

CoVID-19 –The global pandemic

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I. Introduction

Coronavirus disease (CoVID-19) is an infectious disease caused by a new virus that had not been previously identified in humans.

History:

The history of coronavirus dates back to 20th century, in 1965 Tyrell and Bynoe identified B814 virus in respiratory tract of an adult with common cold, these viruses were cultured in human embryonic tracheal organ cultures and later inoculated into human volunteers through intranasal route, common cold was observed in significant proportion of subjects. Concurrently Hamre and Procknow observed 229E virus in tissue cultures from the samples obtained from patients with cold. Both B814 and 229E are ether sensitive but not myxo or paramyxoviruses.

McIntosh et al reported the recovery of a strain of ether sensitive agents termed as OC (as they were grown in organ cultures) from the laboratory of Robert Chanock from national institutes of health. The 229E virus and OC viruses had similar morphology. Within the same time frame Almeida and Tyrrell performed electron microscopy on fluids from organ cultures infected with B814 and found the particles that resembled the infectious bronchitis virus of chickens.

In late 1960s Tyrrell and his group of virologists who were working on human strains and animal viruses concluded that infectious bronchitis virus, mouse hepatitis virus, transmissible gastroenteritis virus of swine had similar morphological features when observed through electron microscopy and thus they termed them as coronavirus and was later officially accepted as a new genus of virus.

According to the research using serological techniques it was found that infections from coronaviruses occur more often in winter and spring than in summer and fall, data revealed that coronavirus infections contribute as much as 35% of the total respiratory viral activity during epidemics

Table no :1 Taxonomy of Corona virus:

Realm	<i>Riboviria</i>
Phylum	<i>Incertae sedis</i>
Order	<i>Nidovirales</i>
Family	<i>Coronaviridae</i>
Sub-family	<i>Orthocoronavirinae</i>
Genera	<i>Alphacoronavirus</i> <i>Betacoronavirus</i> <i>Gammacoronavirus</i> <i>Deltacoronavirus</i>

Alphacoronavirus	Betacoronavirus	Gammacoronavirus	Deltacoronavirus
<ul style="list-style-type: none"> • <i>Human coronavirus 229E</i> • <i>Human coronavirus NL63</i> • <i>Miniopterus bat coronavirus 1</i> • <i>Miniopterus bat coronavirus HKU8</i> • <i>Porcine epidemic diarrhea virus</i> 	<ul style="list-style-type: none"> • <i>Betacoronavirus 1</i> • <i>Human coronavirus HKU1</i> • <i>Murine coronavirus</i> • <i>Pipistrellus bat coronavirus HKU5</i> • <i>Rousettus bat coronavirus HKU9</i> • <i>Severe acute respiratory syndrome-related coronavirus</i> • <i>Severe acute respiratory</i> 	<ul style="list-style-type: none"> • <i>Beluga whale coronavirus SW1</i> • <i>Infectious bronchitis virus</i> 	<ul style="list-style-type: none"> • <i>Bulbul coronavirus HKU11</i> • <i>Porcine coronavirus HKU15</i>

<ul style="list-style-type: none"> • <i>Rhinolophus bat coronavirus HKU2</i> • <i>Scotophilus bat coronavirus 512</i> 	<ul style="list-style-type: none"> • <i>syndrome coronavirus 2</i> • <i>Tylonycteris bat coronavirus HKU4</i> • <i>Middle East respiratory syndrome-related coronavirus</i> • <i>Human coronavirus OC43</i> • <i>Hedgehog coronavirus 1</i> 		
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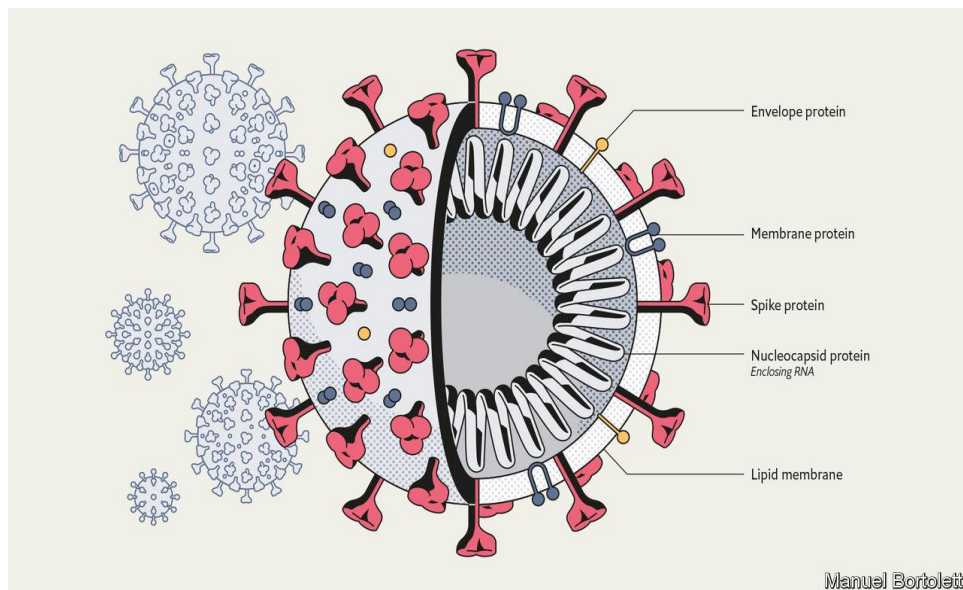
The novel human coronavirus that is causing CoVID-19 is *severe acute respiratory syndrome coronavirus2*. It has emerged in Wuhan, China, in late 2019 and is causing a pandemic.

