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An Overview on Covid-19: Epidemic to Pandemic

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ABSTRACT

A novel coronavirus was well-known as the cause of several pneumonia cases in China and ultimately declared as a pandemic as the virus extend worldwide. Coronavirus disease (COVID-19) is caused by SARS-COV2 and signifies the causative agent of a potentially deadly disease that is of enormous worldwide public health concern. Based on the huge number of infected people that were exposed to the wet animal market in Wuhan City, China, it is suggested that this is likely the zoonotic origin of COVID-19. Coronavirus disease (COVID-19) is a communicable disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and get well without requiring extraordinary treatment. Older people and those with underlying therapeutic problems like diabetes, chronic respiratory disease, cardiovascular disease, and cancer are more probable to develop serious illness. The most excellent way to prevent and decelerate transmission is be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing hands or using an alcohol based rub regularly and not touching your face. Person-to-person transmission of COVID-19 infection led to the separation of patients that were consequently administered a variety of treatments. Extensive measures to decrease person-to-person transmission of COVID-19 have been executed to control the present epidemic. Special awareness and efforts to protect or lessen transmission should be applied in susceptible populations including health care providers, elderly people and children. Enthusiastically hand and respiratory hygiene is essential at every time and is the most excellent way to protect others and yourself. Whenever possible, maintain at least a 1 meter distance between yourself and others. This is principally important if you are talking to someone who is sneezing or coughing. Ever since, some infected persons may not yet be showing symptoms or their symptoms may be mild, maintaining a physical distance with everyone is an excellent idea if you are in an area where COVID-19 is circulating. This review paper highlights the symptoms, epidemiology, pathogenesis, transmission, phylogenetic analysis and future guidelines to control the spread of this deadly disease.

Keywords*: COVID-19, Coronavirus, Wuhan city, Pneumonia, Pathogenesis, Transmission.*

INTRODUCTION

As per currant scenario, COVID-19 is very big problem not for only India for all over world. It is disease caused by a virus called novel corona virus. Firstly it is known as n-CoV but after expert advice of ICTV called SARS-Co-V-2. Firstly this disease was reported in Wuhan China on 31 Dec 2019. WHO declare earlier COVID 19 as International Emergency? As per literature more than 1016372 people are affected by COVID 19 and more than 58238 people killed. SARS stands for severe acute respiratory syndrome because corona virus has effect on respiratory system. At starting phase this virus was spread in the Wuhan City of China but due to regular transportation of people from Wuhan to other countries its leads to its emergency level and spread all over the world. If we see corona virus under a microscope, so it is having positive single strained RNA[1].

RNA is basic genetic material of virus which responsible for mutation of virus. It is having glycoproteins on surface as shown as spike structure. basically corona virus are divided in to four sub categories alpha, beta, delta and gamma in which alpha sub family is responsible for respiratory problem like cold, breathing problem, enteric problem like indigestion, hepatic like decrease functioning of liver. If we are talking about mechanism of corona virus, firstly some sub type of corona virus cause common cold and some cause SARS and MERS. As we talked earlier coronavirus having spike on the surface which is covered with oil lipid material which will falls if it comes contact with Soap or Surfactant. Surfactant are basically those substances reduces surface tension of two surface. They are classified basis on the HLB value (HLB stands for Hydrophilic Lipophilic Balance)[2,3].

When corona virus enters in to the human body through suitable route. After going to respiratory tract it will produce a protein called ACE2 earlier this mechanism shown in bats proof by previous research. After releasing of protein ACE2 it will release its own genetic material in the form of RNA it is basic step of Corona Virus infection . After reassembling of this genetic material in the human body leads to new virus formation and form new copies of novel corona virus and infected cell will make millions of copies of corona virus and leads to the death of cells .human immune system is responsible of fighting with foreign bodies which come in to the body. so corona virus is act as foreign substances to our body[4].

So, self defence system of the body will fight with corona virus but some time immune system overreact and kill the lungs cells which leads to fluid accumulation in the lungs and this process make to breath difficult and leads to death of patient . Sneezing is also self defence system of the body when any external substance come through respiratory tract process of sneezing will exhale out from the body but with reference of corona virus this process leads to spreading of corona virus[5].

The fatalities caused by Middle East respiratory syndrome corona virus (MERS-CoV) was reported by about 35%.3 The noble coronavirus SARSCoV-2 spreads faster than its former two preceding relatives, the severe acute respiratory syndrome corona virus (SARS-CoV), which originated in China and Middle East respiratory syndrome corona virus (MERS-CoV) which originated in Saudi Arabia, but has lower percent mortality. The global impact of this recent epidemic, which is continuously spreading at a super-fast rate to be declared as a pandemic is yet to be understood[6].

