

Potential Factors related to COVID-19 Vaccine Hesitancy in Indonesia: A Literature Review

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Abstract

Introduction: The pandemic of COVID-19 has become a burden to the world's health system, in which strategic measures are needed, especially vaccination. However, numbers of challenge have been reported regarding the so-called most effective public health intervention, such as vaccine hesitancy. On top of that, WHO has acknowledged vaccine hesitancy in the top list of 10 most dangerous threats to global health. The spectrum related to the reluctance to receive vaccination in society has also occurred in previous infectious diseases management and during the COVID-19 pandemic. This review aimed to identify factors and mechanism related to COVID-19 vaccine hesitancy in Indonesia.

Methods: This study provided a review of 14 literatures from 2019 to 2021 using ProQuest and Google Scholar discovered through the selected keywords. The SAGE-WG model for vaccine hesitancy framework was used as the main reference in identifying and explaining the associated factors of phenomenon.

Results: Based on the analysis of framework, determinants related to confidence crucial in affecting the acceptance level of COVID-19 vaccine in the community. In regard to that aspect, various factors within the scope of individual and social influences, vaccine and vaccination-specific issues, as well as contextual influences may well-explained the plausible mechanism that build hesitancy over vaccination. Accordingly, this study found that mistrust and skepticism related to the effectiveness of vaccine, safety concerns, and adverse reactions discouraged people from getting vaccinated. Furthermore, religious matters such as unavailable halal certification, along with poor socioeconomical factors, and misinformation that were spread through the media also prevent people to receive COVID-19 vaccine and risk the development of herd-immunity toward COVID-19 in the community.

Conclusions: Various factors were identified regarding the development of vaccine hesitancy in Indonesia. Understanding the plausible factors and mechanism that prevented people to get COVID-19 vaccine are substantial to strategically address the phenomenon and successfully manage the COVID-19 pandemic in Indonesia.

Keywords: COVID-19 – Indonesia - vaccine hesitancy – asia – outbreak - prevention

INTRODUCTION

COVID-19 pandemic is an outbreak caused by severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2).¹ For more than two years, the pandemic has threatened global population health and worldwide disruption within the social, economic, and cultural context.²⁻⁴ Consequently, various policies have been implemented to overcome the spread of the diseases, namely lockdowns, social distancing, and contact tracing. Unfortunately, the efforts were still inadequate to handle the negative outcomes and the burdens of COVID-19 to a significant level.¹ Therefore, the idea of vaccination was expected to be one of the strategies to overcome the significant burden caused by the pandemic.⁵

Vaccination has been long acknowledged as the most effective approach to overcome infectious diseases. The vaccination program has been reported to successfully diminish the spread of the disease at both the individual and community levels, particularly by inducing herd immunity.⁶ Additionally, vaccination has been proven effective over time in preventing and combating rapidly spreading communicable diseases. Therefore, it is highly regarded in the management of the COVID-19 pandemic.^{7,8} Furthermore, Indonesia has been implementing the vaccination program as a part of pandemic management since 2020, with remarkable coverage to disclose. By 2022, almost 80% of

Indonesians had received both the first and second doses of the vaccine, allowing herd immunity to occur gradually. Unfortunately, the progress in achieving that point was still ensuing, as the number of the first booster coverage in the community among Indonesians was still low.^{9,10}

Despite being scientifically proven as the most effective approach to overcoming communicable disease outbreaks, several groups refuse to support the vaccination program, a phenomenon called vaccine hesitancy.^{11,12} Prior to the COVID-19 pandemic, the World Health Organization (WHO) already considered vaccine hesitancy as one of the top ten global health threats.^{2-4,13,14} This phenomenon has been a significant challenge regarding the management of various outbreaks, including the COVID-19 pandemic, considering its paramount role in achieving herd immunity that depends on the large proportion of vaccine coverage. To a more profound extent, holistic cooperation among vaccine recipients in the community, including Indonesia, is fundamental to successfully overcoming the pandemic.^{12,12,15}

