Investigating Covid-19 Vaccine Booster Dose Policy Acceptance among Pregnant Women

Santy Irene Putri[1*], Abd. Rohman[2], Silfia Angela Norce Halu[3], Nur Dafiq[3], Arie Jefry Ka'arayeno[4] and Retno Dewi Prisusanti[5]

[1]Department of Health Information Management, Politeknik Kesehatan Wira Husada Nusantara Malang, Indonesia

[2]Public Administration Program, Universitas Tribhuwana Tunggadewi Malang, Indonesia

[3]Midwifery Study Program, Universitas Katolik Indonesia Santu Paulus Ruteng, Indonesia

[4]Health Sciences, Universitas Tribhuwana Tunggadewi Malang, Indonesia, Indonesia

[5]Department of Medical Record and Health Information, Institut Teknologi Sains Dan Kesehatan RS Dr. Soepraoen Malang, Indonesia

Abstract

Booster vaccinations have become significant in developing herd immunity due to their ability to reduce mortality rates and the severe dangers of Covid-19. Some people support the government's program and believe that booster vaccines will help prevent Covid-19 during the epidemic. Some people, however, say they do not want booster vaccinations because they believe the first and second doses are adequate and do not want to receive additional doses. The purpose of this study is to investigate the Covid-19 vaccination booster dose policy acceptance among pregnant women. This cross-sectional study was conducted in March to April 2023. Participants were 185 pregnant women selected from several subdistrict in Malang. Instruments for data collection were a demographic questionnaire, an attitude questionnaire, a social media questionnaire, a role of health workers questionnaire, and questions about Covid-19 vaccine booster dose acceptance. Logistic regression analysis was used to assess the effects of the study variables on Covid-19 vaccine booster dose acceptance. In the regression model, the three factors of attitude (b= 0.30; SE=0.07; 95% CI= 0.16 to 0.44), social media (b= 0.47; SE=0.13; 95% CI= 0.22 to 0.73), and role of health workers (b= 0.29; SE=0.15; 95% CI= 0.01 to 0.58) had significant effects on Covid-19 vaccine booster dose acceptance (p< 0.05). Acceptance of the Covid-19 booster vaccines among pregnant women can be accelerated through their positive attitude towards the vaccination program, the proper use of social media, and the involvement of healthcare workers.

Introduction

Vaccination is the use of vaccines to actively build up immune system within the body against illness [1]. It helps people avoid sickness or have milder symptoms if they are sick, which minimizes the risk of the virus spreading to others. Getting vaccinated not only stops the spread of the disease, but it can also eventually eliminate it [2]. On the other hand, if somebody is not vaccinated, he or she will not develop specific immunity to the disease [3].

Vaccination is one method by which the Indonesian government is combating the Covid-19 outbreak across the entire nation [4]. The pandemic has been marked by the rapid spread of the virus and an escalating death toll across the region and country. Vaccination is an important step in battling the epidemic, given

Indonesia's economic, political, social, cultural, security, defence, and welfare circumstances [5]. Furthermore, due to the increasing number of victims and property losses caused by the Covid-19, the need to expand coverage in affected areas, and broader socioeconomic factors in Indonesia, the government has classified Corona Virus Disease 2019 (Covid-19) or coronavirus as a non-social disaster and has taken action accordingly [6].

Everyone is urged to get vaccinated against Covid-19, as well as further booster injections [7]. Despite the fact that the Covid-19 pandemic is still growing, public interest and preparedness to be immunized is not as high as it previously was [8]. Booster vaccines for Covid-19 are used to boost antibodies against the virus and extend protection [9]. According to studies, antibody levels drop six months after receiving the full first dose of Covid-19 vaccination. As a result, a booster dose is needed to ensure maximum individual protection, particularly in vulnerable communities. There are two mechanisms for providing booster vaccinations, namely Homolog and Heterology [10, 11]. Homolog requires the same type of vaccination as the previous complete primary dose [12], whereas Heterology necessitates the use of a different type of vaccine than the prior complete primary dose [13].

Anyone over the age of 18 who has had a complete primary dose of at least 6 months is eligible for a booster vaccination, with priority given to healthcare workers, the elderly, immunocompromised people (those with a weakened immune system who are at risk of infection), and people with a history of diseases such as diabetes, heart disease, respiratory disorders, and other high-risk groups. Some people support the government's program and believe that booster vaccines will help prevent Covid-19 during the epidemic [14, 15]. Some people, however, say they do not want booster vaccinations because they believe the first and second doses are adequate and do not want to

receive additional doses [16]. The Covid-19 booster vaccination plays an essential role in boosting the immune system's reaction to combat and eradicate the Corona virus [17]. Several studies have also shown that receiving a Covid-19 booster vaccine can reduce an individual's risk of contracting Covid-19 with severe symptoms [18].

