

**Emerging Challenges for Dental Practitioners in Coronavirus (COVID-19) Outbreak- A Review**

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**Abstract**

A novel Coronavirus strain emerging from the Wuhan city, Hubei province of China was shown to cause a disease with mild to severe symptoms including fatal pneumonia. This is a highly infectious strain of Coronavirus family and thus has rapidly spread from Wuhan to other parts of China and now covers almost all the countries of the world. Novel Coronavirus (nCoV) belongs to the same group of Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory

Syndrome (SARS-CoV), but it is more closely related to SARS-CoV. The pandemic of nCoV-19 is a serious threat and has become a major concern for public health. World Health Organisation (WHO) recognised this outbreak as a public health emergency of international concern on 30 January 2020. To prevent this pandemic from further spreading, adequate infection control measures are to be adopted. Due to risk of cross infection in dental settings, we need to follow proper infection control protocols. This article provides essential knowledge regarding COVID-

19, its spread in dental settings and recommended protocols for dental practitioners.

**Keywords:** Coronavirus, COVID-19, transmission, prevention, dental practice.

### Introduction

The 21st century is the age of globalization, where crisis in one part of the world affects all. Today, we face a similar crisis in the form of the COVID-19 pandemic. The highly unpredictable and mysterious nature of this viral infection has put each and every human being at risk of contracting and/or transmitting this infection. Amongst these, the individuals at the highest risk of getting affected are human race's first line of defence, health care professionals.

Although Dentist are not at the fore front of our batter against this disease, both the risk and the fear of contracting it are high. Dental professionals come in direct contact with the saliva, aerosols and blood during their everyday practice, and under the current circumstances improper knowledge and awareness about COVID-19 can put lives in danger. In order to prevent it, strict and effective prevention and infection control protocols should be followed. This article aims at providing a basic information regarding Coronavirus and also prevention and control of COVID-19 among dental practitioners.

### Coronavirus- What Do We Know...?

Coronavirus, a member of Coronaviridae family, are the largest positive strand RNA virus of about 100nm diameter by which humans and animals are both affected, with symptoms varying from respiratory to enteric diseases<sup>1,2</sup>. They are named so because of the spikes sticking out of their surface giving it a 'crown' like appearance meaning 'corona'. There are basically 4 genera of Coronavirus<sup>3,4</sup> -  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ , in which  $\alpha$  and  $\beta$  coronavirus mainly infects the respiratory,

gastrointestinal and CNS of humans and mammals whereas,  $\gamma$  and  $\delta$  mainly infect the birds. Several strains of Coronaviruses are known to cause respiratory infections in humans ranging from common cold to more severe diseases such as MERS (Middle East Respiratory syndrome) and SARS (Severe Acute Respiratory Syndrome).

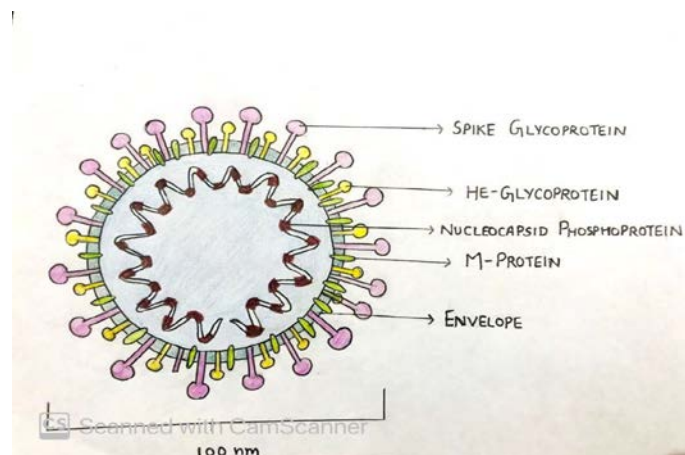


Fig. 1: Structure of Coronavirus

### Coronavirus Archives

Diseases caused by Coronavirus can be traced throughout our history with the first identified case dating back in 1960s where Coronavirus was responsible for a substantial proportion of upper respiratory tract infection in children<sup>5</sup>. However, the pathogenicity of Coronavirus was considered low, until in 2002 when SARS as a Coronavirus originated from Southern China and spread throughout the world with quantifiable speed affecting 8,098 people with 774 deaths<sup>6-9</sup>.

