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An overview of COVID-19 epidemiology, transmission, treatment, and vaccine effectiveness

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ABSTRACT

The emerging infection of COVID-19 was initiated from Wuhan China, have been spread to more than 210 countries around the globe including India. The clinical symptoms of COVID-19 are very similar to other respiratory viruses. The number of laboratory confirmed cases and associated deaths are increasing regularly in various parts of the World.

Seven coronaviruses (229E, NL63, 0C43, HKU1, SARS, MERS, and COVID-19) can naturally infect human beings. Out of these four (229E-CoV, NL63-CoV, OC43-CoV, HKUI-CoV) are responsible for mild respiratory infections, while SARS-COV, MERS- COV and COVID-19 are well known for their high mortality.

KEYWORDS

Clinical presentation , Epidemiology of Covid-19 , Genome structure and receptor of human cells of SARS-COV-2 , Transmission of Covid-19 , Preventing , symptoms of Covid-19 , Diagnosis , Treatment.

INTRODUCTION

1. The World Health Organization (WHO) has declared the coronavirus disease 2019 (COVID-19) a pandemic. A global coordinated effort is needed to stop the further spread of the virus.
2. A pandemic is defined as “occurring over a wide geographic area and affecting an affecting an exceptionally high proportion of the population”
3. Coronaviruses are a family of viruses that cause illness such as respiratory diseases or gastrointestinal diseases. Respiratory diseases can range from the common cold to more severe diseases example - Middle East Respiratory Syndrome (MERS-COV) and Severe Acute Respiratory Syndrome (SARS-COV).
4. A novel coronavirus is a new strain that has not been identified in human previously. Once scientists determine exactly what coronavirus it is , they give it a name (as in the case of COVID-19, the virus causing its is SARS-COV-2.
5. Coronavirus got their name from the way that they look under a micro surrounds scope. The virus consists of a core of genetic material by an envelope with protein spikes. This gives it the appearance of a crown. The word corona means “crown” in Latin.
6. Coronaviruses are zoonotic, meaning that the virus are transmitted between animal and human. It has been determined that MERS-COV was transmitted from dromedary camels to human and SARS-COV

from civet cats to humans. The source of the SARS-COV-2 (COVID-19) is yet to be determined, but investigations are ongoing to identify the zoonotic source to the outbreak.

CLINICAL PRESENTATION

Typically coronaviruses present with respiratory symptoms among those who will become infected, some will show no symptoms. Those who do develop may have a mild to moderate, but self – limiting disease with symptoms similar to the seasonal flu.

Most common symptoms may include:

- Respiratory symptoms
- Fever
- Cough
- Shortness of breath
- Fatigue
- Sore throat
- Tiredness

Less common symptoms:

- Aches and pains
- Diarrhoea
- Headache
- Loss of taste or smell
- A rash on skin, or discolouration of finger or toes

Serious symptoms:

- Difficulty breathing or shortness of breath
- Chest pain or pressure
- Loss of speech or movement

EPIDEMIOLOGY OF COVID-19

In early studies, 49-46% patients had the contact history of Huanan seafood market, where various kinds of living wild animals were on sale, including poultry, bats, and marmots. it is currently speculated that the outbreak of COVID-19 in Wuhan is associated with wild animals. According to WHO , the environmental sample taken from Huanan seafood market were tested positive for SARS-COV-2 , but the specific animals associated with the virus have not be identified.

The bats are the natural reservoir of SARS-COV and MERS-COV, and spreads to human through the palm civets and dromedary camels, respectively.

The RaTG13, which is a short RNA-dependent RNA polymerase region from a bat coronavirus, was closest to SARS-COV-2 with 96.2-98.7% identity in whole- genome sequence.

