DETAILS ON NOVEL CORONAVIRUS 2019 (COVID-19) AND IT'S OUTBREAK

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ABSTRACT:

The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, previously provisionally named 2019 novel coronavirus or 2019-nCoV) disease (COVID-19) in China at the end of 2019, has caused a large global outbreak and a major public health issue. As of February 11, 2020, data from the WHO has shown that more than 43,000 confirmed cases have been identified in 28 countries/regions, with more than 99% of the cases being detected in China. The number of diagnosed cases is more than 40,000 until the submission of this manuscript. On January 30, 2020, WHO has declared COVID-19 as the sixth public health emergency of international concern. The SARS-CoV-2 is closely related to two bat-derived severe acute respiratory syndrome-like coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVZXC21. It is spread by human-to-human transmission via droplets or direct contact, and infection has been estimated to have mean incubation period of 6.4 days and a basic reproduction number of 2.24-3.58. Among the patients with pneumonia caused by the SARS-CoV-2 (novel coronavirus pneumonia or Wuhan pneumonia), fever was the most common symptom, followed by cough. Bilateral lung involvement with ground glass opacity was the most common finding from computerized tomography images of the chest. Although the one case of SARS-CoV-2 pneumonia in the United States responding well to remdesivir, which is now undergoing a clinical trial in China. Currently, controlling infection to prevent the spread of the SARS-CoV-2 is the primary intervention being used. However, public health authorities should keep monitoring the situation closely, as the more we can learn about this novel virus and its associated outbreak, the better we can respond.

KEYWORDS: COVID-19, Epidemiology, Clinical care and treatment.

INTRODUCTION:

DISEASE BACKGROUND:

Coronavirus infections (including SARS and MERS):

Coronaviruses were identified in the mid-1960s and are known to infect humans and a variety of animals (including birds and mammals). Epithelial cells in the respiratory and gastrointestinal tract are the primary target cells. Viral shedding therefore occurs via these systems and transmission can be through a variety of routes: respiratory droplets, airborne, fomites or faecal-oral. To date, seven coronaviruses have been shown to infect humans. Common human coronaviruses Betacoronavirus HCoV-OC43 and HCoV-HKU1, as well as Alphacoronavirus HCoV-229E cause common colds but also severe lower respiratory tract infections in the youngest and oldest age groups; while Alphacoronavirus HCoV-NL63 is considered to be an important cause of (pseudo)croup and bronchiolitis in children. Infections of humans with common coronaviruses are mostly mild and asymptomatic, but severe and fatal infections have also been observed. Occasionally, these viruses are able to cause lower respiratory tract infections and pneumonia in humans, although this is more likely in immunocompromised individuals, people with underlying cardiopulmonary conditions, the elderly and young children.

Only very rarely do the human viruses cause severe disease. Since 2002, two additional coronaviruses infecting animals have evolved and caused outbreaks in humans: SARSCoV (2002, Betacoronavirus, subgenus Sarbecovirus), and MERS-CoV (2012, Betacoronavirus, subgenus Merbecovirus). During the emergence of severe acute respiratory syndrome-related coronavirus (SARS-CoV) in 2002–2003, the virus affected 8 096 people, causing severe pulmonary infections and 774 deaths (case fatality ratio: 10%). Bats were the likely origin of the virus, which spread further to Himalayan palm civets, Chinese ferret badgers and raccoon dogs sold for food at the wet markets of Guangdong, China. People handling or consuming these exotic animals were infected and spread the virus through human-to-human transmission. Middle East respiratory syndrome-related coronavirus (MERS-CoV) was identified in 2012 in Saudi Arabia and since then the majority of human cases have been reported from the Arabian Peninsula. Human-to-human- transmission, particularly in healthcare settings, has been the main route of transmission in the majority of cases. However, dromedary camels are important animal reservoirs of the virus and are currently considered the main source of human MERS-CoV infections. The case fatality ratio of MERS-CoV infections is estimated at 35%.

Novel coronavirus (2019-nCoV) infections:

The novel coronavirus (2019-nCoV) was first isolated from a patient with pneumonia, connected to the cluster of acute respiratory illness cases from Wuhan, China. Genetic analysis revealed that it is closely related to SARS-CoV and genetically clusters within the genus Betacoronavirus, subgenus Sarbecovirus. There is currently limited information on the epidemiological and clinical characteristics of the infection caused by 2019-nCoV. A media statement by a senior expert in China suggests that the mean incubation period observed in the current outbreak is seven days, with a range between 2–12. Based on the epidemiological characteristics of respiratory infections caused by SARS-CoV and MERS-CoV, an incubation period of 2-7 days and up to 14 days is plausible. So far, among the laboratory-confirmed cases about 1,45,000 over the world-wide and more than 5,400 people has been died over the world-wide, the vast majority in mainland China. This timeline is upto the 14th March 2020.

