

# The Effectiveness, Side Effects, and Implementation Between Variation of COVID-19 Vaccines in Indonesia

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## ABSTRACT

The spread of coronavirus 2 (SARS-CoV-2) has affected countries all around the globe in all sectors. This challenge needs an equally rapid response to find medical treatments to reduce the severe impact or prevent the massive spreading among people, and vaccination is one of the answers. The race between the health system and economics breaks down as the cases surge, bringing tension to the researchers everywhere to develop vaccines for COVID-19. Hence there are a variety of vaccines that have been used worldwide. In Indonesia, various vaccines commonly used are AstraZeneca, Sinovac, and Sinopharm. In this perspective, we compare the efficacy, efficiency, and side effects of those vaccines. We also highlight the implementation of vaccination in Indonesia.

**Keywords:** Vaccine, Vaccination, COVID-19, Effective, Efficiency, Side Effect, Implementation.

## 1. INTRODUCTION

According to Stanley A Plotkin (2005) [1], vaccination starts from homeopathic beliefs that ingesting small doses will protect against severe disease. There were hints that variola found around the eleventh century and written in Chinese literature. They used variola scabs insufflated into the nose to immunize against smallpox. Soon this invention widely spread across continents.

Although variolation was a success, Jenner's epochal observation of dairy farmer's immunity towards smallpox as the impact of infection by cowpox, milder disease than smallpox, is the one that brings vaccination to the world and also gives cachet on protection against exposure to infectious disease.

The history of vaccination as a deliberate exertion began by Louis Pasteur. From the observation, he constructed

hypotheses that pathogens could be attenuated by exposure to environmental insults such as high temperature, oxygen, and chemicals. Meanwhile, the concept of antibodies and cellular immunity came from the original work of Metchnikoff for discovering the significant types and functions of phagocytes and Ehrlich for discovering the types of blood leukocytes, helping to uncover how to generate and use antibodies to protect against bacterial toxins, and formulating the receptor concept of antibodies binding to antigens in 1908 [2].

The strategies for vaccine development are getting advanced as time goes by. Several strategies have been done throughout the years: cell-cultured revolution, inactivated vaccines, and genetic engineering [1]. The significant milestones in the historical path of vaccinology and vaccine design [3] could be summed up in Table 1.

**Table 1. Major milestones in the historical path of the development of vaccinology and vaccine design.**

Vaccine strategies	Year	Vaccine or target
Variolation	1721	Smallpox
Live-attenuated vaccine	1885	Live-attenuated rabies
Killed vaccines	1886	Cholera, plague, typhoid
Toxoid Vaccines	1900's	Diphtheria and tetanus toxoids
Combination vaccines	1984	Diphtheria, tetanus, pertussis
In vitro cell-cultured	1950's	Salk and Sabin polio
Polysaccharide vaccines	1970's	Meningococcus, pneumococcus
Glycoconjugates chemistry	1980's	HIB
Recombating antigen vaccines	1981	HBV
Therapeutic vaccines	2010	Prostate cancer
Reverse vaccinology	2013	Meningococcus B

Shan Su, Lanying Du, and Shibo Jiang [4] construct the idea of safety and efficacy COVID-19 vaccine. The safety bar of vaccines should be safe for all people globally, regardless of age, gender, race, and those with or without comorbidities (Several co-existing diseases and/or conditions [5]). The contrary reaction rate of a COVID-19 vaccine should be kept enormously low because it is distributed globally. The wide-ranging safety evaluation in different animal models, clinical trials, rational design of antigens, and adjuvants will lower Vaccine-associated disease enhancement (VADE).

## 2. METHOD

This paper study used descriptive research that can be categorized as a cross-sectional design method. Primary data that we used was from research that has been done by the Ministry of Health of the Republic of Indonesia [6] about vaccine efficiency, effectiveness, and impact. We decided to use this research as our primary resource because the data was collected from a survey, meaning their research's data was obtained directly from the research subject. They were distributing surveys to each respondent online from September 19<sup>th</sup>-30<sup>th</sup>, 2020.

