Microbes and Infectious Diseases 2025; 6(3): 1006-1014

Microbes and Infectious Diseases

Journal homepage: https://mid.journals.ekb.eg/

Original article

Factors influencing knowledge, attitude, and behavior on COVID-19 vaccination program in Indonesia

Brigitta Harla[1], Maria Mardalena Martini Kaisar [2], Soegianto Ali [3*]

1- School of Medicine and Health Sciences Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia
2- Department of Parasitology, School of Medicine and Health Sciences Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia
3-Department of Medical Biology, School of Medicine and Health Sciences Atma Jaya Catholic University of Indonesia, Jakarta, Indonesia

ARTICLE INFO

Article history:
Received 9 July 2024
Received in revised form 5 August 2024
Accepted 8 August 2024

Keywords:
COVID-19 vaccine
Knowledge
Attitude
Behaviour
Self-reported online questionnaire
Influencing factors
False rumours

ABSTRACT

Background: Vaccination has been one of the globally used efforts to minimize the spread of COVID-19 disease, including in Indonesia. The rising number of false rumours has been a challenge for the COVID-19 booster vaccination program in Indonesia. From this perspective, it is important for the community to have adequate knowledge and a positive attitude toward the COVID-19 vaccine. This study aimed to analyse the factors that influence the community's knowledge, attitude, and behaviour toward the COVID-19 vaccination program among Indonesians. **Methods:** This is a cross-sectional study using an online survey form distributed through social media using a snowball sampling method, responded by 595 participants during the period between June and August 2021. The survey assessed factors that influence Indonesian adults' knowledge about COVID-19 and factors that influence their attitude toward COVID-19 vaccination. **Results:** A total of 576 out of 595 filled-in questionnaires were eligible for analysis. Among respondents, 85.4% already received mandatory vaccination programs in their childhood, and almost half of them also received additional non-mandatory vaccine programs. Almost all of the respondents expressed a positive attitude toward the COVID-19 vaccination program. **Conclusions:** The Indonesian community in general had adequate knowledge and a positive attitude towards COVID-19 vaccination. Those factors significantly influenced the attitude and affected their behaviour toward acceptance of the COVID-19 vaccination and its future vaccination booster program.

Introduction

Since March 11, 2020, coronavirus disease 2019 (COVID-19) has been declared a pandemic disease by the World Health Organization [1]. Indonesia confirmed its first COVID-19 case on March 2, 2020, and the incidence has rapidly increased, despite the adoption of numerous preventive measures such as Large Scale Social Restrictions (LSSR), Community Activities Restrictions Enforcement (CARE), and other health protocols [2,3]. As of early January 2023, approximately 6.7 million COVID-19 cases have been reported in Indonesia [4]. In response to the catastrophic COVID-19 pandemic, the Indonesian government has undertaken several efforts, including the COVID-19 vaccination program, to limit the virus's transmission. Until January 2023, the COVID-19 vaccination program included 4

DOI: 10.21608/MID.2024.302858.2064
* *Corresponding author:* Soegianto Ali
E-mail address: soegianto.ali@atmajaya.ac.id

doses. The first and second doses served as basic and mandatory vaccination, while the third and fourth doses served as booster vaccinations and were voluntary. The Indonesian Food and Drug Administration (BPOM = Badan Pengawas Obat dan Makanan) has approved 13 vaccines for COVID-19 through January 2023 and has announced the utilization of the nationally developed vaccines (IndoVac and InaVac) as a second booster [5]. In addition, the country has also received COVID-19 vaccine supplies from the COVAX alliance in the initial vaccination program [6].

According to a survey conducted by the **Ministry of Health *et al*.** in November 2020, 7.6% of Indonesian citizens refuse the COVID-19 vaccine and 27.6% are still hesitant to receive the vaccination [7]. The hesitancy had an impact on the COVID-19 vaccine coverage as only 74.56% of the targeted population received the second dose compared to 86.88% for the first dose [8].

