

Comparative Analysis of Covid-19 Vaccines: Efficacy, Side Effects, and Global Impact

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Abstract - This comprehensive review provides insights into the development, efficacy, and safety of COVID-19 vaccines. It explores the origins of the disease and its symptoms, emphasizing the highly contagious nature of the virus. The landscape of COVID-19 vaccine candidates and their stages of development are presented, including notable vaccines such as Pfizer-BioNTech, Moderna, Johnson & Johnson, and others. Also discuss the side effects and safety profiles of these vaccines, comparing their efficacy percentages. Overall, this review highlights the importance of vaccination in combating COVID-19 and emphasizes the need to continue preventive measures alongside vaccination efforts.

Indexed Terms- Covid-19, vaccine, Review. (Keywords)

I. INTRODUCTION

SARAS-COV-2, also known as the severe acute respiratory syndrome coronavirus 2, first originates in Wuhan, China, and quickly spread throughout the world. A viral infection known as the coronavirus is extremely contagious and harmful[1]. Spike proteins, which give the coronavirus its name, have a crown-like structure that the virus [covid-19] exploits to infect human cells. Most COVID-19 patients will only experience mild to moderate symptoms and fully recover on their own. When an infected person coughs, sneezes, speaks, or sings, small liquid particles from their lips or nose might spread the coronavirus. Coronaviruses are extremely small (65–125 nm in diameter). You can prevent yourself and others from becoming infected by washing your hands or using an alcohol-based rub[2]. Covid-19 has been identified by the World Health Organization as a pandemic. Novel SARS-CoV-2 is the disease's etiological agent[3].

History: The first COVID-19 instances in humans were originally identified by Wuhan City, China, officials in December 2019.

COVID-19 is an illness brought on by the new coronavirus that caused SARS-CoV-2[4]. Since the initial cases were identified, WHO and its partners have been working with Chinese authorities and international experts to gather more information about the virus, including how it spreads, the populations most at risk, the variety of clinical diseases it can cause, and the most effective ways to recognize, halt, and contain "human to human" transmission[5].

Symptoms: COVID-19 symptoms might range from a little discomfort to serious sickness[6]. Symptoms that are frequently experienced include headache, loss of taste and smell, nasal congestion, runny nose, coughing up blood, sore throat, muscle soreness, fever, etc[7].

Three typical groups of symptoms have been noted:

- A group of respiratory symptoms that include coughing, sneezing, fever, and sputum.
- A slew of stomach problems including nausea, vomiting, and diarrhea.

- A collection of musculoskeletal symptoms includes headache, tiredness, and discomfort in the muscles and joints[8].

Who's at increased risk: A larger risk of serious problems exists for older individuals, adults, and those with specific medical issues who come into contact with the virus. These illnesses include:

- Cancer, obesity
- Chronic renal illness
- Chronic obstructive pulmonary disease (COPD)
- Sickle cell hemoglobinemia
- Type 2 diabetes
- Serious heart problems such as heart failure and cardiomyopathy
- Weakened immune system following solid organ transplant

Prevention

- Stay home, if possible
- Wash your hands
- Use hand sanitizer
- Wear a mask
- Keep distance
- Avoid crowd
- Don't touch your face
- Don't travel by bus
- Don't travel by plane
- Don't travel by train [9]

Vaccines: Every year, vaccines save millions of lives. The immune system, the body's natural defence, is trained and prepared by vaccinations to identify and combat the viruses and germs they target. Following immunization, the body is immediately prepared to annihilate those disease-causing microorganisms, preventing illness[10].

Covid-19 vaccine landscape and tracker: The database for the COVID-19 candidate vaccination landscape and tracker gathers thorough data on COVID-19 vaccine

candidates under development. Twice per week, the landscape is modified.

