



## The Novel Corona Virus

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### ABSTRACT

The novel Corona virus 2019 (covid-19) is an infectious disease caused by severe acute respiratory syndrome Corona virus 2 ( SARS-COV-2).It was first originated in Wuhan, Hubei province, China in December 2019.Up to May 21 ,2020 about more than 5.23 million cases have been confirmed in which more than 3,38,000 people died all over the world. This Novel was provisionally named 2019-nCoV, now SARS-CoV-2 according to the ICT (International Committee on Taxonomy of Viruses). Since its discovery, the virus has spread globally, causing thousands of deaths and having enormous impact on our health systems and economies. Currently there is no definite treatment for COVID-19 although some promising drugs are administered in different places like Hydroxychloroquine an antimalarial drug and some other drugs used for symptomatic relief in corona virus. Hence diagnosis can be done based on symptoms and confirmed using RT-PCR testing. This review provides scientific information for better understanding of Novel disease.

**Keywords:** Covid-19, SARS-COV-2, Hydroxychloroquine, RT-PCR Testing

### INTRODUCTION

**C**ORONA VIRUS is a family of virus that can cause common cold, SARS, MERS. In 2019, a new Corona virus was identified which is known as SARS-COV-2<sup>1</sup>. WHO announced the epidemic disease caused by SARS COV-2 as coronavirus disease 2019 (COVID 19).The Most Likely Ecological Reservoirs for SARS-COV-2 are bats, but it is believed that the virus jumped the species barriers to humans from another intermediate animal host. This intermediate animal host could be a domestic food animal, a wild animal, or a domesticated wild animal which has not yet been identified<sup>2</sup>.Hence the name the novel Corona virus reflects its genetic relationship to the original SARS-COV that caused an outbreak in in 2002-2003<sup>3</sup>.

Early reports from china and Italy indicated that SARS-COV-2 causes illness of varying degrees, with female and children being under represented among cases, especially among severe and fatal cases. It is unclear whether this is because females and children are less likely to be infected by SARS-COV-2<sup>4</sup>. The outbreak was declared a public health emergency of International concern on 30 January 2020.

Currently the SARS COV-2 was found to be a novel positive sense RNA virus which belongs to the family Corona viridae. WHO Chief Tedros Adhanom Ghebreyesus declared the official name for new coronavirus disease is COVID-19. This is the third coronavirus pneumonia in the past 20years around the world. From the below Fig 1<sup>32</sup>.



**Figure 1:** The picture shows that the Further Research is going about the novel corona virus<sup>32</sup>.

### Mode of Transmission

Corona virus mainly spreads from one person to another person, i.e through small droplets which are produced by coughing ,sneezing and talking .The droplets mainly falls on the ground or on the surface of the materials whereas they do not spread through long distances in air. Some transmissions occur when the people touch the contaminated surface in which the virus has been exposed and by touching their face with that hands. Hence spread is possible before symptoms appear i.e from asymptomatic persons.one summary of available studies estimated the number of those infected who are asymptomatic to be 40%. For this reason, the lifespan of viruses on the surface materials is stated in the table 1.1. Hence the mode of transmission is described from the below Fig 2.

Table 1.1<sup>8</sup>

Surface Material	Lifespan of Virus
Copper	Four hours
Cardboard	One day
Plastic	Three days
Stainless steel	Three days

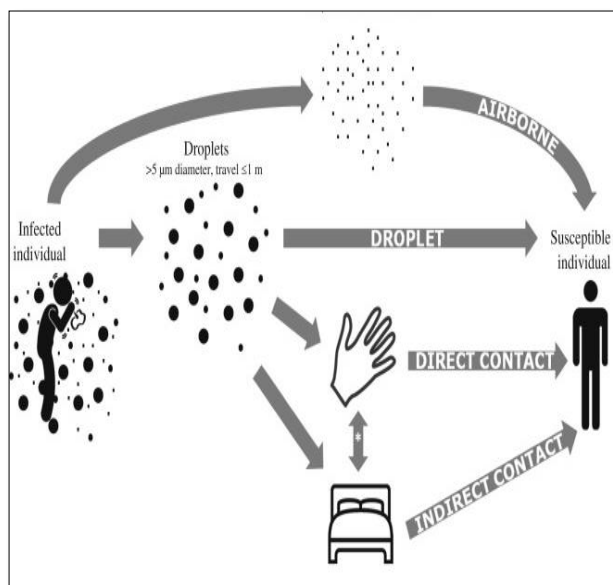


Figure 2: Diagram explains the mode of transmission of covid-19<sup>9</sup>

Though the virus survives on environmental surfaces for varied period of time, it gets easily inactivated by disinfectants. Disinfectants or bleach are not a treatment for COVID-19 causes health problems when they are used for internal purpose.

