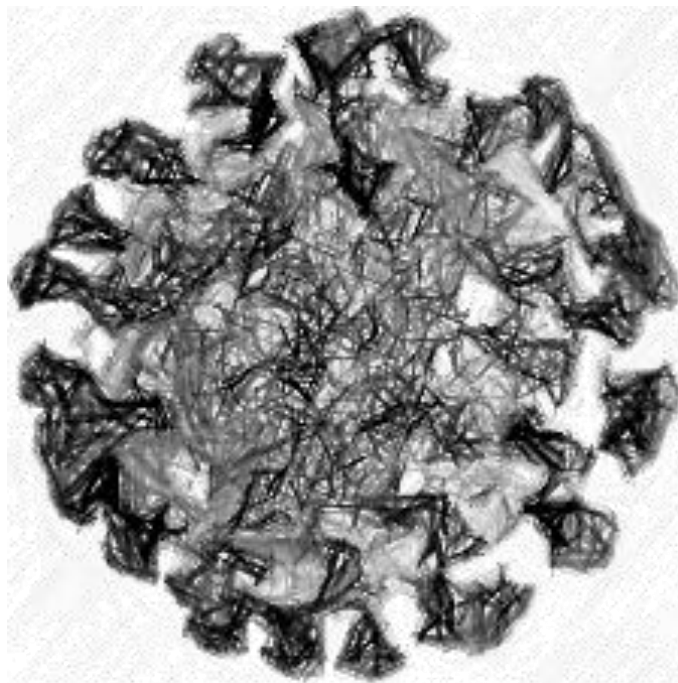


CORONA VIRUS DISEASE

(CoVID – 2019)

“AN OLD FAMILY WITH A NEW DISEASE.”



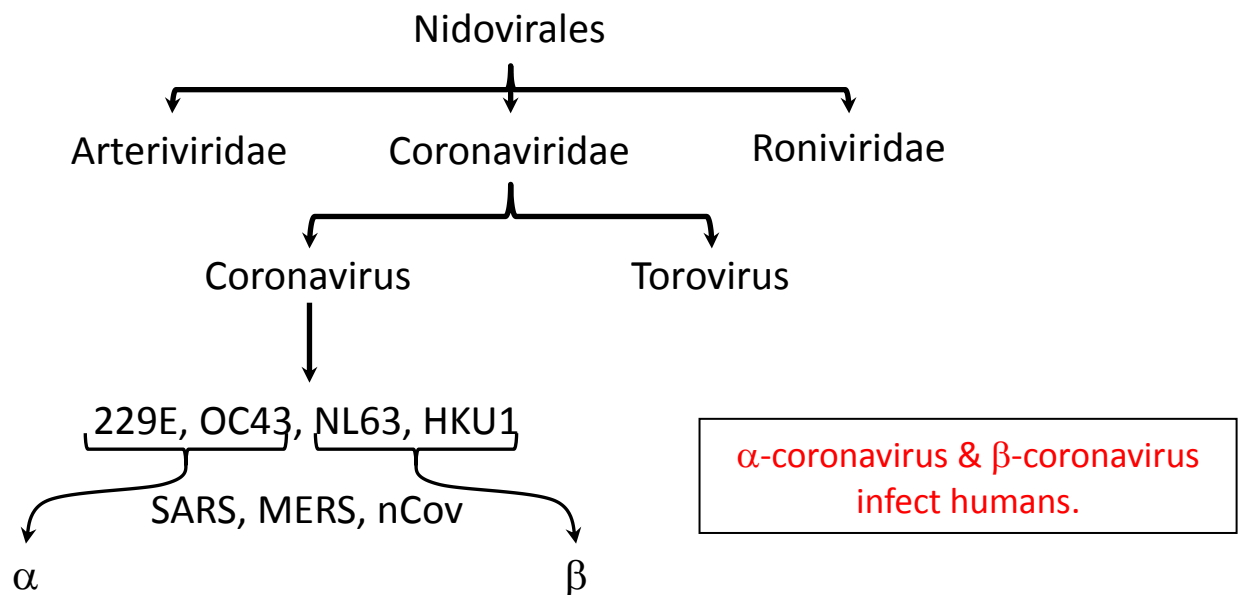
Dr. Vinay Kumar Parepalli.

