



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 8 | Issue 1 | Jan - Mar - 2020
www.ijamscr.com

Research article

Medical research

Microplan for COVID-19: Precautions & preventive measures

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ABSTRACT

Corona virus is a family of viruses causes Respiratory illnesses such as Fever, Tiredness, and Dry cough. Some patients may experience nasal congestion, runny nose, sore throat, diarrhea, aches & pains. Transmitted through both humans and animals but mainly human nasal or saliva droplets and there is NO SPECIFIC Anti-virals proves to be effective currently but supportive therapy can manage the symptom under monitoring. Precautions and preventative measures can control the spread of virus, washing hands for 20 seconds with soap and water followed by using alcohol based sanitizer and by covering the mouth and nose with handkerchief or N95 facemask. Avoid close contact with anyone who has cold or flu-like symptoms.

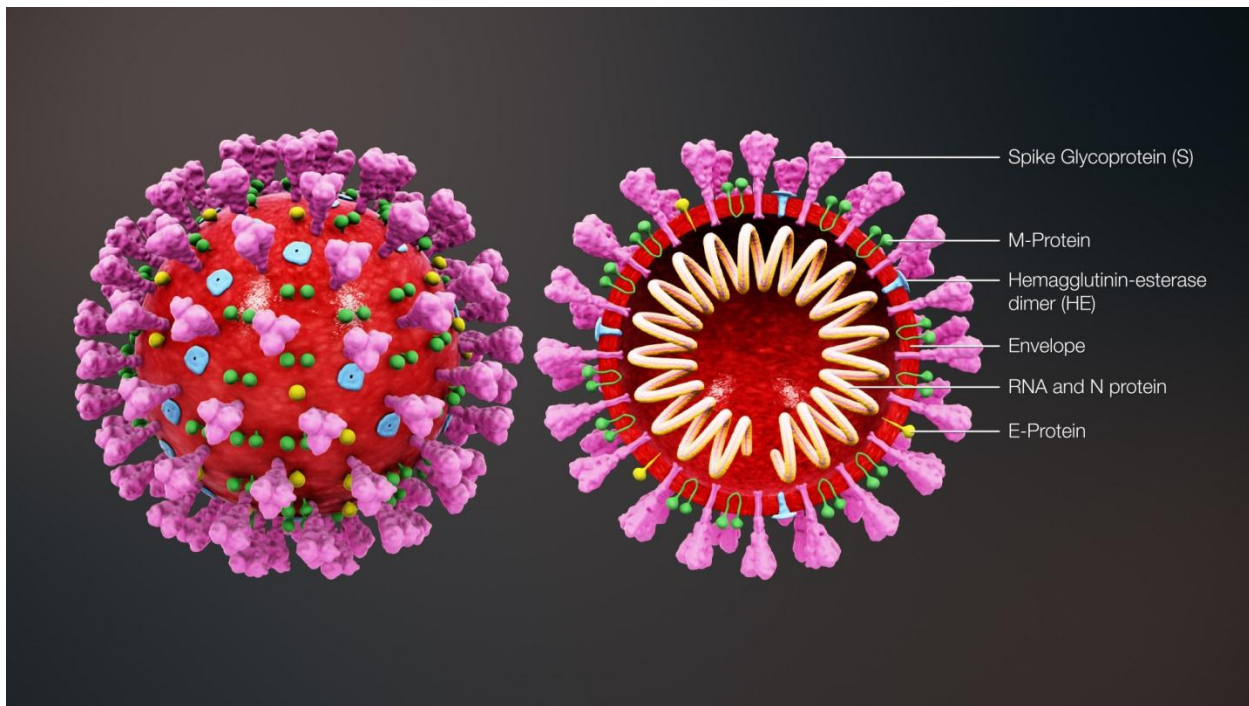
Keywords: Corona virus, Respiratory illnesses, N95 facemask.

