COVID-19: The Virus Which Made Us Discern Humanity

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Abstract

India, and the world, is going through an unparalleled period of worldwide epidemic, lockdown and struggle against the novel corona virus. This viral outbreak is a new frontier and the ways to tackle it is largely unknown, and unpracticed. India with its gigantic population and operational challenges, is trying to contain the spread of COVID-19 and is largely being successful in this attempt. Also, the nationwide lockdown has been instrumental in restricting the spread of the novel coronavirus.

The aim of this review is to understand the etiology, pathogenesis and presentation of this disease and to learn the risk factor associated with it. Also, to comprehend the proper precautions to be taken by the healthcare providers and public to reduce and curb down the ill effects caused by this virus. I hope this review helps us understand the peril caused by this virus and imply the cautionary routine in our lives.

Keywords: Corona, COVID, Novel, Virus, Pandemic, Dyspnoea, ACE Inhibitors, Glycoprotein

1. INTRODUCTION

The inchoate corona virus causing a pandemic and global crisis is an enveloped RNA virus. These are found in mammals including humans, animals and birds. They cause respiratory, enteric, hepatic, and neurologic diseases. [1,2] On January 8, 2020, a novel coronavirus was officially announced as the causative pathogen of COVID-19 by the Chinese Center for Disease Control and Prevention.[3] This virus which originated in Wuhan travelled the world, infected lakhs of people causing a pandemic. The World Health Organization declared that the menaces caused by this novel coronavirus has created panic and havoc and thus causing a major public health emergency. As seen worldwide, India has also been affected by the aftermath of this universal fallout. This highly contagious viral infection has resulted in putting forth the healthcare providers including the dentists at a higher risk. The risk of cross infection between the dentist and patient can be attributed to the specific arrangement of a dental set up. The dentists are directly exposed to the aerosols which may carry the viral load.

The risk group includes individuals with compromised immunity as well as extreme ages. The health care workers should be well aware of the risk factors, etiology, preventive measures, clinical features and the probable treatment protocol of this viral infection.[4]

This review focuses on understanding the characteristic presentation of the novel Corona virus and the increased risk of infection to healthcare workers and dentists dealing with it.

2. ABOUT THE VIRUS

COVID-19 is caused by SARS-CoV-2. Coronaviruses (CoVs) are the largest group of viruses belonging to the *Nidovirales* order including *Coronaviridae, Arteriviridae, and Roniviridae* families.[5] The *Nidovirales* order viruses are enveloped, non-segmented positive-sense RNA viruses.[5]

These are medium sized RNA viruses which has a characteristic appearance in electron micrographs.[6] (Figure 1) The single stranded

RNA [7] codes for a large polyprotein and it is known to be the largest known viral RNA. The nucleic acid is about 30 kb long, positive in sense, single stranded and polyadenylated.[6]

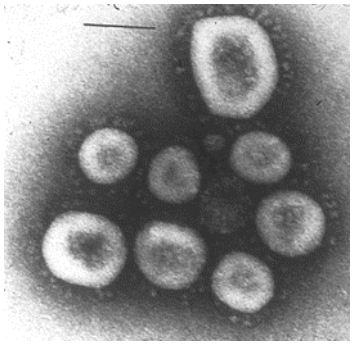


Figure 1. Electron microscopic picture of Coronavirus[5]

The coronavirus is round to elliptical shaped virus. These are of 60-140 nm approximately.[4] It has an outer envelope of S proteins known as 'Spike proteins.' (Figure 2) This carries a positive charge. The human cell is negatively thus attracting the virus to conjugate. It conjugates with the human cell, binds to its DNA and replicate leading to an increase in the viral load and sustainability.