Introduction

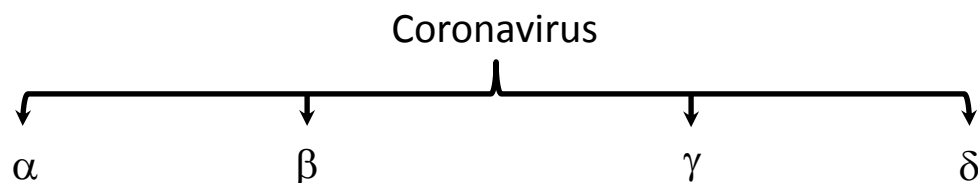
Coronaviridae, one of the families of viruses which are known to cause diseases in mammals and birds ranging from the common cold to Severe Acute Respiratory Syndrome. A new species which belongs to this family emerged recently causing an outbreak of a respiratory disease in the eastern part of Asia.

Coronavirus

- Order – Nirovirales, Family - Coronaviridae, Genus - Coronavirus
- Species – Human Coronavirus 229E
 Human Coronavirus OC43
 Human Coronavirus NL63
 Human Coronavirus HKU1
 SARS related Coronavirus (Sever Acute Respiratory Syndrome)
 MERS related Coronavirus (Middle East Respiratory Syndrome)
 Novel Coronavirus (CoViD – 2019)



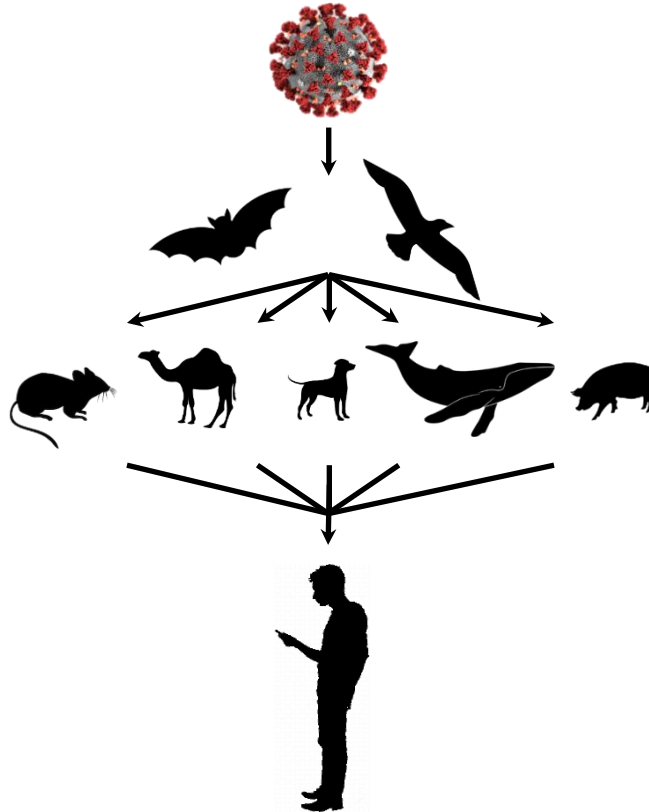
Flowchart 1. Taxonomy of Coronavirus



Flowchart 2. Genera under coronaviridae

- Evolution – The oldest ancestor i.e., MRCA (Most Recent Common Ancestor) for these group of viruses dates back to 8000 B.C., which was initially seen only infecting bats and birds. Due to industrialization, deforestation and their consumption of bats, birds and other animals as food

by humans, it has also started to infect humans. The first species of Coronavirus infecting humans (229E) was identified in 1931 and isolated first in 1965. Eventually, the virus has evolved into the novel Coronavirus (2019-n-CoV).