According to the Indonesian Obstetrics and Gynaecology Association's Recommendation Letter for COVID-19 Vaccination Booster for Pregnant Women, pregnant women can receive the Covid-19 vaccination booster 4 months after receiving the second dose of the Covid-19 vaccine. To be eligible for booster vaccination, pregnant women must have a body temperature of less than 37.5°C, blood pressure of less than 140/90 mmHg, a pregnancy age of more than 13 weeks, no complaints such as swollen feet, headaches, upper abdominal pain, blurred vision, comorbidities under control, no autoimmune diseases (if autoimmune diseases are under control, vaccination can be given), and not receiving treatment for blood clotting, blood disorders, immunodeficiency, and blood transfusions, not receiving immunosuppressive treatment such as corticosteroids and chemotherapy, and never confirmed Covid-19 positive [19].

Materials and Methods

This research employed a quantitative approach with a cross-sectional study design. Data were collected from a sample of pregnant women in Malang City, East Java, Indonesia with a gestational age of more than 13 weeks using a random sampling technique. Pregnant women with a gestational age of more than 13 weeks, and who are willing to participate as respondents, are eligible for this study. The population of this study were 228 pregnant women. The minimal sample size was calculated using the sample size calculation by Lemeshow formula. The researcher gathered a sample of 185 respondents for the study. The research was carried out during March and

April of 2023. The dependent variable of this study focuses on the acceptance of the Covid-19 vaccine booster dose among pregnant women. Meanwhile, the independent variables are made up of various factors that influence the decision-making process, including predisposing factors, such as pregnant women's attitudes, enabling factors such as the use of social media, and reinforcing factors such as the role of healthcare providers.

To collect data, the researcher used a questionnaire. The questionnaire was designed using a Likert scale to measure the pregnant women's attitudes towards the acceptance of the Covid-19 vaccine booster dose. Respondents were asked to express their agreement or disagreement with the statements in four categories of answers. If the statement expressed a favourable impression of the Covid-19 booster vaccine, the response options - "strongly agree" (SA), "agree" (A), "disagree" (D), and "strongly disagree" (SD) - were given a score of 4, 3, 2, and 1, respectively. If the statement expressed a negative impression, the response options - "strongly agree" (SA), "agree" (A), "disagree" (D), and "strongly disagree" (SD) - were given a score of 1, 2, 3, and 4.

The social media usage variable consisted of four aspects: the frequency of daily social media use, the location of social media use, the devices, and the types of the social media frequently accessed. The variable of the healthcare provider's function consisted of 16 statements, 12 of which were positive (favourable) and 4 of which were negative (unfavourable). The function of the healthcare provider included communicator, motivator, facilitator, and counsellor. A closed-ended questionnaire with "yes" and "no" response options was used, with a scoring criterion of 1 for positive (favourable) statements with "yes" response and 0 for "no" response, and a scoring criterion of 0 for negative (unfavourable) statements with "yes" response and 1 for "no" response. The healthcare worker's role questionnaire was analysed using the Guttman's scale due to the clear-cut answer format of the statements.

The variables of attitude, social media, and role of healthcare workers was examined by adding the scores from each questionnaire. The data analysis in this study included univariate, bivariate, and multivariate analysis. The univariate analysis data is presented in the form of frequency distribution tables and percentages of the considered variables. Pearson Product Moment correlation is used in bivariate analysis in this study. In bivariate Pearson correlation analysis, there are three approaches applicable as a guideline or basis for decision-making: first, consider the value of Sig. (2-tailed); second, the value of r count (Pearson correlation) is compared to the value of the product moment r table; third, examine the asterisk (*) in the SPSS program output. If the significance value of Sig. (2-tailed) is below 0.05, there is a correlation among the variables. If the value is higher than 0.05, no association exists. The strength of the association between each variable can be assessed using the Pearson correlation coefficient (r). Furthermore, if the Pearson correlation coefficient value has an asterisk symbol (*) or (**), it indicates that there is a correlation between the analysed variables. On the other hand, if there is no asterisk next to the Pearson correlation value, it means that there is no correlation between the studied variables. The single asterisk (*) denotes an association with a 1% or 0.01 significance level. Meanwhile, double asterisks (**) indicate correlation at 5% or 0.05 significance level. Multiple linear regression tests are used in this study's multivariate analysis. Multiple linear regression analysis is used to determine the influence of more than two independent variables. This study has received ethical approval from Health Research Ethics Committee Institute of Health Science Strada Indonesia with number 579/KEPK/II/2023.

Results

Table 1 lists down the sociodemographic data of the participants. It shows that the dominant age involved in the study is early adulthood (ages 20-34) (92.4%). The dominant parity to fill out the questionnaire is multiparous (65.9%). The highest percentage of gestational week is 13-26 (80.5%). Most respondents in the study have secondary education (55.7%) and work as housewife (69.8%). The most husband education in this study is secondary (42.2%) with self-employed (36.8%). The dominant monthly family income in this study ≥ regional minimum wage (53%).

