

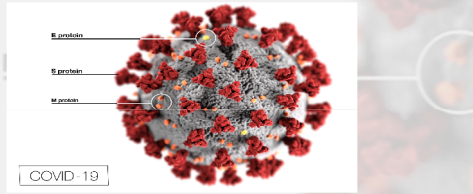
Structure of Novel Coronavirus

Taxonomy: COVID-19 is caused by the virus SARS-CoV-2. This virus belongs to the Coronaviridae family, in the Nidovirales order. The subgroups of the coronavirus family are alpha (α), beta (β), gamma (γ), and delta (δ) coronavirus. The four 'common human coronaviruses' are 229E (α coronavirus), NL63 (α coronavirus), OC43 (β coronavirus) and HKU1 (β coronavirus).

SARS-CoV-2 is a β-coronavirus. β-coronaviruses also include SARS-CoV and MERS-CoV, other acute lung-injury causing coronaviruses of zoonotic origin. SARS-CoV-2 is most closely related to SARS-CoV, sharing roughly 80% identity at a nucleotide level (1).

Structure: Coronaviruses are minute (65-125nm in diameter) encapsulated viruses with a crown-like appearance under an electron microscope, due to the presence of spike glycoproteins on the envelope. Coronaviruses have large (26-32 kbs) single-stranded, positive-sense RNA genomes. The genome is split into 14 open reading frames, which include 16 nonstructural proteins and four structural proteins: the spike (S), membrane (M), envelope (E), and nucleocapsid (N) proteins.

- The N protein holds the RNA genome.
- S, M and E proteins create the viral envelope.
- The S protein is cleaved into two subunits, S1 and S2. S1 contains the receptor binding domain (RBD), and is involved in viral entry into host cells.



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Genetic diversity & viral variants of Novel Coronavirus

Compared to other RNA viruses, coronaviruses have a genetic proofreading mechanism: complex molecular machinery involved in maintaining the integrity of the SARS-CoV-2 RNA genome, preventing and repairing mutations. In consequence, the SARS-CoV-2 sequence diversity and overall evolutionary rate appear to be low. Nevertheless, viral mutations occur, and can rise in frequency either due to natural selection of favorable mutations, random genetic drift, or epidemiological factors.

D614G variant: Till beginning 2021, the main circulating variant of SARS-CoV-2 was the D614G variant (also referred to as G614), resulting from a D-to-G amino acid change caused by a single nucleotide mutation at position 1841 of the S-gene in the Wuhan reference strain (D614). Initially originating in China, this variant emerged in Europe, and went on to become the globally dominant strain over the course of three months (5): as SARS-CoV-2 is transmitted more rapidly than it evolves, the viral population is becoming more homogeneous.

UK variant: In November 2020, a new SARS-CoV-2 variant (VOC202012/01, also named 501Y.V1, lineage B.1.1.7), was identified in the United Kingdom (12,13). The variant is defined by 14 mutations resulting in amino acid changes and three deletions, some of which are believed to influence the virus's transmissibility in humans.

South African variant: One of the mutations identified (N501Y) has also been reported in South Africa, where it arose independently of the UK variant. This variant, named 501Y.V2, lineage B.1.351, has been reported from a total of 68 countries.

Brazilian variant: In the beginning of January 2021, another variant with an N501Y mutation (501Y.V3 or variant P.1, lineage B.1.1.28) was detected in Japan in travelers arriving from Brazil. The variant has since then been reported from 31 countries.

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Second wave of covid-19

The number of active cases of COVID-19 has been steadily reducing since late September 2020 and it was then that most public places, schools, colleges, and offices began opening their doors for regular operation. Despite this, COVID protocols were being maintained with the utmost scrutiny in all such public places. As of February 2021, more than half of all the Indian states reported that there was not a single death due to COVID-19 and this ushered in some much-needed hope. However, recent studies conducted by scientists at Delhi, using a mathematical model have examined that cases will be at a peak around 20th April 2021.

