

Review on COVID 19 - Clinical Characterization, Diagnosis, Management and Potential Treatment

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Abstract: *This review article presents the brief about current COVID-19 pandemic intending to provide integrated information about new viral infection, single stranded RNA Corona virus which belongs to an expanded group of SARS-CoV and it is originated in bats but infected humans. Corona virus is highly contagious. Initially the transmission was from animal-to-animal, later it got transmitted animal-to-human and then human-to-human transmission spread widely across the world having been carried away by travelers from affected region. With incubation period of two-fourteen days, signs and symptoms of infection are common cold, cough, high fever, shortness of breath, fatigue. Presently line of treatment is decided through ongoing research. Thus in limited available action, prevention is the only substantial option. So, social distancing and hygiene practices are recommended by government. We hope this review article helps in understanding COVID-19, its management, diagnosis and potential treatment.*

Keywords: Clinical characterization, Clinical management, Corona virus, COVID-19, Diagnosis of COVID-19, Drugs on corona virus

1. Introduction

COVID 19 is the infectious disease caused by a single virus, about 120 nanometers in diameter called as coronavirus. Until recently most people did not heard of coronavirus but it has been recognized over 50 years. SARS-CoV-2 is novel strain of virus that was first detected in the Wuhan city of Hubei (China). The outbreak started at the end of the December 2019. It is highly contagious and spread primarily if the cough or sneeze droplet of infected person are accidentally inhaled. By early 2020, it spread globally via travelers from affected region. On 11 February 2020 ICTV (International Committee Taxonomy of Viruses) named the viruses as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In March WHO (World Health Organization) declared this outbreak as 'pandemic'. The virus seems to have mutated already after its original transmission from the animal reservoir to humans, leading to at least two different strains. As per the Population genetic analyses of 103 SARS-CoV-2 genomes, these viruses evolved into two major types designated as L and S. Whereas the L type (~70%) is more prevalent than the S type (~30%), the S type was found to be the ancestral version. (Xiaolu Tang, 2020).

While both types play a part in the current outbreak, the higher prevalence of the L-type suggests that it is more aggressive. However, it is important to keep in mind that viruses mutate all the time and that not all mutations are indicative of increased disease severity or transmission rates. In fact, differences between the two types of the novel coronavirus are so small that researchers are reluctant to even classify them as separate strains. Given that multiple groups around the world are working on a vaccine, knowing the exact number of strains (or types) of the virus is crucial because, in order to be efficacious, the eventual vaccine will have to target the features present in all known strains (or types). Luckily, many of the identified genetic differences are unlikely to affect the production of proteins, meaning there should not be significant changes to how the virus operates or the symptoms it causes. (Technology.org, 2020)

2. Clinical Characterization

Corona virus is renowned for its spikes on the surface, which appears like solar corona. Corona viruses are a family of positive single-stranded RNA virus, classified under Nidovirales order. These viruses are enveloped and are round and sometimes pleomorphic of approximately 80 to 120 nanometer in diameter.

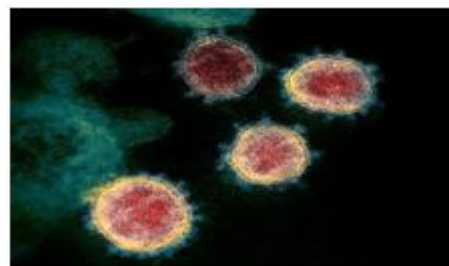


Figure 1: Spikes on the surface which makes virus appears like solar corona

The virion contains an internal helical RNA-protein nucleocapsid surrounded by an envelope made up of lipids and viral glycoproteins. These glycoproteins are spike protein, membrane protein, and small membrane. The genome is well organized with a 5' leader UTR transcriptase followed by structural genes spike envelope membrane. nucleocapsid (N) 3' UTR Poly A with additional haemagglutinin esterase (HE). The spike protein or 's' protein, a type I glycoprotein, forms the peplomers on the virion surface, giving the virus its corona or crown-like morphology in the electron microscope. The viruses attach to the cell surfaces through the spike. The membrane protein or "M" is highly hydrophobic and spans the membrane three times. On the other hand, the small membrane protein or "E" spans the membrane twice, and in some group two Coronaviruses, an additional protein hemagglutinin esterase is present whose function, is unknown. However, literature studies have shown its importance in viral entry and pathogenesis. In addition to arbitrate virus entry, the spike is

a critical determinant of viral host range and tissue tropism and it is a major inducer of host immune responses. All COVID-19 genomes are arranged likewise with replicase locus encoded within 5-dash end and the structural proteins encoded in the 3-dash end of the genome. The viral replicase is a huge protein complex containing 16 viral sub-units and plays an crucial role in the coronavirus replication and transcription at the cytoplasmic membrane. Important feature in corona replication is the production of multiple subgenomic mRNAs that contains sequence corresponding to both sides of RNA. These sub genomic mRNAs are produced by discontinuous replication are responsible for viral proteins which fuse with virion to form a complete virus. It transmits from one to others asymptotically. Probably the virus spreads through silent carriers. So early detection of virus in asymptomatic phase is highly encourageable because most of the RNA viral infections in human have no treatment and are essentially unactionable.