The Main Transmission of COVID-19 is through sputum and saliva.

**Epidemiology**

Though the origin of COVID-19 was china, it is currently reflect that the outbreak of covid-19 in Wuhan is associated with wild animals. Hence the Chinese government had initiated a level-1 public health response to prevent the spread of the disease on 26 January 2020<sup>9</sup>.

On 3rd March 2020 the SARS-COV-2 has resulted in 80,270 Laboratory and clinical confirmed cases in the mainland of china and 2981 patient death. Globally COVID-19 has been reported in more than five million confirmed cases. At the end of 2019 cases have been reported in all continents, except for Antarctica. In the United states COVID-19 has been reported in all 50 states, Washington DC, and at least four territories<sup>10</sup>. We know that over 95% of deaths occurred in those older than 60 years .More than 50% of all deaths were people aged 80 years or older .Hence the people suffered with covid-19 were discussed in the below MAP A. We also know from reports that 8 out of 10 deaths are occurring in individuals

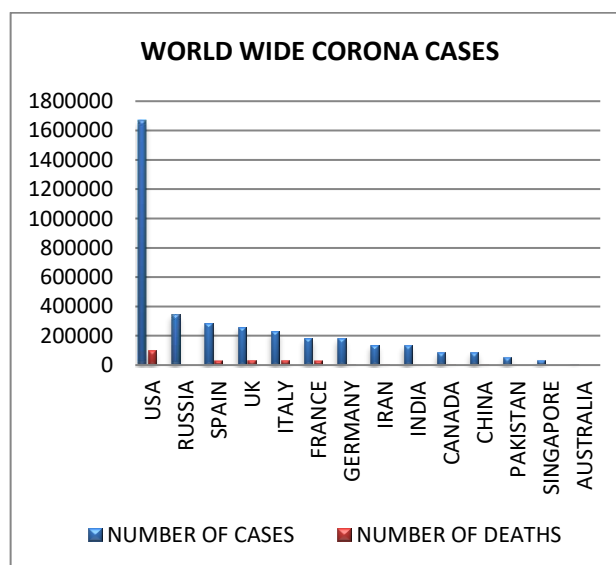
with at least one underlying disease including Cardiovascular diseases, Hypertension and Diabetes. But age is not the only risk for severe disease 10 to 15% of people under 50 have moderate to severe infection. Severe cases of the diseases have been seen in people in their teens or twenties.

We have mentioned the list of some countries which have been affected by the novel coronavirus along with the greater number of cases and deaths in the below table 1.2 and it is plotted in the below GRAPH A.

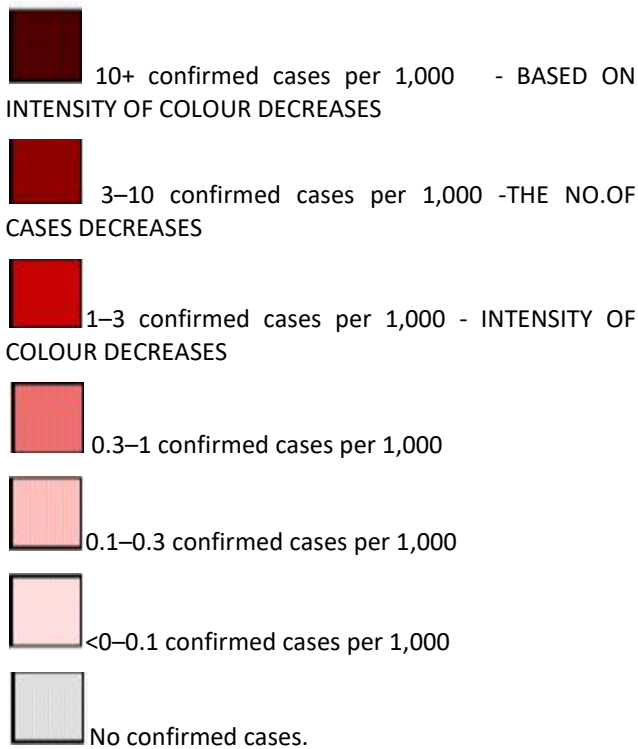
TABLE 1.2<sup>5</sup>

Countries	Number of cases	Number of deaths
USA	1,666,829	98,683
RUSSIA	3,44,481	3,541
SPAIN	2,82,370	28,678
UK	2,57,154	36,675
ITALY	2,29,327	32,735
FRANCE	1,82,469	28,332
GERMANY	1,79,986	8,366
IRAN	1,35,701	7,417
INDIA	1,32,755	3,899
CANADA	83,621	6,355
CHINA	82,974	4,634
PAKISTAN	54,601	1,133
SINGAPORE	31,616	23
AUSTRALIA	7,114	102