CORONAVIRUS OUTBREAK:

Coronaviruses are a large family of viruses that can make humans and animals sick. They cause illnesses that can range from the common cold to more severe diseases.

Coronavirus (COVID-19) was first reported in December 2019 in Wuhan City in China.

The 2019–20 coronavirus outbreak is an ongoing outbreak of coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2, which started in December 2019. It was first identified in Wuhan, capital of Hubei province China, after 41 people presented with pneumonia of no clear cause. The virus can spread between people, with the time from exposure to onset of symptoms generally between 2 and 14 days. Symptoms of the disease may include fever, cough, and shortness of breath.

Complications may include pneumonia and acute respiratory distress syndrome. There is no vaccine or specific antiviral treatment, with efforts typically to management symptoms and support functioning. Hand washing is recommended to prevent spread of the disease. Anyone who is suspected of carrying the virus is advised to monitor their health for two weeks, wear a mask, and seek medical advice by calling a doctor rather than directly visiting a clinic.

As of 18 February 2020, 75,136 cases have been confirmed, including in all provinces of China and more than two dozen other countries. Serious of these, 11,795 cases are various experts have speculated that the actual number of cases exceeds the officially confirmed number. The disease has killed more than 2,000 people, including six outside mainland China (in the Philippines, Hong Kong, Japan, France, and Taiwan). This exceeds the 776 who died in the 2003 SARS outbreak. The outbreak has been declared a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO). Health authorities have been working to contain the spread of the disease since its discovery.

China has introduced travel restrictions, quarantines, and outdoor restrictions— requiring families to stay at home— affecting over 780 million people. A number of countries have issued warnings against travel to Wuhan, Hubei, or China generally. Airports and train stations have implemented body temperature checks, health declarations, and information signage in an attempt to identify carriers of the virus. The epidemic has led to

further consequences beyond quarantine measures and its impact on health, including concerns over potential economic instability and cancellation of several events expected to be attended by people travelling from areas with high risk of contagion. Political consequences have included a number of local leaders of the Chinese Communist Party being fired due to their response to the outbreak. Reports of xenophobia and racism against people of Chinese and East Asian descent have arisen as a result of the outbreak, with fear and hostility occurring in several countries. Misinformation has spread about the coronavirus, primarily online, which the WHO described as an "infodemic". The coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2, mainly associated with the respiratory system.

INTRODUCTION TO RESPIRATORY SYSTEM-

The respiratory system (also respiratory apparatus, ventilatory system) is a biological system consisting of specific organs and structures used for gas exchange in animals and plants. The anatomy and physiology that make this happen varies greatly, depending on the size of the organism, the environment in which it lives and its evolutionary history. In land animals the respiratory surface is internalized as linings of the lungs.

Gas exchange in the lungs occurs in millions of small air sacs called alveoli in mammals and reptiles, but atria in birds. These microscopic air sacs have a very rich blood supply, thus bringing the air into close contact with the blood. These air sacs communicate with the external environment via a system of airways, or hollow tubes, of which the largest is the trachea, which branches in the middle of the chest into the two main bronchi. These enter the lungs where they branch into progressively narrower secondary and tertiary bronchi that branch into numerous smaller tubes, the bronchioles. In birds the bronchioles are termed parabronchi. It is the bronchioles, or parabronchi that generally open into the microscopic alveoli in mammals and atria in birds. Air has to be pumped from the environment into the alveoli or atria by the process of breathing which involves the muscles of respiration.