THE GENOME STRUCTURE AND RECEPTOR OF HUMAN CELLS OF SARS-COV-2

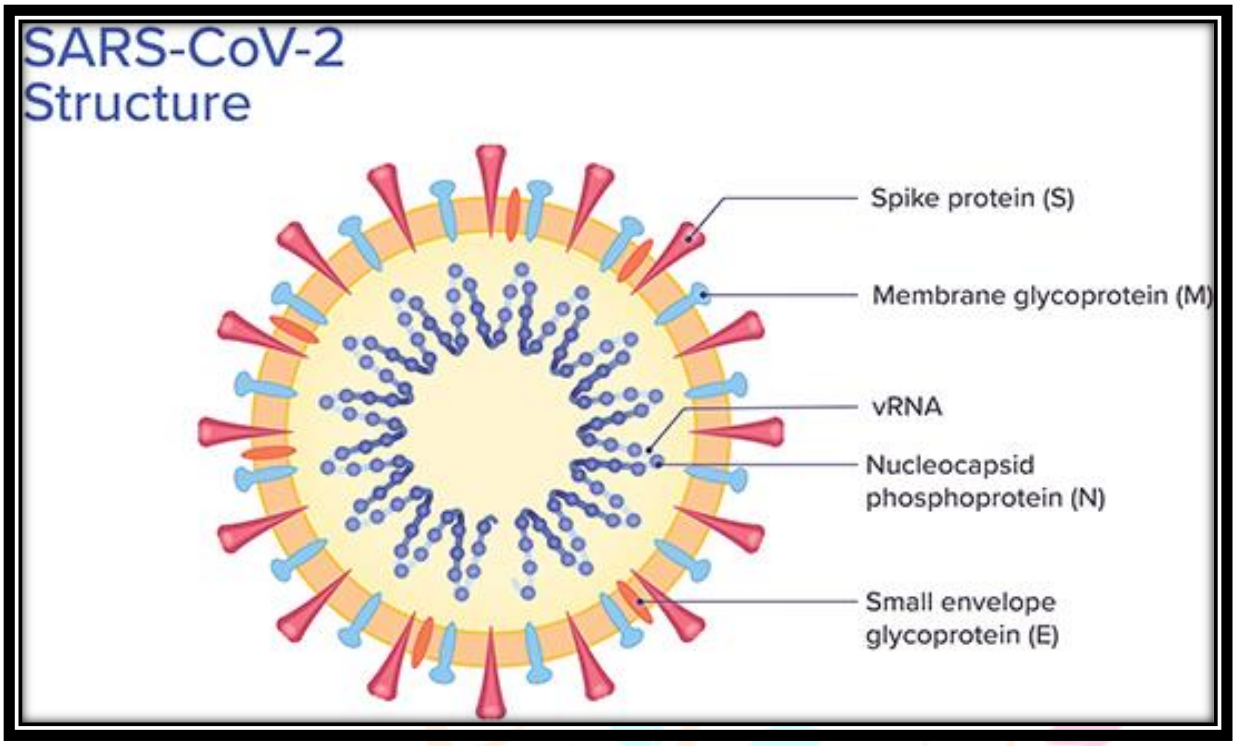

Fig No: 1 SARS-CoV-2 Structure

Coronaviruses are the largest, enveloped, single-stranded positive sense RNA viruses, including 4 genera:

Alpha coronavirus, Beta coronavirus, Gamma coronavirus and Delta coronavirus.

Alpha and Beta coronavirus mainly infect mammals; the rest of two primarily infect birds. Seven coronavirus that related to human disease had been identified. Four human coronaviruses (HCOV 229E, NL63, OC43 and HKU1) had been endemic globally and just resulted in upper respiratory tract infections in adults. The SARS-COV, MERS-COV and SARS-COV-2 are the most severe type that can lead to lower respiratory tract infection and acute respiratory distress syndrome (ARDS) which can cause patient deaths.

Currently, the SARS-COV-2 was found to be novel positive sense RNA virus, which belonged to the Beta coronavirus genus in the coronavirus family . Similar to the SARS-COV-2 and MERS-COV, the SARS-COV-2 genome contain two untranslated region (UTRs): 5'- cap structure and 3' poly-A tail and a single open reading frame encoding a population.