Flowchart 3. Spread of the virus in various hosts since MRCA.

→ History of Serious Outbreaks caused by Coronavirus:

- 2002-03: SARS in China
- 2012: MERS in Saudi Arabia
- 2015: MERS in South Korea
- 2019-20: SARS CoV/nCov

→ Coronavirus:

- A single-stranded positive-sense RNA virus.
- Spherical in shape, 80-160 nm in diameter, Helical Nucleocapsid, Enveloped (hence can be destroyed by organic solvents) with 12-24 nm spikes.
- Major structural proteins: S-Spike, E-Envelope, M-Membrane, N-Nucleocapsid, HE-Hemagglutinin (seen only in HCoV-OC43 and SARS CoV).
- Its Genome is considered the largest among the RNA viruses with 30,000 nucleotides.

- Replicates in the cytoplasm of the host cell and obtains the envelope from the Golgi Apparatus/Endoplasmic Reticulum.

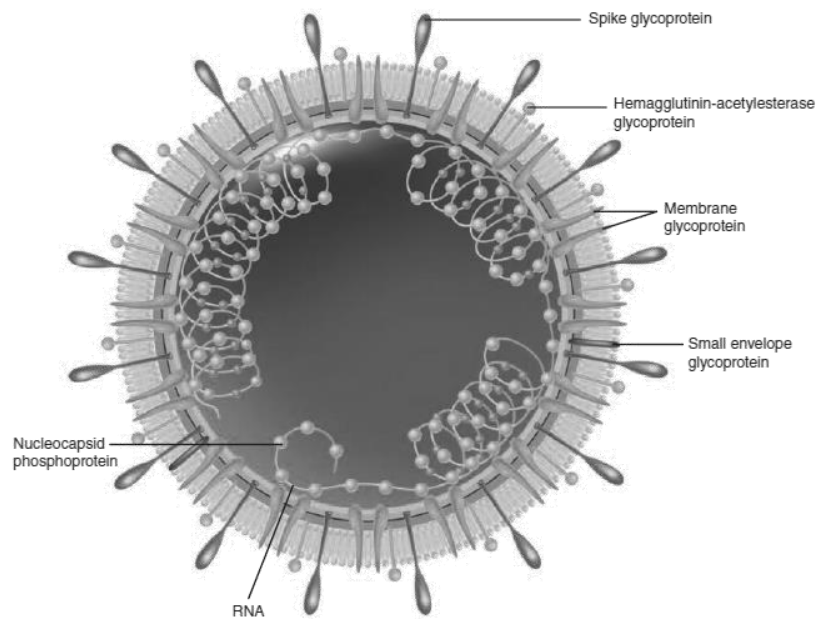


Fig 1. Structure of Coronavirus ^[5]

→ Clinical Presentation:

- Human Coronavirus is known to produce common cold (running nose with malaise) which weans off by 1 week. It rarely causes lower respiratory tract infections.
- SARS/MERS is known to cause severe lower respiratory tract infections such as severe pneumonia, moderate to severe ARDS (Acute Respiratory Distress Syndrome), sepsis, septic shock.
- The virus can spread across the population by respiratory droplets.

→ Detection of a patient with Coronavirus Disease (Case Definitions):

- The WHO after recognizing the coronavirus disease as a potentially dangerous one with an easy transmission has put forward few pointers for the health care workers to identify the suspects and bring them to better medical attention and care in the early stages of the disease.
- The main objective of the definitions is to limit the spread of the disease in the population by identifying the potential suspects and isolating them.