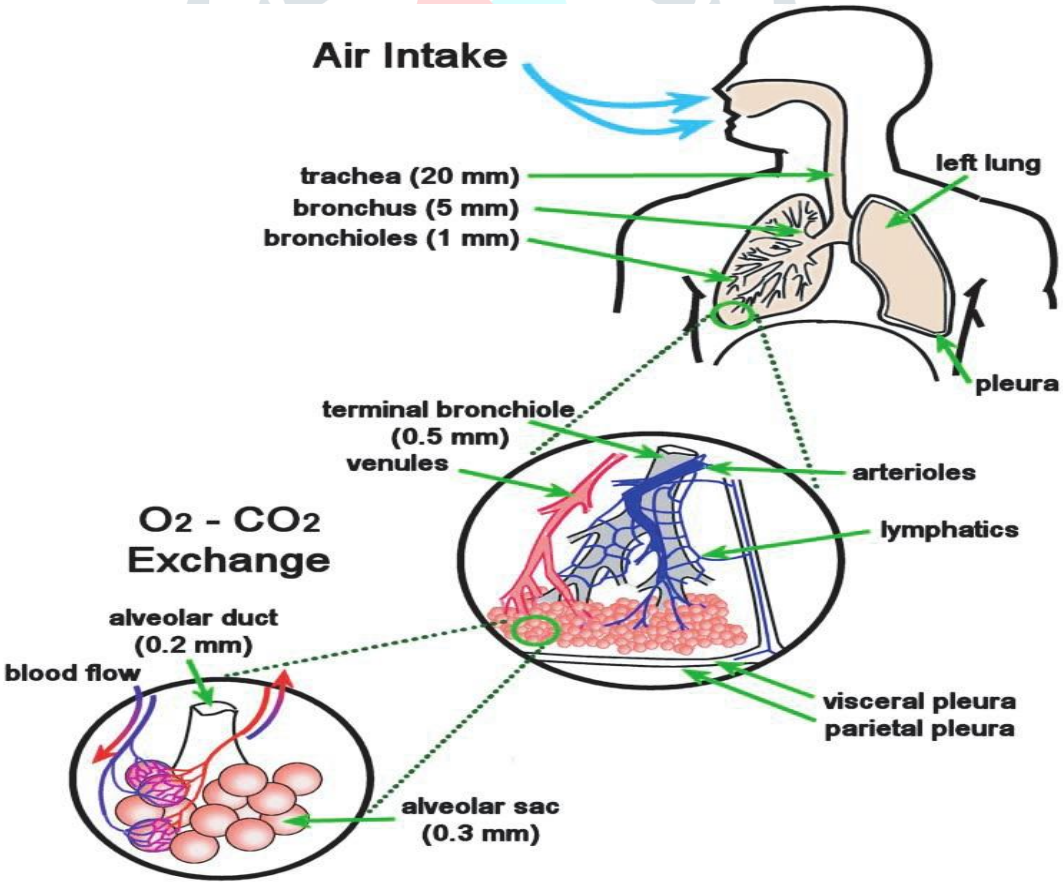

Fig. No.-1:Schematic diagram of the human respiratory system, showing the gross anatomy of the lung, the covering membranes (pleura), airways, and air sacs (alveoli). The average diameter of portions of the air flow system are indicated-trachea, 20 mm; bronchus, 8 mm; terminal and respiratory bronchioles, 0.5 mm; alveolar duct, 0.2 mm; and alveolar sacs, 0.3 mm.

SEVERE ACUTE RESPIRATORY SYNDROME-RELATED CORONAVIRUS (SARSr-CoV):

Severe acute respiratory syndrome-related coronavirus (SARSr-CoV) is a species of coronavirus known to infect certain mammals. Two strains of the virus have caused outbreaks of severe respiratory diseases in humans:

1. SARSCoV, which caused an outbreak of severe acute respiratory syndrome (SARS) between 2002 and 2004

2. SARS-CoV-2, which since late 2019 has caused an outbreak of (COVID-19).Coronavirus disease 2019

Both strains descended from a single ancestor but made the cross-species jump into humans separately, and SARS-CoV-2 is not a direct descendant of SARS-CoV. There are hundreds of other strains of SARS-CoV, all of which are only known to infect non human species: bats are a major reservoir of many strains of SARS-CoV, and several strains have been identified in palm civets which were likely ancestors of SARSCoV.

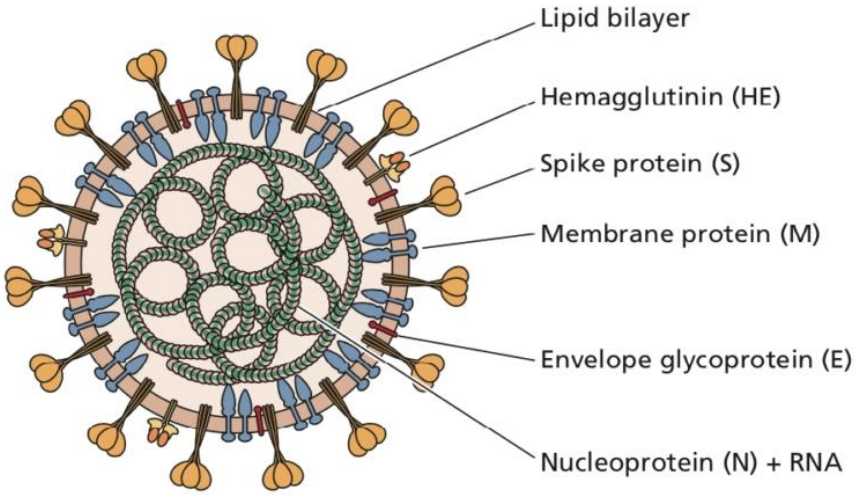

Fig. No.-2: Virion structure showing spikes that form a "crown" like the solar corona, hence the name Coronavirus.