In January 2023, the Indonesian government declared that the fourth dose of the COVID-19 vaccine would be administered as a booster for immunogenicity against COVID-19. These second booster vaccines were specifically addressed to the general public above the age of 18 [5]. Both the third and fourth doses of the COVID-19 vaccine are booster and voluntary, although the third vaccine certification was needed for flying using commercial airlines as a substitute for COVID-19 antigen or PCR testing. However, as of January 2023, the number of Indonesians who have gotten the third dose of COVID-19 vaccination has only achieved 29.23% of the previously established goal [9]. There has been a challenge due to rising numbers of false rumours about the COVID-19 vaccine spreading on social media, as most Indonesians (54%) preferred to get information concerning the COVID-19 vaccine from these platforms (WhatsApp, Facebook, Instagram, etc.), despite the poor authenticity and reliability of the information [7]. Therefore, it is crucial that individuals have adequate knowledge and a positive attitude toward the COVID-19 vaccine to reduce the spread of the virus in Indonesia more effectively. This study aimed to analyse the factors that influence the community's knowledge, attitude, and behaviour on the COVID-19 vaccination program among adults. The insight into this phenomenon is increasingly crucial since the Indonesian government has just begun administering the second booster vaccine in January 2023 against COVID-19.

Methods

This cross-sectional study was conducted between June 2021 and August 2021. In this study, we assessed factors that influence Indonesian adults' knowledge about COVID-19 as well as factors that influence their attitude towards COVID-19 vaccination and its booster program. Respondents were recruited using the snowball sampling method. A questionnaire was distributed through social media, such as WhatsApp, Line, Instagram, and others. Before answering the set of questions, participants were requested to read an explanation regarding anonymity and provide informed consent to participate in the study. At the age of 17, citizens in Indonesia are issued an identity card, which signifies adulthood and grants them the ability to make legal decisions, including giving informed consent. For this reason, the responses from participants who were younger than 17 years old or who did not complete the questionnaire were excluded from the analysis. In total 576 out of 595 respondents were included. This study has been approved by the Institutional Ethics Commission of the School of Medicine, Atma Jaya Catholic University of Indonesia (12/06/KEP-FKIKUAJ/2021).

The questionnaire **(Supplementary file 1**) used in this study has been previously validated [10,11]. It consisted of three sections, with the first section intended to collect information on demographic data, including participants' age (categorized into late adolescents and early adults (17-35 years); and late adults including elderly (>35)) [12]; gender; location of domicile (Jabodetabek (Jakarta-Bogor-Depok-Tangerang-Bekasi), Java and Bali Islands, Outside Java, and Bali Islands); education status (low, for whom has or has not completed the elementary school, middle for whom has or has not completed the junior and senior high school, and high for whom went to colleges and universities); economic status (The value stated in Indonesian currency based on the monthly expenses: Low (<IDR 530.000), Middle (IDR 530.000-6.000.000) and High (>IDR 6.000.000) [13]; and previous vaccination of either mandatory immunization (i.e.: hepatitis B, polio, BCG, measles and DPT) or additional non-compulsory immunization (i.e.: MMR, PCV, rotavirus, hepatitis A, varicella, influenza, HPV,

JEB, dengue, typhoid, DPT-HB-HiB). In this study, we have recorded the data regarding the social media exposure to the COVID-19 vaccination program (per day: seldom (<1), moderate (2-3) and frequent (>3)); support from participant's circle as other's influence (parents, relatives, close friends, teachers, community leaders, and religious leaders); and participant's interest in getting vaccinated against COVID-19. The second section includes 13 questions assessing factors that influence knowledge regarding COVID-19 (for each correct answer, the participant was assigned a score of "1", while incorrect answers and choosing the option "I do not know" were given a score of "0"). The third section consisted of seven questions assessing factors that influence attitudes towards the COVID-19 vaccination program (for each positive response, the participants were assigned a score of "1", while for negative responses and hesitation were given a score of 0). Furthermore, the participants were also questioned about their willingness to pay for the COVID-19 vaccine for booster vaccination. By the end of the questionnaire, we attempted to assess whether knowledge-attitude translated to positive behaviour as determined by the COVID-19 vaccination status of the respondents (either first or first and second dose).