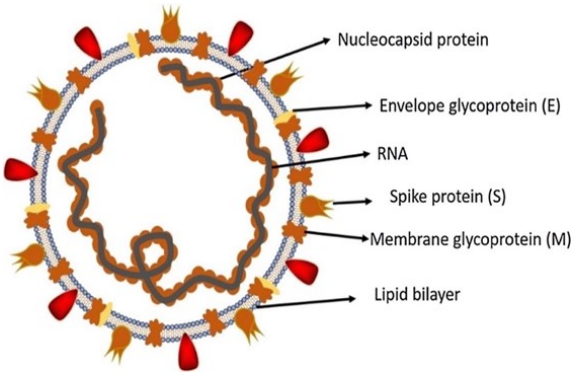


Figure 2. Structure of Corona Virus causing COVID-19[8]

3. TRANSMISSION CYCLE OF SARS-COV 2

The family of coronaviridae virus have originated from bats. From bats they move to other mammalian hosts like Himalayan palm civet in SARS-CoV and Dromedary camels in MERS-CoV. These mammals act as intermediate hosts. From the intermediate hosts it gets transmitted to humans as these mammals are consumed as a dietary source in many countries.[4]

SARS-CoV-2 also appears to arise from bats like the other group of coronaviruses. It then gets transmitted to humans due to consumption of bats as food. Bats are considered to be the primary host making the humans secondary hosts. From humans as secondary hosts, the virus gets transmitted to other humans by direct contact (droplet) infection. This infection also spreads through coughing and sneezing as like the other cold and flu. The spread is directly proportional to the number of aerosols present especially in closed spaces. [4] The healthcare professionals and family members are at increased risk. (Figure 3)

Though the route of transmission is mainly direct contact through droplet infection, Zhang et al also found the virus in stool and blood of patients making these as possible routes of transmission. [9]

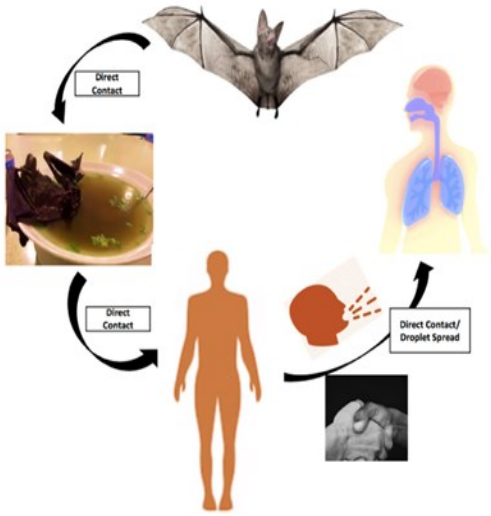


Figure 3. Schematic representation of the step by step transmission of COVID-19

(Source: Pictures taken from Google images)

4. INCUBATION PERIOD

The estimated average incubation period of COVID-19 is 5 to 6 days on an average. Few evidences have showed the incubation period as long as 14 days, therefore a quarantine of 14 days is being adapted in hospitals for doctors and exposed individuals.[10]

5. CLINICAL PRESENTATION

The underprivileged and poor populace are generally prejudiced to infectious diseases which can be attributed to their malnourishment and subsequent reduction in immunity. The recent outbreak of Covid-19 impact individuals belonging to the higher socioeconomic group as well, hence questioning the immune status of these individuals.

The three major clinical manifestations of COVID-19 includes Fever (>104 degrees F), Cough (dry) and Dyspnoea [11,12,13]. Few other symptoms like sore throat, malaise, nausea, vomiting and headache. This virus is seen to affect extremes of age, people of first and more than 5th-6th decade. Those individuals with immunocompromised state are at higher risk. These disorders include, diabetes, hypertension, chronic obstructive pulmonary disease and any cardiovascular/ cerebrovascular pathology.

A report by the Chinese CDC categorized the clinical manifestation of this infection according to severity:[14]

Mild disease:	No to mild pneumonia.
Severe disease:	Dyspnea, increased respiratory rate and reduced blood oxygen saturation within 24 to 48 hours.
Critical disease:	Respiratory failure, septic shock, and/or multiple organ dysfunction syndrome.

