIK/VI/2021).

RESULT

Of the 522 respondents, a roughly equal distribution of male and female was found (52.1%/47.9%), with most of them falling in the 36-45 years old (21.1%). The median BMI falls under the overweight category with 23.8 (13.9-61.3), with 217 respondents (41.6%) belonging to the overweight group. Two hundred respondents

(38.3%) belong to the aspiring middle-class group, with the majority of respondents (77.4%) reporting no changes in income as a result of the epidemic.

Table 1. Sociodemographic characteristics, COVID-19 related history and adverse events

Variables	f (%)	Variables	f (%)
Gender		**COVID-19 impact**	
Male	272 (52.1)	No impact	404 (77.4)
Female	250 (47.9)	Decreased income	106 (20.3)
Age - Median (range)	43 (18-84)	Increased income	12 (2.3)
>65	60 (11.5)	**Insurance**	
56-65	69 (13.2)	Insured	468 (89.7)
46-55	106 (20.3)	Not Insured	54 (10.3)
36-45	110 (21.1)	**Living alone or together**	
26-35	104 (19.9)	Together	484 (89.7)
18-25	73 (14)	Alone	38 (7.3)
BMI - Median (range)	23.8 (13.98-61.29)	**Living with kids**	
Normoweight	178 (34.1)	Yes	315 (60.3)
Underweight	29 (5.6)	No	207 (39.7)
Overweight	217 (41.6)	**Family/friends contracted COVID-19**	
Obese	98 (18.8)	Yes	42 (8)
Marriage		No	393 (75.3)
Married	385 (73.8)	Not Sure	87 (16.7)
Not Married	137 (26.2)	**COVID-19 test**	
Occupation		Yes	238 (45.6)
Working	370 (70.8)	No	284 (54.4)
Not Working	152 (29.2)	**Vaccine registration**	
Ethnicity		Myself	317 (60.7)
Chinese	159 (30.5)	Other	205 (39.3)
Non-Chinese	363 (69.5)	**Self Comorbidities**	
Permission		None	473 (90.6)
Yes	222 (42.5)	1 Comorbid	41 (7.9)
No	300 (57.5)	>2 Comorbidities	8 (1.5)
Income		**Family Comorbidities**	
Poor	95 (18.2)	None	426 (81.6)
Vulnerable	109 (20.9)	1 Comorbid	69 (13.2)
Aspiring Middle Class	200 (38.3)	>2 Comorbidities	27 (5.2)
Middle Class	116 (22.2)	**History of Mental Disorder**	
Upper Class	2 (0.4)	Yes	8 (1.5)
Religion		No	514 (98.5)
Muslim	334 (64)	**Smoking**	
Non Muslim	188 (36)	Yes	24 (4.6)
Education		No	498 (95.4)
Bachelor's/Master's/Doctoral degree	235 (45)	**Vaccine Stance**	
D3 or equivalent	32 (6.1)	Vaccine Acceptance	443 (84.9)
Highschool or equivalent	189 (36.2)	Vaccine Hesistance	79 (15.1)
Secondary school or equivalent	28 (5.4)	**Adverse Event Following Immunisation**	
Primary school or equivalent	24 (4.6)	Yes	124 (23.8)
Did not finish primary school	14 (2.7)	No	398 (74.7)

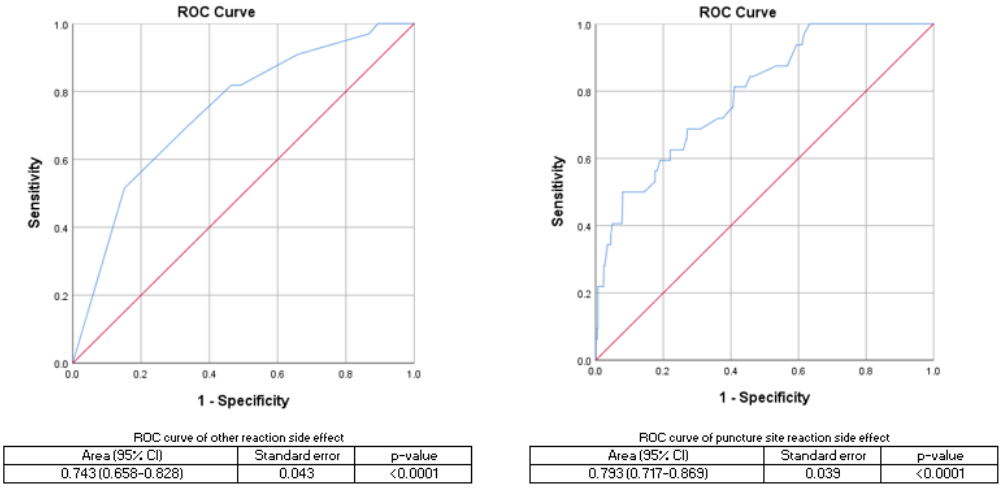
Muslims (64%) and Melayu (33.3%) are our respondents' most common religion and ethnicity, respectively. Our respondents are mostly married (73.8%) and live with other family members (92.7%),

