

Cognizance for COVID 19 Vaccination: Choice of Recombinant Viral Vector or whole Virion Inactivated Vaccine

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As we know viruses are autonomous infectious particles and a mature viral particle is known as virion. It consists three basic components including, genome (DNA or RNA), capsid and envelope. The International Committee on Taxonomy of Viruses classified viruses on the basis shape, size, genomic component (DNA/RNA), its strand (ss/ds) etc. For particular in case of coronaviruses, these are members of Coronaviridae family and genus *Coronavirus*. *Coronavirus* virion, holds various structural proteins such as S, M, E, and N. S is spike protein having three protein components of the viral envelope known as S glycoprotein or E2, which mediates viral receptor attachment and host cell membrane fusion. M is membrane protein which is M glycoprotein or E1, is the most abundant constituent of coronaviruses which gives the virion envelope and its shape. E is envelope protein or small polypeptide protein or sM, minor constituent of virions. N is nucleocapsid protein of the helical nucleocapsid and is thought to bind the genomic RNA in a beads-on-a-string fashion. Accessory proteins that interspersed among the set of canonical genes, replicase, S, E, M, and N. All *Coronavirus* genomes contain additional open reading frame, in a wide range of configurations.^[1]

The coronavirus genome consist non-segmented, single-stranded (ss), positive sense (+) RNA strand exceeding 30 kb, which is integrated in the envelope in the form of a helical ribonucleoprotein. Nucleo capsid symmetry is helical enveloped and size in between nm 80–220 nm (diameter) ss (+) polarity. *Coronaviruse* are could infect humans and animals both. The human *Coronaviruse* develops rhinitis like infections known as "severe acute respiratory syndrome" (SARS). One Human Coronavirus (HuCV) have at least two serotypes and probably a number of serological variants. In November 2002, a new HuCV emerged in China was identified as the causative agent of SARS, in spring 2003.^[2-4] The outbreak of corona virus disease (COVID) first reported in Wuhan, China, in December 2019 named as COVID-19. WHO country office in China, confirmed this on December 31, 2019 with emergence of such symptomatic individuals with unidentifiable causative agent that classified as "pneumonia of unknown etiology"^[5,6] then after leads pandemic situation. According to worldometer's COVID-19 data updated on 5th march 2021 116,322,295

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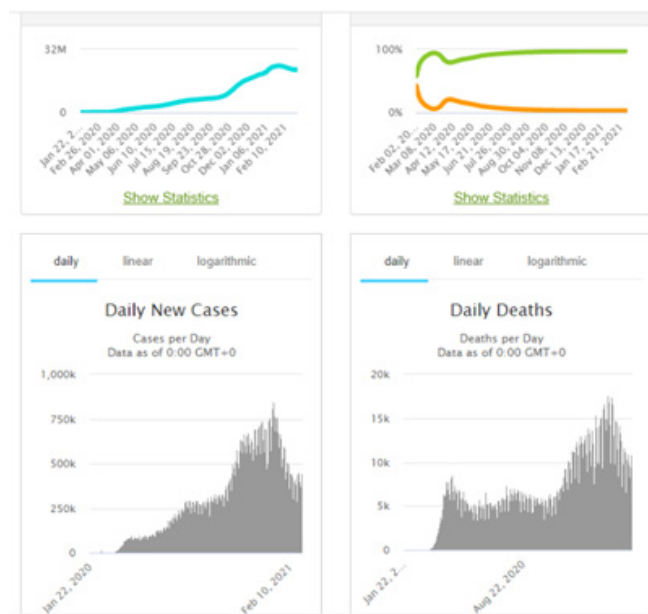
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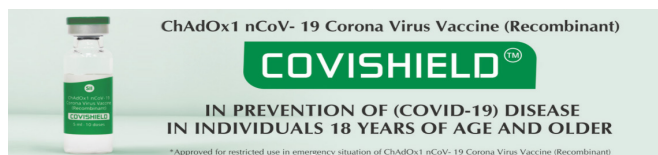
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Coronavirus cases with 2,583,546 deaths and 21,766,290 currently infected patients in which 21,676,657 (99.6%) in mild condition and 89,633 (0.4%) are reported as serious or critical recovered. Till date 219 countries and territories around the world and 2 international conveyances (based on the United Nations Geoscheme classification) affected by COVID-19.^[7]

As per WHO recommendation; oxygen therapy, broad spectrum antibiotics and extracorporeal membrane



Source: Current statistics generated by online registry tool; <https://www.worldometers.info/coronavirus/#countries>



