



## COVID-19: A COMPREHENSIVE REVIEW

### Nursing

<b>Ms. Santosh Kumari*</b>	Nursing Tutor, Maharishi Markandeshwar College of Nursing, Maharishi Markandeshwar University, Kumarhatti, Solan, H.P. *Corresponding Author
<b>Dr. Poonam Sheoran</b>	Professor, Maharishi Markandeshwar College of Nursing, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana.
<b>Ms. Kalpna Chauhan</b>	Nursing Tutor, Maharishi Markandeshwar College of Nursing, Maharishi Markandeshwar University, Kumarhatti, Solan, H.P.
<b>Ms. Rupam Gupta</b>	Nursing Tutor, Maharishi Markandeshwar College of Nursing, Maharishi Markandeshwar University, Kumarhatti, Solan, H.P.

### ABSTRACT

The World Health Organisation (WHO) has declared the coronavirus disease 2019 (COVID-19) a pandemic. On 31 December 2019, a cluster of cases of pneumonia of unknown cause, in the city of Wuhan, Hubei province in China, was reported to the World Health Organisation. As of 4<sup>th</sup> September 2020, over 26,472,012 cases have been identified globally in 213 countries with a total of over 8,73,229 deaths. Also 18,664, 866 were recovered. In India 3,936,747 total cases of COVID-19 have been identified out of them 68,569 were dead and 3,037,151 cases were recovered till 4<sup>th</sup> September, 2020. Objective of the study was to review available information regarding COVID 19 virus, its definition, history, origin & spread, epidemiology, pathophysiology, sign & symptoms, investigations, treatment and management, preventions, complications and prognosis of disease. COVID-19 has become a high risk to the general population and healthcare workers worldwide. However, scientific research is growing to develop a coronavirus vaccine and therapeutics for controlling the deadly COVID-19.

### KEYWORDS

COVID-19, Upper Respiratory Infection, Virus.

### INTRODUCTION

The World Health Organisation (WHO) has declared the coronavirus disease 2019 (COVID-19) a pandemic. A global coordinated effort is needed to stop the further spread of the virus. The last pandemic reported in the world was H1N1 flu in 2009. On 31 December 2019, a cluster of cases of pneumonia of unknown cause, in the city of Wuhan, Hubei province in China, was reported to the World Health Organisation. In January 2020, a previously unknown new virus was identified subsequently named the 2019 novel coronavirus, and samples obtained from cases and analysis of the virus genetics indicated that this was the cause of the outbreak. This novel coronavirus was named Coronavirus Disease 2019 (COVID-19) by WHO in February 2020. The virus is referred to as SARS-CoV-2 and the associated disease is COVID-19.[1] As of 4<sup>th</sup> September 2020, over 26,472,012 cases have been identified globally in 213 countries with a total of over 8,73,229 deaths. Also 18,664, 866 were recovered.[2] In India 3,936,747 total cases of COVID-19 have been identified out of them 68,569 were dead and 3,037,151 cases were recovered till 4<sup>th</sup> September, 2020.[3].

### OBJECTIVES

Objective of the study was to review available information regarding COVID 19 virus, its definition, history, origin & spread, epidemiology, pathophysiology, sign & symptoms, investigations, treatment and management, prevention, complications, prognosis of disease.

### DEFINITION

COVID-19 is a type of common virus that infects humans and causing an upper respiratory infection. Seven different types of human corona virus have been identified. The viruses are spread through the air by coughing and sneezing, close personal contact, touching an object or surface contaminated with the virus and rarely by fecal contamination. The illness caused by most corona viruses usually lasts a short time and is characterized by runny nose, sore throat, feeling unwell, cough, and fever. [4]

