A Review on Coronavirus: Worlds Threstening Pandemic Disease

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***Abstract*- virus which causes diseases in mammals and birds. The virus were first discovered in 1930 when an acute respiratory infections of domesticated chickens was caused by infectious bronchitis virus (IBV). Corona virus cause respiratory tract infection in human being which can be mild to dangerous. Corona virus is huge pleomorphic Sphere shaped particles along with bulbous surface projections.**

A division of Corona virus particularly the member of Beta-Corona virus subgroup A. Also have a shorter spike like surface protein haemagglutin Esterase (HE). New Corona Virus causes the infection severe acute respiratory syndrome coronavirus2, or SARS-COV-2 I.e. causes Corona virus disease 2019 (COVID-19).

The interaction of the Corona virus spike protein with its compliment host cell receptor is central in determining the tissue tropism, infectivity and species range of the virus

***Index terms*- COVID-19, CORONAVIRUS, SARS-CoV-2**

INTRODUCTION

virus which causes diseases in mammals and birds. Corona viruses cause respiratory tract infections in human being which can be mild to dangerous. This virus shows similar symptoms like common cold and other possible causes similar to rhinoviruses; whereas more lethal varieties can cause SARS, MERS, and COVID-19. Symptoms can vary from species to species. They cause an upper respiratory tract disease in chickens, while diarrhea in cows and pigs.

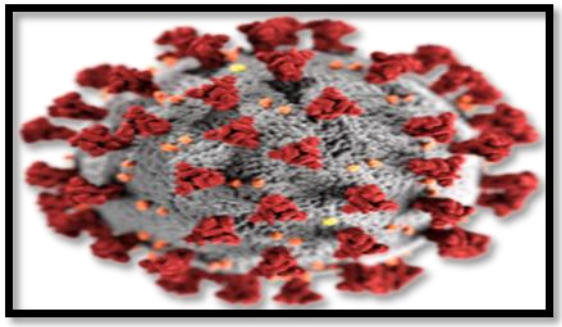


Fig no. 1 Illustration of the morphology of coronaviruses; the club-shaped viral spike peplomers, colored red, creates the look of a corona surrounding the virion when observed with an electron microscope.

VIRUS CLASSIFICATION

(unranked):	Virus
Realm:	Riboviria
Phylum:	incertaesedis
Order:	Nidovirales
Family:	Coronaviridae
Subfamily:	Orthocoronavirinae

Table no. 1 virus classification

Coronaviruses is belonging to subfamily Orthocoronavirinae, in the family Coronaviridae, order Nidovirales, and realm Riboviria. They are enveloped viruses with a positive-sense single-stranded RNAgenome and a nucleocapsid of helical

symmetry. 27 to 34 kilobases is the genome size of coronaviruses. It is the largest RNS viruses.

The name coronavirus is derived from the Latin corona, meaning "crown" or "halo", which means the feature appearance reminiscent of a solar corona around the virions when viewed under two-dimensional transmission electron microscopy, owing to the surface being enclosed in club-shaped protein spikes.

DISCOVERY

These viruses were first discovered in the 1930s when an acute respiratory infection of domesticated chickens was caused by infectious bronchitis virus (IBV).

In the 1940s, two more animal coronaviruses, mouse hepatitis virus (MHV) and transmissible gastroenteritis virus (TGEV), were isolated. Human coronaviruses were discovered in the 1960s.

The earliest ones studied were from human patients with the common cold, which were later named human coronavirus 229E and human coronavirus OC43.

Further human coronaviruses have since been recognized, including SARS-CoVin 2003, HCoV NL63 in 2004, HKU1 in 2005, MERS-CoV in 2012, and SARS-CoV-2 in 2019. All these viruses are responsible for causing respiratory tract infections.