particularly their children or grandchildren (65.1%). Most of our responders are highly educated, with 235 (45%) having a Bachelor's degree or higher. According to the findings, 468 people (89.7%) have at least one insurance, 473 people (88.7%) have no comorbidities, and 426 people (78.3%) have family members with no comorbidities. The number of smokers and those with a history of mental problems is relatively low, with 24 (4.6%) and eight (1.5%), respectively.

Even though the majority (75.3%) of respondents state that no known close connections are positive for COVID-19 and that the majority (92.5%) of respondents have never experienced COVID-19 symptoms, 238 (45.6%) of respondents have taken at least one COVID-19 test. The majority of respondents (60.7%) are self-sufficient in registering their vaccination schedule, while 300 respondents (57.5%) do not get permission for immunisation. Regarding vaccination attitudes, 443 people (84.9%) said they are vaccine acceptors.

Immune reactions (34.1%) was the most common adverse effects reported by the respondents (See Appendix Table A1). Bivariate analysis showed that immune reaction adverse event were significantly associated with female respondents, with an odds ratio (OR) of 2.18 (95% confidence interval (CI): 1.16-4.11; p=0.021), as well as those who falls to the 36-45, 26-35 and 18-25 years old age group (p=0.015, <0.0001, <0.0001, respectively)**,** and not married with an OR of 3.18 (95%CI: 1.72-5.87; p<0.0001). While the age group of 46-55, 26-45 and 18-25 years old (p=0.05, 0.028, 0.032, respectively)**,** having more than two comorbidities (OR=3.98; 95%CI: 1.38-11.47; p=0.02), and having no history of mental disorders (OR=0.1; 95%CI: 0.023-0.44; p=0.003) were associated with puncture site reactions (See Appendix Table A1). Other reactions were associated with age group of 26-35 years old (OR=11.53; 95%CI: 1.49-88.99; p=0.003), not married (OR=2.19; 95%CI: 1.07-4.5; p=0.048), and not working (OR=0.23; 95%CI: 0.07-0.75; p=0.009) (See Appendix Table A2).

Multivariate analysis showed that respondents with no family or friends that are exposed to COVID-19 are less likely to experience puncture site reaction with an OR of 0.28 (95%CI: 0.09-0.92; p=0.036), and those with no history of mental disorder were also less likely to experience this adverse event with an OR of 0.12 (95%CI: 0.024-0.62; p=0.011). As for other reactions, those in the 26-35 years old category are more likely to experience other reactions with an OR of 11.62 (95%CI: 1.5-89.92; p=0.019) (See Appendix Table A3).



ROC curve of other reaction side effect

Area (95% CI)	Standard error	p-value
0.743 (0.658-0.828)	0.043	<0.0001

ROC curve of puncture site reaction side effect

Area (95% CI)	Standard error	p-value
0.793 (0.717-0.869)	0.039	<0.0001

Figure 2. The receiver operating curve to assess discrimination of the multivariate model of other reaction (left) and puncture site reaction (right)

The Hosmer-Lemeshow test yields a p-value of 0.9 for puncture site reaction and 0.95 for other reaction with an AUC value of 0.743 (95%CI: 0.658-0.828; p<0.0001) and 0.793 (95%CI: 0.717-0.869; p<0.0001),

respectively (Figure 2). These results indicate that this model has good calibration and good discrimination.