The occurrence of vaccine hesitancies inhibits the manifestation of herd immunity, which on the contrary, lead to the re-occurrence of vaccine-preventable diseases (VPDs) outbreak in the high-risk populations and increase the number of morbidity as well as

mortality due to the supposedly measured diseases.¹⁶⁻¹⁸ For instance, the re-emergence of the measles outbreak in the United States in 2019 was attributed to low measles vaccine coverage among the population. In Indonesia, moreover, the 2017 outbreak of diphtheria was related to a high number of vaccine hesitancy among the society and inadequate Diphtheria-Pertussis-Tetanus (DPT) vaccine coverage.¹⁶ Therefore, awareness regarding the fundamental of vaccine hesitancy is essential in both management of infectious diseases outbreak and as an optimal preventive measure toward VPDs re-emergence risk.¹⁹⁻²¹

Concurrently, this literature review was conducted to identify strategic approaches in handling vaccine hesitancy by understanding the background thought process of the potential risk factors and the mechanism that might contribute to vaccine hesitancy toward the COVID-19 vaccination program in Indonesia. On top of that, this study was also expected to provide insight and implications regarding key recommendations and strategic approaches to the local and national stakeholders in increasing vaccination coverage, considering the importance of vaccine and vaccination program. The goal is to overcome the global health burden due to the infectious disease outbreak and pandemic.

METHODS

This study is a literature review carried out by searching articles in ProQuest and Google Scholar regarding COVID-19 and Vaccine Hesitancy in Asia. The keywords included in the literature-searching through ProQuest were “coronavirus”, “COVID-19”, “SARS-COV-2”, “Vaccine Hesitancy”, “Anti-vaccine”, “Framework”, “Factors”, “Asia”, “Southeast Asia”, and “Indonesia”. while “keraguan”, “Indonesia”, dan “vaksin COVID-19” were included in Google Scholar. This review included only literature with full-text available in English or Bahasa Indonesia, published between November 2019 and September 2021. This approach was chosen in consideration of the rising COVID-19 studies, which started in November 2019 in Wuhan, China. This review was also limited to the occurrence of vaccine hesitancy in Asia due to the restricted number of previous studies regarding COVID-19 vaccine hesitancy in Asia, especially in Southeast Asia and Indonesia, in the light of providing applicable and acceptable comprehension to the local and national authorities and stakeholders (Figure 1).

Based on the criteria, more than 2.800 pieces of literature were discovered. After the selection process, the amount of literature included was narrowed due to the high number of exclusion and relevancy matters. More on this process, articles without

sufficient explanation and further exploration of COVID-19 vaccine hesitancy in Asian countries were excluded. Consequently, only 14 articles that were successfully selected and further explored in this study, which were relevant to our aim. Furthermore, selected articles were analyzed using collective tables to define factors of vaccine hesitancy included in each study, in line with the Matrix of Determinants of Vaccine Hesitancy, which was initially developed by the Scientific Advisory Group of Experts (SAGE) on behalf of the WHO.²² The collective tables were expected to clearly explain the associated elements in which vaccine hesitancy was most likely to occur based on the given situation in each study.

With regard to the framework used in this study, the World Health Organization's Strategic Advisory Group of Experts on Immunization (SAGE) has developed the SAGE-WG Matrix of Determinants of Vaccine Hesitancy to observe the underlying mechanisms in which vaccine hesitancy is most likely to occur. Based on the model, the plausible determinants were classified into three main groups: Contextual Influences, Individual and Group Influences, and Vaccine/Vaccination-specific issues. The contextual influences discussed the mechanism related to the historical, socio-cultural, environmental, health system, institutional, economic, or political factors. On

the other hand, individual/group influences talked about the potential influences based on personal perception toward vaccines or their social or peer involvement in past experiences, beliefs, or social norms. Lastly, the vaccine/vaccination-specific issues considered the influences directly toward vaccine or vaccination program, which included risk, benefit, the content of the vaccine, cost, mode of administration, vaccination schedule, the health professionals, or the design of the program. This model was developed to disclose the potential risk factors related to vaccine hesitancy, in which stakeholders and officials may benefit from establishing a strategic approach in addressing the vaccine hesitancy movement at the local to national level.²³

