



# AN ARTICLE ON COVID VACCINATION SCENARIO

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## ABSTRACT

Whereas vaccines against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were developed and tested at an unprecedented rate in 2020, vaccine rollout in numerous countries began in the first half of 2021. We give a picture of ongoing vaccination efficacy studies, as well as real-world data on vaccine effectiveness and the impact of viral types of concern, in this Progress piece. The currently licensed vaccinations have been exceedingly efficient in avoiding COVID-19, a particularly severe disease when they have been used in a large proportion of the adult population. Nonetheless, there remain considerable obstacles in maintaining equal vaccination access around the world, as well as lessons to be learned for managing this and future pandemics.

*Keywords:* COVID-19, SARS-CoV-2, vaccine efficiency, vaccine efficacy, India, vaccination scenario, vaccine

## AN ARTICLE ON COVID VACCINATION SCENARIO

There is now a global race against the causative virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) to deploy vaccines to control the pandemic, with varying levels of vaccine rollout in different countries, fifteen months after the first experimental COVID-19 vaccine doses were administered to humans in March 2020 (Our World in Data). Even though many vaccines have been approved, the pandemic is far from ended, as ongoing global outbreaks reveal.

In Wuhan, China, on December 31, 2019, multiple instances of pneumonia of unclear cause were recorded. The outbreak began in early December or November (Huang et al., 2020), and the number of cases soon increased; by March 15, 2020, China had reported over 80,000 infections, with over 3,000 deaths. At the time of this review (April 6, 2020), the disease, dubbed COVID-19 (coronavirus disease 2019), had spread to over 203 countries and territories, with community transmission in countries such as the United States, Germany, France, Spain, Japan, Singapore, South Korea, Iran, and Italy, as well as a large-scale outbreak on the cruise ship Diamond Princess with over 600 cases. More than 870,000 illnesses and 43,000 deaths have been reported internationally as of April 1, with numbers rapidly increasing in many nations. The outbreak's causative agent was quickly identified as a betacoronavirus with a genomic sequence that was closely linked to that of the SARS coronavirus from 2003, earning the new virus the designation SARS-CoV-2 (Gorbalenya et al., 2020; Wu et al., 2020; Zhou et al., 2020; Zhu et al., 2020)

### CORONAVIRUS IN BRIEF

SARS-CoV-2 is a member of the Coronaviridae family, which is called after the crown-like appearance of the virus's surface glycoproteins under the electron microscope. There are two subfamilies in the family: Letovirinae and Orthocoronavirinae. Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus are all types of Orthocoronavirinae. Gammacoronaviruses and deltacoronaviruses primarily infect avian species and occasionally mammals, but alphacoronaviruses and betacoronaviruses typically infect only mammals (Fatima Amanat, Florian Krammer, SARS-CoV-2 Vaccines: Status Report, Immunity, Volume 52, Issue 4, 2020). Coronaviruses are widespread human diseases that produce the common cold. Two types of alphacoronaviruses (229E and NL63) and two types of betacoronaviruses (OC43 and HKU1) circulate in

people and cause the common cold. SARS-CoV-1, the Middle Eastern respiratory syndrome coronavirus (MERS-CoV), and now SARS-CoV-2, all betacoronaviruses, are more pathogenic coronaviruses for humans.

## COVID-19 VACCINE

Prior to COVID-19:

- No vaccine existed for preventing a coronavirus infection in humans.
- Vaccines had been developed for SARS and MERS, which have been tested in non-human animals.
- There is no cure or protective vaccine proven to be safe and effective against SARS in humans and against MERS.
- In March 2020, there was one MERS vaccine which completed Phase I clinical trials in humans and other three were in progress (Gates B ,2020)

## THE DIFFERENT TYPES OF COVID-19 VACCINES.

As of July 2021,

- 322 vaccine candidates have been proposed
- 99 are in clinical testing
- 25 have reached phase III efficacy studies
- 18 have received some form of approval for use (Tregoning, J.S., Flight, K.E., Higham, S.L. et al.)