The data in the study was collected in a Google Sheet, which was entered, coded, and analysed using SPSS version 22.0 (IBM, Chicago, IL). A descriptive analysis was carried out to determine the participants' distribution of demographic data. Evaluation of the relationship of each independent variable with the intervening variable as well as the dependent variable was conducted using bivariate analysis, presented as an odds ratio (OR) with a 95% confidence interval (CI). A non-parametric Chi-square independent test was carried out, with a p-value <0.05 considered statistically significant. Data were visualized using GraphPad Prism 8.0 (GraphPad Software, La Jolla, CA, USA).

Results

Demographic characteristics

A total of 595 individuals were registered as participants; however, 19 participants were excluded due to exclusion criteria, leaving 576 participants eligible for analysis. Depicted details of the participants selected for this study are in **supplementary figure (1)**. Most of the respondents are between 17-35 years old (71.4%); slightly more than 70% of participants were classified as early adults; 69.3% are female; and most were domiciled in Jabodetabek (73.4%). The majority of the respondents had been vaccinated for mandatory vaccination programs (BCG, DPT, polio, hepatitis B, measles/MMR) as provided by the government (85.4%), and some (46.7%) also had received additional vaccines (influenza, HPV, etc). In terms of both education and economic status, approximately 50% of the participants were in the middle category. It is recorded that most participants had completed their mandatory vaccination and nearly half had received additional non-compulsory vaccination. About 40% of participants had frequent social media exposure (per day) to the COVID-19 vaccination. The majority of participants in this study were willing to receive the COVID-19 vaccine and over 97% of participants acknowledged receiving support from their social circle. The vast majority (>80%) of the participants have good knowledge of and a positive attitude toward the COVID-19 vaccination program (**Supplementary table 1**).

Knowledge and attitude toward the COVID-19 vaccination program

Participants were assumed to have good knowledge if they answered more than seven out of thirteen questions correctly. Meanwhile, a participant's attitude towards the COVID-19 vaccination program was considered positive if they responded positively to more than five out of seven statements. The distribution of the score proportions of the participants tends to be good for knowledge and positive for attitude are shown in **supplementary figure (2)** and **supplementary figure (3)**. A chi-square independent test was carried out to evaluate the association between variables. **Table 1** summarizes the putative factors that could influence knowledge and attitude toward the COVID-19 vaccination program.

According to the data analysis, age, mandatory vaccination status, and interest in receiving the COVID-19 vaccination were potential factors correlated with knowledge about the COVID-19 vaccination program. Regarding age, knowledge of the COVID-19 vaccination program is substantially lower among older adults. Participants who completed their mandatory vaccination are 2.5 times more likely to have superior knowledge of the COVID-19 vaccination. The participants in this study who have expressed an interest in receiving the COVID-19 vaccine are five

times more knowledgeable than those who do not. Vaccination history, social media exposure, the influence of others, and knowledge were significant factors influencing positive attitudes. Mandatory and additional vaccination experiences doubled the positive attitude, which in turn influenced the COVID-19 vaccination program. The attitude toward the COVID-19 vaccination program has been strongly (p<0.001) influenced by social media exposure and others' influence. Overall, there was a significant correlation between adequate knowledge of the COVID-19 vaccination program and a positive attitude.

Behaviour as an upshot of knowledge-attitude axis interaction

The vaccination status of each participant was recorded to evaluate their knowledge and attitude toward the COVID-19 vaccination program. In this study, 443 (76.9%) participants had received either the first or second doses of the COVID-19 vaccine, indicating positive behaviour toward the COVID-19 vaccination program. The remaining 133 individuals have yet to be vaccinated; 81.2% (108) expressed their interest in receiving the COVID-19 vaccination, while the remaining participants did not. This specific group of interested participants who had not received the COVID-19 vaccination was dominated by early adults (60.9%) and those domiciled in Jabodetabek (64.7%) (**Supplementary table 2**). Age and domicile slightly influenced positive behaviour. Strikingly, as expected, both knowledge (0.003) and attitude (<0.001) significantly lead to positive behaviour upon receiving the COVID-19 vaccine for individuals with the likelihood of two and 4.5 times, respectively (**Table 2**).