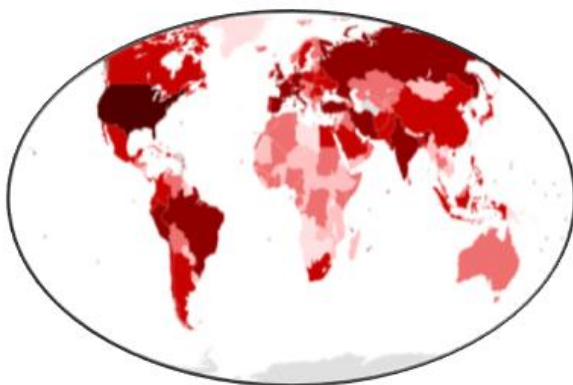
GRAPH A) Graph of the above mentioned data<sup>5</sup>



Map of confirmed cases as per capita of 23 May 2020 are described below



MAP A) MAP OF CONFIRMED CASES<sup>10</sup>



**Signs and Symptoms**

From the below TABLE 1.3<sup>11</sup> Symptoms and its Range are discussed

TABLE 1.3<sup>11</sup>

Symptoms	Range
Fever	Approximately 84%
Cough	60-80%
Loss of appetite	42-83%
Fatigue	40-73%
Breath shortness	30-41%
Cough with sputum	21%-37%
Muscle fatigue	13-34%

COVID-19 effects different people in different ways. Fever occurs in majority of cases as a major symptom. From a study , it shows that approximately more than 40% of people had fever when they are hospitalized, while

approximately 90% of the cases are having fever after hospitalization. Even though most of the patients show fever as the major symptom but based on the immunity of the patient condition some may not show the fever as a symptom but the person is infected with the disease. Some of the symptoms are include in the above table 1.3. Other symptoms include diarrhea, vomiting, runny nose, sore throat and headache have been observed in some cases. Hence chest pain and heart palpitations may also manifest when phlegm is present were observed in china.

Other symptoms like loss of smell and taste have been observed in majority of cases in South Korea.

The patients after infected with covid-19 shows their symptoms after certain period of time which is called as incubation period. The average incubation period for covid-19 cases are 3-9 days whereas some are 1-12 days whereas the time has been exceeding in some cases. Hence, they are detailed from the below Fig 3 and 4.

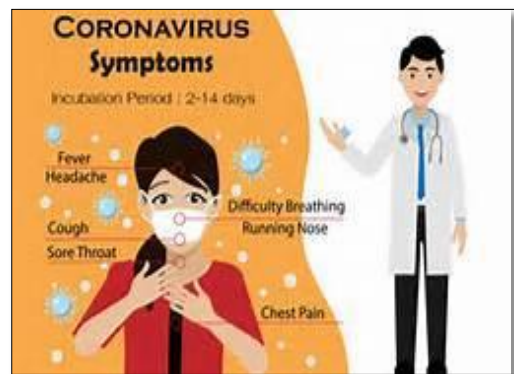


Figure 3: Diagram<sup>11</sup> General signs and symptoms

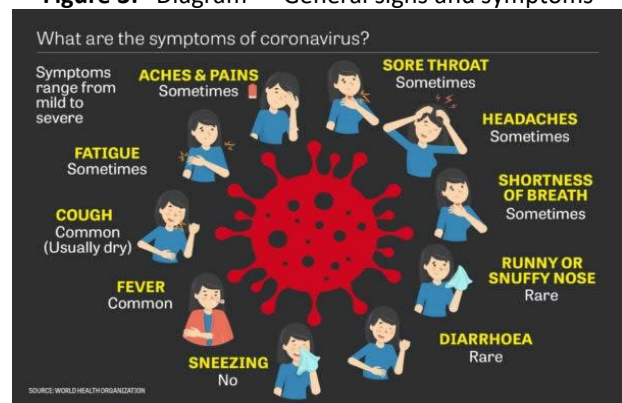


Figure 4: Diagram<sup>15</sup> signs and symptoms in further cases.