Table 1. Sociodemographic Data

Demographic	Frequency	Percent
Age		
≤19 (Adolescents)	4	2.2
20–34	171	92.4
≥35 (Advanced Maternal Age)	10	5.4
Parity		
Primiparous	63	34.1
Multiparous	122	65.9
Gestational Week		
13-26	149	80.5
27-The End of the Pregnancy	36	19.5
Education		
None	5	2.7
Primary	28	15.1
Secondary	103	55.7
Tertiary	49	26.5
Employment		
Housewife	129	69.8
Self-employed	25	13.4
Waged Employee	31	16.8
Husband education		
None	2	1.1
Primary	34	18.4
Secondary	78	42.2
Tertiary	71	38.3
Husband Employment		
Farmers	23	12.4
Self-Employed	68	36.8
Public-Employee	31	16.6
Private Sector	54	29.3
Other	9	4.9
Monthly Family Income (In IDR)		
< Regional Minimum Wage	87	47
≥ Regional Minimum Wage	98	53

Table 2 contains the leading causes behind booster dose rejection are: fear of the booster dose 160 (p<0.001); booster dose will harm my body 155 (p<0.001); booster dose will harm my baby 157 (p<0.001); Covid-19 is not a serious disease 183 (p = 0.063); I am not vulnerable to Covid-19 infection 171 (p = 0.505); I believe that even if I am sick, my baby and I will not encounter any negative events 179 (p = 0.299); I do not think the booster dose will work 176 (p = 0.038); family members hesitant towards the booster dose 164 (p = 0.021); lacking of data about the safety of booster doses in pregnant women 135 (p = 0.001); fear of unknown adverse effects 172 (p = 0.492); and having a chronic illness 3 (p = 0.012).

Table 2. Summary of the Reasons for Refusing the Booster Dose

Questions	Responses		p value
	Yes	No	
Fear A Booster Dose	160	25	<0.001
Booster Dose Will Harm my Body	155	30	<0.001
Booster Dose Will Harm my Baby	157	28	<0.001
Covid-19 is not a Serious Disease	183	2	0.063
I am not Vulnerable to Covid-19 Infection	171	14	0.505
I Believe that Even if I Am Sick, my Baby and I will not Encounter any Negative Events.	179	6	0.299
I do not Think the Booster Dose Will Work	176	9	0.038
Family Members have Hesitancy Toward the Booster Dose	164	21	0.021
Lack of Data About the Safety of Booster Doses in Pregnant Women	135	50	0.001
Fear of Unknown Adverse Effects	172	13	0.492
Having a Chronic Illness	3	182	0.012

Table 3 shows the summary of the reasons for accepting the booster dose. Of the respondents, 178 stated protections against current strains, 183 protections against variants, and 174 protection extension.

Table 3. Summary of the Reasons for Accepting Booster

Questions	Responses		p value
	Yes	No	
Protection Against Current Strains	178	7	<0.001
protection Against Variants	183	2	0.849
Protection Extension	174	11	0.359

Table 4 shows the results of Pearson's correlation analysis. Attitude, social media, and role of health workers showed a positive correlation with Covid-19 vaccine booster dose acceptance. Attitude was related to increased Covid-19 vaccine booster dose acceptance (r=0.55, p value<0.001). Therefore, social media act to increase the Covid-19 vaccine

booster dose acceptance (r=0.51, p value<0.001). The results of Pearson's correlation analysis also revealed that the role of health workers was significantly increase the Covid-19 vaccine booster dose acceptance (r=0.53, p value<0.001).

Table 4. The Correlation Between Attitude, Social Media, Role of Health Workers and Covid-19 Vaccine Booster Dose Acceptance

	Attitude	Social Media	Role of Health Workers
r value	0.55	0.51	0.53
p value (*)	<0.001	<0.001	<0.001

Based on the information in Table 5 the three factors of attitude (b= 0.30; SE=0.07; 95% CI= 0.16 to 0.44), social media (b= 0.47; SE=0.13; 95% CI= 0.22 to 0.73), and role of health workers (b= 0.29; SE=0.15; 95% CI= 0.01 to 0.58) bring about significant effects on Covid-19 vaccine booster dose acceptance (p< 0.05).