VIRUS CLASSIFICATION:

(unranked): Virus

Realm: Riboviria

Phylum: incertae sedis

Order: Nidovirales

Family: Coronaviridae

Genus: Betacoronavirus

Subgenus: Sarbecovirus

Species: Severe acute respiratory syndrome-related coronavirus

SYNONYMS:

- SARS coronavirus
- SARS-related coronavirus
- Severe acute respiratory syndrome coronavirus

The SARS-related coronavirus was one of several viruses identified by WHO in 2016 as a likely cause of a future epidemic in a new plan developed after the Ebola epidemic for urgent research and development before and during an epidemic towards diagnostic tests, vaccines and medicines. The prediction came to pass with the of COVID-19 came to pass with the of COVID-19.

TYPES OF HUMAN CORONAVIRUSES:

There are seven known strains of human corona viruses:

1. Human corona virus 229E (alpha corona virus)
2. Human corona virus OC43 (beta corona virus)
3. Human corona virus NL63 (alpha corona virus)
4. HKU1 (beta corona virus)
5. MERS-CoV (beta corona virus that causes Middle East Respiratory Syndrome)
6. SARS-CoV (beta corona virus that causes Severe Acute Respiratory Syndrome)
7. 2019 Novel Coronavirus

VIROLOGY:

- The SARS-related coronavirus is a positive and single stranded RNA virus belonging to a family of enveloped coronaviruses.
- Its genome is about 29.7kb, which is one of the largest among RNA viruses.
- The virus has 13 known genes and 14 known proteins.
- There are 265 nucleotides in the 5'UTR and 342 nucleotides in the 3'UTR. SARSr-CoV is similar to other coronaviruses in that its genome expression starts with translation of two large ORFs, 1a and 1b, both of which are polyproteins.
- The functions of several of these proteins are known: ORFs 1a and 1b encode the replicase and there are four major structural proteins: nucleocapsid, spike, membrane and envelope.
- It also encodes for eight unique proteins, known as the accessory proteins, all with no known homologues.
- The function of these accessory proteins remains unknown.
- Coronaviruses usually express pp1a (the ORF1a polyprotein) and the PP1ab polyprotein with joins ORF1a and ORF1b.
- The polyproteins are then processed by enzymes that are encoded by ORF1a.
- Product proteins from the processing includes various replicative enzymes such as RNA dependent polymerase, RNA helicase, and proteinase.
- The replication complex in coronavirus is also responsible for the synthesis of various mRNAs downstream of ORF 1b, which are structural and accessory proteins.
- Two different proteins, 3CLpro and PL2pro, cleave the large polyproteins into 16 smaller subunits.

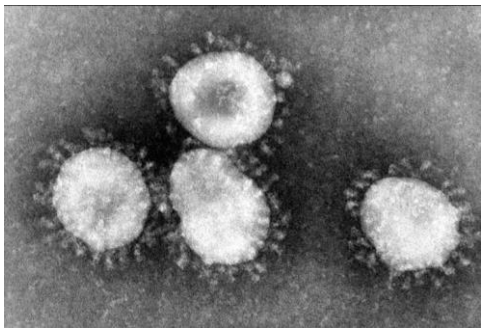

Fig. No.- 3: Scanning Electron Micrograph of SARS virions

REPLICATION CYCLE OF CORONAVIRUS:

SARS-Coronaviruses follows the replication strategy typical of the coronaviruses.

Cell receptor attachment and membrane fusion:

The virus has a lipid bilayer envelope where the membrane (M), envelope (E) and spike (S) proteins are anchored. Inside is the nucleocapsid and multiple copies of the (N) protein serving as a shell for the positive-sense single-stranded (30000 nucleotides) RNA genome. The capsid, membrane and lipid envelope protect the virus when it is outside the host.

The attachment of the virus to the host cell is mediated by the S protein and its receptor. The receptor binding domain (RBD) recognizes and attaches to the ACE2 receptor of lung epithelial cells. Following attachment the virus enters the cell which is mediated by proteolytic cleavage of the S protein by the TMPRSS2 protease. In the SARS coronavirus the C-terminal part of the S protein triggers the fusion of the viral envelope with the host cell membrane by inducing conformational changes that are not fully understood. When over-expressed inside the infected cell the S protein may be secreted on the surface of the cell's membrane which will provoke a membrane fusion with the neighbouring cells.

Genome Translation:

The nucleocapsid passes into the cytoplasm where the viral genome is released. This genome acts as a messenger RNA and the cell's ribosomes translate of 2/3 of the genome into two large overlapping polyproteins. They contain proteases which detach and cleave the polyproteins at various sites, obtaining about 15 proteins needed for and replication.

Replication:

Viral proteins form a replicase transcriptase polyprotein containing enzymes, among which is a RNA polymerase which mediates the synthesis of negative-sense RNA molecules, which is followed by the transcription to the corresponding mRNAs and translation to two polyproteins. The two polyproteins are result of a ribosomal frame shifting. The full-length negative then positive RNA strand is synthesized that becomes the genome of the progeny viruses. The various smaller mRNAs correspond to the last third of the virus genome and are translated mainly into the structural proteins that will become part of the progeny virus particles.