Some infected people have no symptoms known as asymptomatic persons or Pre-symptomatic carriers. As at April 6<sup>th</sup> the estimation of asymptomatic persons range widely from 5%-80%<sup>14</sup>.

**Complications**

A striking feature of covid-19 is the rapid progression of respiratory failure soon after the onset of dyspnea and hypoxemia. Patients with severe covid-19 commonly meet the criteria for the acute respiratory distress syndrome (ARDS). Which is defined as the acute onset of bilateral infiltrates, severe hypoxemia and lung edema

that is not fully exposed by cardiac failure or fluid overload. The majority of patients with severe covid-19 has lymphopenia and some have the disorders of central and peripheral nervous system. Severe covid-19 may also lead to acute cardiac, kidney, and liver injury, in addition to cardiac arrhythmias, rhabdomyolysis, coagulopathy, and shock. These organ failures may be associated with a cytokine release syndrome characterized by high fevers, thrombocytopenia, hyper ferritinemia, and elevation of other inflammatory markers<sup>12</sup>. Certain Cardiovascular complications such as cardiac failure, bradycardia cardiac inflammations and blood clot<sup>15</sup>. Approximately 25–45% of cases with covid-19 have elevated liver enzymes which leads to liver injuries<sup>16</sup>. Neurological problems also arise in certain conditions such as seizures, brain strokes, brain encephalitis, Guillain-Barre syndrome which causes loss of motor functions. Whereas children may develop pediatric multi system inflammatory syndrome which is fatal. Data from china shows the patients with covid-19 having acute kidney injury in hospitalized patients ranges from 5 to 23%. As reports from china shoes high incidence of proteinuria and hematuria by dipstick testing, findings that were seen in this patient<sup>20</sup>.

### Pathophysiology

Lungs are the major affected organs in covid-19 because the virus which mainly accesses the enzyme Angiotensin converting enzyme 2 (ACE2). Which is abundant in type 2 alveolar cells hence these are the host cells in which the virus depends. Upon increasing the alveolar disease caused due to the virus mainly causes the respiratory disease and leads to the death of the patient. Hence Respiratory failure may cause due to the affect produced by the virus in the brain stem whereas the respiratory center relays. The covid-19 has been detected the cerebrospinal fluid of the CNS Whereas the exact mechanism of the invasion of virus is not clear it may first involve invasion of peripheral nerves in the brain which contains low levels of ACE2. Whereas ACE2 is abundantly expressed in the glandular cells of gastric, duodenal and rectal epithelium as well as endothelial cells and enterocytes of the small intestine hence it affects the gastrointestinal organs<sup>21</sup>. Certain cardiovascular complications which occur due to the virus such as cardiac inflammations occurred may also be related to ACE2 receptors in the heart. Whereas ACE2 receptors which are present in the heart mainly involved in heart function. In general the inhaled virus SARS-COV-2 likely binds to epithelial cells in the nasal cavity and start replicating. The life cycle of the virus with the host consists of the steps such as attachment, penetration, biosynthesis, maturation and release. Whereas the virus is bound to the ACE2 Hence ACE2 is abundant in lung, heart, ileum, kidney and bladder. Hence patients with severe diseases were reported to have increase plasma concentration of proinflammatory cytokine, including IL-6, IL-10, G-CSF, MCP1, Macrophage inflammatory protein and tumor necrosis factor. Exhaustion of T- cells could lead to the progression of the disease<sup>22, 23</sup>. Hence the

elevated d-dimer and fibrinogen levels which were observed in severe disease causes thrombosis and pulmonary embolism. Severe disease causes endothelial injury whereas the microvascular permeability as a result of the endothelial injury can facilitate viral invasion, though angiotensin converting enzyme 2 (ACE2) a putative receptor for SARS-COV-2 is expressed in kidneys may be a direct target of the virus. In some studies, the viral, RNA has been recovered in urine. Histopathological analysis of Kidney tissue from patients with COVID-19 has been limited to autopsies<sup>24</sup>. The pathophysiology is discussed from the below Fig 5.