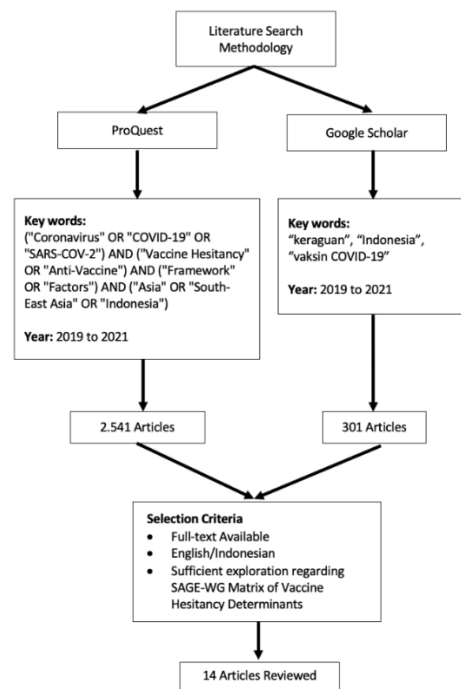


Figure 1. Literature-search methodology workflow

RESULTS

A total of fourteen pieces of literature were reviewed. The result of our discovery has shown a number of plausible factors related to the resurgence of vaccine hesitancy during the pandemic of COVID-19 as well as their possible mechanism. This review analyzed the proposed associated determinants of COVID-19 vaccine hesitancy in various population groups, including ten studies that focused on the phenomenon in Indonesia (Table 1) and four studies that focused on other Asian countries (Table 2). Our findings were limited to research conducted in Indonesia and other Asian countries, such as China, Bangladesh, Vietnam, and Saudi Arabia, comprising twelve cross-sectional/observational studies, a review, and a case study. The selected countries were chosen due to their relevance to the situation in Indonesia.

Vaccine Hesitancy

Vaccine hesitancy is defined as a spectrum that lies between groups of people who have received vaccines and those who are anti-vaccine.^{22,24} This particular group may receive several types of vaccines while refusing the others or hesitant to be vaccinated at a period of time due to disbelief regarding safety and effectiveness of vaccine. Based on Strategic Advisory Groups of Experts (SAGE) on Immunization, vaccine hesitancy is a condition that prevents or refuses vaccine, regardless of the availability of vaccination service.²⁵ This

terminology of vaccine hesitancy was initially used in the mid-19th century regarding the obligatory policy of preventing children from getting vaccinated. Unfortunately, the policy was responded by skepticism and rebellion among the British, who were labelled as the anti-vaxxers.²⁶ The spread of the movement has widely affected the acceptance of vaccine as an effective approach to overcoming infectious diseases, unexceptionally through misleading information, fallacious rumors, as well as conspiracy theories through social media or in-person practices.^{4,16,27}

The root cause of vaccine hesitancy could not be precisely defined due to the variety of root causes and mechanisms, even though many studies have analyzed the probable mechanisms of the phenomenon.²⁸⁻³¹ However, the foundation of vaccine hesitancy lies under the progressive situation of the phenomenon, and therefore, it may depend on a particular period, place, and even types of vaccine.³² Among high-income countries, vaccine hesitancy has been reported, for example, due to safety concerns. For example, the 2019 Influenza vaccine hesitancy in France which was initially developed in relation to the reported side-effects of the influenza vaccine that was exacerbated by an additional complicated schedule, dosing of the vaccine, and the lack of influenza case reports, which further resulted in the lack of urgency in accepting the vaccine.³³ On the other hand,

Table 1. Studies related to COVID-19 vaccine acceptance in Indonesia.