Discoveries of human coronaviruses

Virus	Location	Year
SARS	China	2003
NL63	Netherlands	2004
NL	Netherlands	2004
HCoV-NH	New Haven, CT	2005
HKU1	Hong Kong	2005

Coronavirus genome and structure:

Coronaviruses are positive sense single stranded RNA viruses. The nucleic acid is 30kb long (largest known viral RNA) and polyadenylated.

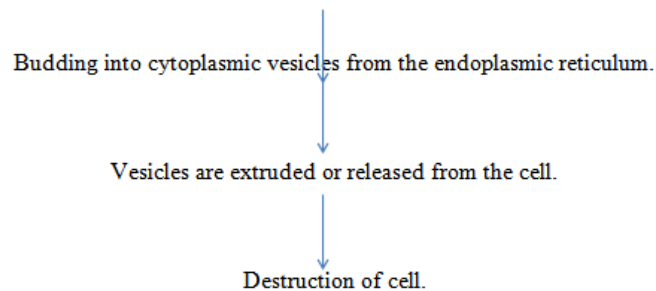


The RNA codes for large polyprotein which is cleaved by viral encoded proteases into the following:

- RNA dependent RNA polymerase
- ATPase helicase
- Hemagglutinin-esterase protein (HE Protein)
- Surface glycoprotein (S Protein)
- Envelope protein (E Protein)
- Membrane glycoprotein (M Protein)
- Nucleocapsid protein (N Protein)

Entry of coronaviruses into cells

(Coronaviruses are capable of genetic recombination if 2 viruses infect the same cell at same time.)



Development of coronaviruses in the cytoplasm of infected cells

Table no :2 Structural scheme of corona virus

virus	Cell receptor used for entry
229E	Amino peptidase N
Mouse hepatitis virus	Corcino embryonic antigen family receptor
SARS	Angiotensin converting enzyme II

Stages of pandemic

Stage1: Cases mostly imported from affected countries.

Stage2: Local transmission from positive cases.

Stage3: Diseases spreads in community, large areas get affected.

Stage4: Disease takes shape of an epidemic with no clear end point.

Currently India is in Stage 2 where China and Italy in Stage4

Measures to be taken by the areas in stage 2 and stage3:

Quarantine: Anyone coming from countries affected by COVID-19 outbreak is being quarantined for 14 days, regarding of symptoms.

Contact tracing: If a person has been found positive, everyone he or she may have come in contact with is put under surveillance. If they show any symptoms, they are tested and quarantined too.

Stop mass gathering: Most states have closed schools, cinema halls or aren't organizing public events

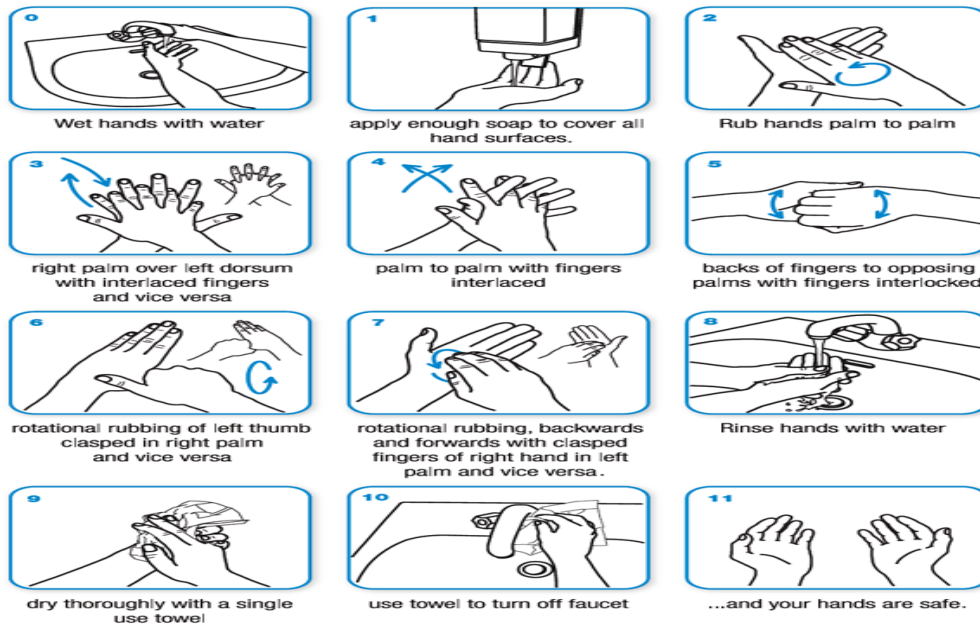
Preparation: Scaling up infrastructure-testing facility, Isolation beds and acute management of positive cases-taking place simultaneously.