### 1. THE WHOLE-MICROBE APPROACH

#### Inactivated Vaccine

- Inactivating a disease-carrying virus
- Requires special laboratory facilities
- Long production time
- Require two or three doses

E.g., The flu and polio vaccines

### Live-attenuated Vaccine

- Living but weakened version of the virus
- May not be suitable for people with compromised immune systems E.g., The MMR vaccine, the chickenpox and shingles vaccine

### Viral Vector Vaccine

- Uses safe virus to deliver specific sub-parts – called proteins – of the germ of interest
- Can trigger an immune response without causing disease
- Can be developed rapidly.

E.g., The Ebola vaccine (WHO)

### 2. THE SUBUNIT APPROACH

- Does not contain the whole microbe
- Uses a safe virus as a vector
- Subunits may be proteins or sugars
- Most vaccines on the childhood schedule are subunit vaccines
- Protects people from diseases such as whooping cough, tetanus, diphtheria (WHO)

### 3. THE GENETIC APPROACH

- Delivers a specific set of instructions to our cells, for making specific protein that the immune system recognizes and respond to.
- It is a new way of developing vaccines
- Before the COVID-19 pandemic, none had yet been through the full approvals process for use in humans (WHO).

### INDIAN COVID -19 VACCINE

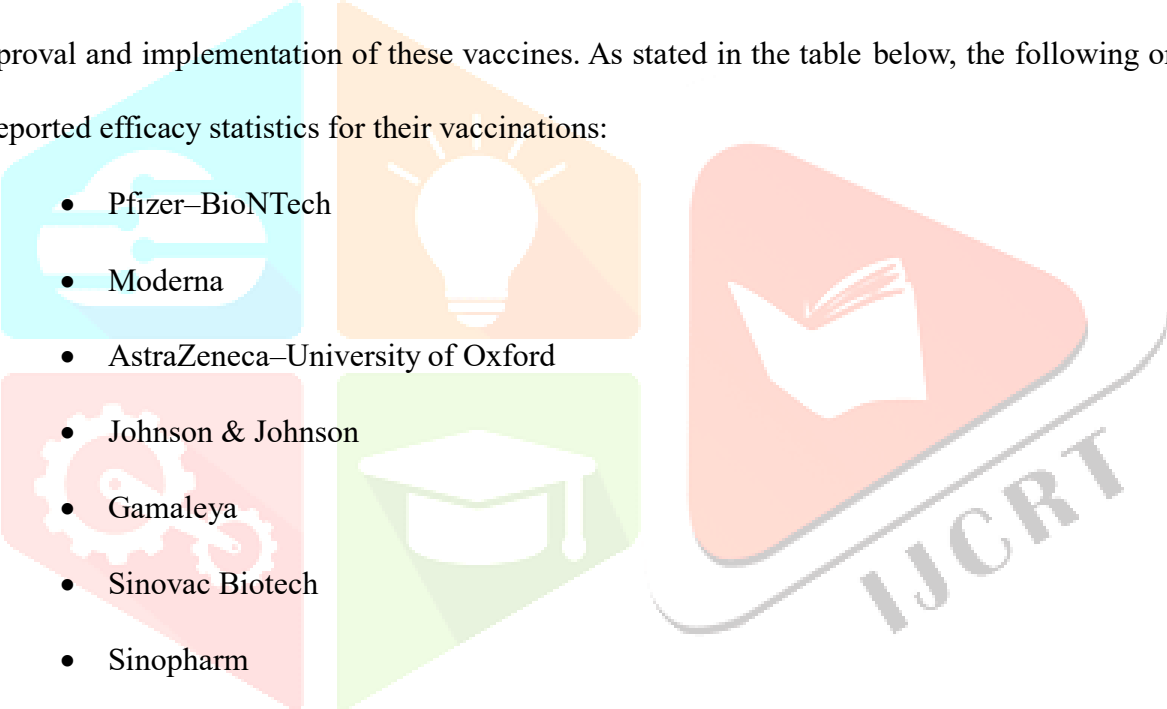
India is recognized as the world's vaccine manufacturing hub, accounting for 60% of worldwide vaccine supplies. The country has the potential to produce more than 3 billion doses of coronavirus disease 2019 (COVID-19) vaccine each year.

Bharat Biotech has developed India's first native COVID-19 vaccine (Covaxin). The National Institute of Virology collaborates with the Indian Council of Medical Research to develop this inactivated vaccine (BBV152).