Reason for the Second Wave:
 Leading Indian scientists from the most renowned institutes and research centres have suggested that 2 distinctive factors can be used to trace this sudden and sharp rise of active cases in India.
 Opening of Schools and Colleges – Although such institutions are following all the COVID protocols reiterated by the government, there has been little control over public transit and the people, many of whom have not been following the necessary COVID protocols. This has led to several asymptomatic carriers transmitting the virus.
 A New Mutant Strain – The double mutant variant of the virus has caused a significant rise in the number of infected cases. Scientists believe that this strain is about 70 times more contagious than the previous one.

Which States are Likely to be affected?
 With such a sharp rise in new cases of COVID-19, the states of Maharashtra, Karnataka, Tamil Nadu, Delhi, Haryana and Uttar Pradesh have been touted to be high-risk states that are already experiencing the effects of the Second Wave. Despite the rapid testing and the extensive vaccination drives undertaken by the government, the daily caseload of infected people is averaging at around 55,000 as opposed to the few couple thousands last year.

What is the Expected Duration of the Second Wave?
 Many states like Gujarat, Maharashtra, Haryana and Punjab have been counting the number of cases peaking either equal to or more than their earlier records from the previous year. Although states like West Bengal, Andhra Pradesh, Bihar and Uttar Pradesh are likely to be still in the infant stages of the Second Wave, state governments have ramped up their testings and inoculation drives. Scientists expect this Second Wave to last more than 2 or 3 months, given the progress of vaccinations of a population that is 1.3 billion strong.

The Silver Lining:
 Manindra Agarwal of IIT Kharagpur who is famous for pioneering the "Super Model" initiative of the spread of the virus has stated that this Second Wave is most likely to see a sharp fall following April. Nevertheless, taking comfort in the low death rates is not the way to go and we should all follow the stipulated COVID protocols whenever venturing out.

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VACCINE DEVELOPMENT

According to the WHO COVID-19 candidate vaccine landscape (updated on 26 March 2021), 184 vaccines are in pre-clinical development and 83 vaccines are now in clinical development (51 in phase I or I/II, 12 in phase II or II/III, and 15 in phase III clinical trials).

The COVID-19 vaccines in use and in development apply various vaccine technology platforms. The main types include **nucleic-acid vaccines** (DNA and RNA), **viral-vector vaccines** (replicating and non-replicating), **virus vaccines** (attenuated or inactivated) and **protein-based vaccines** (virus-like particles, protein subunits). Procurement of vaccines for Belgium goes through a Joint action at EU level. To date, the country has signed contracts with **BioNtech-Pfizer (mRNA vaccine, Comirnaty®)**, **Moderna (mRNA vaccine)**, **AstraZeneca/Oxford (non-replicating viral vector vaccine ChAdOx1, Vaxzevria®)**, **Johnson & Johnson (non-replicating viral vector, Ad26)**, and **Curevac (mRNA vaccine)**. The first to have received conditional authorization by the EU Commission based on evaluation and scientific review by European Medicinal Agency (EMA) has been BioNtech-Pfizer (21 Dec 2020), Moderna (06 Jan 2021), and AstraZeneca-Oxford (29 Jan 2021) and Johnson & Johnson (11 Mar 2021). Full updates and key documents can be found on the EMA website. All have demonstrated high vaccine-efficacy and good safety profiles (97-99). Novavax (protein subunit vaccine), Gamaleya vaccine ("Sputnik V"; viral-vector Ad26/rAc5 heterologous prime boost vaccine) and Curevac are currently under rolling review by the EMA.

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COVID-19

Pandemic is not a word to use lightly and carelessly. -Dr. Tedros
 The coronavirus is a large family of viruses that can cause illness in animals and people including common cold and more severe terms like SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome), which are life threatening. The virus is named after its shape which takes the form of crown with protrusions around it and hence it is known as coronavirus.
 The COVID-19 is a disease, caused by a new strain of Corona virus. 'CO' stands for 'Corona', 'VI' for virus and 'D' for disease. Formerly, this disease was referred to as '2019 novel coronavirus' or 2019-nCoV, that is caused by the virus SARS-CoV-2. This outbreak came to light on December, 2019 in Wuhan city of China.