INTRODUCTION

Corona virus is a family of viruses causes Respiratory infections in both humans and animals. There are seven corona viruses which affects the humans out of which four are commonly found across the world can cause cold like symptoms. The remaining three are known to cause severe diseases such as MERS-Middle east respiratory syndrome (caused by MERS-CoV), SARS-Severe acute respiratory syndrome (caused by SARS-CoV) [1].

Morphology

The name corona virus is derived from Latin word Corona, means “crown” or “halo” which refers to the physical appearance of a crown or a solar corona around the virions (virus particles) were viewed under two-dimensional transmission electron microscopy, due to surface being covered in club-shaped protein spikes.



Corona virus is a large pleomorphic spherical particle with bulbous surface projections. The diameter of virus particles is around 120nm. [2] The viral envelope consists of a lipid bilayer where the membrane (M), envelope (E), and spike (S) structural proteins are anchored. Subsets of corona virus also have a shorter spike like surface protein called hemagglutinin esterase (HE). [3, 4] Inside the envelope, there is a nucleocapsid, which is formed from the multiple copies of nucleocapsid (N) protein, which are bound to positive-sense single stranded RNA genome in a continuous beads-on-a-string type confirmation. [5] The lipid bilayer envelope, membrane protein and nucleocapsid protect the virus when it is outside the host cells. COVID-19 was first reported from Wuhan city on 31st December 2019 in china. Finally, corona virus disease 2019(COVID-19) caused by SARS-CoV-2. The common symptom of COVID-19 includes Fever, Tiredness, and Dry cough. Some patients may experience nasal congestion, runny nose, sore throat, diarrhea, aches & pains. [6]

Pathogenesis of COVID-19

- ✓ After the entry of virus into the body, it needs a special receptor (Angiotensin converting enzyme-2) to enter into the cell. The ACE-2 present on the surface of alveolar cells in the lungs. The ACE-2 is found on the Type-2 of these cells.

There are three types of alveolar cells

Type 1: Responsible for gas exchange.

Type 2: Responsible for producing “surfactants” which is a mixture of proteins and fats which reduces the surface tension of alveoli.

Type 3: Dust cells, which is macrophages.

- ✓ After the entry of corona virus into the cell it (virus) envelope contains protein called spikes and special (s-spike) that helps the virus to bind ACE-2. Then, the genetic material of the virus enters the cell, cell is harnessed to produce viral protein, thus the virus multiplies and then the cell dies.
- ✓ When Type-2 alveolar cells die, they release a substance called specific inflammatory mediators. The inflammatory mediators stimulates the existing immune cells called “Macrophages”. Then, the macrophages secretes three immune substances called “cytokines”. They are: Interleukin-1(IL-1), Interleukin-6(IL-6) and Tumor necrosis factor(TNF- α).
- ✓ These three substances, reaches the blood streams, cause the symptoms associated with infection due to corona virus. [7]

Symptoms

First: at the level of lungs

- ✓ The IL-1, IL-6 and TNF- α substances cause’s expansion of the blood vessels surrounding the vesicles, as well as the increased permeability of the walls of the blood vessels (increase in vasodilation and capillary permeability and thus

leads to “alveolar edema” which leads to hypoxia and shortness of breath) can be seen.

- ✓ The loss of surfactant leads to increase in the surface tension of the vesicles then it leads to alveolar collapse. It can also leads to shortness of breath and hypoxia.
- ✓ The IL-1, IL-6 and TNF- α substances also leads to increase the flow of “neutrophils” to the place of viral infection as an immune response. “Neutrophils” cells kill some viruses by secreting two substances such as Reactive Oxygen Species (ROS) and Proteases.
- ✓ The ROS and Proteases substances also destroy some of the alveolar cells which are responsible for gaseous exchange and cause a condition called consolidation which can causes cough symptoms.

Second: at the level of central nervous system

- ✓ The IL-1, IL-6 and TNF- α substances go to the “hypothalamus” region and thus increase the body temperature and cause the symptoms of “Fever”.