The potential for this SARS-CoV-2 virus to grow to become a pandemic worldwide presents a serious public health hazard. With reference to COVID-19, the WHO raised the threat to the CoV epidemic to the "very high" level, on February 28, 2020. Corona virus is spread at high rate because it can live on living organism as well as non-living surface like plastic, iron and floors. So, better management of corona virus disease is sanitizing surface regularly. Stages of corona virus have been divided basis on the population affected or rate of spreading[7].

Fatality of corona virus patients was mainly elderly patients or child. So its required to keep social distancing from one people to another people. General symptoms of corona virus are mild fever, dry cough, sore throat, nasal congestion, headache, muscle pain and SARS problem. Now finally conclude with what is

prevention of corona virus? So, prevent from droplet contact or physical contact by using PPE (Personnel Protecting Equipment) kits and wearing N95 mask, gloves, gown and minimum exposure to contamination. Keep distance from those people who are suffering from any respiratory symptoms. And avoid contact with face, eyes, nose and mouth[8].

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-Cov-2)[9]

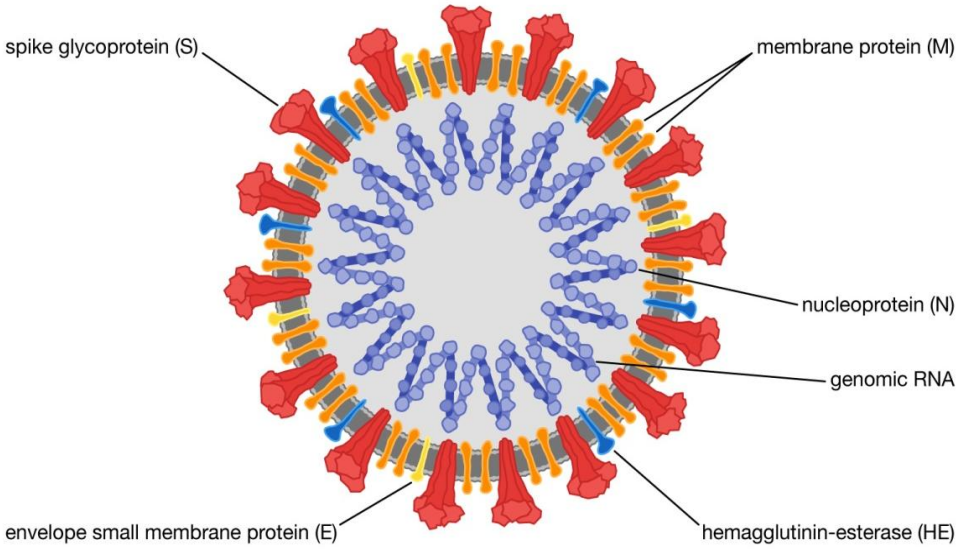

Fig. 1. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2)

PATHOGENSIS

The severe symptoms of COVID-19 are associated with an increasing numbers and rate of fatalities especially in the epidemic region of China. On January 22, 2020, the China National Health Commission reported the details of the first 17 deaths and on January 25, 2020 the death he severe symptoms of COVID-19 are associated with an increasing numbers and rate of fatalities specially in the epidemic region of China[10].

On January 22, 2020, the China National Health Commission reported the details of the first 17 deaths and on January 25, 2020 the death cases increased to 56 deaths. The percentage of death among the reported 2684 cases of COVID-19 was approximately 2.84% as of Jan25, 2020 and the median age of the deaths was 75 (range 48–89) years. Patients infected with COVID-19 showed higher leukocyte numbers, abnormal respiratory findings, and increased levels of plasma pro-inflammatory cytokines[11,12].