DISCUSSION

In total, 23.8% of our respondents reported AEFI after CoronaVac vaccine administration, which is lower than a study in Turkey, with 62.5% of respondents suffering from at least one AEFI after CoronaVac administration.[25] The difference can also be observed in the most prevalent AEFI. While most studies find that the most common adverse events are injection site reactions such as pain and tenderness,[26,27] our study finds that immune reactions are the most common. Our results show similarity with another CoronaVac study by Supangat et al.[28] They found systemic symptoms to be more prevalent on the first dose, with the most common systemic symptoms being malaise (36%) and pain in the injection site for the local symptoms (45%). The disparity may be explained by the vaccination used (CoronaVac vs Pfizer–BioNTech®) and numerous demographic factors, but research on these two factors is currently limited.

We found that the variable most frequently associated with AEFI was the age difference in bivariate analysis. We also found that females were significantly associated with immune reactions. Being single was significantly associated with immune and other reactions. Having no jobs was significantly associated with other reactions. Lastly, having more than two comorbidities in a family was significantly associated with puncture site reaction.

Concerning gender analysis, our bivariate results show significant differences in immune reaction adverse events where females are 2.18 times more likely to experience this adverse event. However, on multivariate analysis, gender differences became insignificant. We hypothesised that sex as a confounder to marriage status might explain the change in results. In Indonesia, there are more married women compared to males, and our study shows that there are more married respondents than the ones not married.[29] Most married respondents who experience immune reactions may be females who experience the same adverse effect. Thus, females appear to be significantly more likely to experience adverse immune reaction events in bivariate analysis, not multivariate analysis.

In multivariate analysis, we also found similar findings regarding age differences. Respondents in the 26-35-year-old group are more likely to experience other reaction adverse events. These findings are consistent with the Food and Drug Administration (FDA) report that injection sites and systemic reactions were more prevalent in the younger group.[30] This finding is explained by the term "immunosenescence," which describes the decreasing functional capacity and reducing the immune system's efficiency with increasing age.[31] The immune systems of older people would produce fewer responses than younger people, thus explaining the findings that younger respondents experience more AEFI.[13]

In multivariate analysis, we also discovered that having no history of family or friends contracting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was significantly associated with puncture site reaction and that having no history of mental illness was significantly associated with puncture site reaction. However, together with marital status, occupation, and comorbidities in the family, the exact mechanism of these demographic characteristics associated with adverse vaccination effects remains unknown.

Our study is naturally limited by its cross-sectional design that relies on self-assessed and self-reported outcomes. In Indonesia, any vaccinee that experience adverse events after vaccination is recommended to report to the government to confirm whether the adverse events felt were actual or not. It is well known that psychosocial factors, such as expectations, emotions, and attitude, could modulate physical adverse event responses to COVID-19 vaccines.[32] This means that when using a questionnaire, respondents who did not feel

any AEFI felt that they were experiencing the listed adverse events when filling out the questionnaire with no way to confirm it. There are also possibilities where respondents could downplay the AEFI they were experiencing at the time. Another downside of our study is that we did not list all AEFI, such as diarrhea, headaches, and vomiting. We only observed the respondents for 30 minutes so we could not analyse late-onset AEFI.[11,33] Although we provided an option where the respondents could write their answer, this could prompt the respondent only to answer the listed AEFI. Our study is also limited to AEFI of the first dose vaccine only. Lastly, our study only achieves a 47.7% (1279/2679) response rate, introducing a non-response bias.[34]

Despite some limitations, our study also has its edges. Our study is the first to look into the association between various demographic factors and COVID-19 vaccine AEFI, thus providing valuable data for further studies concerning COVID-19 vaccine AEFI in Indonesia. Our study is also one of the few vaccine studies conducted in person in Indonesia. Therefore, our study does not suffer from limitations due to using web-based surveys such as sampling and responder bias.[35,36] The multivariate model of our study has good calibration and moderate discrimination, further enhancing its results and usage in clinical settings

CONCLUSION

Younger respondents tend to experience more COVID-19 vaccine adverse events than older groups. Other demographical variables associated with COVID-19 vaccine adverse are no family or friends who contracted COVID-19 and no history of any mental disorders. Further independent epidemiological studies for COVID-19 vaccine AEFI should be carried out to increase public confidence in vaccine safety and accelerate its uptake process. Upcoming studies should also compare vaccines from other manufacturers and investigate demographical variables' associations with COVID-19 vaccine adverse events.