Covishield from the Serum Institute of India, ZyCoV-D from Zydus Cadila, and Sputnik V from Dr. Reddys Lab are three other promising COVID-19 vaccine candidates. (Chakraborty, Sharma, Bhattacharya, Agoramoorthy, Lee, 2021)

## THE CURRENT VACCINE SCENARIO

At the end of 2020, data from many phase III vaccine efficacy trials were released, paving the way for the approval and implementation of these vaccines. As stated in the table below, the following organizations have reported efficacy statistics for their vaccinations:

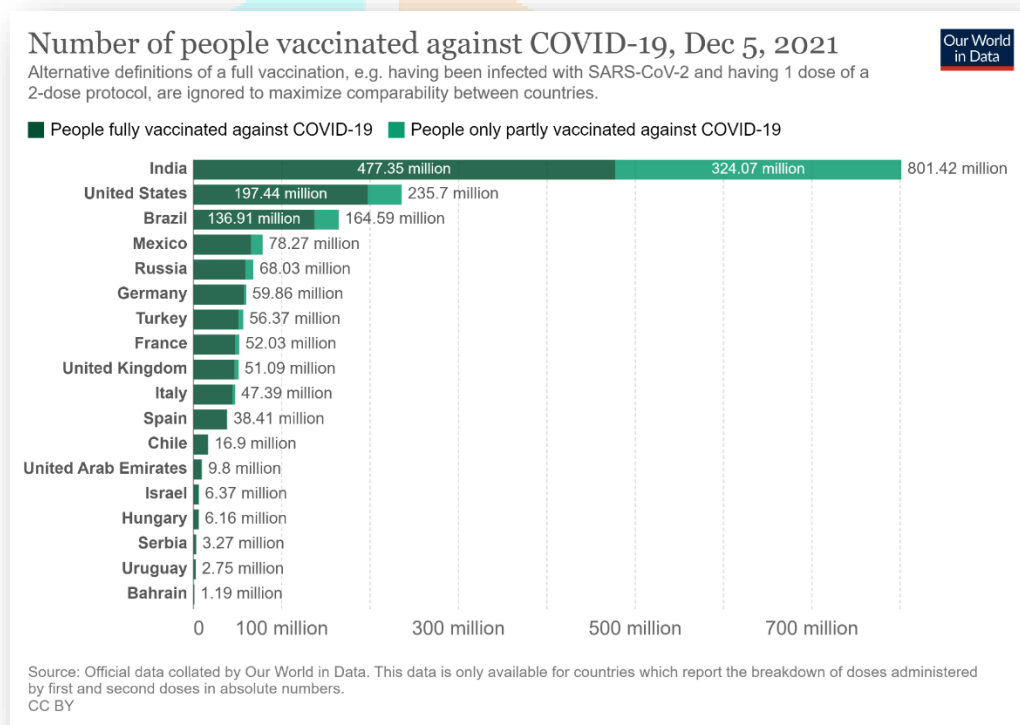
- 
- Pfizer–BioNTech
  - Moderna
  - AstraZeneca–University of Oxford
  - Johnson & Johnson
  - Gamaleya
  - Sinovac Biotech
  - Sinopharm
  - Novavax
  - Bharat Biotech

Except for the Novavax vaccine, all of these vaccines had been licenced for adult and, in some cases, teenage use as of June 14, 2021, following a variety of approval processes that varied by location and regulatory body. This situation is still fluid, and it's worth noting that the initial wave of efficacy data and the first vaccine approvals did not mark the conclusion of the COVID-19 vaccines' clinical trial phase. Vaccine trials are currently underway to assess the efficacy of new vaccines in the face of an evolving virus. They also expand the options for globally dispersed manufacturing of sufficient vaccine doses for global use and strengthen the data for novel vaccine platforms that may be useful in future pandemics. As this is a rapidly moving space, the

best way to stay abreast of the vaccine trials is through live documents, such as the COVID-19 vaccine tracker from the London School of Hygiene and Tropical Medicine.