The SARS-COV-2 genome is ordered by 5'- the viral replicates (ORF1a and ORF1b) – structural protein [Spike(S)- Envelope(E)-Membrane(M)-Nucleocapsid(N)]-3; some gene of accessory protein , such as ORF 3a,7and 8 are inserted in genes of structural protein.

For example, the significant difference of two accessory proteins (ORF3b and ORF8) on the gene sequence between SARS-COV-2 and SARS-COV was reported by several studies.

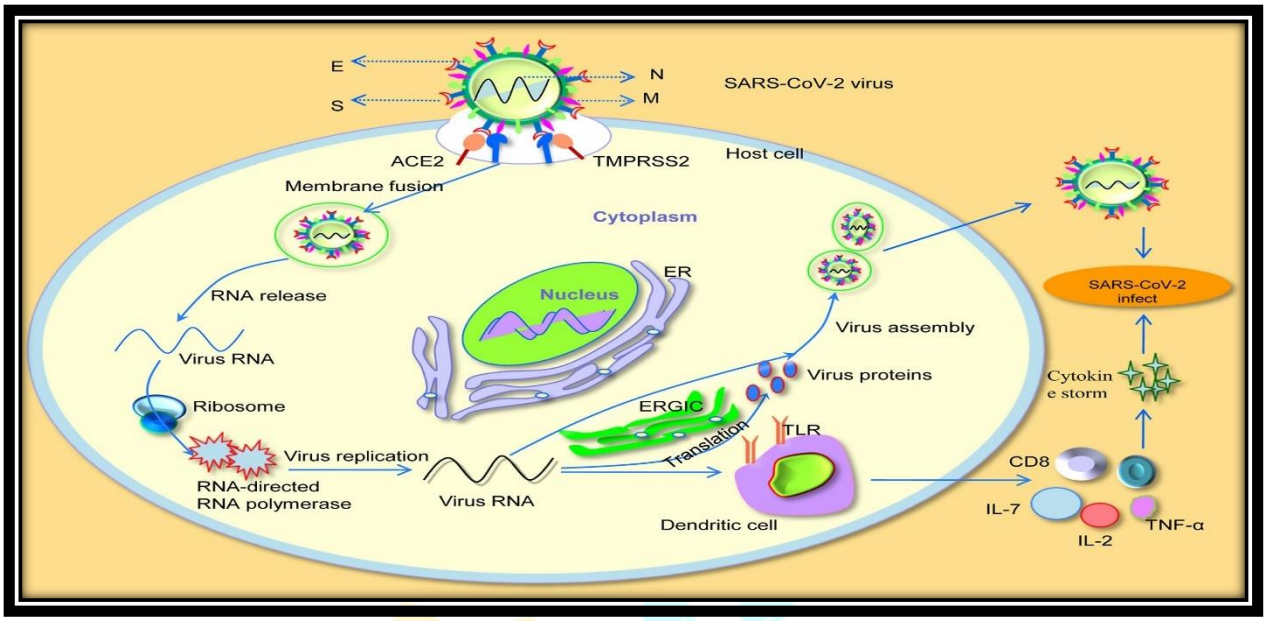

Fig No: 2 Receptors of human cell of SARS-COV-2

As for the novel proteins of SARS-COV-2, whether involving in pathogenesis of the virus or not is unclear.

TRANSMISSION OF COVID- 19

Evidence is still emerging, but current information is indicating that human to human transmission is occurring. The routes of transmission of covid -19 remains unclear at present, but evidence from other coronaviruses and respiratory disease indicates thar the disease may spread through large respiratory droplets and direct or indirect contact with infected secretions.