Table 5. The Multiple Linear Regression Results

Variable	b	SE	ß	t	p	CI 95%	
						Lower Bound	Upper Bound
Attitude	0.30	0.07	0.32	4.28	<0.001	0.16	0.44
Social Media	0.47	0.13	0.26	3.63	<0.001	0.22	0.73
Role of Health Workers	0.29	0.15	0.17	2.03	0.043	0.01	0.58
*Significant at p<0.05							

As shown in Figure 1, the number of pregnant women in Lowokwaru subdistrict is 16% (37/228), Kedungkandang 23% (53/228), Sukun 35% (79/228), Klojen 7% (15/228), and Blimbing 19% (44/228).
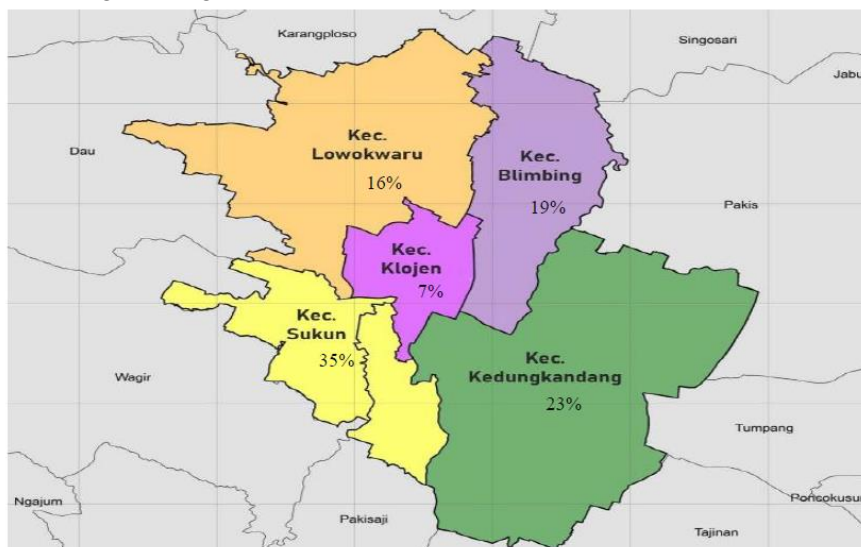

Figure. 1. Geographic Distribution of Pregnant Women

Discussion

According to the Indonesian Obstetrics and Gynaecology Association (POGI), pregnant women should receive a third dose of the Covid-19 vaccine or booster shot. POGI recommends that pregnant women get the booster shot at least 4 months after their first or second dose of Covid-19 vaccine. Several studies have been carried out to investigate the benefits of the Covid-19 booster vaccine. According to preliminary findings, the booster vaccine can increase the number of antibodies that attack the SARS-CoV-2 protein, outperforming previous doses [20, 21].

The tendency of an individual to react to the government-initiated Covid-19 booster immunization campaign can define their attitude towards the Covid-19 booster vaccination campaign [22]. Attitudes can be characterized as acceptance, rejection, support, or apathy, which reflect the individual's feelings towards the program. Attitude is a behavioural habit, inclination, or anticipatory preparedness to adapt, or in other words, a response to a particular stimulus [23]. An individual's response to a particular stimulus can be influenced by some factors, including their level of knowledge [24]. It is essential to understand the Covid-19 and Covid-19 vaccines, including the primary and booster doses, as it enables them to build a positive attitude toward them, especially when dealing with something new [25]. Having enough knowledge about the Covid-19 booster vaccine can encourage people to weigh its positive and negative impacts, resulting in a positive perception of the vaccine [26]. It may lead to an active search for information and an openness to engaging in the booster vaccination campaign [27].

The media serves as a crucial tool for press and mass communication, particularly in conveying information to a large audience [28]. In this sense, encouraging transparency and disseminating public information regarding the Covid-19 booster vaccination, especially administration to pregnant women, is fundamental [29]. When a great number of people who are geographically distant need to be reached, mass media is utilized for communication [30, 31]. The benefit of using mass media for communication is that it may generate coherence, which means that the message can be received by a huge number of people. As a result, when it comes to sharing information, the media is extremely powerful in shaping attitudes, beliefs, and communication practices [32]. Mass media is positioned as a form of mass communication that plays an important part in changing the community's environment by sharing information to the general population [33]. Social media has become an important tool for modern society, with positive and negative implications [34, 35].

On the one hand, it provides a platform for people to share information and connect. On the other hand, it can be a breeding ground for misinformation, particularly about the Covid-19 vaccine, which is especially dangerous for pregnant women. As a result, the government is expected to filter out incorrect information about the Covid-19 vaccine widely spread on social media. It enables the public to crosscheck information by utilizing official government social media outlets to ensure that they receive accurate information [36].

The role of mass media or mass communication in reducing miscommunication in the broadcast of Covid-19 news is crucial. The media can be used to monitor, educate, and motivate the public [37]. In terms of monitoring. It can assist the government in providing accurate information, particularly on the safe Covid-19 vaccine for pregnant women. In terms of education, it can inform the public about the need of full vaccination in achieving immunity and preventing the spread of Covid-19, thus promoting herd immunity. Furthermore, the tagline "Safe and Healthy Travel with Booster Vaccination" is a part of the public education and socialization effort.

