A Literature Review of Coronavirus Disease 2019 - A Global Pandemic

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Abstract Coronavirus disease 2019 (covid-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in Wuhan, China in 2019 and has spread globally since then being declared by the World Health Organization (WHO) as a global pandemic. The general public has very limited knowledge about this virus and hence preventive measures fail, leading to difficulty in its containment. This article focuses on providing detailed information about the nature of this virus and its effects on the human body which will in turn bring about awareness and help in delaying its spread. This can reduce the surge of patients and help the health care system in coping with the outbreak.

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1. Introduction

In the last 3 weeks, the new major epidemic foci of coronavirus disease 2019 (COVID-19) have been identified and rapidly expanding in Europe, North America, Asia and Middle East. By March 16, 2020, the number of cases outside china has increased drastically. On the basis of "High alert" the WHO declared the COVID-19 situation as pandemic. As of march 29, 2020, the global death toll crosses 31,000. Hence it is very crucial to have adequate knowledge about this virus in order to prevent its spread further.

The virus spreads during close contact via respiratory droplets produced during coughing and sneezing. The virus is generally not airborne. It is most contagious when the patient is symptomatic, however, transmission may occur in asymptomatic patients as well. It generally lives on a surface for 72 hours but this varies from different surfaces of different objects. Incubation period refers to the time between first contact with the virus and the time when symptoms begin to appear. This disease has an incubation period of 2-14 days in general. A healthy person might be infected without insight due to its long incubation period and this may further spread the disease to other healthy individuals.

2. Signs and Symptoms of COVID-19

The lungs are the organs most affected as the virus gets access to the hosts cell via the enzyme ACE2 present abundantly in type 2 alveolar cells of the lung parenchymal tissue. Patients generally are asymptomatic or develop mild symptoms such as cough, fever, fatigue and shortness of breath. These symptoms are very similar to a common flu like illness. However, certain group of people mainly the older population and people who have a suppressed immune system due to any underlying conditions for example autoimmune diseases may present with severe symptoms needing intensive care. The severe symptoms include chest pain, confusion, central cyanosis (bluish discoloration of face, lips and tongue), difficulty in breathing. Some cases have presented with chest tightness and palpitations. This disease may progress to pneumonia, multi-organ failure and as the disease progresses it might lead to respiratory failure and death may follow. Such patients require mechanical ventilation 7-8 days after onset of symptoms.

3. Morphology of the Coronavirus

Coronaviruses are large pleomorphic spherical particles with bulbous surface projections giving it a crown like appearance. The diameter of the virus particles is around 120 nm. The envelope of the virus in electron micrographs appears as a distinct pair of electron dense shells. The viral envelope consists of a lipid bilayer where the membrane (M), envelope (E) and spike (S) structural proteins are anchored. Inside the envelope, there is the nucleocapsid, which is formed from multiple copies of the nucleocapsid (N) protein, which are bound to the

positive-sense single-stranded RNA genome in a continuous beads-on-a-string type conformation. The lipid bilayer envelope, membrane proteins, and nucleocapsid protect the virus when it is outside the host cell.
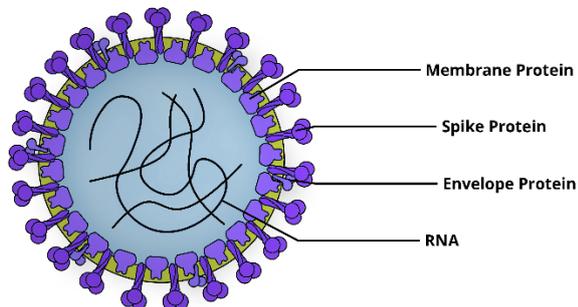

Figure 1. Diagrammatic representation of the coronavirus with the outer membrane, spike protein, envelope protein and the RNA inside the nucleocapsid