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AUTHOR CONTRIBUTION

Conceptualisation: Yanto TA, Octavius GS, Methodology: Heriyanto RS, Octavius GS; formal analysis, investigation, data curation: Heriyanto RS, Octavius GS, Nisa H, Ienawi C, Pasai HE; Supervision: Yanto TA; Writing – original draft: Heriyanto RS, Yanto TA, Octavius GS, Nisa H, Ienawi C, Pasai HE; Writing – review, and editing: Heriyanto RS, Yanto TA, Octavius GS.

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APPENDIX A: Additional Table

Table A1. Analisis Bivariat Immune reaction and Puncture site reaction based on respondent characteristics

Variables	Immune Reaction				Puncture Site Reaction			
	None	Yes	OR (95% CI)	p	None	Yes	OR (95% CI)	p
Gender								
Male	256 (94.1)	16 (5.9)	2.18 (1.16-4.11)	**0.021**	258 (94.9)	14 (5.1)	1.43 (0.7 - 2.94)	0.427
Female	220 (88)	30 (12)			232 (92.8)	18 (7.2)		
Age -								
>65	60 (100)	0 (0)	Ref	Ref	60 (100)	0(0)	Ref	Ref
56-65	67 (97.1)	2 (2.9)		0.499	66 (95.7)	3 (4.3)		0.248
46-55	103 (97.2)	3 (2.8)		0.554	99 (93.4)	7 (6.6)		**0.05**
36-45	100 (90.9)	10 (9.1)		**0.015**	102 (92.7)	8 (7.3)		0.052
26-35	87 (83.7)	17 (16.3)		**<0.0001**	96(92.3)	8 (7.7)		**0.028**
18-25	59 (80.8)	14 (19.2)		**<0.0001**	67 (91.8)	6 (8.2)		**0.032**
BMI - Median (range)								
Normoweight	157 (88.2)	21 (11.8)	Ref	Ref	168 (94.4)	10 (5.6)	Ref	Ref
Underweight	28 (96.6)	1 (3.4)	0.27 (0.04-2.07)	0.325	29 (100)	0 (0)	-	0.363
Overweight	199 (91.7)	18 (8.3)	0.68 (0.35-1.31)	0.321	207 (95.4)	10 (4.6)	0.81 (0.33-1.99)	0.822
Obese	92 (93.9)	6 (6.1)	0.48 (0.19-1.25)	0.191	86 (87.8)	12 (12.2)	2.34 (0.97-5.64)	0.087
Marriage								
Married	362 (94)	23 (6)	3.18 (1.72-5.87)	**<0.0001**	365 (94.8)	20 (5.2)	1.75 (0.83-3.69)	0.198
Not Married	114 (83.2)	23 (16.8)			125 (91.2)	12 (8.8)		
Occupation								
Working	334 (90.2)	36 (9.8)	0.65 (0.31-1.34)	0.312	343(92.7)	27 (7.3)	0.43 (0.16-1.13)	0.12
Not Working	142 (93.5)	10 (6.5)			147 (96.7)	5 (3.3)		
Ethnicity								
Chinese	148 (93.1)	11 (6.9)	1.44 (0.71 - 2.91)	0.399	147 (92.5)	12 (7.5)	0.71 (0.34-1.5)	0.487
Non-Chinese	328 (90.4)	35 (9.6)			343 (94.5)	20 (5.5)		
Permission								
Yes	200 (90.1)	22 (9.9)	0.79 (0.43-1.45)	0.545	204 (91.9)	18 (8.1)	0.56 (0.27-1.14)	0.151
No	276 (92)	24 (8)			286 (95.3)	14 (4.7)		
Income								
Aspiring Middle Class	183 (91.5)	17 (8.5)	Ref	Ref	187 (93.5)	13 (6.5)	Ref	Ref
Poor	84 (88.4)	11 (11.6)	1.41 (0.63-3.14)	0.528	89 (93.7)	6(6.3)	0.97 (0.36-2.664)	1