Finally, media has a responsibility to encourage the community by building trust in the Covid-19 vaccination and dispelling worries among members of the community, notably pregnant women who may be hesitant to receive the vaccine [38].

The World Health Organization (WHO) defines vaccine hesitancy as a delay in accepting or declining vaccinations, even when vaccination services are available. The media's involvement in disseminating information about the Covid-19 vaccination campaign is vital. People are more likely to rely on the media for information during this pandemic, particularly with the Covid-19 vaccine campaign. Media play an important role when it comes to the government's efforts to implement the Covid-19 vaccination program. As a result, more people are aware of the vaccination program, which can help decrease Covid-19 symptoms [39].

Misinformation about the Covid-19 vaccination program, both the primary doses (doses 1 and 2) and booster shots, can cause public fear and anxiety, leading to people delaying their vaccinations. As a result, the Indonesian government's goal for the Covid-19 booster vaccination campaign may be hindered. Providing correct education and information to the public about the Covid-19 immunization program is a vital component of community health education. This communication can be delivered through various media outlets or by community leaders or village administrators in each region of Indonesia. Providing information indirectly will enhance public awareness of the Covid-19 vaccination. To achieve this, some parties must work together to guarantee that all information about the Covid-19 vaccination is appropriately communicated to the public, which will lead to a positive response from the public to engage in the Covid-19 booster vaccine campaign [40].

It is widely recognized that healthcare workers and medical professionals are the most reliable sources of information for the public. They are trusted the most by the public since they are the most knowledgeable and experienced when it comes to vaccination. Healthcare professionals can play a pivotal role in addressing vaccine hesitancy towards Covid-19 booster doses among the public. To accomplish this, they must be able to successfully communicate precise and thorough information, promote positive motivation and behaviour, act as role models, and collaborate with their peers and other important stakeholders [41].

Clear and accurate information is essential in dispelling doubts and misinformation. Healthcare workers should be able to give information about the Covid-19 vaccine's safety, effectiveness, production process, and administration, as well as any adverse effects and how to manage them. It is also critical to underline the importance of broad vaccination to build community immunity [42].

To foster public trust, information must be communicated transparently, accountably, consistently, and accordingly with the social context of the community. Information can be shared in traditional ways, such as during patient visits or health education workshops. However, there is also a highly effective method for disseminating information through social media. Regarding Covid-19, the public has been inundated with information from various sources, which often contradicts each other. Healthcare workers, as trusted figures in the community, play an important role in communicating accurate, complete, and valuable information. Furthermore, information about Covid-19 is constantly evolving and dynamic, requiring healthcare workers to keep themselves updated. Knowing the facts, on the other hand, is frequently insufficient to prompt someone to take action [43].

One common mistake is presuming that knowing is sufficient to trigger action. To transform information into behaviour, a collection of modalities is required. This is

frequently neglected, and people are expected to act only on the basis of their knowledge, resulting in a gap between what is known and what is really done. To address vaccine hesitancy and enhance vaccination implementation, the WHO created the BeSD (Behavioural and Social Drivers of Vaccination) model framework. According to the BeSD model, motivation lies at the heart of vaccination behaviour. The readiness and desire to receive immunization is referred to as motivation [44]. It is formed by one's thoughts and feelings, as well as the social processes existing in one's environment. It includes thinking about the pros and cons of vaccination, as well as having faith in the healthcare workers who deliver the vaccine. To encourage motivation, appropriate attitudes and social circumstances must be developed. Once motivation develops, the behaviour of receiving vaccination can be realized only if the vaccine is available and accessible. In addition, high quality, safe, and effective vaccination are also necessary. Because healthcare workers are trusted by the community, their leadership is critical in promoting Covid-19 vaccination. Furthermore, it is also important to have leadership in receiving the vaccine from government officials, community leaders, religious leaders, and celebrities [45].

Individuals tend to follow the behaviour of the figures they favour. This influence, particularly in the form of vaccination, is more powerful when demonstrated by community leaders such as government officials, religious figures, and public figures. These individuals can set an example for the public by taking the vaccine themselves and sharing their reasons for doing so, their experiences during and after the vaccination, and the benefits of getting vaccinated. Collaboration among healthcare experts is fundamental to support Covid-19 booster vaccines. It can be exhibited independently, although it is preferable to be done together. Collaboration with colleagues in professional groups is possible. Collaboration can also be carried out extensively with health authorities, the media, religious figures, community leaders, non-governmental groups, community organizations, academia, and business circles. Collaboration with numerous societal aspects will be quite useful. In addition to broadening the reach, collaboration with health authorities, mass media, religious figures, community leaders, civil society organizations, academic institutions, and business communities can help to transmit messages in accordance with their social context. A broad partnership with community leaders will boost public trust in the Covid-19 immunization campaign. Even though it will be difficult to implement, collaboration is expected to support the smooth, harmonious, and mutually beneficial implementation of Covid-19 vaccination [46].