Material	Virus viability
Air	3 hours
Plastic, stainless steel	3 days
Copper	4 hours

Table no: 3 corona viability

Protective measures:

- Follow respiratory etiquette.
- Sanitize your vicinity and surfaces used frequently.
The infectious capacity of virus decreases to 50% after 66 minutes and after 3 hours its capacity is minimized to 12.5%.
- Wash your hands properly by using soap and water or an alcohol based hand rub.



Usage of a facemask:

- Everyone need not wear a mask. Only wear mask if having symptoms (Cough, fever, difficulty in breathing), if you are caring for a COVID-19 suspect/confirmed patient and also the health worker attending to patients with respiratory symptoms.
- While wearing a mask make sure that you unfold the pleats of the mask. Place the mask over your nose, mouth, and chin and ensure there are no gaps on either side of the mask, adjust to fit.
- Avoid touching the mask, while using it
- Do not leave the mask hanging from the neck.
- Change the mask after 6 hours or as soon as they become wet.
- Never reuse the disposable masks and dispose the used masks into closed bins after disinfecting them.
- After removal of mask clean your hands with soap and water or use alcohol based hand rub disinfectant.

According to CDC guidelines:

- Clean your hands:
 - Wash your hands with soap and water for a minimum period of 20 seconds or else use a hand sanitizer that has at least 60% of alcohol, after you have been to public places or after blowing your nose, coughing, sneezing.
 - Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid close contact:
 - Avoid close contact with people who are at risk.
 - Maintain distance between people if CoVID-19 is spreading in your community.
- Stay home if you are sick, except to get a medical care.
- Cover coughs and sneezes:
 - Cough or sneeze into your flexed elbow.
 - Use tissues and through them into a closed bin.
 - Wash your hands with soap and water or use a hand sanitizer after coughing or sneezing.
- Usage of facemask:
 - Use a facemask when you are sick or around a person who is sick.
 - There is no need of using a mask unless you are caring for someone who are sick.
- Clean and disinfect the surfaces which are used frequently.

According to WHO guidelines:

- Wash your hands frequently.
- Maintain social distancing.
- Avoid touching eyes, nose and mouth.
- Practice respiratory hygiene.
- If you have fever, coughs, difficulty in breathing seek medical care immediately.

- Stay informed and follow the advice given by your health care provider.

Current treatment:

There is no specific vaccine or drug to treat CoVID-19.

Researchers need to perform randomised control trails before making the vaccines and drugs available, this may take several months or longer.

The following are some treatment options that are under investigation for protection against SARS CoV 2 virus.

Lopinavir/Ritonavir:

Administration of Lopinavir/ Ritonavir to be considered in Laboratory confirmed cases of COVID – 19 when the following criteria are met:

- Symptomatic patients with any of the following:

- i. hypoxia
- ii. Hypotension
- iii. New onset organ dysfunction (one or more)
- iv. High Risk Groups:

Age> 60 years, Diabetes Mellitus, Renal Failure, Chronic Lung disease, Immuno – compromised persons

- Dosage:

- i. Lopinavir/ Ritonavir (200 mg/ 50 mg) – 2 tablets twice daily
- ii. For patients unable to take medications by mouth: Lopinavir 400mg/ Ritonavir 100 mg – 5ml suspension twice daily

- Duration: 14 days or for 7 days after becoming asymptomatic.

Remdesivir: Remdesivir is an experimental broad-spectrum antiviral drug originally designed to target Ebola.

Chloroquine: Chloroquine is a drug that’s used to fight malaria and autoimmune diseases. It’s been in use for more than70 years.**Researchers have discovered that this drug is effective at fighting the SARS-CoV-2 virus in studies done in test tubes.**

Favipiravir:China has approved the use of the antiviral drug favipiravir to treat symptoms of COVID-19. The drug was initially developed to treat inflammation in the nose and throat.Although the results of the study haven’t been released yet, the drug has supposedly shown to be effective in treating COVID-19 symptoms in a clinical trial of 70 people.

Infection prevention and control measures for patients with suspected or confirmed COVID - 19 infection

At triage	Patient should wear a triple layered medical mask and he is isolated into an available room, patient is instructed to follow respiratory etiquette and personal hygiene.
Apply droplet precautions	Use triple layered surgical mask when working with the patients at a distance within 1-2 meters. When providing care in close contact with a patient with respiratory symptoms (e.g. coughing or sneezing), use eye protection (facemask or goggles), because sprays of secretions may occur.
Apply contact precautions	Use personal protective equipment when entering into the patients isolated room and remove PPE while leaving, ensure adequate room ventilation.
Apply airborne precautions when performing an aerosol generating procedure	Ensure that healthcare workers performing aerosol-generating procedures use PPE. Whenever possible, use adequately ventilated single rooms when performing aerosol-generating procedures, meaning negative pressure rooms with minimum of 12 air changes per hour or at least 160 litres/second/patient in facilities with natural ventilation.

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