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|--|---|--|---|---|
| 1. | Puspasari, and Achadi (2021) ⁶² | Analytical study; cross sectional online survey | To analyze COVID-19 vaccine acceptance among general population in Indonesia using Health-Belief Model (HBM) approach. | Based on the HBM components, the perceived vulnerability, severity, and benefit played an important role in constructing people's perception toward vaccination among general population. On the contrary, vaccine <i>halal</i> status, in addition to the reported adverse reactions, information regarding ineffectiveness of vaccine, and cost of vaccine increased vaccine hesitancy. | Vaccine specific issues → Risk/benefit Contextual influences → religion |
| 2. | Muhammad, et al. (2021) ⁶⁰ | Case study | To examine the generation Z perspective, which represented by the university students in Bekasi, regarding the distributed COVID-19 vaccine. | Huge amount of unreliable information regarding COVID-19 vaccination has driven out people to trust in the real benefit and effectivity of vaccine among the university students in Bekasi. | Contextual influences → communication and media information |
| 3. | Alpito, et al. (2021) ⁴³ | Survey using multiple choice question | To observe the perception and awareness of general population in Riau on COVID-19 vaccination | Based on the survey majority of the respondents believe that vaccine was unimportant/not necessary. Most of the respondents concerned regarding the risk of vaccine that outweighs the advantage. | Individual/ social group influences → immunization is not needed/harmful. Contextual influences → communication and media information Vaccine specific → introduction of a new |

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|---|---|---|--|---|
| | | | | | vaccine/new formulation, vaccine schedule |
| 4. | Arumsari, et al. (2021) ⁴⁴ | Descriptive - quantitative; cross-sectional | To depict COVID-19 acceptance among general population in Semarang City | Most of the respondents were doubtful regarding the COVID-19 vaccine effectivity and the unavailability of the halal certification, while another group of the population believe that pandemic of COVID-19 was a part of governmental rumors/propagandas. | Vaccine specific → introduction of a new vaccine/new formulation, risk/benefit individual/social group influences → immunization is not needed/harmful, trust in health system and provider Contextual influences → religion (50%) |
| 5. | Afrizal and Ganafi (2021) ⁴¹ | Descriptive - qualitative | To observe difference perspective regarding the COVID-19 vaccination program among general population in Cibadak Village, Bogor City. | Concerns related to the safety and effectiveness of vaccine were commonly perceived by the respondents of general population in Bogor. Some people concerned about the adverse reaction of the vaccine, while others were reluctant to get vaccinated due to religious matters, including the unavailability of <i>halal</i> certification. | Vaccine specific → introduction of a new vaccine/new formulation, risk/benefit Contextual influences → religion Individual/social group influences → immunization is not needed/harmful, trust in health system and provider. |
| 6. | Novita and Ramadhani (2021) ⁴² | Online survey | To provide massive and comprehensive education | Most of the respondents were reluctant to get vaccinated due to multiple concerns related to the vaccine safety, vaccine effectiveness, | Vaccine specific → introduction of a new vaccine/new formulation, risk/benefit |

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|---|---|--|--|--|
| | | | toward key population in Jakarta regarding the importance of COVID-19 vaccination, and to increase the community awareness toward the ongoing pandemic management. | mistrust on the importance of vaccine, as well as the following adverse reactions such as fever and pain, in addition to several religious matters. | Contextual influences → religion Individual/social group influences → immunization is not needed/harmful, trust in health system and provider |
| 7. | Ichsan, et al. (2021) ⁶³ | Analytic descriptive ; cross-sectional | To analyze determinants of COVID-19 vaccine acceptance among people in Central Sulawesi | Based on the study, it was found that age, educational level, occupation, and marital status, as well as religions and ethnicity played crucial role in constructing sentiment toward vaccine among general population in Central Sulawesi | Contextual influence → religion, culture, socio economic group |
| 8. | Widayanti and Kusumawati (2021) ⁵³ | Analytic-observational; cross-sectional | To analyze the relationship between the awareness of COVID-19 vaccine effectiveness and the willingness to get vaccinated among university students in Surabaya | Based on the study, there was a positive association between perceived COVID-19 vaccine effectiveness with respondents' willingness to get vaccinated, particularly for prevention purposes among the respondents. | Vaccine specific → introduction of a new vaccine/new formulation, risk/benefit |