Assembly:

RNA translation occurs inside the endoplasmic reticulum. The viral structural proteins S, E and M move along the secretory pathway into the Golgi intermediate compartment. There, the M proteins direct most protein-protein interactions required for assembly of viruses following its binding to nucelocapsid.

Release:

Progeny viruses are released from the host cell through secretory vesicles by exocytosis process.

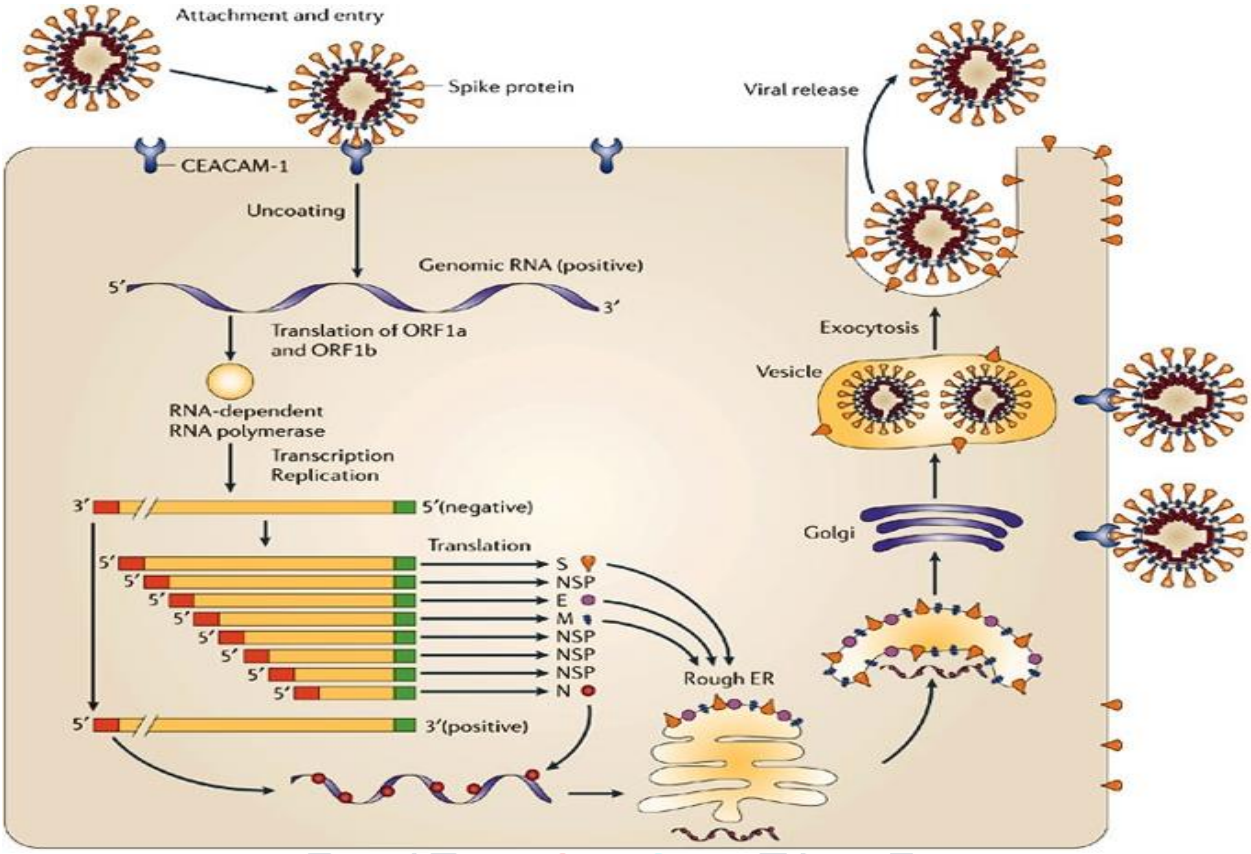

Fig. No.-4: Replication Cycle of Coronavirus

MORPHOLOGY:

- The morphology of the SARSr coronavirus is characteristic of the coronavirus family as a whole.
- These viruses have large pleomorphic spherical particles with bulbous surface projections that form a corona around particles.
- The envelope of the virus contains lipid and appears to consist of a distinct pair of electron dense shells.
- The internal component of the shell is a single-stranded helical ribonucleoprotein.
- There are also long surface projections that protrude from the lipid envelope.
- The size of these particles is in the 80–90 nm range.