The name corona was discovered by WHO, focused simply on the type of virus that causes the disease. Co and Viappear from corona virus, Tedros explained, with D meaning disease and 19 standing for 2019, the year the first cases were seen. In selecting COVID-19 as the name of the disease, the WHO name-givers steered clear of linking the outbreak to China or the city of Wuhan, where the illness was first identified. Although origin sites have been used in the past to identify new viruses, such a namesake is now seen as denigrating. Some experts have come to regret naming the infection caused by a different coronavirus the Middle East respiratory syndrome. “Having a name matters to prevent the use of other names that can be inaccurate or stigmatizing,” Tedros said. “It also gives us a standard format to use for any future coronavirus outbreaks.”

STRUCTURE

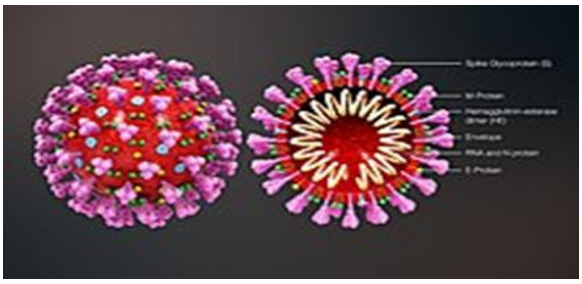


Fig no. 2Cross-sectional model of a coronavirus

Coronaviruses are huge pleomorphicsphere-shaped particles along with bulbous surface projections. Virus particles have average diameter is around 120 nm. Outer envelope diameter is ~80 nm and the spikes are ~20 nm long. Under the electron micrograph the envelop of virus appears as a distinct pair of electron dense shells. Envelope of virus is made up of a lipid bilayerwhere the membrane (M), envelope (E) and spike (S) structural proteins are anchored.

A division of corona viruses particularly the members of beta-coronavirus subgroup A, also have a shorter spike-like surface protein called hemagglutinin esterase (HE). Inside the envelope contains nucleocapsid, which is produced from numerous copies of the nucleocapsid (N) protein, which are bound to the positive-sense single-stranded RNA genome in a continuous beads-on-a-string type conformation. The lipid bilayer envelope, membrane proteins, and nucleocapsidacts as protective layers of virus when it is outside the host cell

SYMPTOMS

Signs and symptoms of COVID-19 may appear two to 14 days after exposure and can include Some people have experienced the loss of smell or taste.

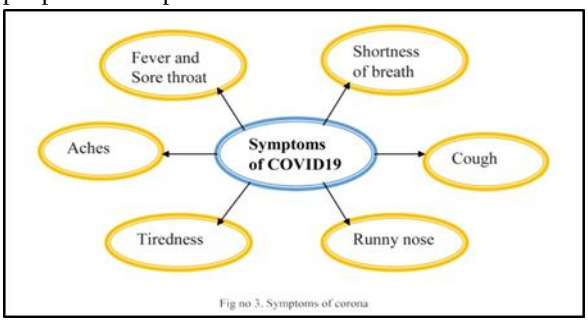


Fig no 3. Symptoms of corona

The severities of COVID-19 symptoms can series from very mild to severe. a number of people may have no symptoms at all. GegiatricPeople orwho have existing chronic medical conditions, such as

heart disease, lung disease or diabetes, or who have compromised immune systems may be at higher risk of serious illness. This is related to what is seen with other respiratory illnesses, such as influenza.

CAUSES

New coronavirus causes the infection severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2 i. e. causes coronavirus disease 2019 (COVID-19).
It's indistinctaccurately how communicablethe new coronavirus is. Data shows that it spreads from person to person among those in close contact within about 6 feet, or 2 meters. This virus spreads through respiratory droplets released when someone with the virus coughs, sneezes or talks.It can also increase if a person touches a surface with the virus on it and then touches his or her mouth, nose or eyes.

