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LITERATURE REVIEW

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Efforts in Securing Vaccine for Covid-19 Outbreak in Indonesia

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ABSTRACT

Indonesia already achieved the highest COVID-19 death rate in South East Asia. Securing enough vaccine is the only way to eradicate this disease by commencing mass vaccination. Therefore, this review is aimed to discuss Indonesia's readiness to commence mass COVID-19 vaccination, discussed from biomedical, socioeconomic, and regulatory approach. An extensive literature study was done in focus to gather the latest information regarding to the efforts made by Indonesia to secure adequate supply of vaccine. Through international collaboration, Indonesia has established several vaccine-related cooperation with multiple organizations. Independently, Indonesia is trying to develop "Merah Putih" vaccines covering 6 parallel local vaccine research. The combined Indonesian efforts may secure around 300 million vaccine doses, whereas the government aims to vaccinate at least 70% of its population to gain herd immunity. If each person needs 2 vaccine doses, then the currently secured vaccines is not yet enough to fill the 376 million doses demand. It can be concluded that Indonesia still needs to secure another 100 million doses before it is ready for commencing mass COVID-19 immunization.

Keywords: COVID-19; mass immunization; Indonesia; readiness; vaccine

INTRODUCTION

As November 4, 2020, Indonesia is still severely impacted by COVID-19. There are 418 thousand confirmed cases and 14 thousand deaths according to Indonesian Ministry of Health. The death rate is around 3.4% which is higher that global (2.6%) and South East Asia regional (1.6%) average[(1)]. This number may raise concern since there are evidences of misinformation within the population because of the rapid spread of hoax that can impede the pandemic mitigation process[(2)]. Even so, one study found that more than 90% of respondents have good knowledge and good behavior towards social distancing. The only problem is, only 59% of respondents have positive attitudes, meaning that only 59% of respondents have awareness of social distancing at work, worship, and learning from home[(3)].

On September 14, 2020, the Jakarta (Indonesian capital) city government independently enforced PSBB (Pembatasan Sosial Berskala Besar), or literally translated as "large-scale social restriction". This caused backlash with the central government which was trying to balance between pandemic mitigation and the economy. Some political figure, like the Minister of Industry, publicly stated his "worries" about the governor's decision[(4)]. This reflected the discordant policy making between the central and local government. However, the two institutions seemed to get along together again when arranging PSBB extension to October 11, 2020[(5)].

The government is indeed in a dilemma. Indonesia is one step closer to recession since it experienced 5.32% economic contraction (y on y) in Q2 based on its National Statistic Centre report[(6)]. Under best case scenario of an estimation, the poverty rate might rise from 9.2% in September 2019 to 9.7% by the end of 2020, which will force around 1.3 million people fall into poverty[(7)]. Yet, the pandemic keeps getting worse. This is reflected in the daily confirmed case count that shows increasing trend. On October 8, 2020, a new highest record was broken with 4850 new cases confirmed in only one day[(1)]. This is far more impressive than the neighbouring country Thailand's total 3797 cases for the whole pandemic period until November 3, 2020[(8)].

Beyond the spread of hoax, low positive attitude, discrepancy between institutions, and complex dilemma between pandemic mitigation and economic rescue, it is proposed that the reason might be more grounded in the system. One study suggested that the problem lies within the specific process of democratic decline which is plagued by populist anti-scientism, religious conservatism, religio-political polarisation, and corruption[(9)].

Despite of the concerning epidemiological parameters, Indonesia has done countless plausible efforts to combat the pandemic. For example, the central government has constructed emergency COVID-19 hospital in Galang island and Wisma Atlet, imposed several regulations for mitigating the outbreak, also allocated budget for

medical worker, social security, and small business owner[10–12]. Nevertheless, all these efforts can only do so much to flatten the curve and alleviate socioeconomic impact experienced by the people. Without vaccine or effective antiviral treatments, recurring epidemic waves is expected only to lead to more lockdowns[13].

Securing vaccine supply even before it is approved became important to quickly end the pandemic since vaccination is already proven able to eradicate a disease, like polio[14]. Securing vaccine supply became a lot more critical since Indonesia, regardless of the cause, is already crowned as the country with the highest COVID-19 death rate in South East Asia[15]. To assess Indonesia's readiness for mass immunization, this review is written to summarize recent progress done for securing COVID-19 vaccine, discussed from biomedical, socioeconomic, and regulatory perspectives. It is hoped that this review can fill the knowledge gap regarding to the efforts made by Indonesia to secure COVID-19 vaccine. To our knowledge, this will be the first review assessing Indonesia's readiness to do mass COVID-19 immunization.

METHODS

An extensive literature study was done in focus to gain up to date information regarding to the efforts made by Indonesia in securing COVID-19 vaccine. The efforts were not limited to the government, but also other stakeholders such as scientist and corporation. The references discussed here were restricted to those published in 2020. However, supporting studies were not restricted.