EVOLUTION:

SARSr-CoV is most closely related to group 2 coronaviruses (Betacoronavirus), but it does not segregate into any of the other three groups of coronaviruses. A theory has been proposed that bat coronaviruses have been coevolved with their hosts for a long time then jumped species from bats to humans. The closest outgroup to the coronaviruses are the toroviruses, with which it has homology in the ORF 1b replicase and the two viron proteins of S and M. SARSr-CoV was determined to be an early split off from the group 2 coronaviruses based on a set of conserved domains that it shares with group 2.

A main difference between other group 2 coronavirus and SARSr-CoV is the nsp3 replicase subunit encoded by ORF1a. SARSr-CoV does not have a papain-like proteinase 1.

TRANSMISSION OF CORONAVIRUS DISEASE:

Coronaviruses are zoonotic in nature, means they are transmitted between animals and people. Coronaviruses can be spread in following ways:

- Coronaviruses are spread through aerosol droplets expelled when an infected individual coughs or sneezes within a range of about 6 feet (1.8 m), which can contaminate surfaces like door handles or railings.
- Coronavirus droplets only stay suspended in the air for a short time, but can stay viable and contagious on a metal, glass or plastic surface for up to nine days. Disinfection of surfaces is possible with cheap substances such as 62–71% ethanol applied for one minute.
- Chinese public health officials suggest extra caution for aerosol transmission in closed rooms and recommend regularly exchanging air.
- On 13 February 2020 the director of the Centers for Disease Control and Prevention of the United States confirmed asymptomatic transmission.
- Viral RNA was detected in stool specimens collected from the first confirmed case in the United States, though it was unclear if enough of the infectious virus was present to suggest fecal-oral transmission of the initial 41 cases, two-thirds had a history of exposure to the Huanan Seafood Wholesale Market.
- Researchers found that 22% had direct exposure to the meat market, and 32% had contact with people who had a fever or respiratory disease.
- There have been estimates for the basic reproduction number (the average number of people an infected person is likely to infect), ranging from 2.13 to 3.11.
- The virus has reportedly been able to transmit down a chain of up to four people so far.
- This is similar to severe acute respiratory syndrome-related coronavirus (SARS-CoV).
- There are disputed reports that some of the infected may be super-spreaders.

SYMPTOMS OF CORONAVIRUS DISEASE:

- Those infected may be asymptomatic or have mild to severe symptoms, including fever, cough, shortness of breath, and diarrhoea.
- The time from exposure to onset of symptoms is estimated at 2 to 10 days by WHO, and 2 to 14 days by the US Centers for Disease Control and Prevention (CDC).
- Upper respiratory symptoms, such as sneezing, a runny nose, and sore throat, are less frequent.
- Cases of severe infection can result in pneumonia, high fever above 100°F, kidney failure, and death.
- Among 137 early cases that were admitted to hospitals in Hubei province, 16 (12%) individuals died. [91] Many of those who died had other conditions such as hypertension, diabetes, or cardiovascular disease that impaired their immune systems.
- As of 18 February 2020, the number of severe cases is 11,795 (16%) out of 73,437 with 12,712 having recovered.