Conclusion

Acceptance of the Covid-19 booster vaccines among pregnant women can be accelerated through their positive attitude towards the vaccination program, the proper use of social media, and involvement of healthcare workers. The study suggests that pregnant women who demonstrate a good attitude towards the government's Covid-19 booster vaccine campaign are more likely to accept, recognize, and approve the program. Furthermore, media plays a crucial role in giving accurate information about the Covid-19 booster vaccine, to pregnant women particularly. When it comes to delivering information and understanding about the Covid-19 booster vaccination, healthcare workers, especially medical professionals, are the most trustworthy sources. Healthcare workers perform an essential role in addressing vaccine hesitancy related to the Covid-19 vaccination by providing accurate information, encouraging motivation and behavioural change, setting an example, and developing programs in collaboration with other healthcare professionals and the larger community.

Conflict of Interest

There is no conflict of interest to declare.

References

[1]. Laupèze, B., Del Giudice, G., Doherty, M. T, Van der Most, R., 2021, Vaccination as a Preventative Measure Contributing to Immune Fitness. npj Vaccines, 6(1). Available from: https://dx.doi.org/10.1038/s41541-021-00354-z

[2]. Zhang, S., Yang, Z., Chen, Z. L., Yue, S. J., Zhang, S., Tang, Y. P., 2022, Why Does Covid-19 Continue to Spread Despite Mass Vaccination? *Front Public Heal,* 10(4).

[3]. Tiyo, B. T, Schmitz, G. J. H., Ortega, M. M., da Silva, L. T., de Almeida, A., Oshiro, T. M., et al., 2021, What Happens to the Immune System After Vaccination or Recovery From COVID-19? Life, 11(11).

[4]. Nugraha, R. R, Miranda, A. V., Ahmadi, A., Lucero-Prisno, D, E., 2021, Accelerating Indonesian COVID-19 Vaccination Rollout: A Critical Task Amid the Second Wave. *Trop Med Health,* 49(1). Available from: https://doi.org/10.1186/s41182-021-00367-3

[5]. Al Awaidy, S. T., Khatiwada, M., Castillo, S., Al Siyabi, H., Al Siyabi, A., Al Mukhaini. S., et al., 2022, Knowledge, Attitude, and Acceptability of COVID-19 Vaccine in Oman: A Cross-Sectional Study. *Oman Med J,* 37(3).

[6]. Rela, I. Z, Ramli, Z., Firihu, M.Z., Widayati, W., Awang, A. H., Nasaruddin, N., 2022, COVID-19 Risk Management and Stakeholder Action Strategies: Conceptual Frameworks for Community Resilience in the Context of Indonesia. *Int J Environ Res Public Health,* 19(15).

[7]. García-Botella, A., García-Lledó, A., Gómez-Pavón, J., Del Castillo, J. G., Hernández-Sampelayo, T., Martín-Delgado, M. C., et al., 2021, Booster or Additional Vaccination Doses in Patients Vaccinated Against COVID-19. Rev Esp Quimioter, 35(2):105–14.

[8]. Jung, J., 2021, Preparing for the Coronavirus Disease (COVID-19) Vaccination: Evidence, Plans, and Implications. *J Korean Med Sci,* 36(7):1–20.

[9]. Sarma, P., Kaur, H., Kumar, H., Mahendru, D., Avti, P., Bhattacharyya, A., et al., 2020, Virological and Clinical Cure in Covid-19 Patients Treated With Hydroxychloroquine: A Systematic Review and Meta-Analysis. *J Med Virol,* 92(7):776–85.

[10]. Atmar, R. L., Lyke, K. E., Deming, M. E., Jackson, L. A., Branche, A. R., El Sahly, H. M, et al., 2022, Homologous and Heterologous Covid-19 Booster Vaccinations. *N Engl J Med,* 386(11):1046–1057.

[11]. Costa Clemens, S. A., Weckx, L., Clemens, R., Almeida Mendes, A. V., Ramos Souza, A., Silveira, M. B. V., et al., 2022, Heterologous Versus Homologous Covid-19 Booster Vaccination in previous Recipients of Two Doses of Coronavac Covid-19 Vaccine in Brazil (RHH-001): A Phase 4, Non-Inferiority, Single Blind, Randomised Study. Lancet, 399(10324):521–9.