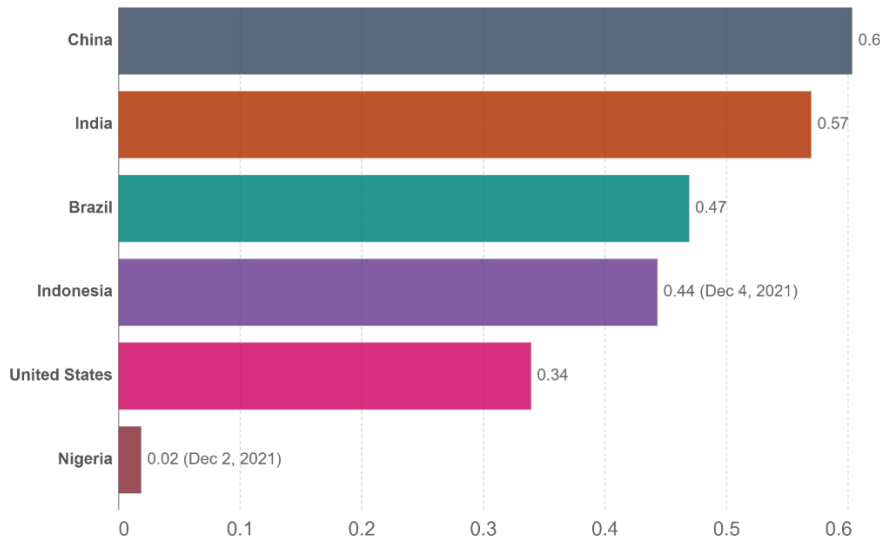
### COVID-19 VACCINATIONS STATISTICS

- At least one dose of the COVID-19 vaccine has been given to 55.4 percent of the world's population.
- Globally, 8.32 billion doses have been administered, with 32.26 million doses being administered every day.
- In low-income countries, only 6.6 percent of people have got at least one dose (Our World in Data)



### Daily COVID-19 vaccine doses administered per 100 people

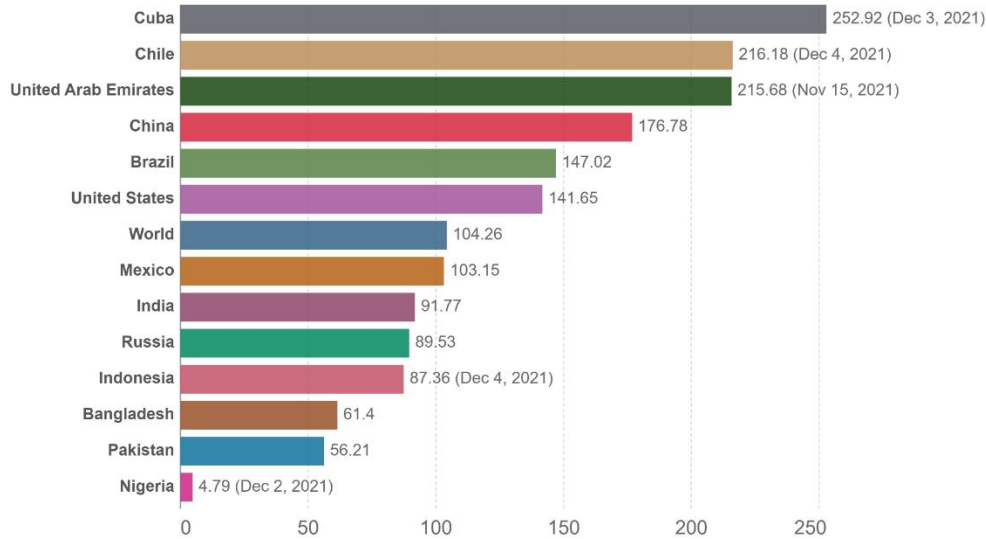
Number of daily doses administered (rolling 7-day average), divided by the total population of the country. All doses, including boosters, are counted individually.