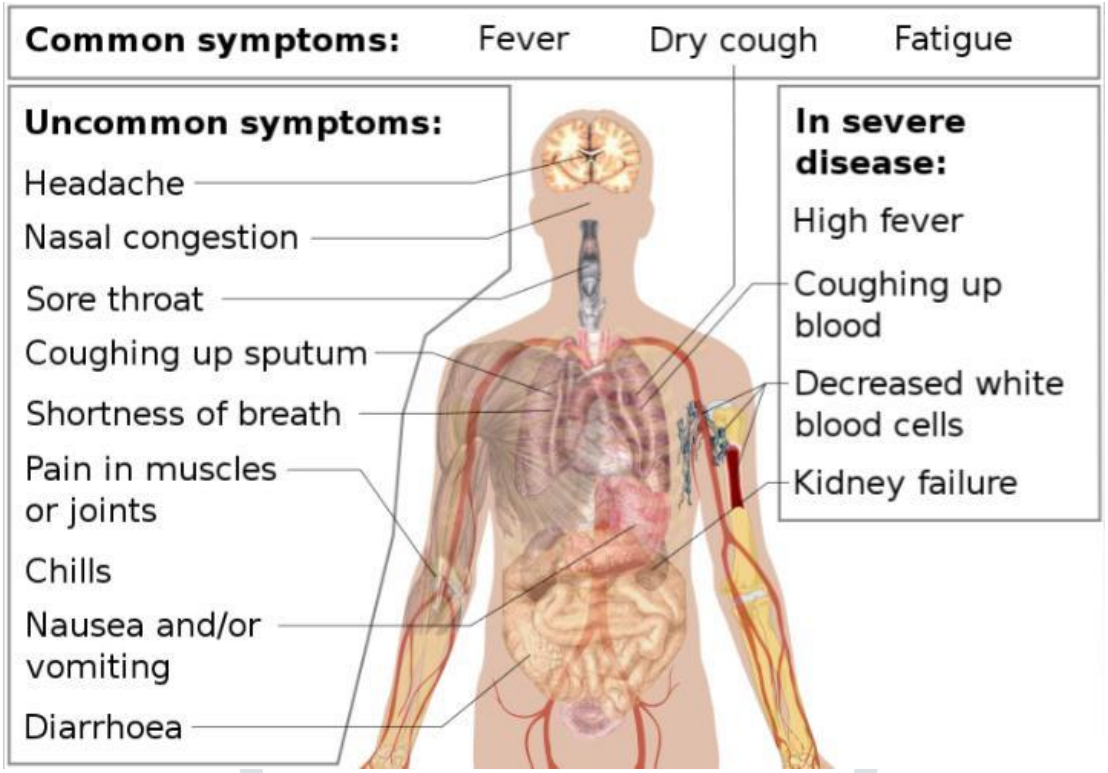

Fig. No.-5: Figure introducing symptoms of coronavirus disease

DIAGNOSIS:

The WHO (World Health Organization) has published several testing protocols for SARS-CoV-2 (also known as 2019nCoV). The test can be done on respiratory or blood samples. Results are generally available within a few hours to days.

1. Respiratory Specimens

A. Lower respiratory tract:

- **Broncho alveolar lavage, tracheal aspirate:**

Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

- **Sputum:**

Have the patient rinse the mouth with water and then expectorate deep cough sputum directly into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

B. Upper respiratory tract:

- **Nasopharyngeal swab (NP) /oropharyngeal swab (OP):**
- Use only synthetic fiber swabs with plastic shafts.
- Do not use calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit PCR testing.
- Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media.
- In general CDC is now recommending collecting only the NP swab.
- If both swabs are used, NP and OP specimens should be combined at collection into a single vial.

Nasopharyngeal swab:

Insert a swab into the nostril parallel to the palate. Leave the swab in place for a few seconds to absorb secretions.

Oropharyngeal swab (e.g., throat swab):

Swab the posterior pharynx, avoiding the tongue.

Nasopharyngeal wash/aspirate or nasal aspirate:

Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

- Storage:

Store specimens at 2-8°C for up to 72 hours after collection. If a delay in testing or shipping is expected, store specimens at -70°C or below.

2. Serology Tests:
Serology testing is used to detect previous infection (antibodies to MERS-CoV) in people who may have been exposed to the virus. Antibodies are proteins produced by the body's immune system to attack and kill viruses, bacteria, and other microbes during infection. The presence of antibodies to MERS-CoV indicates that a person had been previously infected with the virus and developed an immune response.

- CDC has a two-phase approach for serology testing, using two screening tests and one confirmatory test to detect antibodies to MERS-CoV.

- **ELISA:**

enzyme-linked immunosorbent assay, is a screening test used to detect the presence and concentration of specific antibodies that bind to a viral protein. CDC tests by ELISAS for antibodies against two different MERS-CoV proteins, the nucleocapsid (N) and spike (S).

If a clinical sample is determined to be antibody-positive by either ELISA, CDC then uses the micro neutralization test to confirm the positive result.

- **The micro neutralization assay:**

It is a highly specific confirmatory test used to measure neutralizing antibodies, or antibodies that can neutralize virus. This method is considered a gold standard for detection of specific antibodies in serum samples. However, compared with the ELISA, the micro neutralization assay is labor-intensive and time-consuming, requiring at least 5 days before results are available.

- If a clinical sample is positive by either ELISA, and positive by micro neutralization, the specimen is determined to be confirmed positive.
- If a clinical sample is positive by both ELISAs, and negative by micro neutralization, the sample is determined to be indeterminate.
- If a clinical sample is positive by only one ELISA, and negative by micro neutralization, the sample is determined to be negative.
- If a clinical sample is negative by both ELISAS, the sample is determined negative.

In the end, a final determination of a confirmed positive serology result requires a positive ELISA test and confirmation by micro neutralization assay.

C. Polymerase Chain Reaction (PCR):

Polymerase chain reaction (PCR) assay that are more practical and available commercially.

It is used for the detection and identification of genomic RNA sequencing.

- The WHO (World Health Organization) has published several testing protocols for SARS-CoV-2 (also known as 2019nCoV).

- Testing uses real time reverse transcription polymerase chain reaction (rRT-PCR).
- The test can be done on respiratory or blood samples.
- Results are generally available within a few hours to days.
- Chinese scientists were able to isolate a strain of the coronavirus and publish the genetic sequence so that laboratories across the world could independently develop PCR tests to detect infection by the virus.