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|-----|---|-------------------------------|--|--|---|
| 9. | Harapan, et al. (2020) ⁵ | Cross-Sectional Online Survey | To understand the different acceptance rate of COVID-19 vaccine with the reported 50% vs 95% vaccine efficacy among general population in Surabaya | Based on 1.359 respondents of general population, the acceptance rate of 95%-vaccine efficacy (93%) was significantly higher than the 50% one (67%). | Vaccine specific → risk/benefit |
| 10. | Febriyanti, et al. (2021) ⁵⁰ | Descriptive survey | To increase the awareness, knowledge, and acceptance of COVID-19 vaccination among general population in Dukub Menanggal Village, Surabaya | About 81% of the participants were willing to get vaccinated once they have been aware of the COVID-19 vaccine effectiveness. On the other hand, respondents who refused the vaccine had strong concerns related to the adverse reaction, safety, and the effectiveness, as well as refusing to believe on the existence of COVID-19 pandemic. | Individual/social group influence → knowledge |

Table 2. Studies related to COVID-19 vaccine acceptance in Asian Countries.

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|----------------------------------|------------------------|--|--|---|
| 1. | Luo, et al. (2021) ¹³ | Cross-sectional survey | To examine the association between social media exposure and peers influence toward the intention to get free and self-paid COVID- | Among 6.922 respondents of the university students, about 78% willing to be vaccinated if the vaccine was free, while about 57% respondents would do even if it was not. | Contextual influences → communication and media information Vaccine specific issues → cost |

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|------------------------------------|-------------------------------------|--|---|---|
| | | | 19 vaccine among university students in five Chinese provinces. | Dissemination of COVID-19 vaccination information through the peer influence and social media significantly associated with higher number of students who were willing to get vaccinated. | |
| 2. | Kalam, et al. (2021) ² | Barrier analysis through interviews | To discover behavioral determinants associated with the perception of people in Bangladesh in relation to COVID-19 vaccine acceptance. | Based on the study, social norms, safety, and trust concerns regarding COVID-19 vaccine, as well as risk, benefit, efficacy, consequences, and access to vaccine significantly associated with vaccine acceptance among general people in Dhaka, Bangladesh. Social support on behalf of the health workers, close relations, as well as family members have positive influence in increasing vaccine acceptance to about 2-3 times. | <i>Individual/social group influences → immunization is not needed/harmful, trust in health system and provider.</i> <i>Vaccine specific → introduction of a new vaccine/new formulation, risk/benefit</i> |
| 3. | Hyunh, et al. (2021) ⁴⁰ | Cross-sectional | To determine predictive factors associated with the acceptance of the COVID-19 vaccine among general population in Ho Chi Minh City, Vietnam | About 425 respondents included in the study. Among the proposed factors, level of knowledge regarding COVID-19 including the pathogens, management, preventive measures, and level of severity associated with higher vaccine acceptance to about 1-1.2 times in high-risk general population in Vietnam. | <i>Individual/social group influence → knowledge</i> |

| No | Author (Year) | Study Design | Aim of Study | Results | SAGE Matrix Determinants |
|----|------------------------------------|--|---|---|--|
| 4. | Mahmud, et al. (2021) ¹ | Nationwide online cross-sectional survey | To assess the intention and predictors of COVID-19 vaccine among general population in Saudi Arabia | Based on the study, there were three groups of people who were more likely to get vaccinated among the general populations; they were older people (>50 years old; aOR 2.11), health professionals (aOR 2.50), and people who were annually receive influenza vaccination (aOR 2.63). Those groups of people were reported to have higher positive attitude toward COVID-19 vaccine than the general populations. | <i>Individual/social group influence → experience in past vaccination, knowledge</i> <i>Vaccine specific → risk/benefit</i> |

skepticism and religious practices were highly influential in promoting vaccine hesitancy in low-middle-income countries. For instance, vaccine hesitancy in Nigeria developed mainly due to the stigma that polio vaccines caused infertility among children, which was highly regarded as unfortunate in the cultural and social context.³⁴ Based on those circumstances, providing reliable understanding of vaccine and vaccination among society is paramount in increasing vaccination coverage, especially by identifying the associated mechanism in which hesitancy may occur and providing the proper interventions.^{29,31,35,36} Consequently, it is also vital to acknowledge determinants that promote vaccine hesitancy to inhibit the expansion of the harmful movement.