Vulnerable	95 (87.2)	14 (12.8)	1.59 (0.75-3.36)	0.309	106 (97.2)	3 (2.8)	0.41 (0.11-1.46)	0.188
Middle Class	112 (96.6)	4 (3.4)	0.38 (0.13-1.17)	0.102	107 (92.2)	9 (7.8)	1.21 (0.5-2.92)	0.846
Upper Class	2 (100)	0 (0)	-	1	1 (50)	1 (50)	14.39 (0.85-243.33)	0.134
Religion								
Muslim	300 (89.8(	34 (10.2)	0.6 (0.3-1.19)	0.191	317(94.9)	17 (5.1)	1.62 (0.79-3.32)	0.258
Non Muslim	176 (93.6)	12 (6.4)			173 (92)	15 (8)		
Education								
Bachelor's/Master's/Doctoral degree	211 (89.8)	24 (10.2)	Ref	Ref	213 (90.6)	22 (9.4)	Ref	Ref
D3 or equivalent	29 (90.6)	3 (9.4)	0.91 (0.26-3.21)	1	32 (100)	0	-	0.087
Highschool or equivalent	171 (90.5)	18 (9.5)	0.93 (0.49-1.76)	0.942	181 (95.8)	8 (4.2)	0.43 (0.19-0.98)	0.063
Secondary school or equivalent	28 (100)	0 (0)	-	0.088	28 (100)	0 (0)	-	0.144
Primary school or equivalent	24 (100)	0 (0)		0.142	24 (100)	0		0.239
Did not finish primary school	13 (92.9)	1 (7.1)	0.68 (0.09-5.39)	1	12 (85.7)	2 (14.3)	1.61 (0.34-7.68)	0.632
COVID-19 impact								
No impact	367 (90.8)	37 (9.2)	Ref	Ref	382 (94.6)	22 (5.4)	Ref	Ref
Decreased income	99 (93.4)	7 (6.6)	0.7(0.3-1.62)	0.523	96 (90.6)	10 (9.4)	1.81 (0.83-3.95)	0.2
Increased income	10 (83.3)	2 (16.7)	1.98 (0.42-9.39)	0.312	12 (100)	0 (0)	-	1
Insurance								
Insured	425 (90.8)	43 (9.2)	0.58 (0.17-1.94)	0.61	438 (93.6)	30 (6.4)	0.56 (0.13-2.42)	0.627
Not Insured	51 (94.4)	3 (5.6)			52 (96.3)	2 (3.7)		
Living alone or together								
Together	442 (91.3)	42 (8.7)	1.24 (0.42-3.66)	0.928	457 (94.4)	27 (5.6)	2.57 (0.93-7.09)	0.127
Alone	34 (89.5)	4 (10.5)			33 (86.8)	5 (13.2)		
Living with kids								
Yes	290 (92.1)	25 (7.9)	1.31 (0.71 - 2.41)	0.476	296 (94)	19 (6)	1.04 (0.5 - 2.16)	1
No	186 (89.9)	21(10.1)			194 (93.7)	13 6.3)		
Family/friends contracted COVID-19								
Yes	39 (92.9)	3 (7.1)	Ref	Ref	37 (88.1)	5 (11.9)	Ref	Ref
No	362 (92.1)	31 (7.9)	1.11 (0.33-3.81)	1	374 (95.2)	19(4.8)	0.38 (0.13-1.07)	0.121
Not Sure	75 (86.2)	12 (13.8)	2.08 (0.55-7.81)	0.383	79 (90.8)	8 (9.2)	0.75 (0.23-2.45)	0.867
COVID-19 test								
Yes	218 (91.6)	20 (8.4)	1.1 (0.6-2.02)		221 (92.9)	17 (7.1)	0.73 (0.35-1.48)	0.484
No	258 (90.8)	26 (9.2)			269 (94.7)	15 (5.3)		