4. Diagnosis of COVID-19

Laboratory testing for COVID-19 and the associated SARS-CoV-2 virus consists of detection of the virus and the antibodies produced in response to the virus. Detection of virus is done by real time reverse transcription polymerase chain reaction (rRT-PCR). This test can be done with samples obtained from nasopharyngeal swab or sputum. Results usually are available in a span of few hours to 2 days. The rRT-PCR is a technique used in the laboratory where the viral RNA is transcribed into DNA, furthermore, this DNA is amplified which is monitored in real time. This is routinely used for analysis of gene expression and quantification of viral RNA in research and clinical setting. Computed tomographic scan of the chest (CT Chest) are of little value in diagnosis of COVID-19. Typical features of CT chest include bilateral multi-lobar ground-glass opacities with a peripheral, asymmetric and posterior distribution leading to consolidation as the disease develops. CT chest is highly sensitive test but many of its features overlap with that of pneumonia leading to lesser specificity as compared to rRT-PCR technique. Detection of antibodies kits using blood are being developed which hopes to provide results within 15 minutes by detecting both IgM and IgG antibodies.

5. General Prevention

Preventive measures for COVID-19 include staying at home and avoiding crowded places, washing hands with soap and warm water for at least 20 seconds has proven to be beneficial in preventing this disease. The CDC recommends covering the mouth, nose with a tissue when coughing or sneezing and avoiding touching the eyes, mouth and nose with unwashed hands. Governing bodies of various countries have began practicing social distancing strategies in aim to reduce contact of infected people with large groups by closing schools, work places, restricting travel and cancellation of mass gatherings. This also includes people staying 6 feet apart. A key part in managing the COVID-19 is trying to decrease the epidemic peak known as flattening the epidemic curve through various measures seeking to reduce the rate of new infections since a cure is still not available against this virus. This helps to decrease the risk of health services being overwhelmed allowing for better treatment of ongoing cases and delaying additional cases until the availability of a vaccine. According to WHO the usage of masks is recommended only if a person is coughing or sneezing or if someone is in direct contact with a virus positive patient. Hand sanitizers with alcohol percentage being greater than 60% is beneficial when soap and water are unavailable.

6. Personal Protective Equipment for Healthcare Professionals

Prevention in healthcare sectors is a must hence precautions need to be taken for it, especially whilst performing certain procedures in acute settings such as intubation where a healthcare professional is in direct contact with the aerosols in the saliva. CDC outlines specific guidelines for this. This includes respirators (N95 respirator) or facemask, gown, medical gloves and eye protection.

7. Treatment

People are managed with supportive care. A cure is unavailable and only symptomatic management is possible for patients infected with SARS-CoV-2. Supportive measures include providing oxygen and fluid therapy to patients and supporting other organs involved. Medical professionals recommend paracetamol over ibuprofen to provide relief from pyrexia (fever), however, the usage of NSAIDs are not opposed by the WHO. Corticosteroids such as methylprednisolone are not recommended unless the disease has progressed to acute respiratory distress syndrome. Research is being currently performed on several drugs such as chloroquine, arbidol, remdesivir and favipiravir to test their efficacy and safety in treatment of coronavirus disease 2019 (COVID-19). Some promising results have been achieved thus far.

Mechanical ventilation is required in severely ill patients. The disease in such patients have progressed to pneumonia and acute respiratory failure. Signs of cyanosis and confusion are known to be seen in such patients.

8. Prognosis

The severity of COVID-19 varies. The disease may be mild with a few being symptomatic and many being asymptomatic resembling flu like symptoms. Such cases recover within 2 weeks whereas severe cases require 4 to 6 weeks to recover. Amongst the deaths the time from onset of symptom to death ranged between 2 to 8 weeks.

The Younger population are known to show milder symptoms than adults. Those younger than 50 years the death rate is less than 0.5% while those above 70 years it reaches 8%. Pregnant women are susceptible to severe infection based on data from similar viruses such as SARS and MERS, however, data for COVID-19 is limited. In later stages sepsis and multi organ failure may occur leading to death, these patients require intensive care.

9. Conclusion

Since no vaccine or cure is currently available, there has been a rise of anxiety and panic amongst the general population. However, it is only a matter of time till researchers discover a cure, a vaccine and test its safety leading to eradication of this disease. Until then practicing social distancing and maintaining respiratory hygiene would help in prevention and lead to a delay in its spread. This would give adequate time for healthcare services to cope and provide better treatment to those currently infected.

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