Matrix of Determinants of Vaccine Hesitancy

In 2015, SAGE-WG developed a framework³² to discover the thought process for understanding the determinants of vaccine hesitancy among populations. The framework was also known as the 3C model, which referred to Confidence, Complacency, and Convenience. Based on that framework, the researchers have discovered that Confidence was the most vital determinant, which plays a significant role in encouraging people to accept vaccination.

Accordingly, the SAGE-WG Matrix of Determinants of Vaccine Hesitancy²² was developed regarding the crucial aspect of Confidence in the framework, comprising three categories that enable people to get

vaccinated. The three main categories were classified as Individual/Social Group Influences, Vaccine and Vaccination-specific Issues, and Contextual Influences. Nevertheless, the main factors that were attributed to the occurrence of vaccine hesitancy may be different within different circumstances.³² This study focused on understanding the plausible factors and mechanism of vaccine hesitancy in Indonesia and other relevant Asian countries.

Individual/social group influences

Individual or social group factors separate individuals and communities into several aspects related to knowledge, attitude, and behavior toward COVID-19 vaccine. Studies involving multiple countries by Bono et al.³⁷ revealed that although knowledge related to COVID-19 differed within countries, they were most affected by the recipients' level of education and social background. Higher levels of education were correlated with higher levels of knowledge, a more positive attitude, and greater acceptance of vaccination, respectively. Therefore, it is essential to understand the social determinants of vaccine hesitancy concerning individual and community education to increase vaccination coverage.^{32,38,39}

Besides educational level, vaccine reception has also been associated with prior experiences regarding the vaccination process. This was particularly supported by the SAGE

WG model, which also depicted this influence in the matrix. A study by Mahmud et al.¹ in Saudi Arabia has shown that the role of previous vaccination experiences is highly related to the sentiment toward the vaccination program. Regarding that matter, past experiences of individuals toward previous vaccination determined their demeanor in getting the COVID-19 vaccine on the current occasion. However, any applied modifications or approaches to policies and culture may also contribute to the sentiments within countries and populations.

On top of that, trust and perception regarding the diseases among communities may influence vaccine acceptance. Cross-sectional research in Bangladesh² showed a significant relationship between the awareness of the existence of COVID-19 and positive attitudes toward vaccination. Based on the study, the respondents were three times more likely to receive vaccine if their physicians positively promoted the importance of vaccine. Accordingly, Hyunh et al.⁴⁰ presented a positive relationship between knowledge and vaccine acceptance among recipients in Vietnam. The research showed that comprehensive recognition of the pathogens, treatments, manifestations, and preventive measures related to COVID-19 possibly decreases the reluctance to get vaccinated in the community.

On the contrary, misunderstandings regarding the advantages and disadvantages and the effectiveness and safety of vaccines were mainly attributed to vaccine hesitancy at both the personal and population levels. A cross-sectional survey by Ganafi and Afrizal⁴¹ has discovered that negative stigma due to negative adverse-reaction regarding vaccination among the population outweighs the advantage perceived by the community, which resulted in hesitancy. Accordingly, a study by Novita et al.⁴² has also discovered the main concerns among the respondents, which were specifically related to safety concerns (30%), uncertain regarding the importance (13%), and adverse reactions, such as fever and pain (12%), enhance the negative stigma of vaccine in the society which further decrease the motivation to get vaccinated.

Moreover, it is also postulated that individual or group perceptions may play a role in directing other people's tendencies in receiving the vaccine, particularly in relation to the awareness of the vaccine's advantages and disadvantages. For instance, Alpito et al.⁴³ have reported the paramount role of positive testimonies in motivating people to get vaccinated in Indonesia. On the contrary, negative reports emphasizing the vaccine's ineffectiveness or disadvantage may build resistance to getting vaccinated. This situation was also depicted in the study by Arumsari et al.⁴⁴. According to the study, about 60% of the

respondents admitted that their uncertainty about being vaccinated was due to the dissemination of testimonies regarding the ineffectiveness of the vaccine, along with the self-limiting characteristics of the disease that may be treated simply using traditional and herbal medicine.