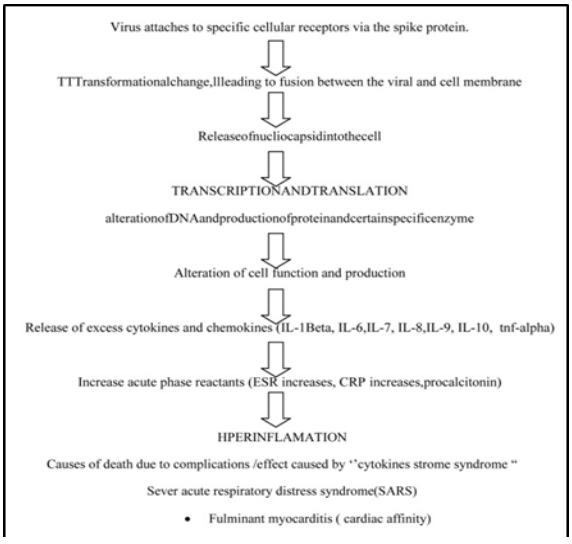
RISK FACTORS

Risk factors for COVID-19 appear to include:

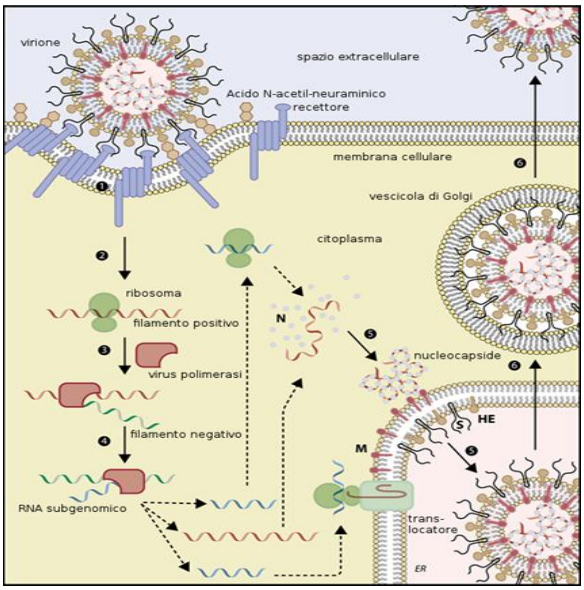
- Recent travel from or residence in an area with ongoing community spread of COVID-19 as determined by CDC or WHO.
- Close contact with someone who has COVID-19 — such as when a family member or health care worker takes care of an infected person

PATHOGENESIS

Unique feature it cause both upper respiratory tract infection and Lower respiratory tract infections



THE LIFE CYCLE OF A CORONAVIRUS



ENTRY

Infection starts when the viral spike (S) glycoprotein attaches to its complementary host cell receptor and after attachment, a protease of the host cell cleaves and activates the receptor-attached spike protein. Cleavage and activation allows the virus to enter the host cell by endocytosis or direct fusion of the viral envelop with the host membrane is depend on the host cell protease available,
It enters into the host cell, the virus particle is uncoated, and its genome enters the cell cytoplasm. The coronavirus RNA genome contains a 5′ methylated cap and a 3′ polyadenylated tail, which allows the RNA to connect to the host cell's ribosome for translation. The host ribosome translates the primary overlapping open reading frame of the virus genome and forms a long polyprotein. The polyprotein has its own proteases which cleave the polyprotein into multiple nonstructural proteins.

REPLICATION

Numerals of the nonstructural proteins coalesce to form a multi-protein replicase-transcriptase complex i.e.RTC. The chiefreplicase-transcriptase protein is the RNA-dependent RNA polymerase i.e. RdRp. It is directly intricte in the replication and transcription of RNA from an RNA strand. The extra nonstructural

proteins in the complex help in the replication and transcription process. The exoribonuclease nonstructural protein, for example, provides extra fidelity to replication by providing a proofreading function which the RNA-dependent RNA polymerase lacks.