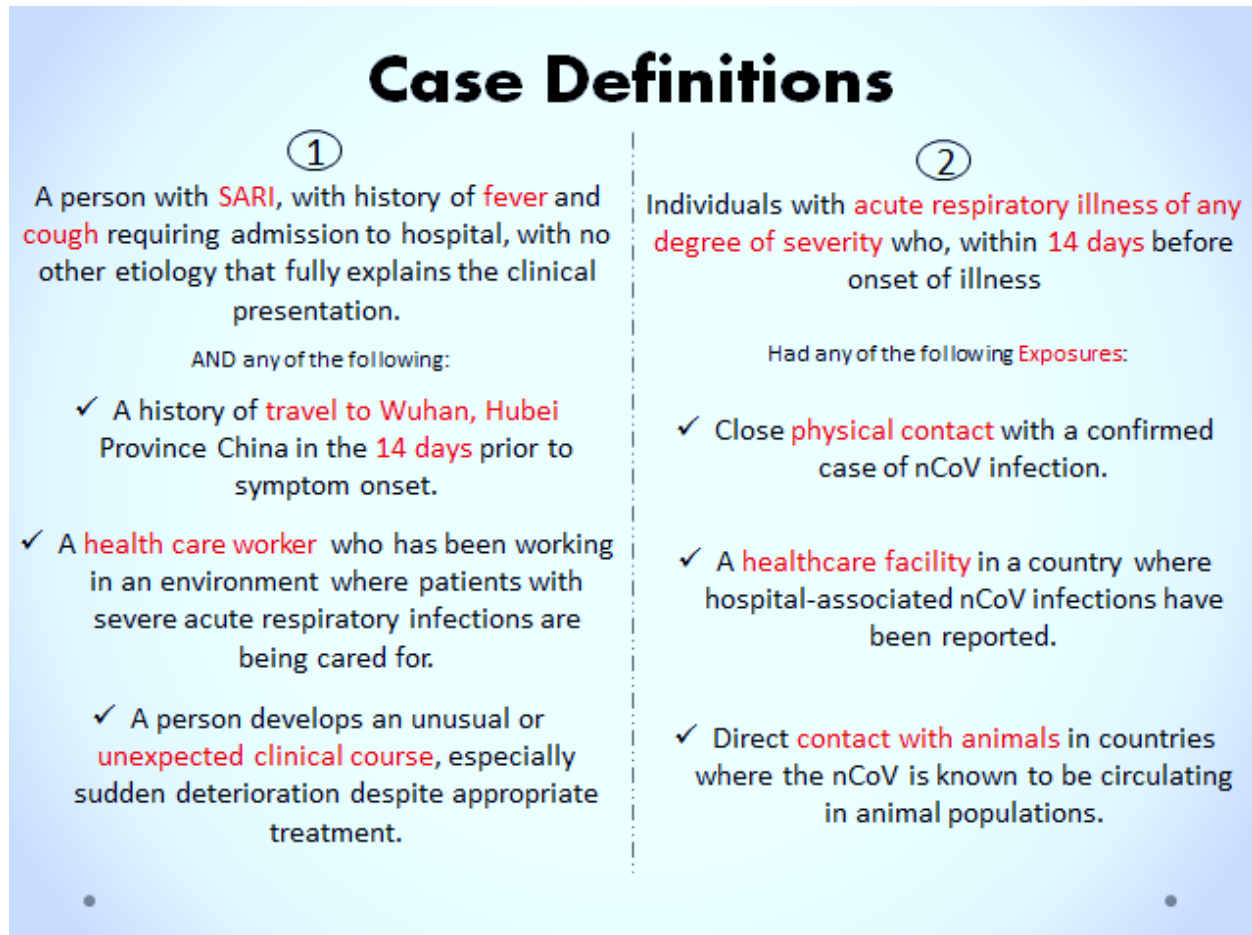


Fig 2. Case Definitions (WHO)

→ Case Management at OPD:

- An immediate Infection and prevention control has to be followed as soon as any patient meets the case definitions.
- The patient has to be handed over a mask and instructed the correct method of using it. He/She needs to be isolated from other patients and needs to be educated about hand hygiene and respiratory hygiene.
- Health care staff needs to be educated regarding mask management and hand hygiene.