[12]. Cerqueira-Silva, T., Shah, S. A., Robertson, C., Sanchez, M., Katikireddi, S. V., de Araujo Oliveira, V., et al., 2023, Effectiveness of mRNA Boosters After Homologous Primary Series With BNT162b2 or ChAdOx1 Against Symptomatic Infection and Severe COVID-19 in Brazil and Scotland: A Test-Negative Design Case–Control Study. *PLoS Med,* 20(1):1–15.

[13]. Sapkota, B., Saud, B., Shrestha, R., Al-fahad, D., Sah, R., Shrestha, S., et al., 2022, Heterologous Prime – Boost Strategies for COVID-19 Vaccines, 1–10.

[14]. Bert, F., Scaioli, G., Vola, L., Accortanzo, D., Lo Moro, G., Siliquini, R., 2022, Booster Doses of Anti COVID-19 Vaccines: An Overview of Implementation Policies Among OECD and EU Countries. *Int J Environ Res Public Health,* 19(12).

[15]. Limbu, Y. B., Huhmann, B. A., 2023, Why Some People are Hesitant to Receive COVID-19 Boosters: A Systematic Review. Trop Med Infect Dis, 8(3):159.

[16]. Galanis, P., Vraka, I., Katsiroumpa, A., Siskou, O., Konstantakopoulou, O., Katsoulas, T., et al., 2022, Predictors of Willingness of the General Public to Receive a Second COVID-19 Booster Dose or a New COVID-19 Vaccine: A Cross-Sectional Study in Greece. Vaccines, 10(7):1–12.

[17]. Meng, H., Mao, J., Ye, Q., 2022, Strategies and Safety Considerations of Booster Vaccination in COVID-19. Bosn *J Basic Med Sci,* 22(3):366–73.

[18]. Wong, M. T. J., Dhaliwal, S. S., Balakrishnan, V., Nordin, F., Norazmi, M. N., Tye, G. J., 2023, Effectiveness of Booster Vaccinations on the Control of COVID-19 During the Spread of Omicron Variant in Malaysia. *Int J Environ Res Public Health,* 20(2).

[19]. Poh, X. Y., Lee, I. R., Lim, C., Teo, J., Rao, S., Chia, P. Y., et al., 2022, Evaluation of the Safety and Immunogenicity of Different Covid-19 Vaccine Combinations in Healthy Individuals: Study Protocol for a Randomized, Subject-Blinded, Controlled Phase 3 Trial [PRIBIVAC]. Trials, 23(1):1–13, https://doi.org/10.1186/s13063-022-06345-2

[20]. Atyeo, C., Shook, L. L., Nziza, N., Deriso, E. A., Muir, C., Baez, A. M., et al., 2023, COVID-19 Booster Dose Induces Robust Antibody Response in Pregnant, Lactating, and Nonpregnant Women. *Am J Obstet Gynecol,* 228(1):68.e1-68.e12, https://doi.org/10.1016/j.ajog.2022.07.014

[21]. Badell, M. L., Dude, C. M., Rasmussen, S. A., Jamieson, D. J., 2022, Covid-19 Vaccination in Pregnancy. *BMJ,* 11.

[22]. Ryalat, S., Alduraidi, H., Al-Ryalat, S. A., Alzu'bi, M., Alzyoud, M., Odeh, N., et al., 2022, Attitudes Towards COVID-19 Booster Vaccines, Vaccine Preferences, Child Immunization, and Recent Issues in Vaccination among University Students in Jordan. Vaccines, 10(8).

[23]. Verplanken, B., Orbell, S., 2022, Attitudes Habits and Behavior Change.

[24]. Cragg, L., 2016, The Development of Stimulus and Response Interference Control in Midchildhood. Dev Psychol, 52(2):242–52.

[25]. Tharwat, S., Eleraky, E. S., Adel, T., Nassar, M. K., Saleh, M., 2023, Attitudes and Concerns Regarding Booster Dose of Covid-19 Vaccine Among Egyptian Patients with Autoimmune and Rheumatic Diseases: A Cross-Sectional Survey Study. *J Pharm Policy Pract,* 16(1):1–12, https://doi.org/10.1186/s40545-023-00558-9

[26]. De Giorgio, A., Kuvačić, G., Maleš, D., Vecchio, I., Tornali, C., Ishac, W., et al., 2022, Willingness to Receive COVID-19 Booster Vaccine: Associations Between Green-Pass, Social Media Information, Anti-Vax Beliefs, and Emotional Balance. Vaccines, 10(3):1–18.

[27]. Shah, A., Coiado, O. C., 2023, COVID-19 Vaccine and Booster Hesitation Around the World: A Literature Review. *Front Med,* 9.