One of the COVID-19 case reports showed a patient at 5 days of fever presented with a cough, coarse breathing sounds of both lungs, and a body temperature of 39.0°C. The patient's sputum showed positive real-time polymerase chain reaction results that confirmed COVID-19 infection. The laboratory studies showed leucopenia with leukocyte counts of 2.91 × 10^9 cells/L of which70.0% were neutrophils. Additionally, a value of 16.16 mg/L of blood C-reactive protein was noted which is above the normal range(0–10 mg/L). High erythrocyte sedimentation rate and D-dimer were also observed. The main pathogenesis of COVID-19 infection as a respiratory system targeting virus was severe pneumonia, RNAaemia, combined with the incidence of ground-glass

opacities, and acute car-diac injury. Significantly high blood levels of cytokines and chemokines were noted in patients with COVID-19 infection that includedIL1-β, IL1RA, IL7, IL8, IL9, IL10, basic FGF2, GCSF, GMCSF, IFNγ, IP10,MCP1, MIP1α, MIP1β, PDGFB, TNFα, and VEGFA. Some of the severe cases that were admitted to the intensive care unit showed high levels of pro-inflammatory cytokines including IL2, IL7, IL10, GCSF, IP10, MCP1, MIP1α, and TNFα that are reasoned to promote disease severity[13–16].

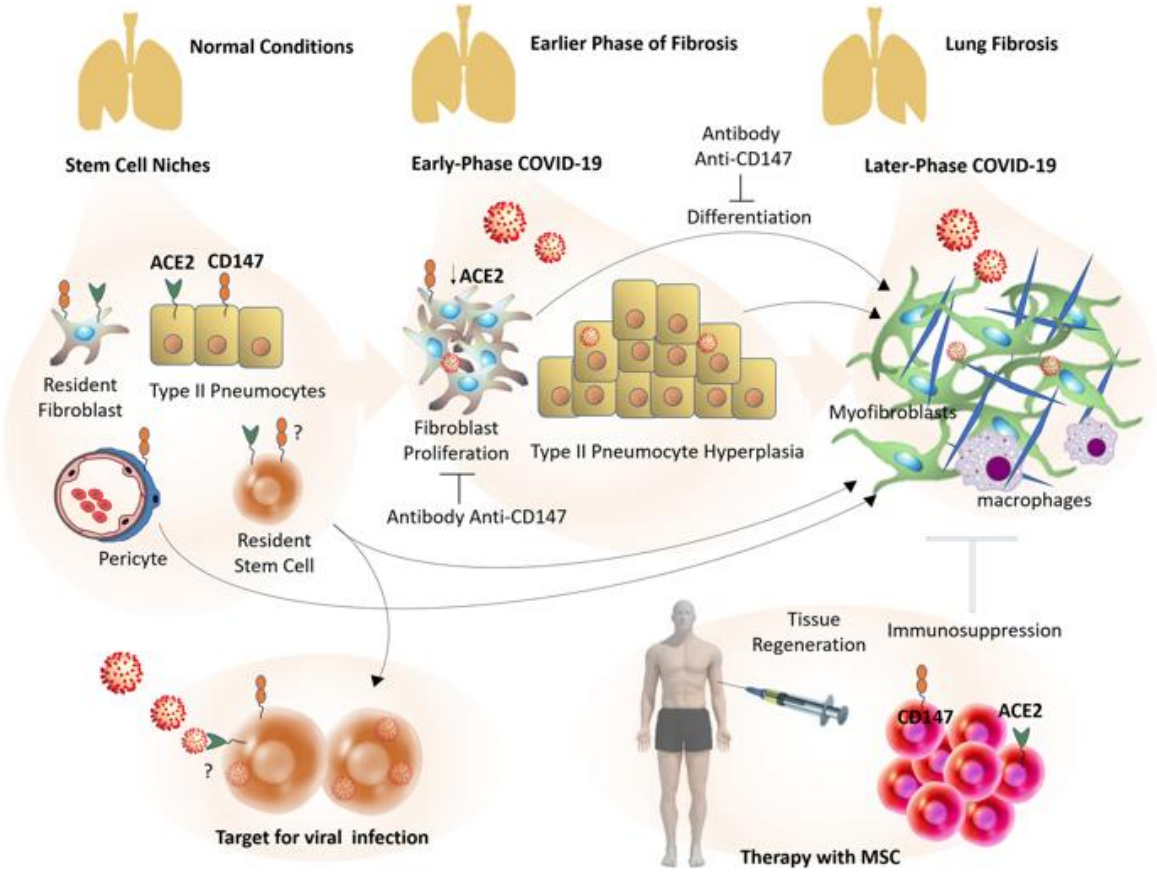

Fig. 2. Transimission of SARS-Cov-2

TRANSMISSION

Person-to-person transmission occurs primarily via direct contact or through droplets spread by coughing or sneezing from an infected individual. Respiratory infections can be multiplies through droplets of various sizes: when the droplet particles are >5-10 μm in diameter they are known as respiratory droplets, and when then are <5μm in diameter, they are known as droplet nuclei.