### HISTORY

In the past two decades, there have been two events wherein crossover of animal beta Corona viruses to humans has resulted in severe disease. The first such instance was in 2002–2003 when a new Corona virus of the  $\beta$  genera and with origin in bats crossed over to humans via the intermediary host of palm civet cats in the Guangdong province of China. This virus, designated as SARS-CoV, affected 8422 people

mostly in China and Hong Kong and caused 916 deaths (mortality rate 11%) before being contained.[5]. MERS started in Saudi Arabia in 2012. Almost all of the nearly 2,500 cases have been in people who live in or travel to the Middle East. This corona virus is less contagious than its SARS cousin but more deadly, killing 858 people (fatality rate 34%). It has the same respiratory symptoms but can also cause kidney failure. Origin of this MERS was bat emerged in Saudi Arabia with dromedary camels as the intermediate host.[6]

### ORIGIN AND SPREAD

According to experts SARS-CoV-2 originated in bats. Now how the corona viruses behind Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) got started. SARS-CoV-2 made the jump to humans at one of Wuhan's open-air "wet markets." Customers buy fresh meat and fish, including animals that are killed on the spot. Some wet markets sell wild or banned species like cobras, wild boars, and raccoon dogs. Crowded conditions can let viruses from different animals swap genes. Sometimes the virus changes so much it can start to infect and spread among people. Still, the Wuhan market did not sell bats at the time of the outbreak. Early suspicion also fell on pangolins, also called scaly anteaters, which are sold illegally in some markets in China. Some corona viruses that infect pangolins are similar to SARS-CoV-2. As SARS-CoV-2 spread both inside and outside China, it infected people who have had no direct contact with animals. That meant the virus is transmitted from one human to another. It is now spreading around the globe. This growing worldwide transmission is now a pandemic. [6]

According to the Centers for Disease Control and Prevention, COVID-19 is spread mainly from person-to-person, usually via close contact (within six feet). Simply being near an infected person who coughs, sneezes, or talks can expose person to their infected respiratory droplets. If those virus-containing particles land in eyes, nose, or mouth, or if person inhale them into their lungs, person could become infected. Some people may be capable of spreading it to others even though they do not have any symptoms. [7]

### EPIDEMIOLOGY

A cluster of pneumonia cases of unknown origin in Hubei province, China, caused concern among health officials in late December 2019. On December 31, an alert was issued by the Wuhan Municipal Health Commission, a rapid response team was sent to Wuhan by the Chinese Center for Disease Control and Prevention (China CDC), and a

notification was made to the World Health Organization. Likely potential causes including influenza, avian influenza, adenovirus, SARS-CoV, and MERS-CoV were found out. Epidemiological investigation implicated Wuhan's Huanan Seafood Wholesale Market, which was shut down and disinfected, and active case finding was initiated and vigorously pursued. On January 7, 2020, the causative pathogen was identified as a novel CoV, and genomic characterization and test method development ensued. Now named 2019-nCoV, the virus is distinct from both SARS-CoV and MERS-CoV, yet closely related. Early cases suggested that COVID-19 may be less severe than SARS and MERS. However, illness onset among rapidly increasing numbers of people and mounting evidence of human-to-human transmission suggests that 2019-nCoV is more contagious than both SARS-CoV and MERS-CoV.[8]

The first fatal case was reported on January 11, 2020. Cases in other provinces of China and those in other countries (Thailand, Japan, and South Korea in quick succession) were reported in people who were returning from Wuhan. Transmission to health-care workers caring for patients was described on January 20, 2020. By January 23, 11 million population of Wuhan was placed under lockdown with restrictions of entry and exit from the region. Soon, this lockdown was extended to other cities of Hubei province. Cases of COVID-19 in countries outside China were reported in those with no history of travel to China, suggesting that local human-to-human transmission was occurring in these countries.[9]

Airports in different countries including India put in screening mechanisms to detect symptomatic people returning from China and placed them in isolation and testing them for COVID-19. Soon, it was apparent that the infection could be transmitted from asymptomatic people and also before the onset of symptoms. Therefore, countries including India who evacuated their citizens from Wuhan through special flights or had travelers returning from China, placed all people symptomatic or otherwise in isolation for 14 days and tested them for the virus. Cases continued to increase, studies reported an epidemic doubling time of 1.8 days.[10]

