

Coronavirus Disease 2019 (COVID-19) Outbreak – A Pandemic Situation

S Akbar*

Biochemistry, Agricultural Research Station, University of Agricultural Sciences, Dharwad Farm, Dharwad, Karnataka, India

***Corresponding Author:** S Akbar, Biochemistry, Agricultural Research Station, University of Agricultural Sciences, Dharwad Farm, Dharwad, Karnataka, India.

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Abstract

Coronavirus disease 2019 (COVID-19) is a communicable disease caused by a novel coronavirus (2019-nCoV). The virus was discovered in China in December 2019. Earlier it was an endemic in China but within a short period of time it emerged as pandemic spreading across the globe. The virus infected tens of thousands of people and caused several deaths worldwide ensuing into travel limits and nationwide lockdowns in many countries affecting the economy. People infected with the 2019-nCoV virus will experience fever, dry cough, achiness, sore throat, running nose, nasal congestion and briefness of breath progressing to pneumonia in humans. In this context, the viral structure, its mode of transmission and infection, precautions, nutritional requirement and need of the hour for research and development during pandemic situation are discussed.

Keywords: *Coronavirus; Coronavirus Disease 2019; Pandemic; Respiratory Illness*

Introduction

Coronavirus disease 2019 (COVID-19) is a communicable disease caused by a novel coronavirus (2019-nCoV). Coronaviruses are a set of allied viruses that cause respiratory tract infections in animals and humans. The respiratory illness due to coronaviruses can be mild, such as the common cold, and sometimes be lethal, such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and Coronavirus Disease-2019 (COVID-19) [1]. The respiratory illness outbreak in the city Wuhan in China in December 2019 was traced back to the infection due to a novel coronavirus (2019-nCoV) [2,3]. The virus is thought to be emerged in bats initially and then entered into human beings through an intermediate animal host. The epidemic virus quickly infected tens of thousands of people in China and within a short span of about three months i.e, on 11th March 2020 it was declared as pandemic by WHO. As of 8th May 2020, there have been 37,59,967 confirmed cases detected and 2,59,474 deaths worldwide ensuing into travel limits and nationwide lockdowns in many countries [4]. The systematic name of coronavirus is *Orthocoronavirinae* or *Coronavirinae* [5] and it belongs to the large family of viruses Coronaviridae, subfamily Orthocoronavirinae, order Nidovirales, and realm Riboviria [6,7]. The novel strain out broke in Wuhan possess 70% genetic resemblance to the SARS-CoV [8]. The symptoms of the disease includes fever, dry cough and briefness of breath progressing to pneumonia in humans, in some cases fatal with a mortality rate of 2.3% according to Center for Disease Control and Prevention (CDC). Other symptoms include, achiness, sore throat, running nose and nasal congestion. The 2019-nCoV is a highly contagious with a minimum incubation period of 2 to 14 days.

Structure of the 2019-nCoV and mode of infection

All structural features of the 2019-nCoV are related to coronaviruses in nature. Coronaviruses are large spherical particles with a diameter of 120 nm. The envelope of the virus consists of lipid bilayer where bulbous surface projections called spike structural proteins are anchored [9,10]. The virus possesses a single stranded positive sense RNA genome enclosed in the envelope. Multiple copies of nucleocapsid proteins are bound to the RNA genome in a beads on a string type conformation [9,11]. The genome size varies from 27 to 34 kilobases which is largest among the RNA viruses. The RNA genome possesses reading frames that encode replicase, spike and envelope protein, and nucleocapsid.

The viral spike glycoprotein binds to its complementary host cell surface receptor angiotensin-converting enzyme 2 (ACE2) [12]. The spike protein of 2019-nCoV possesses 10 to 20 times higher affinity to bind ACE2 on human cells than the spike from the SARS virus [13]. The binding induces a structural change in the spike protein allowing the viral membrane to fuse with host's cell membrane. Once the virus particle enters the host cell, it is uncoated and the viral genome RNA is translated into a polyprotein resulting in the synthesis of several structural proteins and replication of genome RNA ultimately leading to the synthesis of new viral particles which are released by exocytosis [9].