The quantifiable continuum of COVID-19 diverges from asymptomatic, paucisymptomatic to severely symptomatic. These manifestations may lead to respiratory failure requiring a ventilator to more severe forms leading to septic shock and eventually multiple organ dysfunction syndrome (MODS).[4]

6. PATHOGENESIS

Similar to the SARS-CoV infection [15], the pathogenesis of COVID-19 starts with the spike proteins of the virion attaching to the Angiotensin Converting Enzyme 2 (ACE 2) receptor which is present in the lower respiratory tract of humans. [16] Zhou et al isolated the virus from the broncho alveolar lavage fluid (BALF) of a COVID-19 patient confirming the same. [17] Both the cross species and human to human transmission of Covid-19 is controlled by ACE 2 receptors. [18] A detailed pathophysiology of COVID 19 has been illustrated in a schematic representation below. (Figure 4)

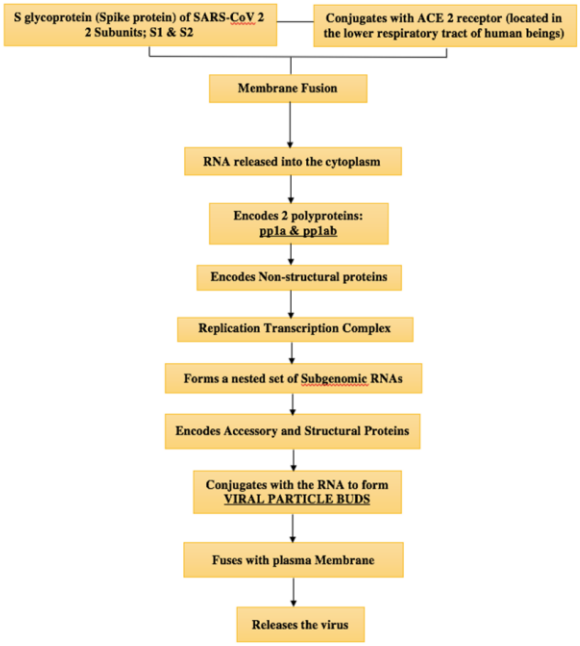


Figure 4. A schematic representation of Pathophysiology of COVID 19 [19]

7. ROLE OF HEALTHCARE WORKERS

Early in the year, COVID-19 was put in the category of group B infectious diseases, by National Health Commission of China which included highly contagious infections like SARS and avian influenza. Even though it was categorized under group B category, the infection control protocols which applied remained same as group A infections which included Cholera and plague. [10] As healthcare providers, we have whole and sole responsibility on our shoulders to help in reducing the viral load of this microorganism. We along with cooperation from the public should strive towards curbing the infection by increasing awareness about the spread of Corona infection and hence the associated risks and hazards. Since this virus is extremely contagious both the healthcare workers

and the public should take proper preventive measures. Due to the setup of a dental office, dentists have to take special precautions while working on a patient. The chance of nosocomial infection is more.[10] The sharp dental instruments can get contaminated and can spread infection due to direct contact or puncture. [20] Sometimes the patients are not even aware of the underlying infection, therefore only emergency cases should be taken up. More weightage should be given on disinfection of all the surfaces of a dental clinic/hospital.