[28]. Elrod, J. K., Fortenberry, J. L., 2020, Advertising in Health and Medicine: Using Mass Media to Communicate With Patients. *BMC Health Serv Res,* 20(Suppl 1):1–8, https://dx.doi.org/10.1186/s12913-020-05599-3

[29]. Piekos, S., Hwang, Y. M., Roper, R., Sorensen, T., Price, N., Hood, L., et al., 2022, The Effect of COVID-19 Vaccination and Booster on Maternal-Fetal Outcomes. *SSRN Electron J.*

[30]. Osuagwu, U. L., Mashige, K. P., Ovenseri-Ogbomo, G., Envuladu, E. A., Abu, E. K., Miner, C. A., et al., 2023, The Impact of Information Sources on Covid-19 Vaccine Hesitancy and Resistance in Sub-Saharan Africa. *BMC Public Health,* 23(1):1–16, https://doi.org/10.1186/s12889-022-14972-2

[31]. Okorie, N., 2022, Global Media Framing, COVID-19 and the Issue of Vaccination: An Empirical Inquisition. *Heal Promot Perspect,* 12(2):186–191.

[32]. Wang, Y., Dai, Y., Li, H., Song, L., 2021, Social Media and Attitude Change: Information Booming Promote or Resist Persuasion? *Front Psychol,* 12(6):1–9.

[33]. Kreslake, J. M., Elkins, A., Thomas, C. N., Gates, S., Lehman, T., 2019, Use of Mass Communication by Public Health Programs in Nonmetropolitan Regions. *Prev Chronic Dis,* 16(7):1–6.

[34]. Kanchan, S., Gaidhane, A., 2023, Social Media Role and its Impact on Public Health: A Narrative Review. Cureus, 15(1):1–10.

[35]. Stellefson, M., Paige, S. R., Chaney, B. H., Chaney, J. D., 2020, Evolving Role of Social Media

in Health Promotion: Updated Responsibilities for Health Education Specialists. *Int J Environ Res Public Health,* 17(4).

[36]. Joseph, A. M., Fernandez, V., Kritzman, S., Eaddy, I., Cook, O. M., Lambros, S., et al., 2022, COVID-19 Misinformation on Social Media: A Scoping Review. Cureus, 14(4):6–15.

[37]. Ahmad Rizal, A. R., Nordin, S. M., Ahmad, W. F. W., Ahmad Khiri, M. J., Hussin, S. H., 2022, How Does Social Media Influence People to Get Vaccinated? The Elaboration Likelihood Model of a Person's Attitude and Intention to Get COVID-19 Vaccines. *Int J Environ Res Public Health,* 9(4).

[38]. Bardus, M., Assaf, S. A., Sakr, C. J., 2023, Using Social Marketing to Promote COVID-19 Vaccination Uptake: A Case Study from the "AUBe Vaccinated" Campaign. Vaccines, 11(2):1–14.

[39]. Ahiakpa, J. K., Cosmas, N. T., Anyiam, F. E., Enalume, K. O., Lawan, I., Gabriel, I. B., et al., 2022, COVID-19 Vaccines Uptake: Public knowledge, Awareness, Perception and Acceptance Among Adult Africans. *PLoS One,* 17(6):1–21, https://dx.doi.org/10.1371/journal.pone.0268230

[40]. Su, L., Du, J., Du, Z., 2022, Government Communication, Perceptions of COVID-19, and Vaccination Intention: A Multi-Group Comparison in China. *Front Psychol,* 12(1):1–11.

[41]. Elwy, A. R., Maguire, E. M., Kim, B., West, G. S., 2022, Involving Stakeholders as Communication Partners in Research Dissemination Efforts. *J Gen Intern Med,* 37:123–7.

[42]. Hudson, A., Montelpare, W. J., 2021, Predictors of Vaccine Hesitancy: Implications for Covid-19 Public Health Messaging. *Int J Environ Res Public Health,* 18(15).

[43]. Rao, R., Koehler, A., Beckett, K., Sengupta, S., 2022, COVID-19 Vaccine Mandates for Healthcare Professionals in the United States. Vaccines, 10(9):1–7.

[44]. Andrade, G., Bedewy, D., Bani, I., 2022, Motivational Factors to Receive the COVID-19 Vaccine in the United Arab Emirates: A Cross-Sectional Study. *J Community Health,* 47(3):530–8, https://doi.org/10.1007/s10900-022-01084-6

[45]. Soni, G. K., Bhatnagar, A., Gupta, A., Kumari, A., Arora, S., Seth, S., et al., 2023, Engaging Faith-Based Organizations for Promoting the Uptake of COVID-19 Vaccine in India: A Case Study of a Multi-Faith Society. Vaccines, 11(4).

[46]. Elmore, C. E., Blackstone, S. R., Carpenter, E. L., de Cortez, P. I., O'donnell, C., Uhlmann, E., et al., 2022, Advancing COVID-19 Vaccination Equity Among the Refugee Community: An Innovative Multi-Sector Collaborative Outreach Program. *J Health Care Poor Underserved,* 33(2):25–43.