Vaccine registration								
Myself	288 (90.9)	29 (9.1)	0.9 (0.48-1.68)	0.858	294 (92.7)	23 (7.3)	0.59 (0.27-1.3)	0.252
Other	188 (91.7)	17 (8.3)			196 (95.6)	9 (4.4)		
Self Comorbidities								
None	428 (90.5)	45 (9.5)	Ref	Ref	445 (94.1)	28 (5.9)	Ref	Ref
1 Comorbid	40 (97.6)	1 (2.4)	0.24 (0.03-1.77)	0.16	38 (92.7)	3 (7.3)	1.26 (0.37 - 4.32)	0.728
>2 Comorbidities	8 (100)	0 (0)	-	1	7 (87.5)	1 (12.5)	2.27 (0.27-19.1)	0.394
Family Comorbidities								
None	387 (90.8)	39 (9.2)	Ref	Ref	403 (94.6)	23 (5.4)	Ref	Ref
1 Comorbidity	64 (92.8)	5 (7.2)	0.78 (0.29-2.04)	0.819	65 (94.2)	4 (5.8)	1.08 (0.36-3.22)	0.78
>2 Comorbidities	25 (92.6)	2 (7.4)	0.79 (0.18-3.48)	1	22 (81.5)	5 (18.5)	3.98 (1.38-11.47)	**0.02**
History of Mental Disorder								
Yes	8 (100)	0 (0)	-	0.797	5 (62.5)	3 (37.5)	0.1 (0.023-0.44)	**0.003**
No	468 (91.1)	46 (8.9)			485 (94.4)	29 (5.6)		
Smoking								
Yes	22 (91.7)	2 (8.3)	1.06 (0.24-4.68)	1	20 (83.3)	4(16.7)	0.3 (0.01-0.93)	0.052
No	454 (91.2)	44 (8.8)			470 (94.4)	28 (5.6)		
Vaccine Stance								
Vaccine Acceptance	401 (90.5)	42 (9.5)	0.51 (0.18-1.46)	0.281	415 (93.7)	28 (6.3)	0.79 (0.27-2.32)	0.8
Vaccine Hesitance	75 (94.9)	4 (5.1)			78 (98.7)	1 (1.3)		

Table A2. Analisis Bivariat Vagal Reaction and Other reaction based on respondent characteristics

Variables	Vagal reaction				Other reaction			
	None	Yes	OR (95% CI)	p-value	None	Yes	OR (95% CI)	p-value
Gender								
Male	259 (95.2)	13 (4.8)	0.92 (0.4-2.09)	1	253 (93)	19 (7)	0.79 (0.39-1.61)	0.639
Female	239 (95.6)	11 (4.4)			236 (94.4)	14 (5.6)		
Age								
>65	59 (98.3)	1 (1.7)	Ref	Ref	59 (98.3)	1 (1.7)	Ref	Ref
56-65	68 (98.6)	1 (1.4)	0.87 (0.05-14.18)	1	68 (98.6)	1 (1.4)	0.87 (0.05 (14.18)	1
46-55	100 (94.3)	6 (5.7)	3.54 (0.42-30.13)	0.424	103 (97.2)	3 (2.8)	1.72 (0.18-16.89)	1
36-45	103 (93.6)	7 (6.4)	4.01 (0.48-33.39)	0.263	103 (93.6)	7 (6.4)	4.01 (0.48-33.39)	0.263
26-35	97 (93.3)	7(6.7)	4.26 (0.51-35.48)	0.26	87 (83.7)	17 (16.3)	11.53 (1.49-88.99)	**0.003**
18-25	71 (97.3)	2 (2.7)	1.66 (0.15-18.79)	1	69 (94.5)	4 (5.5)	3.42 (0.37- 31.45)	0.378
BMI -								
Normoweight	169 (94.9)	9 (5.1	Ref	Ref	166 (93.3)	12 (6.7)	Ref	Ref
Underweight	28 (96.6)	1 (3.4)	0.67 (0.08-5.5)	1	28 (96.6)	1 (3.4)	0.49 (0.06-3.95)	0.699
Overweight	208 (95.9)	9 (4.1)	0.81 (0.32-2.09)	0.851	203 (93.5)	14 (6.5)	0.95 (0.43-2.12)	1
Obese	93 (94.9)	5 (5.1)	1.01 (0.33-3.1)	1	92 (93.9)	6 (6.1)	0.9 (0.33-2.48)	1
Marriage								
Married	365 (94.8)	20 (5.2)	0.55 (0.18-1.64)	0.347	366 (95.1)	19 (4.9)	2.19 (1.07 - 4.5)	**0.048**
Not Married	133 (97.1)	4 (2.9)			123 (89.8)	14 (10.2)		
Occupation								
Working	352 (95.1)	18 (4.1)	0.79 (0.31-2.05)	0.806	340 (91.9)	30 (8.1)	0.23 (0.07-0.75)	**0.009**
Not Working	146 (96.1)	6 (3.9)			149 (98)	3 (2)		