3. Diagnosis

3.1 Symptoms

The prime suspects for noval coronavirus include patients with fever and lower respiratory tract symptoms. The recent contact with the suspected patients should also be taken into consideration. The most common symptoms of COVID-19 are dry cough, fever and tiredness. Other symptoms which are less common and may affect some patients are aches and pains, nasal congestion, conjunctivitis, diarrhoea, headache, sore throat, loss of taste or smell or a rash on skin, discoloration of fingers or toes. These symptoms are generally mild and go about gradually. Some people get infected but only have very mild symptoms.

Most people (about 80%) recover from the disease without the need of hospital treatment. Around 1 out of every 5 people who gets infected by COVID-19 becomes seriously ill and develops difficulty in breathing. Older people and those with underlying medical problems like high blood pressure, heart and lung problems, diabetes or cancer are at higher risk of developing COVID-19.

An asymptomatic person is the one infected with COVID-19 but does not develop any related symptoms. Asymptomatic transmission refers to the transmission of the disease from a person who does not show any symptoms. As per the Union Health Ministry, India, 80 per cent of the COVID-19 cases are either asymptomatic or with mild symptoms. It can spread from asymptomatic person only during the early stages of the disease. There is a possibility to catch COVID-19 from someone who does not feel ill, does not show any major symptoms or has just a mild cough.

3.2 Early Investigations and Methods

Respiratory material from upper and lower respiratory tract must be collected. The upper respiratory tract specimen includes nasopharyngeal or oropharyngeal swab or wash in ambulatory patients. The lower respiratory specimens include sputum and or endotracheal aspirate. Other methods include collection of blood and stool. The specimens are to be collected in sterile containers and must be stored at 2 to 8

degree centigrade. In case of delay, the specimens are frozen at minus 20 degree centigrade and then shipped.

There are various types of coronavirus tests that can be done:

- Swab Test – In this test, a special swab is used to collect a sample from your nose or throat
- Nasal aspirate – In this test, a saline solution is injected into the nose and, then a sample is taken with a light suction
- Tracheal aspirate – In this test, a thin tube with a torch, also known as a bronchoscope, is put into the mouth to reach the lungs from where a sample is collected.
- Sputum Test – Sputum is thick mucus that gets accumulated in the lungs and comes out with a cough. During this test, you're required to cough up sputum in a special cup or a swab is used to take a sample from your nose.
- Blood test – In this test, a blood sample is collected from a vein in the arm.

3.3 Laboratory Investigations

The various laboratory investigations include:

- Nucleic acid amplification tests or NAAT tests by Real Time Reverse Transcription Polymerase Chain Reaction or RT-PCR for COVID-19 to check for evidence of viral load indicating active infection.
- Serological testing for detecting antibodies.
- Viral Sequencing.
- Viral culture



Figure 2: SARS-CoV-2 Testing kit

Molecular test

Molecular diagnostic tests which detect the genetic material of the virus are commonly used for diagnosis of COVID-19 or active coronavirus infection. This test is also known as viral test, Diagnostic test, molecular test, nucleic acid amplification test (NAAT), RT-PCR test, and LAMP test. This test is generally highly accurate and does not need to be repeated. Sample is collected through Nasal or throat swab (most tests) and Saliva (a few tests). Result may be obtained on the same day (some locations) or up to a week.

Antigen test

Antigen tests generally provide results diagnosing an active coronavirus infection faster than molecular tests, but it has a higher chance of missing an active infection. If an antigen test shows a negative result indicating that you do not have COVID-19 infection, your health care provider may order a molecular test to confirm the result. Sample may be taken through Nasal or throat swabs. Results are available in a hour or less.

Antibodies test

Antibody tests may provide quick results, but it should not be used to diagnose an active coronavirus infection. Antibody tests only detect antibodies which are developed by the immune system in response to the virus, not the virus itself. It may take days to several weeks to develop enough antibodies to be detected in a test. The strength of antibodies developed by the immune system depends on various factors like age, infections, medication, severity of disease etc.

4. Case Management**4.1 Home Management of Patients with Suspected COVID-19 Infection**

As per the World Health Organization or W.H.O, the patients with suspected COVID-19 should be triaged at the first point of contact. The emergency treatment should be initiated based on the disease severity. Patients, household members and caregivers should be educated about personal hygiene, basic Infection Prevention and Control or IPC measures to prevent the widespread of the infection.

- The patient should be placed in a well-ventilated room, and his or her movement should be limited in the house.
- All the household members should reside in a different room or should maintain a distance of at least one meter from the sick person.
- The number of caregivers should be limited. Visitors should not be allowed to meet the patient until he or she recovers completely.
- Hand hygiene should be performed only if hands are visibly dirty. However, soap and water are indicated for visibly dirty hands.
- A medical mask should be provided to the patient to avoid the spread of infection.
- Caregivers should also be provided with the mask. Furthermore, masks should not be touched or handled during use and should be disposed of on a regular basis.
- Direct contact with the body fluids must be avoided
- Avoid reuse of masks and gloves
- Disposable glasses and plates should be used for the patient
- Daily surfaces like bedside tables, bed frames and other furniture should be disinfected Household soap or detergent containing 0.5 percent of bleach solution should be used for cleaning.
- Disinfect the bathroom and toilet surfaces at least once in a day.
- The patient's clothes, bed linen, and bath and hand towels should be washed at 60–90 degree centigrade and changed on regular basis.