Similarly, MERS (Middle East Respiratory Syndrome), a viral disease caused by novel Coronavirus (MERS-CoV) was identified in Saudi Arabia in 2012<sup>10</sup>, source of which was believed to be Dromedary camels and infected 2,442 persons and killed 842 person worldwide<sup>11</sup>.

Presently, history has repeated itself, with COVID-19 emerging as a pandemic and a huge challenge for humanity. In December 2019, a suspiciously large number of pneumonia cases were reported in Wuhan, China. The

epicenter of this outbreak were the wet markets of Wuhan, from where the disease was transmitted to China's population and other parts of world<sup>12</sup>. By 7th January 2020, an unknown virus was isolated which was finally identified as a novel Coronavirus (2019-nCoV), the seventh member of the family of Coronaviruses that infect humans<sup>13</sup>. On 11th February 2020, WHO named the novel viral pneumonia as Corona Virus Disease (COVID-19) and officially as Severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2)<sup>14</sup>. COVID-19 has since become a pandemic and was declared as Public Health Emergency of International concern. By 28 April it has been recognised in 212 countries, with total of 2,314,621 confirmed cases and 157,847 deaths<sup>14</sup>.

### Decoding Covid - 19

COVID-19 is a disease that causes respiratory tract infections affecting both the upper (nose and throat) and lower respiratory tracts (windpipe and lungs)<sup>15</sup>. Similar to SARS and MERS, COVID-19 is also a zoonotic disease. Paramount research regarding this pandemic has been surging across the world, in an attempt to identify and understand the novel virus. Wuhan Institute of Virology published a detailed paper showing that full length genome are almost identical and share 79.6% sequence identical to SARS-CoV. Furthermore, they showed that COVID-19 is 96% identical at the whole-genome level to a bat Coronavirus<sup>16</sup>. Another study published on 26 March 2020, stated that genetic sequence of Corona virus in Pangolins are between 88.5% and 92.4% similar to COVID-19<sup>17</sup>. Even with several break-through discoveries been made, the cause of COVID-19 is still unknown. For a better understanding, one must have appropriate knowledge about its routes of transmission, sign & symptoms and adequate diagnostic approach.

### Transmission of Covid-19

Several speculations have been made regarding the transmission of nCoV, with some light being shed over its most probable routes from an infected individual to a healthy individual/community. The Chinese health authorities described the following possible routes of transmission for COVID-19<sup>18</sup> -

- a) Contact transmission, b) droplet transmission, c) Aerosol transmission

### Clinical Manifestation

The incubation period of COVID-19 is about 1-14 days, mostly around 3-7 days with prominent manifestations being fever, fatigue and dry cough which are mid initially with no pneumonia, and later in severe cases may progress to dyspnea and/or hypoxemia<sup>18,19</sup>. Other less common symptoms are nasal congestion, runny nose, sore throat and diarrhoea. Also acute respiratory distress syndrome, septic shock metabolic acidosis, coagulation dysfunction can rapidly progress in severe cases. COVID-19 can be more dangerous and susceptible in older people and people with pre-existing medical conditions like CVS, diabetes, chronic respiratory diseases and cancer.

### Diagnosis<sup>12,20,21</sup> -

- Correct diagnosis of a disease is a key for both, its prevention and transmission. International travels and globalisation have been the culprits behind the world-wide spread of COVID-19. Hence, accurate travel history is the prime element of diagnosis.
- Medical diagnosis based on clinical symptoms have been greatly effective in identifying both the carrier and diseased individuals
- Several laboratory test including Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) to detect positive nucleic acid of SARS-CoV-2 in sputum, throat swabs and secretions of lower

respiratory tract samples are used in recognising the disease among suspected persons.