There were several similarities and differences regarding the mechanism of the individual/group influences in explaining vaccine hesitancy in Indonesia compared to other countries.^{27,30,45-47} In Indonesia and other Asian countries, mistrust toward COVID-19 and the vaccine was estimated to be one of the most substantial factors preventing people from getting vaccinated.^{38,48} The lack of understanding and awareness regarding the existence of COVID-19 among the societies, namely Bangladesh², resulted in low national vaccine coverage. Unfortunately, the lack of trust among Indonesians, combined with strong misconceptions, low educational levels, and false assumptions regarding COVID-19, has become a highly influential burden that prevents people from getting vaccinated without exception.^{2,27,35,42,44,48,49} Furthermore, Febriyanti et al.⁵⁰ reported that knowledge of COVID-19 may not solely be influenced by the societal background of education, but also by the level of initial motivation, the ability to adapt to the situation, and compliance with advanced technology

Vaccine and vaccination-specific issues

Based on the thought process matrix that has been proposed³², vaccine and vaccine-specific issues concern the vaccine's built-in characteristic, which includes the content of the product, the adverse reactions, doses and schedules, and the method of injection and healthcare support toward the program. Additionally, cross-sectional research in Southeast Asia has also identified that the cost-effectiveness of getting vaccination was the main subject of interest to motivate people to get vaccinated, which was agreed by 62,8% of the respondents. Even though issues related to the cost of vaccine should no longer be prominent, considering COVID-19 vaccine was free of charge, the availability and access expended to receive the vaccine were still a major problem in Indonesia. On top of this, older people were amongst the most disadvantaged population in receiving vaccination, along with the lower socioeconomic status, due to the lack of access to the vaccine, and supplemental spending to get vaccinated, while exacerbated by the low level of income and other personal matters, such as misinformation susceptibility.^{36,51,52}

Besides the economic aspect, societal perceptions of the vaccine's novel substances are also significant issues to consider. Regarding the unfamiliarity of the newly developed vaccine and its contents, the

likelihood of vaccine hesitancy was estimated to rise to approximately two-fold times.^{27,37,47,52} These characteristics of vaccine-related matters, including the mode of delivery, doses, and schedules, were reported to affect reluctance in the global context, including Indonesians. For instance, the reported COVID-19 vaccine hesitancy in Semarang City.⁴⁴ It was found that religiosity played a significant role in empowering hesitancy, particularly due to the novelty of the vaccine and its substances. Based on the results of the study, approximately 50% of the respondents revealed that vaccines were assumed as inappropriate due to the absence of a *halal* registry from the corresponding authorities. On top of that, about 52% of the respondents preferred to believe solely in God's protection instead of getting vaccinated to keep them safe. Meanwhile, almost 48% preferred to protect themselves with preventive measures or herbal medicine instead of getting the vaccine. It is expected that problems regarding religion and vaccination were also reported as a part of the contextual aspect of vaccine hesitancy, which affected many individuals to be reluctant to get vaccination..^{43,44}

Moreover, the level of uncertainty regarding vaccine effectiveness has also been an issue at the national level. A study by Widayanti and Kusumawati⁵³ reported the relationship between people's perception regarding

vaccine effectiveness and their willingness to receive vaccine for COVID-19 in Indonesia. Based on the 188 samples included in the research, only about 73% of respondents were aware of the effectiveness of vaccine to prevent COVID-19 and agreed to be vaccinated. Consequently, a 2020 cross-sectional survey about vaccine acceptance in Indonesia showed a positive correlation between awareness regarding the vaccine effectiveness and the attitude toward vaccination. Based on a total of 1.359 respondents, about 93,3% agreed to receive vaccine with a higher level of scientifically proven effectiveness (95% vs 50%-effective), while only 57% of the participants agreed to the latter.⁵³