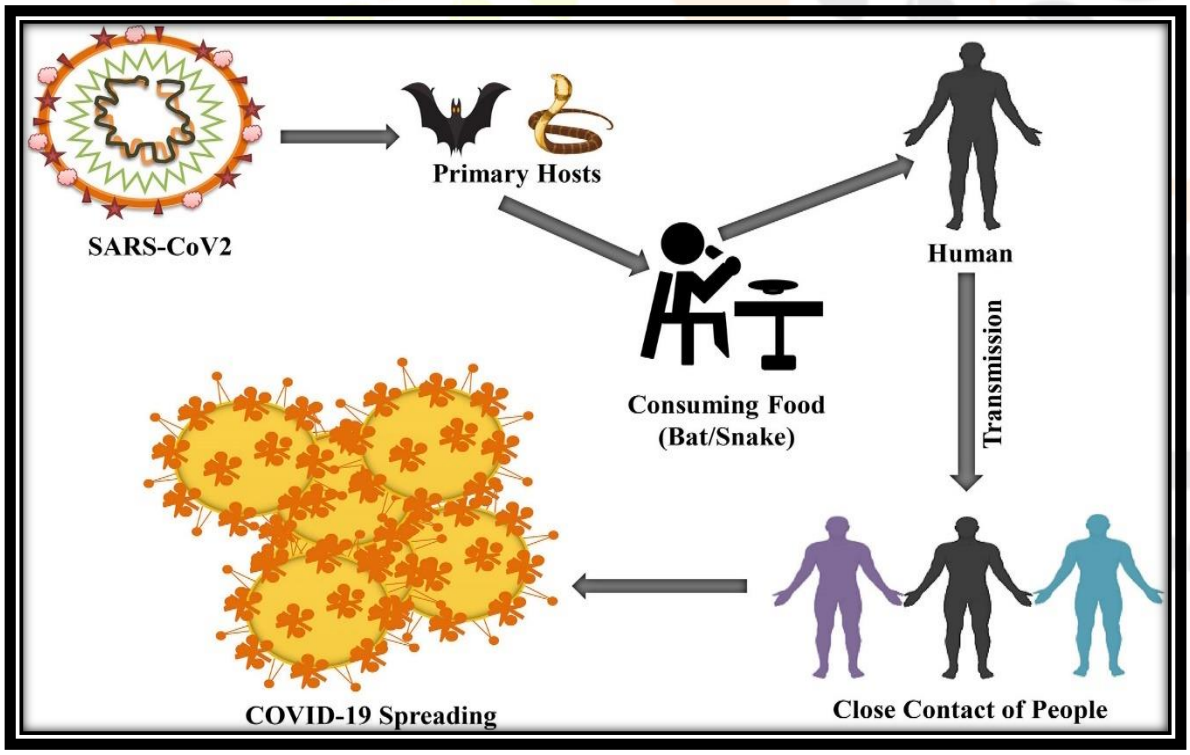

Fig No: 3 Transmission of Covid-19

The incubation period of covid-19 is currently understood to be between 2 to 14 days. This means that if a person remains well after 14 days after being in contact with a person with confirmed COVID-19, they are not infected.

PREVENTING TRANMISSION

The WHO suggests the following basic preventative measures to protect against the new coronavirus.

- Stay up to date with the latest information on the COVID-19 outbreak through WHO updates or your local and national public health authority.
- Perform hand hygiene frequently with an alcohol based hand rub if your hands are dirty.
- Avoid touching your eyes , nose, and mouth.
- Wear a medical mask if you have respiratory symptoms and performing hand hygiene after disposing of the mask.
- Maintain social distancing (approximately 2 meters) from individuals with respiratory symptoms.
- If you have a fever, cough and difficulty breathing seek medical care.