4.2 Community Management of Patients with Suspected COVID-19 Infection

- Responsive, empathic, transparent, culturally appropriate and consistent messaging in local languages should be created in community.
- Communication to the public on what is known about COVID-19, what is unknown, and what should be done.
- Developing community laboratory capacity to manage large-scale testing for COVID-19

- Activation of surge plans to manage increased volume of samples in the event of widespread community transmission
- Review and enhancement of infection prevention and control (IPC) practices in communities and health facilities to: prepare for treatment of patients infected with 2019-nCoV and prevent transmission to staff, other patients/visitors and in communities

4.3 National Management of Patients with Suspected COVID-19 Infection

- Adaptation of national action plans for health security and pandemic influenza preparedness plans to COVID-19 Country Preparedness and Response Plan, if available
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- Engage with national authorities and key partners for development of a country specific operational plan with estimated resource requirements for COVID-19 preparedness and response, or preferably adapt, where available, an existing Influenza Pandemic Preparedness Plan
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- Regularly monitor and evaluate the effectiveness of readiness and response measures at points of entry, and adjust readiness and response plans as appropriate

4.4 International Management of Patients with Suspected COVID-19 Infection

- Find out the countries more prone to COVID-19 and provide assistance to them by various international organizations.
- Multilateral agreements between countries beyond geographical boundaries in benefit of humanity.
- Setting up check points on international airports to avoid the global transmission of virus.

5. Potential Treatment**5.1 General treatment**

A confirmed patient of COVID-19 should be given complete bed rest along with the supportive treatment, ensuring adequate calorie and water intake to reduce the risk of dehydration.

5.2 Symptomatic Treatment

Control measures are needed for patients with a high fever. Antipyretic drug treatment should be performed in case the temperature exceeds 38.5 °C.

5.3 Oxygen Therapy

The chances of hypoxia are increased as the virus targets the

lungs. Nasal catheter, mask oxygen should be immediately provided to the patient.

Vaccines and treatment options for COVID-19 are currently being investigated around the world. There's some evidence that certain medications may have the potential to be effective with regard to preventing illness or treating the symptoms of COVID-19. However, researchers need to perform randomized controlled trials in humans before potential vaccines and other treatments become available. This can take several months or even longer.

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

5.4 Antiviral Drugs

Group of antiviral drugs including interferon α (IFN- α), lopinavir/ritonavir, chloroquine phosphate, ribavirin, and arbidol are therapeutically useful for the Prevention, Diagnosis, and Treatment of Novel Coronavirus-induced Pneumonia by the National Health Commission (NHC) of the People's Republic of China for tentative treatment of COVID-19

Remdesivir:

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

Chloroquine

Chloroquine is a drug that's used to fight malaria and autoimmune diseases. It's been in use for more than 70 years Trusted Source and is considered safe. Researchers have discovered that chloroquine is effective against 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 fighting the novel coronavirus.

Lopinavir and ritonavir

Lopinavir and ritonavir are sold under the name Kaletra. It is a fixed drug combination for the treatment of HIV. In South Korea, a 54-year-old man was given a combination of these two drugs and had a notable reduction in the levels of the coronavirus. According to the World Health Organization (WHO), there could be benefits of using Kaletra in combination with the other drugs.

APN01

A clinical trial is set to start soon in China to study the potential of a drug called APN01 to combat the novel coronavirus. The scientists who first developed APN01 in the early 2000s discovered that SARS infections involve a certain protein called ACE2. This protein also helped protect the lungs from injury caused by respiratory distress. From recent research, it comes out that the 2019 coronavirus, like SARS, also uses the ACE2 protein to infect cells in humans. The arbitrary, dual-arm trial will look at the effect of the

medication on 24 patients for 1 week. Half of the participants in the trial will receive the APN01 drug, and the other half will be given a placebo. If results are favourable, larger clinical trials will be done.

Favilavir

China has approved the use of the antiviral drug favilavir for treatment of COVID-19. The drug was first developed to treat inflammation in the nose and throat. Whereas the results of the study haven't been released yet, the drug has allegedly shown to be effective in treating COVID-19 symptoms in a clinical trial of 70 people.

6. Conclusion

At present, there's no vaccine to protect you from the novel coronavirus. There are no special medications for treatment of symptoms of COVID-19.

Although, researchers around the world are working hard to develop potential vaccines and treatment

There's emerging evidence that some drugs may have the potential to treat the symptoms of COVID-19 but more large-scale testing is needed to determine if these treatments are safe. Clinical trials for these medications could take several months.

Authorship Contributions

Concept – S.B, S.G, P.B, K.P;

Design – S.B.;

Materials & Data collection – S.G., P.B, K.P

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