As of March 22, 2020, around 300,000 cases of COVID-19 and approximately 13,000 deaths have been reported globally. India has reported around 394 cases with 7 mortalities till date. Many of the contacts of these cases have been quarantined. These numbers are possibly an underestimate of the infected and dead due to the limitations of surveillance and testing. Though the SARS-CoV-2 originated from bats, the intermediary animal through which it crossed over to humans is uncertain. [11]

### **PATHOPHYSIOLOGY**

According to studies all ages are affected and susceptible. Infection is transmitted through large droplets generated during coughing and sneezing by symptomatic patients, but can also occur from asymptomatic people and before the onset of symptoms. Studies have shown higher viral loads in the nasal cavity as compared to the throat, with no difference in viral burden between symptomatic and asymptomatic people. Patients can be infectious for as long as the symptoms last and even on clinical recovery. These infected droplets can spread 1–2 m and deposit on surfaces. The virus can remain viable on surfaces for days in favorable atmospheric conditions, but are destroyed in less than a minute by common disinfectants such as sodium hypochlorite and hydrogen peroxide. Infection is acquired either by inhalation of these droplets or touching surfaces contaminated by them or then touching the nose, mouth, and eyes. The virus is also present in the stool, and contamination of the water supply and subsequent transmission via aerosolization/ feco-oral route is also hypothesized. The incubation period varies from 2 to 14 days (median 5–7 days). [12]. Studies have identified angiotensin receptor 2 as the receptor through which the virus enters the respiratory mucosa. The basic case reproduction rate is estimated to range from 2 to 6.47 in various modeling studies [13].

### **SIGN AND SYMPTOMS**

COVID-19 was similar to SARS and MERS in some clinical manifestations. Among those who will become infected, some will show no symptoms. Those who develop symptoms may have a mild to moderate, but self-limiting disease with symptoms similar to the seasonal flu. Symptoms may include: Respiratory symptoms like Fever, Cough, Shortness of breath, Breathing difficulties, Fatigue, Sore throat. Fever occurred in 98-100% of patients with SARS or

MERS, compared to 81.3% of patients with COVID-19. 18.7% of patients had no fever at admission, suggesting that the absence of fever could not rule out the possibility of COVID-19 [14].

A minority group of people have more severe symptoms and need to be hospitalized, most often with pneumonia, and in some instances, the illness can include ARDS, sepsis and septic shock. Emergency warning signs where immediate medical attention should be sought, include:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face [1]

### **INVESTIGATIONS**

The gold standard for testing for COVID-19 is Reverse Transcription Polymerase Chain Reaction (RT-PCR). However, current data suggest that RT-PCR is only 30-70% effective for acute infection. The CDC recommends that any person who may have had contact with a person who is suspected of having COVID-19 and develops a fever and respiratory symptoms are advised to get tested and be isolate. The main criteria for testing are:

- Location
- Age
- Medical history and risk factors
- Exposure to the virus and contact history
- Duration of symptoms
- If the given criteria are met it is advised that the testing procedure should be followed:
- Collect and test upper respiratory tract specimens, using a nasopharyngeal swab
- If available testing of lower respiratory tract specimens
- If a productive cough is evident then a sputum specimen should be collected
- For patients who are receiving invasive mechanical ventilation, a lower respiratory tract aspirate or broncho-alveolar lavage sample should be collected

Chest X-rays are not especially sensitive for COVID-19, but chest CT gives a much more detailed view appears to have good sensitivity in initial stages of the disease. However chest CT or X-ray is not currently recommend as a diagnostic method as they can easily be confused with other infections such as H1N1, SARS, MERS and seasonal flu. Lung ultrasound is also emerging as a valuable diagnostic testing procedure. According to the CDC, even if a chest CT or X-ray suggests COVID-19, viral testing is the only specific method for diagnosis.