REGULATORY AND FINANCIAL PREPARATIONS

Before anything, laws must be passed to support all efforts made to secure vaccine for mitigating COVID-19 outbreak in Indonesia. The central government had passed a law regulating the COVID-19 vaccine procurement and implementation on October 5, 2020. The national vaccination roadmap is specifically highlighted in this law, covering procurement, execution, financing, and other technicalities. According to this law, the government will handle COVID-19 vaccine procurement within 2020 – 2022 range, where this range can be extended according to the proposal from The Minister of Health. Vaccination will be commenced after deciding the criteria of prioritized recipient, prioritized region, schedule, standard of service, and vaccination phases[16].

The second aspect needs to be built is the financial support. Indonesia has pledged to cover vaccination cost for its 93 million people from low-income families. The government appealed for the financially capable employers to arrange free vaccination for their employees as a mean to lessen financial burden. The government also has already set the mass vaccine production to start from January 2021 even though there is no promise of vaccine approval by that time yet. This signaled how the government is trying to encourage rapid vaccination in Indonesia as soon as possible. The first vaccination wave is said to be allocated for medical workers vulnerable to COVID-19 infection[17].

INTERNATIONAL COLLABORATIONS

In pursuit to secure a vaccine, Indonesia has been looking for international collaborators. The strategic partnership is not only limited to vaccine, but also in COVID-19 related technologies. Currently there are several companies closely associated with Indonesian government, namely Sinovac, Sinopharm, G42 Health Care, CanSino, and Genexine.

Sinovac is a Chinese company already partnering with a state-owned pharmaceutical company, Biofarma, to roll phase 3 clinical study in Bandung, Indonesia. In this partnership, Indonesia secured 18 million vaccine doses until the end of 2020 and another 125 million doses in 2021[18–20].

Sinovac vaccine is an inactivated virus termed PiCoVacc. It means that the vaccine contains most, if not the whole SARS-CoV-2 virus. Based on its preclinical study, PiCoVacc was able to induce SARS-CoV-2–specific neutralizing antibodies in mice, rats, and nonhuman primates. Moreover, these antibodies were reactive against 10 different representative SARS-CoV-2 strains. This result demonstrated PiCoVacc's broad neutralizing ability and a possible broader reactivity against other strains not in the study[21]. The vaccine is administered through 2 intramuscular shots[18].

Despite of the promising early result, the main reason behind this agreement was because Bio Farma already have the sufficient competency for manufacturing the vaccine. Bio Farma is known to produce pertussis vaccine which uses similar manufacturing method. Upon completing clinical trial and approval from BPOM (Indonesian food and drug regulator), Bio Farma is targeted to produce this vaccine on January 2021 at 250 million doses/year capacity[16]. It should be noted that Bio Farma still have to order the vaccine material from Sinovac to produce it[22].

Sinopharm is a Chinese company which will partner with state-owned Kimia Farma[18,23]. According to WHO database, there are 2 vaccine developers under the name of "Sinopharm". One is associated with Wuhan Institute of Biological Products, the other is associated with Beijing Institute of Biological Products. Both uses inactivated vaccine that is administered by 2 intramuscular shots and already entered phase 3 clinical trial[18]. It is unclear which vaccine is being referred to.

Sinopharm and G42 Health Care have formed an alliance to do the phase 3 study of their vaccine. The phase 3 is done in Abu Dhabi under the lead of UAE's G42 and supervised by Abu Dhabi's Department of Health[24]. Here Indonesia managed to secure a commitment of 15 million vaccine doses from the developer by the end of 2020 and additional 50 million in 2021[20].

G42 Health Care is the only company having a deal in both vaccine and test kit development. G42 partnered with Indofarma to develop viral detection test kit. The test kit uses laser technology augmented with AI (Artificial Intelligence) for viral detection[23].

CanSino is a Chinese company associated with two different institutions in WHO database which are the Beijing Institute of Biotechnology and Institute of Biotechnology, Academy of Military Medical Sciences, PLA of China[18]. CanSino from Beijing Institute of Biotechnology is probably the one being referred to. CanSino is using non-replicating viral vector vaccine and still undergoing phase 3 clinical trial. The vaccine only requires one-time intramuscular shot. Cansino is committed to provide Indonesia with 100 thousand vaccine doses by the end of 2020 and additional 20 million by 2021[20].

Genexine is a South Korean company which will partner with Kalbe Farma, another Indonesian pharmaceutical company. It is currently developing DNA-based vaccine named GX-19 that is administered through 2 intramuscular shots. Genexine is scheduled to enter phase 2 clinical trial by the end of 2020 in Indonesia[18,25].