PREVENTION:

- Recommended measures to prevent infection depend on the likelihood of a person coming into contact with the disease. The US CDC recommends avoiding exposure. A number of countries have advised against travel to either Mainland China, the province of Hubei, or just Wuhan.
- Other recommendations include frequent washing of hands with soap and water, not touching one's eyes, nose or mouth unless the hands are clean, and covering the mouth when one coughs and sneezes.
- People in high risk areas should take additional precautions even around people that are not displaying symptoms.
- Coronaviruses can survive for a few hours and up to nine days on a metal, glass or plastic surface, while remaining contagious.
- Methods to remove the virus from surfaces include chlorine-based disinfectants, 75% and chloroform, ethanol, peracetic acid,
- There is no evidence that pets such as dogs and cats can be infected. The Government of Hong Kong warned anyone travelling outside the city to not touch animals; to not eat avoid visiting wet markets, live poultry markets, and farms.

Hand washing:

- Hand washing is recommended to prevent the spread.
- The CDC recommends that individuals: "Wash hands often with soap and water for at least 20 seconds, especially after going to the bathroom; before eating; and after blowing your nose, coughing, or sneezing."
- If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol.
- Always wash hands with soap and water if hands are visibly dirty.
- The CDC, NHS, and WHO also advise individuals to avoid touching the eyes, nose, or mouth with unwashed hands.

Respiratory hygiene:

- Those who suspect they are infected should wear a surgical mask (especially when in public) and call a doctor for medical advice.
- By limiting the volume and travel distance of expiratory droplets dispersed when talking, sneezing, and coughing, masks can serve a public health benefit in reducing transmission by those unknowingly infected.
- If a mask is not available, anyone experiencing respiratory symptoms should cover a cough or sneeze with a tissue, promptly discard it in the trash, and wash their hands.
- If a tissue is unavailable, individuals can cover their mouth or nose with a flexed elbow.
- Masks are also recommended for those taking care of someone who may have the disease.
- Rinsing the nose, gargling with mouthwash, and eating garlic are not effective.

- There is no evidence to show that masks protect uninfected persons at low risk and wearing them may create a false sense of security.
- Surgical masks are widely used by healthy people in Hong Kong, Japan, Singapore and Malaysia.
- Surgical masks are not recommended by the CDC as a preventive measure for the American general public.
- The WHO advises the following best practices for mask usage:

1. Place mask carefully to cover mouth and nose and tie securely to minimise any gaps between the face and the mask; While in use, avoid touching the mask.
2. Remove the mask by using appropriate technique (i.e. do not touch the front but remove the lace from behind)
3. After removal or whenever you inadvertently touch a used mask, clean hands by using an alcohol-based hand rub or soap and water if visibly soiled.
4. Replace masks with a new clean, dry mask as soon as they become damp/humid.
5. Do not re-use single-use masks; Discard single-use masks after each use and dispose of them immediately upon removal

TREATMENT:

There is no vaccines or antiviral drugs are available against the novel coronavirus. Researchers are currently working on creating a vaccine specifically for this virus, as well as potential treatments for COVID-19 but the symptoms can be treated.

If your symptoms are more severe, supportive treatments may be given by your doctor or at a hospital. This type of treatment may involve:

- fluids to reduce the risk of dehydration
- medication to reduce a fever
- supplemental oxygen in more severe cases
- People who have a hard time breathing on their own due to COVID-19 may need a respirator.

However, researchers need to perform randomized controlled trials in humans before potential vaccines and other treatments become available. This may take several months or longer.

Here are some treatment options that are currently being investigated for protection against SARS-CoV-2 and treatment of COVID-19 symptoms.

1. Remdesivir:

- Remdesivir is an experimental broad-spectrum antiviral drug originally designed to target Ebola virus.
- Researchers have found that remdesivir is highly effective at fighting the novel coronavirus in isolated cells.
- This treatment is not yet approved in humans, but two clinical trials for this drug have been implemented in China. One clinical trial was recently also approved by the FDA in the United States.

2. Chloroquine:

- Chloroquine is a drug that's used to fight malaria and autoimmune diseases. It's been in use for more than 70 years and is considered safe.
- Researchers have discovered that this drug is effective at fighting the SARS-CoV-2 virus in studies done in test tubes.

- At least 10 clinical trials are currently looking at the potential use of chloroquine as an option for combating the novel coronavirus.
- Lopinavir and ritonavir**:**
- Lopinavir and ritonavir are sold under the name Kaletra and are designed to treat HIV.
- In South Korea, a 54-year-old man was given a combination of these two drugs and had a significant reduction in his levels of the coronavirus.
- According to the World Health Organization (WHO), there could be benefits to using Kaletra in combination with other drugs.

3. Favilavir:

- China has approved the use of the antiviral drug favilavir 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.

CONCLUSION:

This article provides the valuable information regarding the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) and coronavirus disease-2019 (COVID-19) outbreak. It is more useful reference for the research scientist.

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