### How It Can Be Prevented And Treated<sup>14,22</sup>

An ounce of prevention is worth a pound of cure Global collaboration of researcher community to accelerate the COVID-19 pandemic has been vigorous. Prevention of disease transmission has been stressed upon at both individual and community level. Strategies such as social distancing, use of personal protective gear and personal hygiene.

WHO has issued simple measures to insure person safety

- Wash hands with soap and water or apply alcohol based hand rub
- Avoid touching eyes, ears and nose
- Cover nose and mouth when coughing and sneezing with tissue or flexed elbow
- Stay home if sick
- Maintain 1 meter distance from people who are coughing or sneezing

As of now, a definite treatment of for the Management of COVID-19 is under investigation and several potential vaccines and drugs are under trials. Palliative treatment for suspected and mild confirmed cases are underway with self-isolation to contain the disease and for severe cases life supportive therapy is given<sup>18</sup>. Although a definitive antiviral therapy has not been devised, according to the Revised National Clinical Management Guideline for COVID-19, India, and NIH (National Institute of Health Sciences), HYDROXYCHLOROQUINE (Dose- 400 mg for 1 day followed by 200 mg for 4 days) in combination with AZITHROMYCIN (500 mg OD for 5 days)<sup>23</sup> may be considered as an off label indication in patients with severe COVID-19

### Transmission Route of Covid-19 in Dental Clinics/Hospitals

In epidemics of highly infectious diseases such as COVID-19, healthcare workers are at much greater risk of infection than the general population, due to their contact with patient's contaminated body fluids. An understanding of the different routes of viral transmission helps in planning for its prevention. Viruses can be transmitted in dental settings by direct contact and indirect contact.

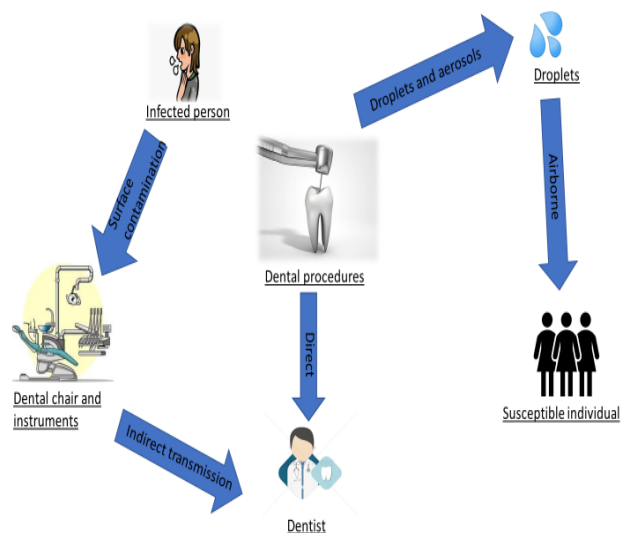


Fig.2: showing transmission of COVID-19 in dental setting

### Direct Transmission<sup>24</sup>

Direct contact transmission occurs when there is physical contact between an infected person and a susceptible person. It can be subcategories into:

- **Contact spread-** dentists have frequent direct contact with the human fluids like blood, saliva etc, patient materials and contaminated dental instruments makes possible route of transmission of virus in dental clinics.
- **Aerosol transmission-** aerosol and droplets from an infected person by coughing and sneezing without mask, and inhalation of that aerosol can transmit virus from infected person to a healthy individual.

➤ **Airborne spread-** high speed handpiece and ultrasonic instruments used in dental procedures make the saliva and blood aerosolise in the surrounding

**Indirect Transmission:** indirect contact transmission occurs when there is no physical contact between an infected person and a susceptible person.