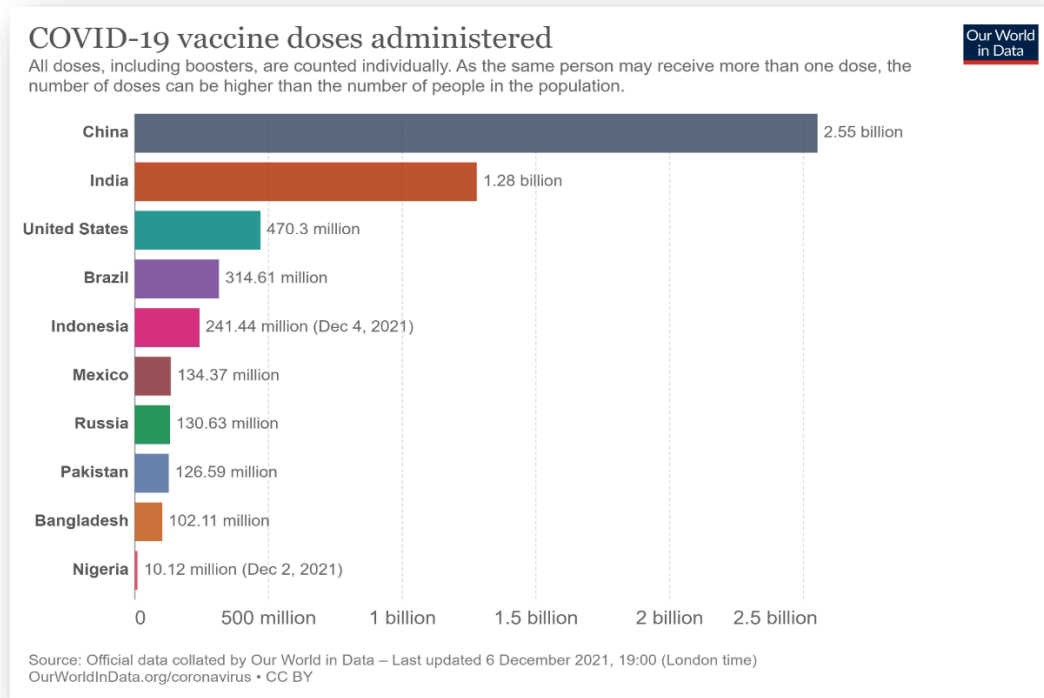
Source: Official data collated by Our World in Data – Last updated 6 December 2021, 19:00 (London time)  
OurWorldInData.org/coronavirus • CC BY

### COVID-19 vaccine doses administered per 100 people

All doses, including boosters, are counted individually. As the same person may receive more than one dose, the number of doses per 100 people can be higher than 100.



Source: Official data collated by Our World in Data – Last updated 6 December 2021, 19:00 (London time)  
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## GLOBAL CHALLENGES TO VACCINATION

- The problem of increasing vaccination coverage is important for two reasons: overcoming vaccine hesitancy in nations that have vaccines but are slow to distribute them and obtaining vaccine supply to countries in need.
- In comparison to vaccination hesitancy, global vaccine equity and access is a significantly greater challenge.
- Intellectual property is one issue that has received a lot of attention. The United States announced its support for waiving COVID-19 vaccination patents in early May 2021.
- The COVID-19 has a severe challenge in the form of vaccination hesitancy associated to vaccine efficacy. Several health/frontline workers have been affected while being fully vaccinated, raising public concerns about vaccination efficacy.
- The second barrier is vaccination illiteracy, which is particularly prevalent in rural areas.
- The third impediment is the vaccine's high price, which is prohibitive for low-income individuals.
- The vaccine is distributed through both public and private hospitals and clinics.



- Minimum immunizations are only provided daily in both places, and people may return empty-handed after two or three visits, leading to hesitancy.

### COVAX

COVAX is co-led by Coalition for Epidemic Preparedness Innovations (CEPI), Gavi and WHO, alongside key delivery partner UNICEF.

Its aim is to accelerate the development and manufacture of COVID-19 vaccines, and to guarantee fair and equitable access for every country in the world.

### COVAX OFFERS

- Doses for at least 20% of countries' populations
- Diverse and actively managed portfolio of vaccines
- Vaccines delivered as soon as they are available
- End the acute phase of the pandemic
- Rebuild economies

### CONCLUSION

In the context of this pandemic and future pandemics, there are lots of questions need to be answered regarding the Covid-19 vaccine efforts. Providing 2.8 billion vaccine doses within 16 months of the first vaccine trials is a spectacular scientific success story about the production and distribution of vaccine for Covid-19. The question is whether this accomplishment can be repeated in future pandemics.

As of June 2021, according to Our World in Data only 0.9 percent of people in low-income countries had received at least one dose; most COVID-19 vaccine doses have been given out in high- and middle-income countries. Investment in production capacity, training, and the ability to provide vaccines globally, in addition to continuous research, is critical to building on the amazing results of the past 18 months.

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