According to current facts, COVID-19 virus is predominantly transmitted between people through respiratory droplets and contact routes 2-7[17]. In an analysis of 75,465 COVID-19 cases in China, airborne transmission was not informed. Droplet transmission occurs when a person is in in close contact (within 1 m) with somebody who has respiratory symptoms (*e.g.*, coughing or sneezing) and is therefore at risk of having his/her mucosae (mouth and nose) or conjunctiva (eyes) exposed to potentially infective respiratory droplets. Transmission may also occur through fomites in the immediate environment around the

infected person. Consequently, transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person (*e.g.*, stethoscope or thermometer). Airborne transmission is different from droplet transmission as it refers to the existence of microbes within droplet nuclei, which are generally considered to be particles <5μm in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m[18–21].

In the viewpoint of COVID-19, airborne transmission may be possible in particular circumstances and settings in which procedures or support treatments that produce aerosols are performed; *i.e.*, endotracheal intubation, bronchoscopy, manual ventilation before intubation, administration of nebulized treatment, open suctioning, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation[22–25].

PHYLOGENETIC ANALYSIS

World Health Organisation (WHO) has classified COVID-19 as aβCoV of group 2B [23]. Ten genome sequences of COVID-19 obtained from a total of nine patients exhibited 99.98% sequence identity[19]. Another study showed there was 99.8–99.9% nucleotide identity in isolates from five patients and the sequence results revealed the presence of a new beta-CoV strain. The genetic sequence of the COVID-19 showed more than 80% identity to SARS-CoV and 50% to the MERS-CoV [5, 19], and both SARS-CoV and MERS-CoV originate in bats [24].

Thus, the evidence from the phylogenetic analysis indicates that theCOVID-19 belongs to the genus betacoronavirus, which includes SARS-CoV, that infects humans, bats, and wild animals[26].

COVID-19 represents the seventh member of the coronavirus family that infects humans and has been classified under the orthocoronavirinae subfamily. The COVID-19 forms a clade within the subgenus sar-becovirus. Based on the genetic sequence identity and the phylogenetic reports, COVID-19 is sufficiently different from SARS-CoV and it can thus be considered as a new betacoronavirus that infects humans. The COVID-19 most likely developed from bat origin coronaviruses.

Another piece of evidence that supports the COVID-19 is of bat origin is the existence of a high degree of homology of the ACE2 receptor from a diversity of animal species, thus implicating these animal species as possible intermediate hosts or animal models for COVID-19 infections. Moreover, these viruses have a single intact open reading frame on gene 8, which is a further indicator of bat-origin CoVs. However, the amino acid sequence of the tentative receptor-binding domain resembles that of SARS-CoV, indicating that these viruses might use the same receptor[27].

THERAPEUTICS/TREATMENT OPTIONS

The person-to-person transmission of COVID-19 infection led to the isolation of patients that were administered a variety of treatments. At present, there are no specific drugs or other therapeutics presently approved by the U.S. Food and Drug Administration (FDA) to avoid or treat COVID-19. Modern clinical management includes infection avoidance and control measures and loyal care,

including supplemental oxygen and mechanical ventilator support when indicate. The only option available is using broad-spectrum antiviral drugs like Nucleoside analogues and also HIV-protease inhibitors that could soothe virus infection until the particular antiviral becomes available[28].

Based on what we know now, those at high-risk for severe illnesses from COVID-19 are:

Based on currently available information and clinical expertise, older adults and people of any age who have serious underlying medical conditions might be at higher risk for severe illness from COVID-19[29].

- Older Adults, people above 65 years and older
- People with diabetes
- People with liver disease
- People with Asthma
- People with HIV
- People with chronic lung disease or moderate to severe asthma
- People who have serious heart conditions
- People with immunocompromised
- People in nursing homes or long-term care facilities.

RECOMMENDATIONS AND ADVICE FOR THE PUBLIC[29]

To prevent the spread of COVID-19:

- Clean your hands often. Use soap and water, or an alcohol-based hand rub.
- Maintain a safe distance from anyone who is coughing or sneezing.
- Don't touch your eyes, nose or mouth.
- Cover your nose and mouth with your bent elbow or a tissue when you cough or sneeze.
- Stay home if you feel unwell.
- If you have a fever, cough and difficulty breathing, seek medical attention. Call in advance.
- Follow the directions of your local health authority.
- Avoiding unneeded visits to medical facilities allows healthcare systems to operate more effectively, therefore protecting you and others.

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