Ethnicity								
Chinese	153 (96.2)	6 (3.8)	1.33 (0.52-3.42)	0.713	148 (93.1)	11 (6.9)	0.87 (0.41-1.84)	0.861
Non-Chinese	345 (95)	18 (5)			341 (93.9)	22 (6.1)		
Permission								
Yes	215 (96.8)	7 (3.2)	1.85 (0.75 - 4.53)	0.253	206 (92.8)	16 (7.2)	0.77 (0.38-1.57)	0.594
No	283 (94.3)	17 (5.7)			283 (94.3)	17 (5.7)		
Income								
Aspiring Middle Class	193 (96.5)	7 (3.5)	Ref	Ref	188 (94)	12 (6)	Ref	Ref
Poor	93 (97.9)	2 (2.1)	0.59 (0.12-2.91)	0.773	90 (94.7)	5 (5.3)	0.87 (0.29-2.55)	1
Vulnerable	102 (93.6)	7 (6.4)	1.89 (0.65-5.54)	0.371	100 (91.7)	9 (8.3)	1.41 (0.58 - 3.46)	0.605
Middle Class	108 (93.1)	8 (6.9)	2.04 (0.72-5.79)	0.274	109 (94)	7 (6)	1 (0.39-2.63)	1
Upper Class	2 (100)	0 (0)	-	1	2 (100)	0(0)	-	1
Religion								
Muslim	319 (95.5)	15 (4.5)	1.07 (0.46)-2.49)	1	313 (93.7)	21 (6.3)	1.01 (0.49-2.12)	1
Non Muslim	179 (95.2)	9 (4.8)			176 (93.6)	12 (6.4)		
Education								
Bachelor's/Master's/Doctoral degree	220 (93.6)	15 (6.4)	Ref	Ref	216 (91.9)	19 (8.1)	Ref	Ref
D3 or equivalent	31 (96.9)	1 (3.1)	0.47 (0.06-3.71)	0.702	30 (93.8)	2 (6.3)	0.76 (0.17 - 3.42)	1
Highschool or equivalent	183 (96.8)	6 (9.4)	0.48 (0.18-1.27)	0.198	179 (94.7)	10 (5.3)	0.64 (0.29-1.4)	0.348
Secondary school or equivalent	27 (96.4)	1 (3.6)	0.54 (0.07-4.28)	1	27 (96.4)	1 (3.6)	0.42 (0.05-3.27)	0.705
Primary school or equivalent	23 (95.8)	1 (4.2)	0.64 (0.08-5.05)	1	24 (100)	0 (0)	-	0.232
Did not finish primary school	14 (100)	0 (0)	-	1	13 (92.9)	1 (7.1)	0.87 (0.11-7.05)	1
COVID-19 impact								

No impact	386 (95.5)	18 (4.5)	Ref	Ref	381 (94.3)	23 (5.7)	Ref	Ref
Decreased income	100 (94.3)	6 (5.7)	1.29 (0.49-3.33)	0.792	98 (92.5)	8 (7.5)	1.35 (0.59-3.12)	0.629
Increased income	12 (100)	0(0)	-	1	10 (83.3)	2 (16.7)	3.31 (0.69-16.01)	0.158
Insurance								
Insured	448 (95.7)	20 (4.3)	1.79 (0.59-5.45)	0.297	438 (93.6)	30 (6.4)	0.86 (0.25-2.91)	1
Not Insured	50 (92.6)	4 (7.4)			51 (94.4)	3 (5.6)		
Living alone or together								
Together	461 (95.2)	23 (4.8)	0.54 (0.07-4.12)	1	456 (94.2)	28 (5.8)	2.47 (0.89-6.81)	0.146
Alone	37 (97.4)	1 (2.6)			33 (86.8)	5 (13.2)		
Living with kids								
Yes	301 (95.6)	14 (4.4)	1.09 (0.48 - 2.51)	1	297 (94.3)	18(5.7)	1.29 (0.63-2.62)	0.603
No	197 (95.2)	10 (4.8)			192 (92.8)	15 (7.2)		
Family/friends contracted COVID-19								
Yes	42 (100)	0 (0)	Ref	Ref	39 (92.9)	3 (7.1)	Ref	Ref
No	375 (95.4)	18 (4.6)	-	0.239	373 (94.9)	20 (5.1)	0.69 (0.19-2.45)	0.477
Not Sure	81 (93.1)	6 (6.9)		0.176	77 (88.5)	10 (11.5)	1.69 (0.44-6.49)	0.545
COVID-19 test								
Yes	227 (95.4)	11 (4.6)	0.99 (0.44-2.25)	1	223 (93.7)	15 (6.3)	1.01 (0.5-2.04)	1
No	271 (95.4)	13 (4.6)			266 (93.7)	18 (6.3)		
Vaccine registration								
Myself	300 (94.6)	17 (5.4)	0.62 (0.25-1.53)	0.41	297 (93.7)	20 (6.3)	1 (0.49-2.07)	1
Other	198 (96.6)	7 (3.4)			192 (93.7)	13 (6.3)		
Self Comorbidities								