Myocardial injury tends to affect COVID.19 severity and mortality. A meta-analysis showed patients with high cardiac troponin I (>13.75 ng/L) and aspartate aminotransferase levels (>27.72U/L) combined with either advanced age (>60 years) were more likely to develop adverse outcomes. Evaluating cardiac injury biomarkers may assist in identifying patients at the highest risk and leading to specific therapeutic interventions.[1]

### **TREATMENT AND MANAGEMENT**

After the diagnosis of SARS-Cov2 infection was made, the prevention and quarantine are considered as the most way to stop the fast spreading of the virus, because there is no effective vaccine, drugs, or antiviral to prevent and treat this disease despite the great efforts made by the scientists and researchers around the world to develop vaccines and treatments of coronavirus. Furthermore, several strategies were carried out to help patients with COVID-19 as oxygen therapy (major treatment intervention), antivirals (Lopinavir, Ritonavir, Ribavirin, Favipiravir (T-705), remdesivir, oseltamivir, Chloroquine, and Interferon). Convalescent plasma can be used to help people recover from viral infection without the occurrence of severe adverse events.

Among the difficulties that avoid finding the treatment for COVID-19 is that the spike protein of the virus interacts with the host cell receptor including GRP78 (Glucose Regulating Protein 78). Consequently, the inhibition of this interaction would probably decrease the rate of the infection. Lopinavir (protease inhibitor used to treat HIV) or Lopinavir/Ritonavir has shown in vitro anti-corona virus activity. In addition, the utilization of Lopinavir/Ritonavir showed a reduction of viral loads and it was found that it is able to improve virus symptoms during the treatment period. Other reported antiviral treatments form human pathogenic CoVs include neuraminidase inhibitors like oral

oseltamivir has been used in China hospitals for COVID-19 cases. No study has demonstrated the effectiveness of oseltamivir in the treatment of SARS-CoV-2. In Wuhan, on 6 February 2020, a clinical trial was initiated of remdesivir (Newly discovered antiviral drug) on SARS-CoV-2. This compound showed an inhibition of the replication of SARS-CoV and MERS-CoV in tissue cultures and efficacy in animal models. However, given the related issues of security, safety, and efficacy, it is necessary to take some time to develop the vaccine and the antiviral drugs [14].

In the case of mild to moderate symptoms the following considerations should be taken into account:

1. **Early identification** - Clinicians, especially physiotherapists, are most often in direct contact with their patients, which can make them infected or infected by others. It is therefore very important for physiotherapists and other health professionals to be familiar with the condition of COVID-19.
2. **Strategies for infection prevention and control (IPC)** - Suspect, probable and confirmed cases should be educated on Infection Prevention Control strategies to prevent transmission of the disease and health management strategies for quarantine.

For hospitalized patients the WHO highlights several considerations:

1. **Recognising and sorting patients with severe acute respiratory disease** - Early recognition of suspected patients allows for timely initiation of IPC. Early identification of those with severe symptoms allows for immediate, optimised supportive care treatments and safe, rapid admission (or referral) to the intensive care unit according to institutional or national protocols. For those with mild illness, hospitalization may not be required unless there is a concern for rapid deterioration. All patients discharged home should be instructed to return to the hospital if they develop any worsening of illness.
2. **Strategies for infection prevention and control (IPC)** - IPC is a critical and integral part of the clinical management of patients and should be initiated at the point of entry of the patient to the hospital. Standard precautions should always be routinely applied in all areas of health care facilities. Standard precautions include hand hygiene; use of PPE to avoid direct contact with patients' blood, body fluids, secretions including respiratory secretions and non-intact skin. Standard precautions also include prevention of needle-stick or sharps injury; safe waste management; cleaning and disinfection of equipment; and cleaning of the environment.
3. **Early supportive therapy and monitoring** - Give supplemental oxygen therapy immediately to patients with severe acute respiratory illness (SARI) and respiratory distress, hypoxaemia, or shock. Use conservative fluid management in patients with SARI when there is no evidence of shock. Closely monitor patients with SARI for signs of clinical deterioration, such as rapidly progressive respiratory failure and sepsis, and apply supportive care interventions immediately. Understand the patient's co-morbid conditions to start the management of critical illness and appreciate the prognosis. Communicate early with the patient and family.
4. **Collection of specimens for laboratory diagnosis** - Collect blood cultures for bacteria that cause pneumonia and sepsis, ideally before antimicrobial therapy. Collect specimens from both the upper respiratory tract (nasopharyngeal and oropharyngeal) and lower respiratory tract.
5. **Management of respiratory failure and ARDS** - Recognise severe hypoxaemic respiratory failure when a patient with respiratory distress is failing standard oxygen therapy. In the case of respiratory failure, intubation and protective mechanical ventilation may be necessary. Non-invasive techniques can be used in non-severe forms, however, if the scenario does not improve or even worsen within a short period of time (1–2 hours) then mechanical ventilation must be preferred.
6. **Management of septic shock** - Haemodynamic support is essential for managing septic shock.
7. **Prevention of complications** - Implement the following interventions to prevent complications associated with a critical illness such as:
  - reduce days of invasive mechanical intervention
  - reduce the risk of ventilator-associated pneumonia
  - reduce the risk of venous thromboembolism
  - reduce the risk of pressure ulcers
  - reduce the incidence of ICU related weakness [1].