Table 1. Factors influencing knowledge and attitude toward the COVID-19 vaccination program.

Factors		Knowledge				Attitude			
		Poor	Good	OR (95% CI)*	*p*-value	Negative	Positive	OR (95% CI)*	*p*-value
		n (%)				n (%)			
Age (years old)	17-35	61 (14.8)	350 (85.2)	0.603 (0.382-0.951)	0.029	NA			
	>35	37 (22.4)	128 (77.6)						
Educational status	Low	0 (0.0)	1 (100)	NA	0.335				
	Middle	46 (15.0)	261 (85.0)						
	High	52 (19.4)	216 (80.6)						
Economic status	Low	28 (17.0)	137 (83.0)	NA	0.682				
	Middle	46 (16.0)	242 (84.0)						
	High	24 (19.5)	99 (80.5)						
Mandatory vaccination	Not completed	25 (29.8)	59 (70.2)	2.432 (1.432-4.131)	0.001	18 (21.4)	66 (78.6)	2.123 (1.176-3.834)	0.011
	Completed	73 (14.8)	419 (82.5)			56 (11.4)	436 (88.6)		
Additional vaccination	Not completed	56 (18.20)	251 (81.8)	1.206 (0.778-1.870)	0.402	48 (15.6)	259 (84.4)	1.732 (1.042-2.880)	0.033
	Completed	42 (15.6)	227 (84.4)			26 (9.37)	243 (90.3)		
Social media	Seldom	24 (19.2)	101 (80.8)	NA	0.136	29 (23.2)	96 (76.8)	NA	<0.001
	Moderate	44 (19.7)	179 (80.3)			32 (14.3)	191 (85.7)		
	Frequent	30 (13.2)	198 (86.8)			13 (5.7)	215 (94.3)		
Interest in COVID-19 vaccination	Not interested	12 (48.0)	13 (52.0)	4.991 (2.203-11.306)	<0.001	NA			
	Interested	86 (15.6)	465 (84.4)						
Other's influence	Unsupportive	NA				8 (57.1)	6 (42.9)	10.020 (3.372-29.779)	<0.001
	Supportive					66 (11.7)	496 (88.3)		
Knowledge	Poor					26 (26.5)	72 (73.5)	3.235 (1.888-5.543)	<0.001
	Good					48 (10.0)	430 (90.0)		

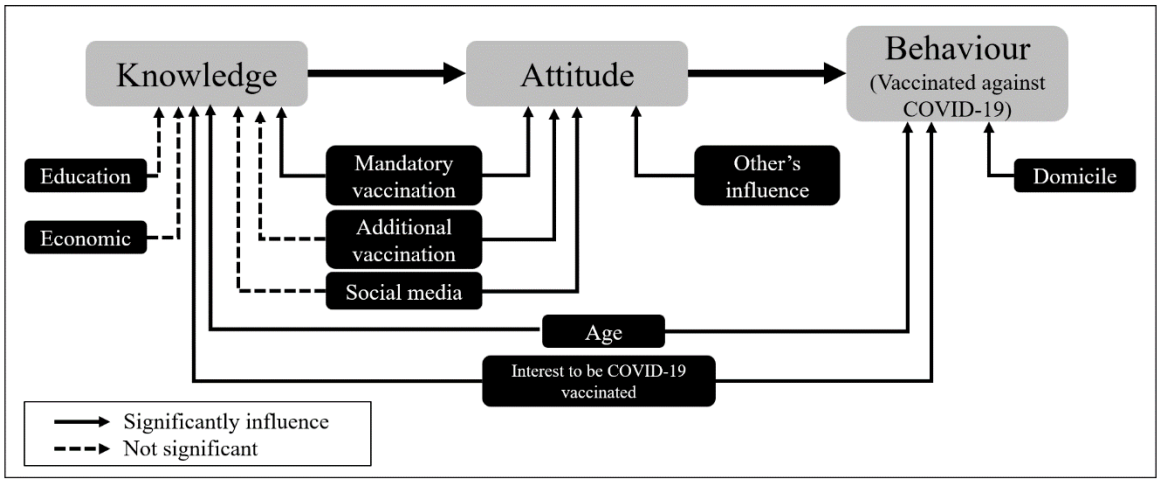
* OR was calculated as the risk of poor knowledge and negative attitude toward the first-row condition in the related field.
NA: Not Applicable