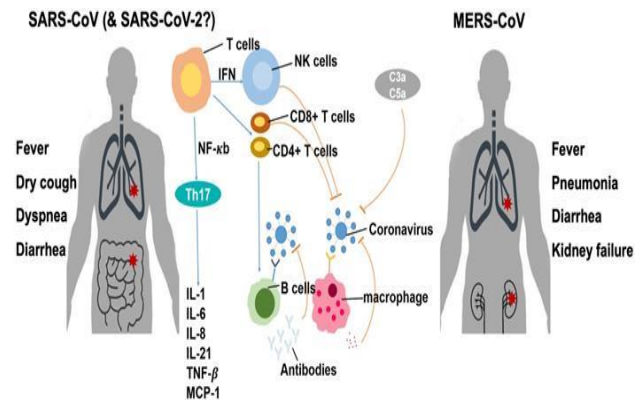


Figure 5: pathophysiology<sup>23</sup>

### Diagnosis

Delay of the diagnosis may cause the disease progression rate higher. To minimize the death toll, it is important to diagnose the patient as early as possible with multiple analysis. CT Scan, antibody detection and biochemical parameter analysis can be possible way to diagnose COVID-19 early. As we know that proper diagnosis can lead to proper treatment. As this corona virus shows flue like symptoms, it is indispensable to diagnose properly. RT-PCR is a widely used technique for the diagnosis of COVID-19. Moreover, CT Scan is also used to diagnose the disease. Although it shows some advantages as well as it has some disadvantages in their methods<sup>25</sup>.

Now-a-days the standard diagnostic technique is the RT-PCR testing which means real time reverse transcription polymerase chain reaction technique which mainly targets the RNA-dependent RNA Polymerase. Spike and nucleocapsid genes of SARS-COV-2. The computerized tomographic chest scan is usually abnormal even in those with no symptoms or mild disease. It is only helpful for diagnosis in individuals where there is a high suspicion of infection based on symptoms and risk factors; however, many of the guidelines do not recommend using CT imaging for routine screening. RT-PCR test is typically done with the respiratory samples obtained by a nasopharyngeal swab<sup>26</sup>. Results are generally available within a few hours to two days. Even though Blood tests can be used, but these require two blood samples which takes two weeks apart. Hence some countries develop the independent polymerase chain reactions based on the genetic sequence obtained from the strain of the

corona virus provided by some Chinese scientists. Though antibody tests can be used to diagnose diseases, in the case of covid-19, they are not very helpful for diagnoses.<sup>27</sup>

Chest radiography should be performed and commonly shows bilateral consolidations or ground-glass opacities. Soon after symptom onset, the sensitivity of PCR testing of nasopharyngeal swabs appears to be high, but false negatives may occur, with uncertain frequency. If a person is suspected to have Covid-19 but has negative testing of a nasopharyngeal swab, repeat testing is prudent, especially if that person lives in an area with active community transmission. However, laboratories are increasingly able to test sputum and lower respiratory tract specimens. The Food and Drug Administration (FDA) recently recognized on-site self-collection of an anterior nares specimen as an acceptable method of collection; this option may facilitate home-based testing and reduce exposures for health care workers. Chest radiography is usually the initial imaging method. Some centers also use lung ultrasonography<sup>28</sup>.

### Treatment

Several therapeutic agents have been evaluated for the treatment of Covid-19, but none have yet been shown to be efficacious. Remdesivir (GS-5734), an inhibitor of the viral RNA-dependent, RNA polymerase with inhibitory activity against SARS-CoV and the Middle East respiratory syndrome (MERS-CoV), was identified early as a promising therapeutic candidate for Covid-19 because of its ability to inhibit SARS-CoV-2 *in vitro*. In addition, in nonhuman primate studies, Remdesivir initiated 12 hours after inoculation with MERS-CoV reduced lung virus levels and lung damage. The Food and Drug Administration has made Remdesivir available under an emergency-use authorization for the treatment of adults and children with severe Covid-19 disease. Our preliminary report is intended to help inform clinicians considering the use of Remdesivir<sup>29</sup>. Hydroxychloroquine has been widely administered to patients with Covid-19 without robust evidence supporting its use. Aminoquinolines like Chloroquine and Hydroxychloroquine are widely used in the treatment of malaria and rheumatic diseases, and they have been suggested as effective treatments for coronavirus disease 2019 (Covid-19) on the grounds of both anti-inflammatory and antiviral effects. In the United States, the Food and Drug Administration issued an Emergency Use Authorization on March 30, 2020, that allowed the use of these drugs in patients with Covid-19 who were not enrolled in clinical trials<sup>30</sup>. Lopinavir-ritonavir drugs in 1:1 ratio is also used in the treatment of covid-19. Lopinavir-ritonavir treatment was stopped early in 13 patients (13.8%) because of adverse events<sup>31</sup>. Nitazoxanide has been recommended for further *in vivo* study after demonstrating low concentration inhibition of SARS-CoV-2.