- Provides analysis and visualization for several COVID-19 vaccine candidate categories; lists the COVID-19 vaccine candidates that are in both clinical and pre-clinical development in summary tables.
- monitors the development of each vaccination from the pre-clinical stage through the Phase 1 through Phase 3 efficacy studies, as well as the Phase 4 interventional studies that are registered.
- Users can search for COVID-19 vaccines using a variety of criteria, including vaccine platform, vaccination schedule, route of administration, developer, trial phase, and clinical endpoints[11].

Submission of data: All information on vaccine candidates being produced utilizing the information template is welcome from independent institutions and vaccine developers. Regular open access to submitted data will be offered to facilitate quick data exchange[11].

However, the documents to be submitted in support of the product are easily acceptable in Asian countries. The goal of the essentiality to submit the data and documents is to ensure that the patients would receive high-quality, safe, and effective products[12].

COVID-19 VACCINE

- Pfizer-BioNTech,
- Moderna,
- Johnson & Johnson,
- COVAXIN,
- COVISHIELD,
- NOVAVAX,
- SINOVA BIOTECH,
- SINOPHARM,
- ASTRA ZENECA / OXFORD,
- GAMALEYA CENTER,
- ZYDUS CADILA,
- COVOVAX,
- CORBEVAX,
- GENNOVA [13].

Summary safety data of covid-19 vaccines: Response-related symptoms (7 days after immunization, adverse symptoms start to show up) were frequent but often mild to moderate during clinical studies.

- After the second dosage of the vaccination, side effects (including fever, chills, fatigue, and headaches throughout the body) became increasingly prevalent.
- The majority of adverse effects were mild to severe.
- Data reveal that persons who received the vaccination (Pfizer, Moderna, COVAXIN, COVISHIELD, etc.) compared to individuals who received the saline placebo, were less likely to experience these more significant consequences. This is true even though few patients in the clinical trials ended up either dying or going to the hospital[14-18].

Side effects of covid-19 vaccine:

1. **Adults aged 18 and older:** In the arm where the shot was delivered: Pain, erythema, and swelling. The remainder of the body: Fatigue, headache, aches in the muscles, chills, fever, and nausea
2. **Youngsters and children from birth to 17 years old:** Swollen lymph nodes, discomfort in the arm or leg where the injection was administered, Irritability, Sleepiness, decrease in appetite, fatigue, headache, chills, and joint or muscle pain [19].

Table 1: Comparison of vaccines

COVID-19 vaccine	Type	No. of shots	Storage	Efficacy %
Pfizer	mRNA	2	-70°C	95%
Moderna	mRNA	2	-20 °C	95%
Johnson & Johnson	Non-replicating vector	1	+4 °C	72%
Astra Zenica	replicating vector	2	+4 °C	62-90%
Novavax	Subunit	2	+4 °C	90%

II. DISCUSSION

The highly contagious illness known as COVID-19 is brought on by a novel coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was initially discovered in Wuhan, China, in December 2019. COVID-19 has now affected million people as a result of its global pandemic expansion. The Pfizer and Moderna vaccines employ a process called messenger RNA. These vaccines instruct to make a harmless piece of the spike protein. This protein is found on the surface of coronavirus. The effectiveness of the Pfizer and Moderna vaccines is roughly 95%. The effectiveness of the Johnson and Johnson vaccination in preventing moderate-to-severe COVID-19 was determined to be 72%.

III. CONCLUSION

My review concludes that people who got the vaccine (Pfizer, Moderna, COVAXIN, COVISHIELD, etc.) compared to those who received the saline placebo, were less likely to experience these more serious consequences. COVID-19 vaccines are effective against the SARS-COV virus variants. These vaccines work for both mild and severe diseases. It stimulates the body's immune system without any risk. The Government has arranged two doses of COVID vaccines. After having the first dose of vaccination, a person must take the second dose after a certain period. And after having been vaccinated against COVID-19, a person should not drop the preventive measures taken by him/her before their vaccination is done, they must take all the preventive actions like using a mask for covering their nose and mouth and also using sanitizer after touching any public areas.

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