The complex plays most important function in replication the viral genome. RdRp directly mediates the synthesis of negative-sense genomic RNA from the positive-sense genomic RNA. This process is followed by the replication of positive-sense genomic RNA from the negative-sense genomic RNA. The further significant function of the complex is to transcribe the viral genome. RdRp directly mediates the synthesis of negative-sense subgenomic RNA molecules from the positive-sense genomic RNA. This is followed by the transcription of these negative-sense subgenomic RNA molecules to their corresponding positive-sense mRNAs.

RELEASE

The replicated positive-sense genomic RNA becomes the genome of the progeny viruses. The mRNAs are gene transcripts of the last third of the virus genome after the initial overlapping reading frame. These mRNAs are translated by the host's ribosomes into the structural proteins and a number of accessory proteins. RNA translation occurs inside the endoplasmic reticulum. The viral structural proteins S, E, and M move into the Golgi intermediate compartment through the secretory pathway. There, the M proteins direct most protein-protein interactions required for assembly of viruses following its binding to the nucleocapsid. Progeny viruses are then released from the host cell by exocytosis through secretory vesicles.

TRANSMISSION

The interaction of the coronavirus spike protein with its complement host cell receptor is central in determining the tissue tropism, infectivity, and species range of the virus. The SARS coronavirus,
for example, infects human cells by attaching to the angiotensin-converting enzyme 2i.e ACE2 receptor.

SCREENING / LABORATORY ANALYSIS

This Screening / laboratory Analysis includes

- WBC count may vary leukopenia (more common) /leukocytosis
- Decreased lymphocytes count lymphopenia (most commonly finding)
- Increased LDH limits (due to affinity of cytokines for cardiac tissue, hepatic tissue
- Increased ferritin level. (early finding)
- • Increased AST ALT. (aminotransferases)
- Increased ESR, increased D- Dimer, increased procalcitonin

Virus confirmed by RTPCR technique

- IMAGING: CT chest
- Ground glass opacification w/wo consolidation
- B/L. Peripheral involvements esp lower lobe
- Can be found even before onset of symptoms but not specific for covid

HOW CAN YOU PREVENT CORONAVIRUSES?

- The best way to prevent the spread of infection is to avoid or limit contact with people who are showing symptoms of COVID-19 or any respiratory infection or by maintain social distancing.
- The next best thing you can do is practice good hygiene and social distancing to prevent bacteria and viruses from spreading.
- Wash your hands frequently for at least 20 seconds at a time with warm water and soap. How long is 20 seconds.
- Don’t touch your face, eyes, nose, or mouth when your hands are dirty.
- Don’t go out if you’re feeling sick or have any cold or flu symptoms.
- Stay at least 3 feet Trusted Source i.e.1 meter away from anyone who is coughing or sneezing.
- Cover your mouth with the inside of your elbow whenever you sneeze or cough. Throw away any tissues you use right away.
- Clean any objects you touch a lot like phones, computers, utensils, dishware, and doorknobs by using disinfectants.

DIAGNOSIS

Initially it does not show any symptoms. If you develop symptoms of COVID-19 and you've been exposed to the virus, contact to your doctors. Tell him or her if you've traveled to any areas with ongoing community spread of COVID-19 according to CDC and WHO. Also let your doctor know if you've had close contact with anyone who has been diagnosed with COVID-19.

Various factors used to decide whether to test you for COVID-19 may differ depending on where you live. Depending on your location, you may need to be screened by your clinic to conclude if testing is suitable and accessible.

Your doctor will determine whether to conduct tests for COVID-19 based on your signs and symptoms, as well as whether you have had close contact with someone diagnosed with COVID-19 or traveled to or lived in any areas with ongoing community spread of COVID-19 in the past 14 days. Your doctor may also consider testing if you're at higher risk of serious illness.

For COVID-19 test, a health care provider uses a long swab to take a nasal sample. The sample is then sent to a lab for testing. If you're coughing up saliva (sputum), that may be sent for testing.