Contextual influences

The role of contextual matter in the development of reluctance toward vaccination arises from various perspectives, namely government policies, politics, geographical conditions, and media influences. A study in China by Luo et al.¹³ stated that the contextual aspect, particularly in relation to social media or verbally exchanged information through word of mouth, significantly influenced the perception among higher education students toward vaccine. This study revealed that any exposure from social media, either verbal or non-verbally spread regardless of the purpose, could be a very strategic approach in enhancing people's awareness and motivation to vaccinate. Another study also supported

this situation, given that knowledge regarding vaccine and vaccination played a role in motivating people to get vaccinated, particularly in Asia countries.^{27,37,54}

Nonetheless, the influence of the media is substantial in motivating people to receive vaccine. Therefore, inadequate amount of information and hoaxes or fallacious news disseminated through the media had a destructive impact on the vaccination program significantly.^{27,55} Based on several surveys, the media played a strategic role in constructing motivation of people within Asian countries. Studies have found that the media has influenced the perception of vaccination's importance in 10 to 80% of respondents.^{4,27,56-58} In Indonesia, the media's tremendous influence has always been a major force in driving the majority of the population, subjecting that strategy as an effective approach to promote vaccine coverage nationwide.^{55,59}

On the other hand, relying on social media to disseminate vaccine-related information has been a challenge currently. Even though a study by Muhammad et al.⁶⁰ has depicted a meaningful relationship between vaccination-related context that was spread through social media with the positive attitude that encouraged people to get vaccinated, the significance of negative tendency may exceed the positive influence in the light of getting people vaccinated. Additionally, false

information shared through television and social media has been increasing the prejudice among society regarding vaccination programs. The study also revealed that unreliable and irresponsible judgments which were disseminated through the media toward vaccine and vaccination would decrease the motivation of their consumers to get vaccinated. Furthermore, about 14% of the respondents were found to be indecisive in getting vaccinated because they were uncertain of the disseminated information, considering the polarities of each influence, which resulted in confusion and mistrust.

Besides the spread of misinformation and rumors found to be superior in the contextual factors, the religious matter was still considered one of the most complicated challenges to address.^{44,53} In addition to vaccine-specific issues, religion might act as not only a catalyst to facilitate people to support governmental programs and public health measures but also the exact opposite. The latter was possible due to the aforementioned misconception of their faith which mainly relied on the divinity power to be protected against the COVID-19 and inconsistency regarding the religious practices as well as the key figures among the societies. Regardless, religion should be as well considered as a strategic approach to handling false information, particularly among

population where religion plays a remarkable portion in the lives of many.⁶¹

Several researchers to date have studied the relationship of religiosity in the context of vaccine hesitancy. The studies have found that certain religious affairs, namely Islam, played a pivotal role in defining the followers' attitude toward vaccine in regard to several factors, mainly the *halal* status.^{41,44,62} Consequently, the study by Arumsari et al.⁴⁴ in Semarang showed that about 50% of the respondents involved in the study did not get the vaccination against COVID-19 due to the unsettled *halal* status from the government. The result was also consequently supported by another study by Ichsan et al.⁶³ in Central Sulawesi, which reported that only about 30% of the local Muslims were willing to be vaccinated despite the unclear *halal* status.

CONCLUSION

Vaccine hesitancy is a public health concern that obscured the successful management of the COVID-19 pandemic. The phenomenon is associated with various contributing factors, depending on the location, societal background, and types of vaccine, as well as additional contextual matters that need to be addressed effectively. Globally, the SAGE-WG matrix of determinants of vaccine hesitancy has been acknowledged as a thought process model to understand vaccine hesitancy matters, which analyzes three main influential

determinants that include individual/group influences, vaccine/vaccine-specific issues, and contextual matters. In Indonesia, several issues, such as the lack of knowledge, misconception of vaccine effectiveness, concerns related to adverse reactions, and the media as well as religious practices, were among the prominent determinants involved in COVID-19 vaccine hesitancy that further decreased the vaccine coverage. Finally, the COVID-19 pandemic has peeled the base of the iceberg issues of challenges in successful vaccination program in Indonesia, especially in regard to vaccine hesitancy. Acknowledging factors related to the rise of vaccine hesitancy using the matrix of vaccine hesitancy determinants is substantial to develop strategic approaches to overcome the future pandemic effectively.

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CONFLICT OF INTEREST

The Authors have no conflict of interest to disclose.

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