Table 2. COVID-19 vaccination status and possible factors.

Factors		Behaviour			
		Negative	Positive	OR (95% CI)*	*p*-value
		n (%)			
Age (years old)	17-35	104 (25.3)	307 (74.7)	1.589 (1.004-2.513)	0.047
	>35	28 (17.6)	136 (82.4)		
Domicile	Jabodetabek	105 (24.8)	318 (75.2)	NA	0.029
	Java and Bali	22 (24.2)	69 (75.8)		
	Outside Java and Bali	6 (9.7)	56 (90.3)		
Attitude	Negative	38 (51.4)	36 (48.6)	4.522 (2.722-7.513)	<0.001
	Positive	98 (18.9)	407 (81.1)		
Knowledge	Poor	34 (34.7)	64 (65.3)	2.034 (1.270-3.258)	0.003
	Good	99 (20.7)	379 (79.3)		

* OR was calculated as the risk of the negative behaviour of the first-row condition in the relative field.
NA: Not Applicable

Figure 1. Schematic chart of the factors influencing the interaction between knowledge and attitude which lead to the positive behaviour of getting COVID-19 vaccination.



Discussion

The population in this study had good knowledge (83%) and a positive attitude (87.2%) toward the COVID-19 vaccination program in Indonesia, which aligns with the previous systematic review [14]. Our study demonstrated that previous mandatory vaccination experience was significantly associated with both knowledge and attitude, in line with the result of prior studies [15]. However, previous additional non-mandatory vaccination experience did not significantly affect participants' knowledge of the COVID-19 vaccine. A prior study on the hepatitis A vaccine [16], however showed previous vaccination experience had a significant association with knowledge of getting vaccinated; as participants gained beneficial information from the experience for future knowledge. The knowledge obtained from prior non-compulsory vaccination experience significantly influences the attitude toward obtaining the COVID-19 vaccination, confirming the findings of the previous study [17].

This study revealed that education status and social media exposure did not significantly affect knowledge, although a study conducted in the United Kingdom (UK) presented contradictory outcome [18]. In the UK study, ethnicity was proven to have an association with education and public access to information regarding the COVID-19 vaccine. Ethnic minority groups (particularly African-Caribbean) consistently experienced discrimination and racism in accessing healthcare services [18]. Moreover, the dissemination of incorrect information on the COVID-19 vaccination program has led to mistrust toward pharmaceutical companies and the government. Indirectly, this contributed to a low level of knowledge within the

community [19]. The same situation was not encountered in Indonesia, as the national vaccination programs are widely available to all citizens at no cost in all primary healthcare facilities and hospitals.

This study showed (**Supplementary table 1)** that most participants were often exposed to information on social media (Instagram, WhatsApp, Line, Twitter, and Facebook). These findings were similar to a previous systematic review [17], which stated that information circulating on social media greatly influences one's attitude toward receiving the COVID-19 vaccination. False or misleading information will raise doubts regarding the COVID-19 vaccine. Meanwhile, positive information will certainly create a positive public attitude toward the COVID-19 vaccination program. Furthermore, this study aligns with the systematic review, which asserts that the support of family and friends influences an individual's attitude [17].