→ Case Management at ICU/Ward:

- Categorize the patient based on the symptoms to place them in an ICU or a Ward.
- Start supplemental oxygen therapy to patients with respiratory distress.
- Manage fluid and electrolyte balance if the patient presents with SARI (Severe Acute Respiratory Infection) and not in shock.
- Administer empiric antimicrobials against likely pathogens causing SARI.
- Counsel the patient and the relative regarding the disease and the probable course of management.

→ Laboratory Diagnosis:

- Specimen – Respiratory material from URT (nasopharyngeal and oropharyngeal swab/secretions) and LRT (sputum, endotracheal aspirate or bronchoalveolar lavage), blood samples and serum.
- Investigations – NAAT (Nucleic Acid Amplification Test) and RT-PCR (Reverse Transcription Polymerase Chain Reaction) to be done on the respiratory secretions, blood culture may be done to rule out other aetiology causing a similar pattern of illness. If NAAT and PCR are not available tests on serum can be done to evaluate the host immune response.
- A regular investigation panel has to be carried out on a confirmed patient until 2 consecutive samples are negative taken 24 hours apart only when clinically recovered.

→ THE PATIENT HAS TO BE MONITORED CLOSELY TO PREVENT DETERIORATION, ON THE CONTRARY, IF THE PATIENT IS SEEN WORSENING ADEQUATE SUPPORT HAS TO BE GIVEN.

→ Prevention:

- General Precautions – Get to know the various presentation of the disease, maintain a distance of 1m from an infected person as it is a respiratory disease. Maintain hand and respiratory hygiene. Get medical attention as soon as possible if you can identify the symptoms.

Prevention

★ You are at risk of being exposed to potentially infectious material if present **within 1m** of infected patient. ★

<u>AT HOME:</u>	<u>IN A COMMUNITY:</u>	<u>AT HOSPITAL</u>
<ul style="list-style-type: none"> • If sick – <ul style="list-style-type: none"> ✓ Hand Hygiene ✓ Medical Mask ✓ Respiratory Hygiene ✓ Improve ventilation • Caregiver – <ul style="list-style-type: none"> ✓ Hand Hygiene ✓ Medical Mask ✓ Proper disposal of respiratory secretions 	<ul style="list-style-type: none"> • If sick – <ul style="list-style-type: none"> ✓ Medical Mask ✓ Respiratory Hygiene ✓ Seek medical attention ASAP. ✓ Follow appropriate mask management. • Others – <ul style="list-style-type: none"> ✓ Avoid gatherings ✓ Maintain distance from infected person ✓ Hand Hygiene 	<ul style="list-style-type: none"> • Patients– <ul style="list-style-type: none"> ✓ Medical Mask ✓ Respiratory Hygiene • HCW– <ul style="list-style-type: none"> ✓ Wear a mask when entering the ward. ✓ Use respirators / N95 while performing aerosol generating procedures.

Mask Management

→ Ensure mouth and nose are covered

→ Avoid gaps between mask and face

→ Do not touch the front of the mask

→ Always untie the mask from behind

→ Discard the mask as it gets moist

→ Perform Hand Hygiene after removing

→ NEVER REUSE A MASK.

Fig 3. Precautions to be taken by one

- ✓ **Hand Hygiene** – Has to be performed regularly, with either alcohol-based solution or soap (if hands are visibly soiled). It has to be done strictly if there has been contact with an infectious individual.
Use disposable towels or napkins after the wash.
- ✓ **Respiratory Hygiene** – If one is sick with any respiratory symptoms, he/she has to try to isolate themselves as much as possible. Cover your mouth and nose properly during a sneeze or cough followed by washing hands thoroughly. Use a surgical mask.

- Duties of the Hospital Management Team – Hospitals are a hub of infected patients in such a situation and a lot of care has to be taken to limit the spread.
Any diagnostic procedure on these patients has to be preceded and followed by stringent guidelines and precautions. These procedures have to be conducted in a HEPA (High Efficiency Particulate Air) filter rooms or AIIR (Airborne Infection Isolation Room).