A proper protocol should be followed which is enumerated below:

For all the healthcare workers:

- Treat all patients as infected
- Wear proper Personal Protective Equipment while seeing a patient (N-95 masks/ FFP2 masks, gloves, gowns, goggles, face shields, etc.)
- Change the mask every 4-6 hours
- Maintain 1-meter distance while talking to a patient
- Measure and record the temperature of all the working and non-working staff
- Maintain proper infection control protocols

Special measures to be taken by the dentists:

- Treat only emergency cases
- Take appropriate measure to prevent cross infection (nosocomial infection)
- Pre-treatment with an antimicrobial mouth rinse
- Use 4 handed technique while working on a patient
- Use of saliva ejectors should be a must
- Aerosol generating equipment's like three-way syringe should be used minimally
- Procedures inducing gag reflex and cough should be avoided like putting intraoral cameras; instead a panoramic view OPG should be used

For the public:

- Social distancing (at least maintain 1.5 meters distance from one another)
- Avoid public gathering
- Maintain Proper hand hygiene, wear face mask whenever you go outside
- Do not touch your face, eyes and nose without washing hands
- Eat healthy food (include more vegetables and protein)

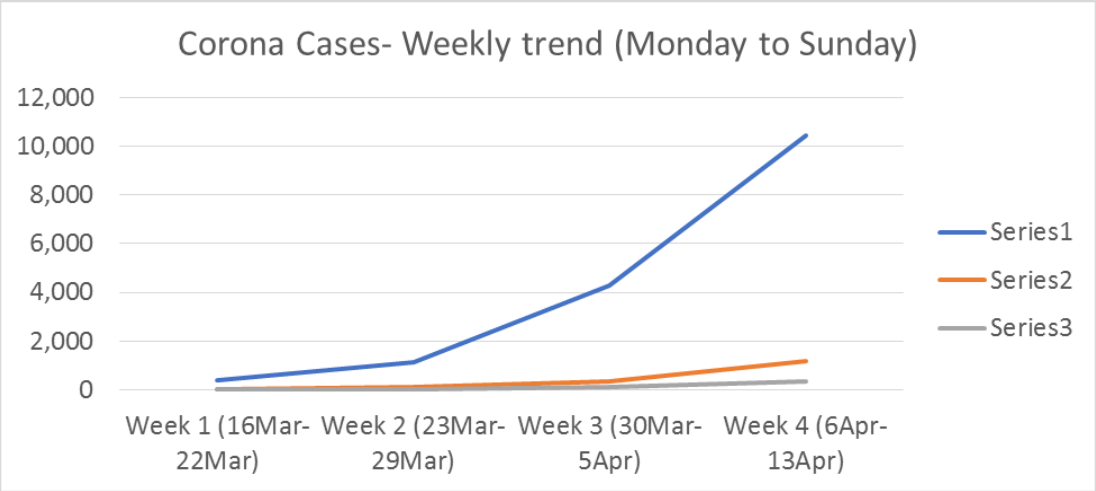
8. STATISTICS OF COVID 19 IN INDIA

The Covid-19 cases are growing exponentially showing a linear pattern. Here is a schematic representation of the number of COVID 19 cases in India in one-month duration. (Table 1 & Graph 1) [21]

Table 1. Weekly data of the Covid-19 cases

S.No.	Duration	Number of new cases (Series 1)	Number of recovered cases (Series 2)	Number of Deceased (Series 3)
1.	Week 1 (16Mar-22Mar)	403	23	7
2.	Week 2 (23Mar-29Mar)	1,139	102	27
3.	Week 3 (30Mar-5Apr)	4,289	329	121
4.	Week 4 (6Apr-13Apr)	10,455	1,198	361

Graph 1. Weekly data of the Covid-19 cases



9. CONCLUSION

We must be constantly conscious of infectious threats that may challenge the current infection control regimen. Social distancing is the key to control this contagious disease. Proper precautions should be taken by anyone who comes in close contact with this virus. Corona virus appears to be sensitive to heat and ultraviolet rays. These viruses can also be inactivated by 75% alcohol (ethanol), disinfectant with chlorine, chloroform and peroxyacetic acid.[4] In case of contact all the surfaces should be disinfected by the above-mentioned disinfectants thoroughly. The general public plays an important role in stopping the spread and containing the havoc caused by this virus. The collective effort of public and the frontline workers can only help in bringing the nation and the world back on track.

Source of Funding: Self-funded

Conflict of Interests: Nil

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