None	450 (95.1)	23 (4.9)	Ref	Ref	440 (93)	33 (7)	Ref	Ref
1 Comorbidity	40 (97.6)	1 (2.4)	0.49 (0.06-3.72)	0.749	41 (100)	0 (0)	-	0.097
>2 Comorbidities	8 (100)	0 (0)	-	1	8 (100)	0 (0)		1
Family Comorbidities								
None	403 (94.6)	23 (5.4)	Ref	Ref	400 (93.9)	26 (6.1)	Ref	Ref
1 Comorbidity	69 (100)	0 (0)	-	0.058	66 (95.7)	3 (4.3)	0.69 (0.21-2.38)	0.783
>2 Comorbidities	26 (96.3)	1 (3.7)	0.67 (0.09-5.19)	1	23 (85.2)	4 (14.8)	2.68 (0.86-8.31)	0.094
History of Mental Disorder								
Yes	7 (87.5)	1 (12.5)	0.33 (0.04-2.78)	0.316	8 (100)	0	-	0.993
No	491 (95.5)	23 (4.5)			481(93.6)	33 (6.4)		
Smoking								
Yes	24 (100)	0 (0)	-	0.618	23 (95.8)	1 (4.2)	1.58 (0.21-12.01)	1
No	474 (95.2)	24 (4.8)			466 (93.6)	32 (6.4)		
Vaccine Stance								
Vaccine Acceptance	423 (95.5)	20 (4.5)	1.13 (0.38 - 3.39)	0.773	411 (92.8)	32 (7.2)	0.17 (0.02-1.22)	0.044
Vaccine Hesistance								

Table A3. Multivariate analysis of variables towards COVID-19 vaccine adverse events following immunization

Variables	Immune reaction		Puncture site reaction		Vagal reaction		Other reaction	
	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Gender								
Male	1.89 (0.98-3.66)	0.059	-		-		-	
Female								
Age								
>65							-	
56-65							0.97 (0.06-15.89)	0.982
46-55	-		-		-		1.83 (0.19-18.1)	0.604
36-45							4.01 (0.48-33.44)	0.2
26-35							11.62 (1.5-89.92)	**0.019**
18-25							3.27 (0.36-30.17)	0.295
BMI								
Normoweight					-		-	
Underweight	-		- -	-				
Overweight			0.69 (0.26 - 1.79)	0.443				
Obese			1.84 (0.72-4.73)	0.204				
Religion								
Muslim	-		2.13 (0.95-4.76)	0.066	-		-	
Non-Muslim								
Education								
Bachelor's/Master's/Doctoral	-		-		-		-	
D3 or equivalent								

High school or equivalent		0.5 (0.21-1.23)	0.133				
Secondary school or equivalent		-					
Primary school or equivalent							
Did not finish primary school		2.08 (0.38-11.48)	0.402				
Family/friends contracted COVID-19							
Yes				-		-	
No	-	0.28 (0.09-0.92)	**0.036**				
Not Sure		0.64 (0.17-2.48)	0.521				
COVID-19 test							
Yes	-	-		-		-	
No							
Vaccine registration							
Myself	-	0.44 (0.18-1.08)	0.072	-		-	
Other							
Family Comorbidities							
None						-	
1 Comorbidity	-	1.01 (0.31-3.29)	0.993	-	-	-	
>2 Comorbidities		4.12 (1.29-13.15)	0.017	0.67 (0.09-5.19)		0.705	
History of Mental Disorder							
Yes	-	0.12 (0.024-0.62)	**0.011**	-		-	
No							
Smoking							
Yes	-	-		-		-	
No							
Vaccine Stance							
Vaccine Acceptance	-	-		-		0.19 (0.03-1.4)	0.103
Vaccine Hesistance							

aOR= adjusted OR