We found that increased age was associated with greater knowledge along with positive behaviour. This is consistent with previous studies [20,21]. The majority of participants who had yet to receive COVID-19 vaccination but were interested in getting the vaccine were late adults, similar to those who were interested and had received COVID-19 vaccination (**Table 2**). Additionally, the study supported the theory that interest encourages individuals to seek out additional information. Thus, it will significantly affect knowledge [22]. Equivalent to previous studies [17,23,24], most participants had a strong understanding, which encouraged a positive attitude toward the COVID-19 vaccination program. A positive attitude along with interest in getting vaccinated led to a willingness to be immunized against COVID-19. This was supported by the "Theory of Planned Behaviour (TPB)", which states that a person's behaviour begins with one's interest in producing behaviour and is influenced by one's attitude [25]. Consistent results were also demonstrated in other published studies [26,27].

Participants interested in getting COVID-19 vaccination provided a variety of reasons, including the belief that the vaccine could provide protection without fatal adverse effects, prevent the transmission of the virus, and was guaranteed to be safe. Participants who were not interested or still hesitant to get vaccinated highlighted several reasons, such as having doubts regarding the vaccine's safety and efficacy, fearing side effects, allergies, being pregnant, and waiting for another COVID-19 vaccine with greater efficacy to be distributed in Indonesia. Most of the participants who were still hesitant to get vaccinated mentioned that they preferred to consult family, medical personnel, friends, professional experts or scientists, and religious leaders for the vaccination program.

The study indicated that economic status was not significantly associated with COVID-19 vaccination knowledge. Inconsistency with the previous study could be explained by the fact that the majority of participants in this study are domiciled in Jabodetabek, an area with a higher economic status than other parts of Indonesia [14,28]. This in turn allows the majority of respondents to have better access to information; as such, that economic status did not significantly affect this study. The policy of the Indonesian government to provide free COVID-19 vaccinations to all citizens may also contribute to this phenomenon.

Domicile had a significant impact on participants' behaviour towards the COVID-19 vaccination program in this study. The fact that most participants were domiciled in Java Islands (especially Jabodetabek areas) and Bali, the top priority for the COVID-19 vaccination program due to the rise in cases may have a role in this phenomenon [29]. The prevalence of participants who were interested but unvaccinated against COVID-19 was higher in the Java & Bali Islands (including Jabodetabek) than outside Java & Bali (**Supplementary table 2**). The reason was likely because most Indonesian citizens tend to choose certain vaccine brands despite the stock limitation declared by the government [30,31].

Strengths and limitations

This study provides several advantages, such as evaluating the obligatory second dose of the COVID-19 vaccination program (second half of 2021) and analysing the association between knowledge and attitude toward the ongoing COVID-19 vaccination program on adults' behaviour. The insight gained from this study could be used for designing approaches to the future voluntary booster vaccination program. However, an uneven distribution of participants in terms of age and domicile was present in this study. We also encountered difficulties in assessing ethnic and cultural factors that might affect the knowledge and

attitude of adult Indonesians toward the COVID-19 vaccination program, as interethnic marriage is common in Indonesia. In the era of the COVID-19 endemic, it is interesting to find out whether the attitude of the COVID-19 booster vaccination program would be the same as other voluntary vaccinations, such as vaccination for Influenza.

Conclusions

Figure 1 indicates that participants had a comprehensive understanding and positive attitude toward the COVID-19 vaccination program. Age, interest, and past vaccination experiences had an impact on knowledge about the vaccine, whereas social media exposure, peer influence, and previous vaccination experience played a role in shaping their attitude toward it. Behaviour was significantly influenced by the desire to be vaccinated, domicile, age, knowledge, and attitude. These findings are useful for planning the COVID-19 vaccination program in Indonesia, particularly for ensuring the success of booster shots. They may also apply to future vaccination programs with newly developed vaccines.

Declaration of conflicting interests

The authors declared that the research was conducted with no conflict of interest.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

1- **World Health Organization (WHO).** Listings of WHO's response to COVID-19. WHO 2020. Available from: https://www.who.int/news/item/29-06-2020-covidtimeline. Accessed on 2021 Aug 8.

2- **World Health Organization (WHO).** Media statement on confirmed COVID-19 Cases. WHO 2020. Available from: https://www.who.int/indonesia/news/detail/02-03-2020-media-statement-on-covid-19. Accessed on 2022 Aug 5.