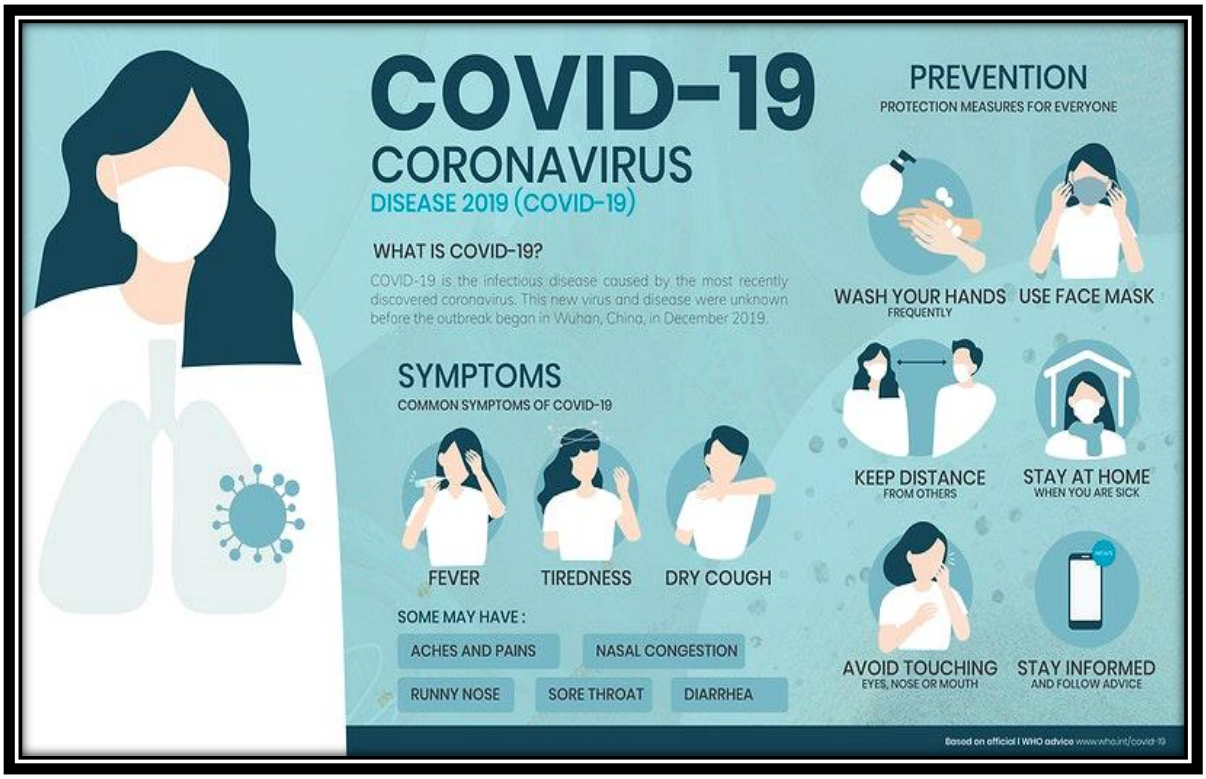

Fig No: 4 Preventions & Protection

CORONAVIRUS DIAGNOSIS

Call your doctor or local health department if you think you've been exposed and have symptoms like:

- Fever 100 F or higher
- Cough
- Trouble breathing

In most states, decision about who gets tested for COVID -19 are made at the state or local level.

A swab test is the most common method; it looks for signs of the virus in your upper respiratory tract. The person giving the test puts a swab up your nose to get a sample usually goes to a lab that looks for viral material , but some areas may have rapid test that gives result in as little as 15 minutes.

The FAD is granting emergency use authorization for tests that don't have full approval yet. These includes a home nasal swab test , a home saliva test and tests that check your blood for things called antibodies. Your immune system makes antibodies in response to an infection.

CORONAVIRUS TREATMENT AT HOME

If your symptoms are mild enough that you can recover at home, you should:

- Rest. It can make you feel better and may speed your recovery.
- Stay home. Don't go to work, school or public places.
- Drink fluids. You lose more water when you're sick. Dehydration can make symptoms worse and cause other health problems.
- Ask your doctor about over-the-counter medicines that may help, like acetaminophen to lower your fever.

CORONAVIRUS TREATMENT IN A HOSPITAL

- You don't need to go to the hospital or ER if you have basic COVID-19 symptoms, like a mild fever or cough.
  If you do, much hospital will send you home.
- If your case is serving, members of the medical staff will check for signs that the illness is causing more serious problems. They might:
- Check the level of oxygen in your blood with a clip on finger display.
- Listen to you lungs
- Give you a COVID-19 test. This involves putting a 6-inch cotton swab up both sides of your nose for about 15 seconds.
- Give you a chest X-ray or CT scan.