Transmission of COVID-19: This virus spreads from person to person, most of the time, it spreads when a sick person coughs or sneezes. They can spray droplets as far as six feet away. If you breathe them in, the virus can get into your body. You can also get the virus from touching a surface or object, the virus is on, then touching your mouth, nose or eyes.

Incubation period: - As with most virus, the incubation period of SARS-CoV-2 can vary person to person. 97.5% of covid patients are estimated to develop symptoms within 11.5 days of infection and 2.5% of patients are estimated to develop symptoms within 2.2 days. The time between exposure to covid-19 and when symptoms start is commonly around 5 to 6 days and ranges from 1 to 14 days.

Common symptoms: Common signs of infection, include fever, coughing, breathing difficulties, loss of taste or smell, conjunctivitis, sore throat, aches and pains etc. In severe cases, pneumonia, multiple organs failure and death.
 Nowadays, we are seeing New COVID strain and some Newer symptoms are found in patients like, (a) fever for more than two days (b) rash (c) conjunctivitis (d) stomach pain (e) vomiting and diarrhoea (f) swelling in lymph node (g) neck pain (h) red cracked lips (i) swollen hands or feet etc.

NEW COVID STRAIN:- The second wave of COVID-19 pandemic, caused by new strain has taken the daily cases of coronavirus infections to an all time high of over 1.26 lakh. The new strain is called double mutant virus that is first identified around March end is currently in circulation. Much like other mutation of the virus, the new mutant too carries differences in the genetic code of the virus which allows it to attach itself to ACE2 receptor faster. What also make it super scary is that it carries marking of two virus mutations making it a double mutant. The double mutant variant has been scientifically named B.1.617, which contains E484Q and L452R mutations. Both these mutations are located in a key portion of the virus- the spike protein, that it uses to penetrate human cells. Spike proteins attach via a "receptor binding domain" - meaning it can attach to receptors in our cells. Most particularly this variant is said to be quite scary for kids.

Vaccination: - India has granted emergency use authorisation to two COVID-19 vaccines – Pune based Serum Institute of India's Covishield and Hyderabad based Bharat Biotech International Ltd's covaxin which are being used in the government's vaccination drive.

Covishield is a monovalent vaccine composed of a single recombinant, replication deficient chimpanzee adeno virus (ChAdOx1) vector encoding the S glycoprotein of SARS-CoV-2. Following administration the S glycoprotein of SARS-CoV-2 is expressed locally stimulating neutralising antibody and cellular immune responses.

Covaxin is the first indigenous COVID-19 vaccine of India. That is developed using whole virion inactivated Vero cell derived platform technology.

Recently India approves **Russia's Sputnik v** vaccine for emergency use. But you can still be infected even after taking vaccine. There is no permanent solution. So you have to take all precautions and obey Covid protocols even after taking vaccine.

- Precautions:-**
1. When you can't keep a safe distance from others, cover your mouth and nose with mask.
 2. Clean hands often and disinfect frequently touched surfaces at home.
 3. Cover coughs and sneezes with your elbow or tissue.
 4. Don't touch your eyes, nose, and mouth.
 5. Keep a safe distance from others and listen instructions from health centers.
 6. Don't go to any crowded place in this situation.

- Do's and don'ts and changes in life style:-**
- Always wear mask to protect yourself and others.
 - Disinfect surfaces you touch often like doorbells, switches, mobile phones.
 - In my opinion, it is necessary to limit your contact with other people as much as possible.
 - We must refrain ourselves from shaking hands, hugging for the safety of our loved ones, family members and broader community.
 - You are advised to stay away from any gathering like funeral, marriage reception, or any political conventions.
- Our doctors, nurses, paramedical staff, ambulance staff, sanitation workers, police forces, and several others have continuously worked to fight with the CORONAVIRUS. So respect them and obey all the covid protocols to stay safe.

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