Care at Hospital

(Infection Prevention Control)

LIMIT TRANSMISSION

- | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Early Triage • Ensure adequate clinical suspicion. • Maintain a screening questionnaire. | <ul style="list-style-type: none"> • Educate patients about hand and respiratory hygiene • Perform Hand Hygiene • Mask management | <ul style="list-style-type: none"> • Provide adequate training to all HCW • Adequate patient to staff ratio • Monitor HCW compliance with the standard precautions. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Duties of HCW

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> → Use standard precautions. → Wards to be adequately ventilated. → Only 1 team of HCW to work at the ward. → Perform Hand Hygiene between <ul style="list-style-type: none"> • every patient. | <ul style="list-style-type: none"> → Use personal protective equipment. → Use disposable instruments. → Avoid unnecessary shifting of the patient from the ward. → Limit the number of entries by HCW/relatives into the ward. • |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Fig 4. Precautions at a Health Care Set-Up

PPE	Patient	HCW at OPD	Aerosol generated procedures	Visitor
Gown			✓	✓
Glove		✓	✓	✓
Surgical Mask	✓	✓		✓
N - 95			✓	
Eye Care		✓	✓	✓

Table 1. Personal Protective Equipment

- Maintenance of the Hospital – A strict policy has to be designed by the hospital authority to curb the mode of spread. Disinfection needs to be carried out using 70% Ethyl Alcohol or 0.5% Sodium Hypochlorite.

Environmental Care

→Designate specific and well trained housekeeping staff for the wards.

→Maintain a checklist

→Ensure that all the housekeeping staff use adequate PPE.

→Ward / Patient room to be disinfected daily.

→Disinfect portable medical equipment after use on the patient.

→Disinfect the surroundings of the room where aerosol generated procedures are done.

→Perform standard disinfection care to the room/ bed after the patient is discharged.

Fig 5. Measures to prevent further transmission

- Laboratory Measures – Highly infectious material is handled at the labs for investigation, which makes it a potentially serious threat for transmission. Stringent standards have to be maintained by the laboratories.

Non-propagative work (NAAT, PCR) in a biosafety laboratory level – 2 Propagative work (Culture) in a biosafety laboratory level – 3

Care at Laboratory

All specimens taken to the Lab are potentially infectious

- ✓ Ensure HCW take proper precaution during collection.
- ✓ Ensure transport handlers are trained and use spill proof containers.
- ✓ Use a secondary leak proof bags for transport.
- ✓ Ensure adequate biosafety measures at the laboratory.
- ✓ Label all the specimens with the complete patient details
- ✓ Document all the specimens in the lab.

Fig 6. Laboratory Safety.

Summary

- ✓ Coronavirus named due to its resemblance to SUN which contains the largest genome among RNA viruses.
- ✓ It usually causes respiratory illness and rarely gastrointestinal symptoms too.
- ✓ The virus initially was identified in bats and birds and due to increased interaction and consumption, it is seen that humans are also infected.
- ✓ Adequate measures have to be taken by all the sectors of society to prevent further transmission of the disease. This initiative has to be taken not only by the hospital management and policymakers but also by the citizens.
- ✓ Measures are to be taken such as preventing close contact with the infected individual, maintaining hand and respiratory hygiene. Use a correct mask at the correct time in the right place following adequate guidelines.

References

1. World Health Organization Website - <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
2. Center for Diseases Control Website - <https://www.cdc.gov/coronavirus/index.html>
3. Jawetz Medical Microbiology, Coronavirus.
4. Virology, An Illustrated Color Text, Stephen Korsman, Human Coronaviruses.
5. Sherri's Medical Microbiology, Coronaviruses.
6. Schaechter's Mechanism of Microbial Diseases, Coronavirus, SARS.