3- **Budiono A, Ngestiningrum AH, Nurani S, Rizka R, Nurhayati N, Sari SD, et al.** Large-Scale Social Restrictions and Public Community Activity Restriction legal policy to decrease COVID-19 infections effectivity to handling COVID-19 pandemic. Open Access Maced J Med Sci 2022;10(A):176–180. doi:10.3889/oamjms.2022.8325.

4- **World Health Organization (WHO).** WHO Coronavirus (COVID-19) Dashboard. WHO 2023. Available from: https://covid19.who.int/region/searo/country/id. Accessed on 2023 Feb 7.

5- **Directorate General of Disease Prevention and Control.** Government Issues Circular on Second COVID-19 Booster Shot. Directorate General of Disease Prevention and Control 2023. Available from: https://setkab.go.id/en/govt-issues-circular-on-second-covid-19-booster-shot/. Accessed on 2023 Feb 2.

6- **World Health Organization (WHO).** Indonesia Received the First Batch of COVID-19 Vaccines from the COVAX Facility. WHO 2021. Available from: https://www.who.int/indonesia/news/detail/09-03-2021-indonesia-received-the-first-batch-of-covid-19-vaccines-from-the-covax-facility. Accessed on 2022 Nov 20.

7- **The Ministry of Health, The National Immunization Technical Advisory Group (NITAG), United Nations Children's Fund (UNICEF), World Health Organization (WHO).** COVID-19 Vaccine Acceptance Survey in Indonesia. UNICEF 2020. Available from:https://www.unicef.org/indonesia/coronavirus/reports/covid-19-vaccine-acceptance-survey-indonesia. Accessed on 2022 Aug 8.

8- **The Ministry of Health Republic of Indonesia.** Vaksinasi COVID-19 Nasional (National COVID-19 Vaccination). The Ministry of Health Republic of Indonesia, 2024. Available from:

https://vaksin.kemkes.go.id/#/vaccines. Accessed on 2024 Jul 28.

9- **Antara News.** 68.57 Million Indonesians Receive Third COVID-19 Vaccine Dose. Antara News 2023. Available from: https://en.antaranews.com/news/268248/6857-million-indonesians-receive-third-covid-19-vaccine-dose. Accessed on 2023 Feb 7.

10- **Angelo AT, Alemayehu DS, Dacho AM.** Knowledge, attitudes, and practices toward Covid-19 and associated factors among university students in Mizan Tepi University, 2020. Infect Drug Resist 2021;14:349–360.

11- **Islam MS, Siddique AB, Akter R, Tasnim R, Sujan MSH, Ward PR, et al.** Knowledge, attitudes and perceptions towards COVID-19 vaccinations: A cross-sectional community survey in Bangladesh. BMC Public Health 2021;21(1):1851.

12- **Sonang S, Purba AT, Pardede FOI.** Pengelompokan jumlah penduduk berdasarkan kategori usia dengan metode K-Means (Grouping the population based on age categories using the K-Means method). J Tek Inf dan Komput 2019;2(2):166–172.

13- **The World Bank.** Aspiring Indonesia: Expanding the Middle Class. The World Bank 2020. Available from: https://www.worldbank.org/en/country/indonesia/publication/aspiring-indonesia-expanding-the-middle-class. Accessed on 2023 Feb 6.

14- **Sallam M.** Covid-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. Vaccines 2021;9(2):160. doi:10.3390/vaccines9020160.

15- **Vardavas C, Nikitara K, Odani S, Symvoulakis E.** The predictors and association between knowledge of vaccines and vaccination among adults and children in 28 European countries, 2019. Popul Med 2022;4(March):11.

16- **Ahmad I, Endarti D, Andayani TM.** Analisis tingkat pengetahuan masyarakat terhadap penyakit dan vaksin Hepatitis A di Indonesia (Analysis of community's knowledge of Hepatitis A disease and vaccines in Indonesia). J Farm Galen (Galenika J Pharmacy) 2020;6(2):221–228.