More than 115,000 respondents from 34 provinces participated in the survey. The population in this study was all respondents who vary between provinces. Most 514 districts and cities (nearly 99%) participated in this survey, and there were six districts do not have respondents (two in West Papua Province and four in Papua Province).

In addition, the sampling method that we used is non-probability sampling, specifically with the convenience sampling technique. The respondents we used in this study are 69% of all respondents came from Java and 13% from Sumatra, where almost 75% of Indonesia's population lives. A total of 22% of respondents could not be used because they did not meet the criteria.

Data collection in this study was carried out by distributing an online survey. Based on the data collected, most respondents were male at 52% out of 99% and the other 1% preferred not to say their gender. Furthermore, three percent of the total respondents are under 18 years of age. Most respondents (76%) are aged 18 to 45 years old and more than 1% are over 65.

### 2.1 The Definition of AstraZeneca Vaccine

AstraZeneca uses a modified live adenovirus (adenovirus) as a distinct protein sender. Later

the protein will give instructions to the cells in the body to produce a small portion of the Coronavirus and trigger an immune response. Adenovirus is known as a harmless virus. The United States Centers for Disease Control and Prevention (CDC) said the spike-like part of DNA is usually found on the virus's surface. [7]

**2.2 The Definition of Sinovac Vaccine**

Sinovac is made from the inactivated SARS-CoV-2 virus to trigger an immune response. Vaccination methods from previously killed viruses have often been found in other vaccines and have shown to be effective. Some of them are flu and polio vaccines [7]. The Sinovac vaccine is licensed for emergency use (EUL) from WHO. Therefore, Sinovac is considered to meet international standards related to quality and safety.

Based on the results of clinical trials, the Food and Drug Supervisory Agency (BPOM) stated that the efficacy of Sinovac was 65.3 percent.

This figure meets the WHO requirements, which is above 50 percent [8].

**2.3 The Definition of Sinopharm Vaccine**

Sinopharm's Covid-19 vaccine is an inactivated vaccine called the SARS-CoV-2 Vaccine (Vero Cell). Inactivated vaccines use inactivated viral particles to expose the immune system to the virus without risking a severe disease response. The Sinopharm vaccine is also the first vaccine equipped with a temperature monitor on the vaccine bottle. A small sticker on the vaccine bottle changes color when the vaccine is exposed to heat and tells health care workers whether the vaccine can be used safely [10].

**2.4 The Side Effects of Each Vaccine**

Table 2 below shows the side effects of the three types of Corona vaccines currently used in Indonesia, namely Sinovac, AstraZeneca, or Sinopharm.

**Table 2. Side effects of each vaccine**

<b>Name</b>	<b>Side Effects</b>
AstraZeneca [9]	Feeling tired, tenderness, bruising, pain, or itching in the arm where the patient had the vaccine injection, headache, muscle pain, joint pain, nausea, fever (temperature of 38 degrees Celsius or above)
Sinovac [8]	pain, irritation, redness, and swelling
Sinopharm [11]	pain, swelling, redness, headache, muscle aches, diarrhea, and cough.

**3. RESULTS AND DISCUSSION**

According to the World Health Organization [11], all legally approved COVID-19 vaccines distributed for widespread use must have undergone various intensive trials to ensure those vaccines' quality, efficacy, effectiveness, safety, and impact. The vaccine efficacy must be quite 50% to be approved, and then, it still has to be monitored and still go through some trial process to determine the safety and effectiveness of the vaccine.

According to the World Health Organization's explanation [12], vaccine efficacy is measured by how the vaccine works under ideal conditions, controlled in clinical trials, and tested by how much it reduces the

risk of exposure to disease. The higher the level of efficacy, the less likely the vaccine recipient will contract the disease when in contact with the virus. Meanwhile, vaccine effectiveness is measured by how the vaccine works and protects the vaccine recipient in the actual situation and tests various samples such as gender, ethnicity, and certain medical conditions. Because of this method, there may be differences between effectiveness in the actual situation and clinical trials due to the difficulty of predicting the vaccine effectiveness in a larger group of more varied conditions than the sample tested.