Oseltamivir does not inhibit SARS-CoV-2 *in vitro* and has no known role in COVID-19 treatment<sup>32</sup>. Plasma therapy is also used. Increasing the immunity of the individual in order to fight against the covid-19 has major impact<sup>33</sup>. The Strategies which are applied in the treatment of SARS have been used in the treatment of covid-19.

Currently there are many studies on SARS-COV-2 and COVID-19. More research findings are needed to help to limit spread of the disease and invent the vaccine and specific drugs. Hence the condition of the present situation is mentioned from the below Fig 6.



Figure 6:<sup>32</sup> the condition of covid patients in hospitals

### Prevention

Protect yourself and others around you by knowing the facts and taking appropriate precautions.

#### ➤ WASHING HANDS

Wash your hands with soap and running water, Frequently CETR clean them by using alcohol-based hand rub or soap and water.

Wash your hands when after coughing or sneezing , caring for the sick, before, during and after you prepare food, before eating, after toilet use, hands are visibly dirty, after handling animals.

- Throw the tissue into closed bin immediately after use.
- Avoid close contact when you are experiencing cough and fever.
- Avoid spitting in public.
- Avoid touching the eyes, nose, and mouth with unwashed hands.
- Keep a distance at least 6feet (1.8m) away from other people there by social distance avoid the exposure to the disease.
- If you fell sick (suffering with fever cough and breathing problems for more than a week) call the help line.

Hence the precautions are mentioned from the below Fig 7.

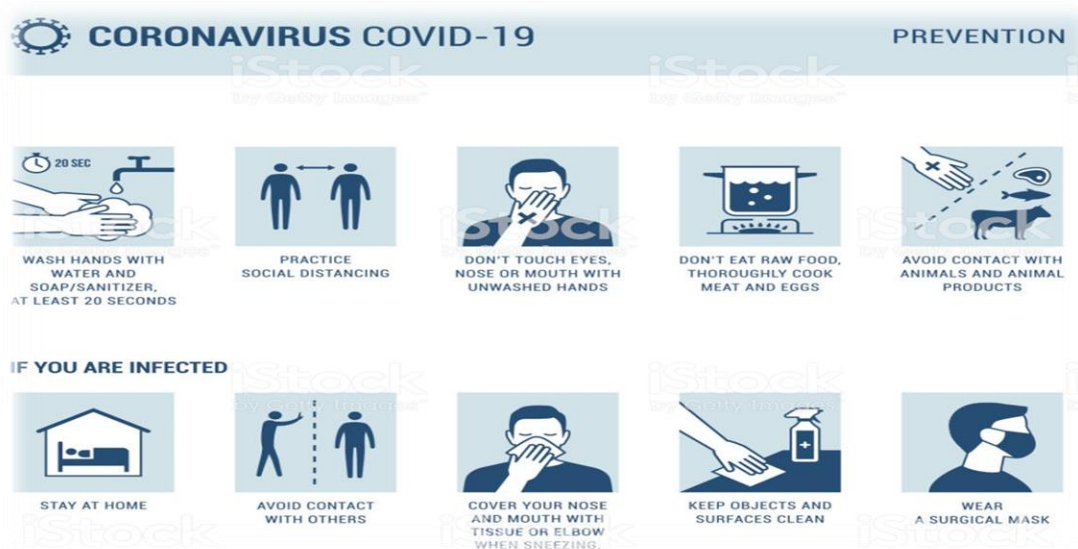


Figure 7: Preventive measures to be followed<sup>14</sup>

## CONCLUSION

In today's scenario the spread of COVID-19 virus is practically uncontrollable, a global outbreak is a worst-case scenario and devastating the global economy. The performing arts and cultural heritage, politics, education and health sectors has been profoundly affected by the pandemic. Certain preventive measures must be followed to avoid the attack of COVID-19. People must increase their immunity to fight against this virus. In emergency situations mechanical ventilation is used for the COVID-19 patients. Hence countries to prepare plans to prevent, COVID-19 is not life threatening in all the cases since many of them are recovered from COVID-19. Researchers continue working on more effective treatments and many vaccine candidates are in development or in testing phases.

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