TREATMENT

There is no specific antiviral treatment recommended for COVID-19, and no vaccine is currently available. The treatment is symptomatic, and oxygen therapy represents the major treatment intervention for patients with severe infection. Mechanical ventilation may be essential in cases of respiratory failure refractory to oxygen therapy, whereas hemodynamic support is essential for managing septic shock.

The WHO released a document summarizing WHO guidelines on 28 January2020 and scientific proof derived from the treatment of previous epidemics from HCo Vs. This document addresses measures for recognizing and categorizing patients with severe acute respiratory disease; strategies for infection prevention and control; early supportive therapy and monitoring; a guideline for laboratory diagnosis; management of respiratory failure and ARDS; management of septic shock; prevention of complications; treatments; and considerations for pregnant patients. With all these recommendations, we report the strategies for addressing respiratory failure, including protective mechanical ventilation and high-flow nasal oxygen (HFNO) or non-invasive ventilation (NIV).

INTUBATION AND PROTECTIVE MECHANICAL VENTILATION

We need to take some special precautions during intubation. The procedure should be executed by an expert operator who uses personal protective equipment called as PPE, FFP3 or N95 mask, defensive goggles, disposable gown long sleeve raincoat, disposable double socks, and gloves. If possible, rapid sequence intubation i.e. RSI should be performed. Preoxygenation means 100% O2 for 5 minutes should be performed via the continuous positive airway pressure (CPAP) method. Heat and moisture exchanger (HME) must be positioned between the mask and the circuit of the fan or between the mask and the ventilation balloon.

Mechanical ventilation should be with lower tidal volumes (4 to 6 ml/kg predicted body weight, PBW) and lower inspiratory pressures, reaching a plateau pressure (Pplat) < 28 to 30 cm H2O. PEEP must be as high as possible to maintain the driving pressure (Pplat-PEEP) as low as possible (< 14 cmH2O). Additionally, disconnections from the ventilator must be avoided for preventing loss of PEEP and atelectasis. Finally, the use of paralytics is not recommended unless PaO2/FiO2 < 150 mmHg. The prone ventilation for > 12 hours per day, and the use of a conservative fluid management strategy for ARDS patients without tissue hypoperfusion (strong recommendation) are emphasized.

NON-INVASIVE VENTILATION

Concerning HFNO or non-invasive ventilation (NIV), the experts' panel, points out that these approaches performed by systems with good interface fitting do not create widespread dispersion of exhaled air, and their use can be considered at low risk of airborne transmission. Non-invasive techniques can be used in non-severe forms of respiratory failure. However, if the scenario does not recover within a short period of time (1–2 hours) the mechanical ventilation must be chosen.

OTHER THERAPIES

Among other therapeutic strategies, systemic corticosteroids for the treatment of viral pneumonia or acute respiratory distress syndrome (ARDS) are not recommended. In addition, inappropriate administration of antibiotics should be avoided, although some centers recommend it. Although no antiviral treatments have been approved, several approaches have been proposed such as lopinavir/ritonavir (400/100 mg every 12 hours), chloroquine (500 mg every 12 hours), and hydroxyl chloroquine (200 mg every 12 hours). Alpha-interferon (e.g., 5 million units by aerosol inhalation twice per day) is also used.

Preclinical studies suggested that remdesivir (GS5734) — an inhibitor of RNA polymerase with in vitro activity against multiple RNA viruses, including Ebola — could be effective for both prophylaxis and therapy of HCoVs infections. This drug was positively tested in a rhesus macaque model of MERS-CoV infection.

When the disease results in complex clinical pictures of MOD, organ function support in addition to respiratory support is compulsory. Extracorporeal membrane oxygenation (ECMO) for patients with refractory hypoxemia despite lung-protective ventilation should merit consideration after a case-by-case analysis. It can be suggested for those with poor results to prone position ventilation.

Supportive treatment:

- Maintain airway, breathing, circulation
- Ventilation if required (PO2 <55%)
- Isolation (to prevent spread)
- Correction of electrolyte imbalance
- Correct temperature

There is no certain specific treatment protocol published by WHO.

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