As for a country with the highest number of new COVID-19 cases per day, the Indonesian government is starting to find ways to cope with the increasing number of additional cases. One of the ways the government can reduce the spread of COVID-19 is by appealing to the public to carry out vaccinations as soon as possible. The Indonesian government even facilitates the community by providing free vaccinations. As for the types of vaccines provided, there are AstraZeneca, Sinovac/CoronaVac, and Sinopharm.

With the three types of COVID-19 vaccines offered and provided by the government, concerns began to arise regarding these three types of vaccines as there are several factors a person decides whether they want to be vaccinated or not. Furthermore, the

Ministry of Health of the Republic of Indonesia [6] research includes vaccine efficiency, effectiveness, and impact.

Medical institutions and scientists then published statements through papers and discussed them through press conferences and social media. Moreover, to respond to the concerns regarding vaccines' effectiveness, efficacy, and impact, the World Health Organization then provided an article entitled 'Vaccine efficacy, effectiveness, and protection' and published various other reports accessible through their website. As for the three vaccine variants provided by the Indonesian government, according to several sources [13][14], all of the three vaccine variants provided by the Indonesian government have more than 50% efficacy. The details are shown in Table 3.

**Table 3. Vaccine comparison**

Name	Type	Efficacy	Effectiveness	Protection
AstraZeneca	Viral vector	76% - 100%	90%	92% protective against the delta variant
Sinovac / CoronaVac	Inactivated virus	50.4% - 91.3%	50-83%	65% protective against COVID-19 infections; Prevent death in 86% of cases.
Sinopharm	Inactivated virus	79%	79%-80%	N/A

Although the World Health Organization has issued medical study reports related to each type of vaccine and disseminated them to the public to dispel doubts and increase public acceptance of the COVID-19 vaccination. A new problem has arisen where anti-vaccine groups have begun to emerge and rare cases in Indonesia where some vaccine recipients were tested positive for COVID-19 after being vaccinated, some became paralyzed, and others even passed away.

However, after these cases were investigated, it was proven that the COVID-19 vaccination did not cause those numbers of death. According to the Head of the National Commission for Post-Immunization Adverse Events (Komnas KIPI), Hindra Irawan Safari

[15], from hundreds of COVID-19 vaccinations reports they received, there were only 30 cases of death after being vaccinated and were all caused by other diseases such as heart disease, kidney failure, diabetes mellitus, hypertension, and pneumonia.

As well for the case of paralysis that occurred after being vaccinated, according to the spokesperson for the Ministry of Health's COVID-19 vaccination, Dr. Siti Nadia Tarmizi [16], the paralysis occurs due to another virus that causes the immune system to damage nerve cells, causing muscle weakness and sometimes paralysis, and not because of the COVID-19 vaccination. This rare condition is called Guillain-Barre Syndrome. The victim's condition was linked to the COVID vaccination because she just got vaccinated, and right

before being paralyzed, the victim had experienced several symptoms similar to the common side effects after receiving the COVID vaccine.

According to the Chairperson of the Infection Working Group of the Central Management of the Indonesian Lung Doctors Association (PP PDPI), Dr. Erlina Burhan [17], for the other cases where the vaccine recipients were tested positive for COVID-19 after being vaccinated, several factors could cause a person to get COVID-19 after the vaccination. One of the causes is because they have been exposed to the virus days before being vaccinated. It could be that these people have been infected with the virus or are in the incubation period when they receive the vaccine, so then they are tested positive for COVID-19 after being vaccinated.

With clarification from credible parties on some of these problems, the government recommends that people remain willing to be vaccinated since it is clear that all the cases were not related to COVID-19 vaccination. The World Health Organization also recommends that the public should be vaccinated as soon as possible to prevent the possibility of adding new cases, wider spread, or even the emergence of new clusters.

According to the World Health Organization Q&A section held on their website, the impact of vaccines on the continuation of this pandemic will depend on several factors, including the effectiveness of the vaccines used, how quickly they are distributed, and how many people are vaccinated.