More than that, Indonesia also uses broader multilateral channel to make sure equitable and affordable access to COVID-19 vaccine not only for itself, but also for all by joining COVAX initiative[26]. COVAX is an initiative which act like an insurance policy with the largest portfolio of vaccine candidates in the world co-led by Gavi, CEPI, and WHO. When a wealthier country buys an approved vaccine in COVAX's portfolio, it will also contribute to the development of the production capacity, cost reduction, logistic, etc. so the poorer country will have greater chance of accessing the approved vaccine[27].

The secured vaccine doses count can still be changing over time. For example, Astra Zeneca was originally reported ready to supply 100 million vaccine doses for Indonesia[20]. However, this agreement seems to be put on hold not long after the announcement[28]. Therefore, deviation should be expected when reading about secured vaccine doses commitment count elsewhere from time to time.

INDEPENDENT EFFORTS

Indonesia is currently trying to develop its own COVID-19 "Merah Putih" vaccine. Interestingly, this is not just one vaccine, there are 6 institutions independently developing their own vaccine under the "Merah Putih" flag. Merah putih itself means "red white" which is the color of Indonesian flag. The institutions involved are Eijkman Institute, Bandung Institute of Technology (ITB), University of Indonesia (UI), Indonesian Institute of Sciences (LIPI), Airlangga University (UNAIR), and Gajah Mada University (UGM). This worthy effort is led by Eijkman Institute, where the state-owned Bio Farma is gearing up to mass produce the vaccine[29–31].

Each institution is trying to develop COVID-19 vaccines according to their own discretion. Eijkman Institute is developing recombinant protein subunit-based and inactivated virus vaccine. ITB is developing vaccine based on adenovirus platform. UI is developing vaccine using different platforms, namely DNA, RNA, and virus like particle (VLP). LIPI is developing recombinant protein-based vaccine, UNAIR is developing vaccine based on adenovirus platform, Lastly, UGM is developing recombinant protein-based vaccine[30,31]. All vaccine development approaches are already applied in vaccines currently in clinical trial[18]. For example, Oxford's ChAdOx1-S uses adenovirus vector just like ITB[32]. However, due the lack of detail, no head to head comparison can be done between Merah Putih vaccines.

The COVAX initiative allows Merah Putih vaccines to be distributed through COVAX facilities[26]. This opens up the possibility of exporting Indonesian vaccines upon fulfilling domestic demand. Indonesia can even help other countries to rise from this crisis if the 6 Merah Putih vaccines can be quickly developed, which could be a great bilateral and multilateral leverage in the future.

READINESS AND PERSPECTIVESS

As November 4, 2020, Indonesia has secured around 18 million vaccine doses until the end of 2020 and additional 195 million doses in 2021 from Sinovac, G42 – Sinopharm, and CanSino[20]. The COVAX initiative also offers vaccines for at least 20% of the population, which is around 54 million doses[27,33]. Thus, the secured vaccine stock is expected to be around 300 million doses.

Only 65 – 70% of the population need to be immunized to gain herd immunity[34]. Herd immunity is the overall population immunity effect caused by the lack of pathogen transmitting individual within the population[35]. Using this state as a threshold, Indonesia only needs to vaccinate at least 188 million people (70%) from its population[33]. If the vaccine used requires 2 shots per person, the required vaccine must be at least 376 million doses. Thus, around 100 million additional vaccine doses are needed to fulfill this demand.

The predicted cost of each vaccine is different, and the government is still unsure about the exact price due to the high dynamic. The Sinovac vaccine price is predicted to be between 148 – 296 thousand rupiah. The vaccine

from COVAX is predicted to be between 44 – 74 thousand rupiah[36]. Meanwhile, Merah Putih vaccine is predicted to be around 73 thousand rupiah[37].

There should not be any concern regarding to the vaccine price since the government has already pledged to provide free vaccination for 93 million people from the low-income families[17]. The immediate challenge right now might be how to obtain more vaccine supply from various sources such as the potential partnership with Genexine that has not generated any deal yet and supply from Indonesia's very own Merah Putih vaccine[25,30]. Not to mention that there is always the option to buy vaccines from other vaccine developers worldwide. As November 4, 2020, it is plausible to say that Indonesia is not yet ready for COVID-19 mass immunization.

CONCLUSION

Indonesia has done several efforts in securing COVID-19 vaccine doses for its population, namely by international collaboration and independent efforts. Internationally, Indonesia managed to establish cooperation with Sinovac, Sinopharm, G42 Health Care, CanSino, Genexine, and COVAX initiative. Independently, Indonesia has incited 6 parallel home-grown vaccine researches under "Merah Putih" banner. Those combined efforts by estimation have secured around 300 million vaccine doses. If the vaccine used requires 2 doses for each person, this estimated stock is not yet enough for vaccinating 70% of Indonesian population to achieve herd immunity. With the available law regarding to COVID-19 vaccination and the commitment to vaccinate those from low-income families free of charge, it is safe to conclude that Indonesia only needs to secure another 100 million vaccine doses before it is ready to commence mass COVID-19 immunization.

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