17- **Al-Jayyousi GF, Sherbash MAM, Ali LAM, El-Heneidy A, Alhussaini NWZ, Elhassan MEA, et al.** Factors influencing public attitudes towards COVID-19 vaccination: A scoping review informed by the socio-ecological model. Vaccines 2021;9(6):548.

18- **Razai MS, Chaudhry UAR, Doerholt K, Bauld L, Majeed A.** Covid-19 vaccination hesitancy. BMJ 2021;373:n1138.

19- **Robinson E, Jones A, Lesser I, Daly M.** International estimates of intended uptake and refusal of COVID-19 vaccines: A rapid systematic review and meta-analysis of large nationally representative samples. Vaccine 2021;39(15):2024–2034.

20- **Hammour KA, Farha RA, Manaseer Q, Al-Manaseer B.** Factors affecting the public's knowledge about COVID-19 vaccines and the influence of knowledge on their decision to get vaccinated. J Am Pharm Assoc 2022;62(1):309–316.

21- **Troiano G, Nardi A.** Vaccine hesitancy in the era of COVID-19. Public Health 2021;194:245–251.

22- **Richter-Beuschel L, Bögeholz S.** Student teachers' knowledge to enable problem-solving for sustainable development. Sustainability 2020;12(1):79.

23- **Liu R, Zhang Y, Nicholas S, Leng A, Maitland E, Wang J.** COVID-19 vaccination willingness among Chinese adults under the

free vaccination policy. Vaccines 2021;9(3):292. doi:10.3390/vaccines9030292.

24- **Liu Z, Yang JZ.** In the wake of scandals: How media use and social trust influence risk perception and vaccination intention among Chinese parents. Health Commun 2021;36(10):1188–1199.

25- **Guidry JPD, Laestadius LI, Vraga EK, Miller CA, Perrin PB, Burton CW, et al.** Willingness to get the COVID-19 vaccine with and without emergency use authorization. Am J Infect Control 2021;49(2):137–142.

26- **Ilogu LC, Lugovska O, Vojtek I, Prugnola A, Callegaro A, Mazzilli S, et al.** The intent of students to vaccinate is influenced by cultural factors, peer network, and knowledge about vaccines. Hum Vaccines Immunother 2022;18(1):1938492.

27- **Zhang KC, Fang Y, Cao H, Chen H, Hu T, Chen Y, et al.** Behavioral intention to receive a COVID-19 vaccination among Chinese factory workers: Cross-sectional online survey. J Med Internet Res 2021;23(3):e24673.

28- **Asian Green Real Estate. Indonesia News & Insights.** Asian Green Real Estate 2022. Available from: https://www.asiagreen.com/en/news-insights/indonesia-s-second-tier-cities-on-the-move. Accessed on 2022 Aug 8.

29- **The Jakarta Post.** Java, Bali top priority to receive vaccines due to number of COVID-19 cases. The Jakarta Post 2020. Available from: https://www.thejakartapost.com/news/2020/12/13/java-bali-top-priority-to-receive-vaccines-due-to-number-of-covid-19-cases.html. Accessed on 2022 Aug 8.

30- **Situmorang HD.** Kemenkes akui warga masih pilih-pilih vaksin (Ministry of Health acknowledged that citizens are choosing type of vaccines). Berita Satu 2021. Available from: https://www.beritasatu.com/archive/855275/kemenkes-akui-warga-masih-pilihpilih-vaksin. Accessed on 2022 Jul 18.

31- **Cahyana B.** Target Vaksinasi Terancam Tak Tercapai, Warga DIY Diminta Tidak Pilih-Pilih (Vaccination target in threat of unachievement, citizens of Yogyakarta Special Region were asked to not being picky) . Harian Jogja 2021. Available from: https://jogjapolitan.harianjogja.com/read/2021/10/29/510/1086864/target-vaksinasi-terancam-tak-tercapai-warga-diy-diminta-tidak-pilih-pilih. Accessed on 2022 Jul 18.