Third: in case of severe “SIRS”

- ✓ In case of the severe systemic inflammatory response syndrome (SIRS) that leads to septic shock also multiple organ dysfunction syndrome (especially the kidney failure). [8]

Supportive therapy and Monitoring

Patient with acute respiratory illness (fever with cough/SOB) with:

- History of travel to COVID-19 affected countries in the last 14 days, or
- Close contact with infected patient of COVID-19 in last 14 days, are suspected.

Mild cases

Symptoms

Low-grade fever, Cough, Malaise, Rhinorrhea, Sore throat without SOB. Treatment includes Tab. Oseltamivir 75mg BD, Antibiotics if needed (Azithromycin+Amoxyclav) and Paracetamol-500mg SOS (symptomatic).

Moderate to Severe cases

Give oxygen supplementation to maintain SPO₂>94% immediately to the patients with SARI and respiratory distress, hypoxaemia or shock.

- Anti-pyretics, Anti-tussives, Antibiotics as indicated
- Nebulization

- Hydroxychloroquine (400 mg BD for 1 day) followed by (200 mg BD for 5 days) may be considered.
- Lopinavir or Ritonavir (200 mg BD) may be considered within 10 days of symptoms onset.
- Don't administer Hydroxychloroquine and Lopinavir (moderate drug interaction) which cause dose-related prolongation of the QT-interval may result in additive effects and increased risk of ventricular arrhythmias including torsade de pointes and sudden death.
- Corticosteroids should be avoided. [9]

If worsen (respiratory failure, hypotension and mental status) patient should be shifted to ICU. Non-invasive ventilation(NIV) and high-flow nasal cannula(NFNC) to be used carefully in view of risk due to aerosol generation. Ventilation management as per Acute respiratory distress syndrome (ARDS) protocol.

Specific therapy

NO SPECIFIC Anti-virals proves to be effective currently. Presently patients with severe disease and requiring ICU managements: Hydroxychloroquine -400mg for 1 day followed by 200 mg BD for 4 days in combination with Azithromycin-500mg OD for 5 days under close monitoring including QT-interval. [10]

Precautions

COVID-19 is a highly contagious disease; adequate precautions can prevent infection (if infected). Virus spread through while sneezing or small droplet (cough) from the mouth of the infected person. The droplet can travel more than one meter from the source. Others can infect by the virus by touching their eyes, nose and mouth. The virus can also caught by inhaling the infected droplets if the distance between affected people is less than one meter. If 60+ years of aged have any existing or past medical history such as Heart diseases, Diabetes, Respiratory diseases, Hypertension or any serious illness, should take special precautions. [11]

Preventive measures

There is no evidence that virus can be transmitted through air. The following are the preventive measures to be taken:

Washing hands frequently

Transmission of virus occurs through hands.so, wash hands frequently and thoroughly.it is

recommended to use soap and water for atleast 20 seconds, else use hand sanitizers especially sufficient amount of alcohol to kill the micro-organisms.

Avoid touching eyes, nose and mouth

If the contaminated person/skin touches eyes, nose or mouth the virus can transfer into the body (Don't face without washing hands first).

Maintain distance

Keep a safe distance atleast one meter (>3 feet) from anyone who is coughing/sneezing.

Cover mouth and Nose while sneezing or coughing

If any one coughing/ sneezing cover face with bent elbow or with hand kerchief/disposable facial

tissues. This helps to prevent the spread of viruses such as Flu, cold/COVID-19.

Self-quarantine

Restrict activities outside the home, except for getting medical care. [12]

CONCLUSION

Individuals should utilize contact and airborne precautions such as N95 or FFP3 masks, eye protection, gowns and gloves to prevent transmission of pathogens. Strict personal hygiene is necessary for the prevention and control of infection. Wash hands frequently, especially after contact with sick people. Usage of alcohol based hand sanitizer frequently.

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How to cite this article: Dr.Velicharla Raviteja, Dr.Durfeshan Eram, Dr.N Nagesh, Dr.N Sriram. Microplan for COVID-19: Precautions & preventive measures. Int J of Allied Med Sci and Clin Res 2020; 8(1): 106-109.

Source of Support: Nil. **Conflict of Interest:** None declared.