Source: Flyer of COVISHIELD publish by with Serum Institute of India Private Limited, Pune, India <https://www.seruminstitute.com/index.php>

oxygenation (ECMO) to almost all patients, convalescent plasma and immunoglobulin G delivery were main therapeutic options.^[8] Lopinavir/Ritonavir (Protease inhibitors), Chloroquine (9-aminoquinolin), Ribavirin (protease inhibitor), Oseltamivir (neuraminidase inhibitor), Penciclovir/Acyclovir (Nucleoside analog) are some of potent antiviral drugs approved for trials against COVID-19 infection.^[3] With these therapeutic option development of antiviral vaccines was main priority. In general, vaccination is induction of immunity is the most important factor in prevention of viral infection. These antiviral vaccines may generally either inactive or live-attenuated viruses, virus-like particle (VLP), viral vectors, protein-based components, DNA based, or mRNA-based vaccines. Vaccines containing inactivated viruses generally provide shorter-lived and weaker protection than live vaccines. In January 2021, various vaccine comes in clinical trials those are focused on the *Coronavirus* spike protein and its variants as the primary antigen of COVID19 infection based on involved nucleic acid technologies, non-replicating viral vectors, peptides, recombinant proteins, live attenuated viruses, and inactivated viruses.^[9-12] Drug manufacturers such as Pfizer, Moderna, and AstraZeneca predicted a manufacturing capacity of 5.3 billion doses in 2021, which could be used to vaccinate about 3 billion people.^[13,14]

COVID 19 vaccination program had been started across the world. With reference of letter DO No. T22020/14/2020-Imm dated 14th January 2021, Government of India, Ministry of Health and Family Welfare, Nirman Bhavan New Delhi, Government of India had been circulated a note on vaccination of COVID 19 was started since 16th January 2021 in all states and union territories (UT). As per the request of proper dissemination documents related to vaccination was needful. In India two vaccines with their trade name as COVAXIN, and COVISHIELD are approved for emergency uses.^[15]

COVISHIELD was developed by University of Oxford, and AstraZeneca, CEPI, United Kingdom. It was developed by recombinant DNA technology (RDT) using modified chimpanzee adenovirus vector, ChAdOx1.^[16] Clinical trials were done in recommended phase. 30,000 randomized, placebo-controlled study for efficacy, safety, and immunogenicity was done in Phase III trial.^[17] Positive results from a provisional analysis of four ongoing trials were published on 8th December 2020. Overall efficacy was recorded in between the range of 70% to 90% with different dosing regimens under peer-reviewed safety profile. COVISHIELD was under sign with Serum Institute of India Private Limited, Pune, India for production.^[18,19]



India's First and Largest Phase 3 Efficacy trial with 25,800 participants included in the trial.

Source: Flyer of COVAXIN publish by Bharat Biotech, Genome Valley Shameerpet Hyderabad – 500 078 Telangana INDIA. <https://www.bharatbiotech.com/covaxin.html>

COVAXIN is India's indigenous COVID-19 vaccine manufactured by Bharat Biotech and with the collaboration of Indian Council of Medical Research (ICMR) - National Institute of Virology (NIV) Pune, India. It was based on whole-virion inactivated vero cell derived platform technology. This contain dead virus, incapable of infecting people but still able to instruct the immune system to mount a defensive reaction against an infection. In November 2020, COVAXIN received the approval to conduct Phase III human trials after completion of Phase I and II. The Phase III trials involved around 26,000 volunteers from 22 sites that consist several states in the country, including Delhi, Karnataka and West Bengal. Refusal rate for Phase III trials was much higher than that for Phase I and Phase II. As a result only 13,000 volunteers had been recruited by 22nd December 2020 with the number increasing to 23,000 by 5th January 2021.^[20] Efficacy is estimated by the incidence of COVID-19 cases accumulation between the vaccine and the placebo group, which will begin two weeks after the second dose. The interim efficacy approximation had been generated by the end of Feb, 2021 and it was more than 81%. COVAXINTM has been granted approval for emergency restricted use in India by DCGI-CDSO on Jan 03rd, 2021. Bharat Biotech has been approached by several countries across the world for the procurement of COVAXINTM. Supplies from government to government in the following countries to take place such as Mongolia, Myanmar, Sri Lanka, Philippines, Bahrain, Oman, Maldives and Mauritius.^[21,22] This editorial properly focuses in to a brief knowledge for COVID 19 vaccination. The proper knowledge overwhelms choice as recombinant viral vector or whole virion inactivated vaccine.

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