In Indonesia, the vaccination program started in early 2021 and is still ongoing in various parts of the country. Despite several problems that arise during this time, and some people who are still doubtful and afraid of the COVID vaccine, there has been an increase in vaccination rates from month to month, as shown in chart 1. As of 30 July 2021, from the total population of 271,349,889, there have been 20,146,421 people fully vaccinated, and a total of

46,805,993 people have received at least the first vaccine as graphic shown by Figure 1.

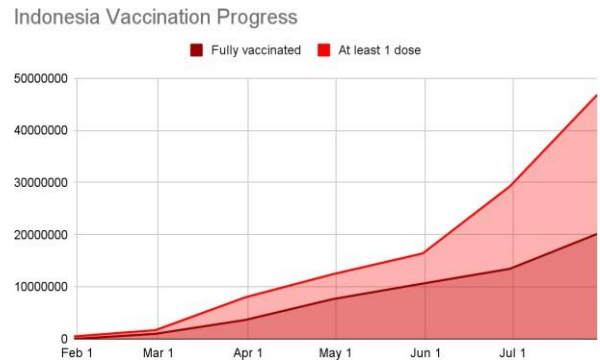


Figure 1. Indonesia Vaccination Progress

Although there has been a drastic increase, this number is still far enough to reach the vaccination target of 208,265,720 by the end of 2021. This issue became a new concern for the government because the virus has mutated, and new increasingly dangerous variants have appeared. This way, the COVID-19 vaccines have become an important step to protect people from getting sick from COVID-19 and prevent further spread.

The World Health Organization [11] stated that even if it is not 100%, the vaccine could still prevent most people from contracting COVID-19 and there may be only an insignificant percentage of people who do not develop protection even after they got vaccinated.

Even though being vaccinated does not guarantee immunity to COVID, it will benefit self-protection and prevention of COVID-19 exposure. Besides, even if COVID-19 infects vaccinated people, they will only experience mild symptoms, and it is uncommon among the vaccinated people who will develop severe symptoms or even death.

#### 4. CONCLUSION

The effectiveness of the vaccine has influenced the COVID-19 vaccine in Indonesia. When the vaccine has very high effectiveness, acceptance is relatively high, but it reduces to only 67.0%

when the vaccine efficacy is 50%. If the COVID-19 vaccine has low efficacy, governments will have to introduce strategies to persuade their population to become vaccinated. In addition, since acceptance is associated with perceived risk for COVID-19, it is also vital to increase the perceived risk in communities [18].

Earlier in the table of vaccine comparison, it is mentioned that the AstraZeneca vaccine is 92% protective against the delta variant, so another 620,000 AstraZeneca vaccines arrived in Indonesia on Sunday, 1 August and Monday, 2 August, respectively. The 32nd and 33rd shipments of vaccines to Indonesia, increasing Indonesia's total number of vaccines to 440 million.

The baseline effectiveness of the vaccine highly influenced the acceptance of COVID-19. Convince the general population to accept a vaccine with relatively low effectiveness could be difficult [18].

For the COVID-19 vaccines, these "events of special interest," which number nearly two dozen, include arthritis, narcolepsy, encephalitis, and stroke. Also on this list: Adding blood clotting condition thrombosis after the issue emerged with the AstraZeneca vaccine. COVID-19 vaccines allow pandemic stays under control. However, there are no vaccines that are 100% effective at preventing COVID-19. Nevertheless, only a minuscule percentage of fully vaccinated people still get sick, are hospitalized, or die from COVID-19 [19]. Although vaccines have side effects, people have to remember that these cases are unlikely to happen. Also, it has been proven that these cases occur not because of the vaccination but because of other diseases.

COVID-19 is a more significant threat for unvaccinated people. They can be severely ill and become more dangerous for people with comorbid diseases. So, in our opinion, we believe that people should get vaccinated regardless of whether they already have COVID-19. Studies have shown that vaccination provides a substantial boost in

protection in people who have recovered from COVID-19. Prevent the COVID-19 virus from spreading and replicating, which allows it to mutate and possibly become more resistant to vaccines.

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