Transmission

According to the WHO and the United States Centre for Disease Control, COVID-19 spreads through close contact and by means of respiratory droplets of cough and sneeze of an infected person [14]. Spread of COVID-19 may also be caused due to the touching of 2019-nCoV contaminated surfaces and then to the face [15]. Transmission is also expected to be through faeces but the risk is believed to be low.

How to avoid from getting infected with 2019-nCoV

Currently there is no vaccine to get protection from the novel coronavirus. Even the antibiotics are also ineffective because COVID-19 is a viral infection. There are several clinical trials under evaluation for potential treatments. However WHO recommends following few protection measures [16] to avoid COVID-19:

- Washing hands of tenley with soap or handwash reagent and water for at least 20 seconds after touching the surfaces like walls, windows, doors, elevators, grocery carts etc. at public places such as airports, railway stations, bus stands, ATM machines, petrol pumps and shopping malls etc. In absence of soap and water, hand sanitizer with at least 60% alcohol can also be used to clean hands.
- Avoiding frequent touching of hands to face.
- Maintaining six feet distance from an infected person or person showing the earlier discussed symptoms.
- Avoiding large assembly of people to prevent spillage of droplets on other persons while talking and/or sneezing.
- Use of face mask and hand gloves are highly recommended.
- Not sharing the personal items such as mobile, keys, lip balm, goggles, drinking glasses and bottles, etc. with others.
- Wiping out the highly touching surfaces like stair banister, doorknobs, bike handle, car steering, keyboards, etc. with any household cleaner or diluted bleach.
- In any respiratory illness or if any symptom resembling COVID-19 appears, it is advised to consult the doctor.

Nutritional advice during COVID-19 outbreak

Strong immune system is crucial during the pandemic outbreak of 2019-nCoV to fight back if an individual is infected. Suitable nutrition and hydration are essential to maintain healthy and strong immune system and to reduce the risks due to infectious diseases. Therefore WHO advises [17] for a balanced diet, and recommends to eat fresh and unprocessed foods like vegetables, fruits, nuts, whole grains every day to supply minerals, vitamins, antioxidants and dietary fiber protein to the body. It also implies to take enough water which regulates body temperature, removes waste from the body, lubricates and cushions the joints. WHO also suggests avoiding unsaturated fats, and foods with high salt and sugar content. White meat with low fat may be consumed rather than red meat with high fat. Processed meats should be avoided which possess high fat and salt. Food made in home is to be consumed rather than the outside food to reduce the chances of being exposed to COVID-19. People with chronic symptoms suspected or confirmed COVID-19 may be supported with mental health and psychosocially.

Need for immediate research

With the availability of whole genome sequence of 2019-nCoV [18,19], it is possible to detect the two genes of the virus in COVID-19 patients using PCR assay based nucleic acid amplification. However the protocol is tedious, and to speed up the process of diagnosis, amplification of specific sequences without the necessity of extra sequencing, nucleic acid amplification test (NAAT) should be made available. Scientists have revealed the crystal structure of the spike protein of 2019-nCoV [13] which can be exploited in screening of antiviral compounds through molecular docking and classical wet lab procedures for the identification of potent vaccines against the virus. Serological studies involving search for antibodies will also be helpful in development of immunoassays such as immunodiffusion assay and ELISA. Therefore, there is an urgent global need to develop rapid and reliable diagnostic tools for the detection of 2019-nCoV and drugs to control its spread.

Conclusion

During the pandemic outbreak of COVID-19, currently where there are no specific vaccines available against the causative virus and also the scores of the COVID-19 affected-patients and the deceased are in competition among the countries it is therefore recommended to prevent coronavirus infection by avoiding getting in contact with the COVID-19 affected persons and follow the precautions and eat balanced diet to stay healthier and maintain strong immune system to develop tolerance if infection occurs.

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