DRUGS USE IN TREATMENT

For the treatment of covid-19 disease no any effect medicated are available. Some drugs are used to treatment.

- Glucocorticoids
- Remdesivir
- Chloroquine
- Hydroxychloroquine
- Angiotensin converting enzyme

COVID-19 VACCINATION IN INDIA

India began administration of COVID-19 vaccines on 16 January 2021. India has administration 253,195,048 doses overall, including first and second doses of the currently approved vaccines.

The government of India has constituted a National Expert Group on Vaccine Administration for COVID-19 (NEGVAC) to provide guidance on all aspects of COVID-19 vaccine administration in India.

The COVID-19 vaccine will be firstly offered to frontline workers, healthcare workers, and to persons above 50 year age, followed by persons younger than 50 years of age with associated comorbidities.

Two vaccines received approval for emergency use in India at the onset of the programme; covishield -a brand of the Oxford-AstraZeneca vaccine manufactured by the Serum Institute of India , and Covaxin, which was developed by Bharat Biotech. In April 2021, the Indian government approved the Russian Sputnik V vaccine as a third vaccine, which began use in May 2021.

VACCINE DEVELOPMENT AND DISTRIBUITION

India has sufficient manufacturing capability for the vaccine more than 2.4 billion doses annually and various medical and surgical disposals such as vials, stoppers, syringes, gauze, and alcohol swabs. Some of the vaccines under development and temperature as low as -80 ^{0}C. fortunately, the vaccines that India has introduced first for distribution in the country require storage temperature of 2-8 ^{0}C.

Fig No: 5 A vial of Covaxin and Covishield

As of early May 2020, there were over 30 vaccine candidates in development in India, many of which were already in pre-clinical trials.

The Pune-based Serum Instituted of India (SII) is the world's largest vaccine maker and this existing capacity enabled India to be a major participant in the COVAX program to distribute vaccines to developing countries.

COVID-19 VACCINES EFFICACY

Thirty papers were found in a systematic review on vaccination efficacy that included research from January 1 to May 14, 2021. Almost majority of the studies demonstrated 80–90% vaccine efficiency against symptomatic and asymptomatic illnesses in fully vaccinated individuals.

Three vaccines—Pfizer-Biotech (~95%), Modern (~94%), and Sputnik V (~92%)—had greater (>90%) effectiveness against COVID-19 infection in clinical trials than did the vaccines produced by Oxford-AstraZeneca (~70%) and Janssen (54-72%) against mild and severe types of COVID-19 infection.

The Moderna, Sputnik V, Janssen, and Oxford-AstraZeneca vaccines decreased the probability of severe forms of COVID-19 infection and mortality, whereas the mRNA vaccines demonstrated great effectiveness against infection and a very high degree of protection against severe illness, hospitalization, and death. On the other hand, the Pfizer-BioNTech vaccine published studies did not have access to these data. The Moderna vaccine is simpler to carry and store than the Pfizer vaccine since it can be stored at greater temperatures. Certain nations have granted EUA designation to additional vaccines manufactured by other firms that have demonstrated

positive effectiveness outcomes. The evaluation of vaccine recipients over time is an essential and crucial assessment as it offers insights on the potential for vaccination to provide permanent immunity.

The majority of the evidence points to "immune responses elicited by SARS-CoV-2 infection are present and might protect against" reinfection; however, past experiences with seasonal coronaviruses and current SARS-CoV-2 experience imply that immunity to natural infection may gradually wane as reinfection cases arise. Consequently, protection may be maintained with a further booster dosage. In terms of the COVID-19 vaccines' interchangeability, the WHO advises using the same vaccine for each dose in a two-dose regimen; however, there is scientific proof that heterologous vaccination, using an mRNA vaccine for the second dose and AstraZeneca or Covishield for the first, is effective.

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