## PREVENTIONS

According to what was published by the World Health Organization

and a number of international health institutes, there are many restrictions that must be followed, either on a personal level or on the environmental level, including early recognition by the patients; carrying out additional precautions for persons suspected of infection, as well as for people who had contact with patients before their patients were revealed; applying standard precautions for all patients and imposing administrative measures from various authorities, such as the environment and health authorities. In the current situation and to limit the spread of the COVID-19 virus, all countries should publish an awareness declaration of the symptoms of infection in all cities, especially in remote areas. Also, published the easiest and fastest way for the methods that every patient should follow in the event of a patient. In addition, encourage HCWs to have a high level of clinical suspicion. The WHO confirmed that the rational, correct, and consistent use of personal protective equipment (PPE) also helps reduce the spread of pathogens. PPE effectiveness depends strongly on adequate and regular supplies, adequate staff training, appropriate hand hygiene, and appropriate human behaviour.

At the level of additional precautions for patients, patients should be isolated in private quarantine rooms; everyone who contact with the patients, whether family, friends, or visitors, should be placed in a quarantine and a distance for contacting between them should be established the patients should cover their mouth and nose during sneezing by using masks or tissue as well as the persons COVID-19 suspected should place medical masks in public places and closed rooms and after every sneeze; the patient must wash their hands with an alcohol-based hand rub or with soap and water, as a result of coming into contact with respiratory secretions a proper and careful approach should be taken to eliminate all waste from patient uses, reducing as much as possible the exchange of equipment between patients and sterilizing them well when transporting them from one patient to another and after patient care, appropriate doffing and disposal of all PPE and hand hygiene should be carried out. At the level of additional precautions for health care workers (HCWs), a specialized team must be identified to deal with the patients to limit the spread of infection through protection methods, including the use of a medical mask, use of gloves, wearing of eye protection or facial protection, and wearing a clean, nonsterile, and long-sleeved gown, health care workers are prohibited from touching their eyes and nose with gloves or uncovered hands and limit the number of HCWs, family members, and visitors who are in contact with suspected or confirmed COVID-19 patients. At the level of additional precautions for the environment surrounding patients, the surfaces and places that patients come in contact with should be sterilized regularly, ensure adequate ventilation in the health care facility, separation of at least one meter should be maintained between all patients and manage laundry, food service utensils, and medical waste in accordance with safe routine procedures. The last section is on administrative policies and regulations that include educating caregivers on how to dealing patients, developing policies and plans through which early recognition of acute respiratory infection potentially caused by COVID-19 virus, preventing overcrowding in public places as much as possible, ensuring that the necessary equipment for health care is provided in sufficient quantities and permanently, providing protection to quarantine areas by the authorities to reduce patient's contact with healthy people, and imposing sanctions on those who violate the provisions that have been put in place by the authorities to limit the spread of the COVID-19 virus. [14]

## COMPLICATIONS

Some people about 1 in 6 will have complications, including some that are life-threatening. Many of these complications may be caused by a condition known as cytokine release syndrome or a cytokine storm. This is when an infection triggers the immune system to flood in the bloodstream with inflammatory proteins called cytokines. They can kill tissue and damage the organs, including lungs, heart, and kidneys. COVID-19 complications may include Acute Respiratory Failure, Pneumonia, Acute Respiratory Distress Syndrome, Acute Liver Injury, Acute Cardiac Injury, Acute Kidney Injury, Septic Shock, Disseminated Intravascular Coagulation, Blood Clot, Multi System Inflammatory Syndrome in Children, Chronic Fatigue, Rhabdomyolysis.[15].

## PROGNOSIS

The overall global case fatality rate (CFR) is currently estimated to be 3.4% based on World Health Organization data as of 24 August 2020. The CFR varies considerably between countries [16]

## CONCLUSION

COVID-19 has become a high risk to the general population and healthcare workers worldwide. However, scientific research is growing to develop a coronavirus vaccine and therapeutics for controlling the deadly COVID-19. Hence, health education on knowledge for disease prevention and control is also important to control and reduce the coronavirus infection rate. Further research should be directed toward the study of SARS-CoV-2 on animal models for analyzing replication, transmission, and pathogenesis in humans.

## REFERENCES

1. Coronavirus Disease (COVID-19) - Physiopedia [Internet]. [cited 2020 Sep 4]. Available from: [https://www.physio-pedia.com/Coronavirus\\_Disease\\_\(COVID-19\)](https://www.physio-pedia.com/Coronavirus_Disease_(COVID-19))
2. Coronavirus Update (Live): 26,472,012 Cases and 873,229 Deaths from COVID-19 Virus Pandemic - Worldometer [Internet]. [cited 2020 Sep 4]. Available from: <https://www.worldometers.info/coronavirus/>.
3. India Coronavirus: 3,936,747 Cases and 68,569 Deaths - Worldometer [Internet]. [cited 2020 Sep 4]. Available from: <https://www.worldometers.info/coronavirus/country/india/>.
4. Medical Definition of Coronavirus. Written by Doctors [Internet]. [cited 2020 Sep 4]. Available from: <https://www.medicinenet.com/script/main/art.asp?articlekey=22789>.
5. Richman DD, Whitley RJ, Hayden FG, Peiris JS. Coronaviruses, *Clinical Virology*. Ch. 52, 4th ed. New York, NY: McGraw-Hill; 2016. p. 1243-66.
6. Coronavirus History: How did coronavirus start? [Internet]. [cited 2020 Sep 4]. Available from: <https://www.webmd.com/lung/coronavirus-history>.
7. How is Coronavirus Spread? Coronavirus Transmission Facts | Health.com [Internet]. [cited 2020 Sep 4]. Available from: <https://www.health.com/condition/infectious-diseases/how-is-coronavirus-spread>.
8. Chan Yeung M, Xu RH. SARS. *Epidemiology, Respirology* 2003;8 Suppl: S9-14.
9. CDC Weekly C. The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China, 2020. *China CDC Wkly* [Internet]. 2020 Feb 1 [cited 2020 Sep 4];2(8):113–22. Available from: <http://weekly.chinacdc.cn/en/article/doi/10.46234/ccdcw2020.032>.
10. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019 nCoV Infection from an Asymptomatic Contact in Germany. *N Engl J Med* 2020;382:970-1.
11. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus Infected Pneumonia. *N Engl J Med* 2020;382:1199-207.
12. Pallavi P, Vijaya B, Rashmi B K. Recipient Hemovigilance Study in a University Teaching Hospital of South India: An Institutional Report for the Year 2014–2015. *Glob J Transfus Med*. 2017;2(2):124–9.
13. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect* 2020;104:246-51.
14. Pallavi P, Vijaya B, Rashmi B K. Recipient Hemovigilance Study in a University Teaching Hospital of South India: An Institutional Report for the Year 2014–2015. *Glob J Transfus Med*. 2017;2(2):124–9.
15. What Are the Complications of Coronavirus (COVID-19)? [Internet]. [cited 2020 Sep 4]. Available from: <https://www.webmd.com/lung/coronavirus-complications>.
16. Coronavirus disease 2019 (COVID-19) - Prognosis | BMJ Best Practice US [Internet]. [cited 2020 Sep 4]. Available from: <https://bestpractice.bmj.com/topics/en-us/3000168/prognosis>.