Surface spread- aerosol and droplets on any instrument or surface in the dental settings have the capability to spread infection from one person to the other. Coronavirus can persist on surfaces like glass, metal or plastic<sup>4</sup>. A study showed that virus can persist on copper surface for 4 hours, cardboard- 24 hours and plastic or stainless steel for 2-3 days<sup>15</sup>.

### Prevention & Infection Control by Dental Practitioners

Dental procedures are known to generate maximum amount of droplets and aerosols in their surroundings, which could transmit the virus. Contact precautions by means of personal protective equipment (PPE) are proven to reduce the risk. Accurate information regarding which type of full body PPE and which method of donning or doffing PPE have the least risk of self

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infection for healthcare workers, and training methods to increase compliance with PPE protocols is the need of the hour.

IDA gave a few guidelines to minimise the chance for exposure in dental settings<sup>25</sup>-

- Post a sign showing symptoms at the entrance of dental setup instructing the patient to reschedule the appointment if any of the symptoms are present.
- Detailed travel and health history- reschedule the appointment if your patient has travelled out of India or any place which is COVID-19 affected. Also screen patient for any of the symptom present and reschedule the appointment.

- Ask all your patients for any new onset of respiratory symptom.
- Take temperature reading before starting any dental treatment.
- Take the contact details and address of all the patient treated.
- Install physical barriers to limit close contact with the potentially infected person.
- Personal protective equipment should be appropriate for performing the procedure.

### How to Deal With Patients in Dental Clinics during This Pandemic..?

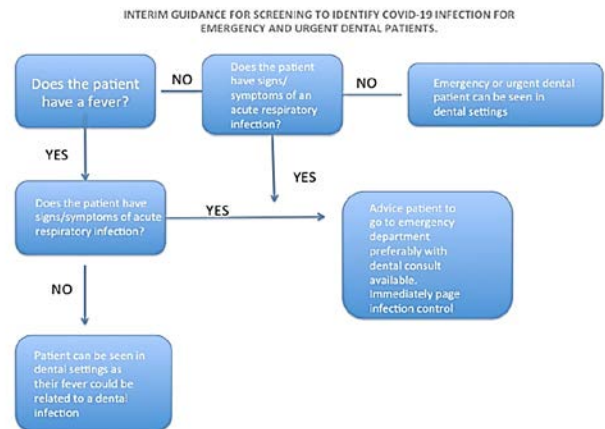


Fig. 3: Interim Guidance to Minimise Risk of Covid-19<sup>26</sup>

If a patient requiring urgent dental care is asymptomatic, recovered and do not have COVID-19 infection-

- If the procedure requires aerosol production – dentist and the staff should have N95 respirators, full-face shields and basic clinical PPE and dentist should be prepared to follow approved disinfection procedures in between and immediately after treatment.
- If the procedure requires no aerosol production- dentist and staff could have surgical facemasks, basic clinical PPE like eye protection, and should be prepared to follow approved disinfection after every procedure.

Table 1: Assessments of Risk Factors In Dental Settings

Low Risk	Moderate Risk	Moderate-High Risk
No 14 days quarantine required for dentist	use clinical judgements and take all precautions to prevent transmission	CDC suggests 14-day quarantine
	if the tests suggests, patient is positive for COVID-19 infection, dentist should quarantine for 14 days	Use clinical judgement and take all precautions to prevent transmission.
		If the patient is tested COVID-19 positive immediately after dental care, dentist should quarantine for 14 days.
Treat the patient	Refer patient to emergency department or dental facility that meets the above criteria.	

Resolved COVID-19 infection patients can be treated in dental setting-

- At least 3 days (72 hours) after completed resolution
- At least after 7 days since their symptoms first appeared

Recommendation for prevention of COVID-19 based on *Guidelines for Prevention and Control of Novel Coronavirus Pneumonia in Medical Institutes (1 edition)*<sup>27</sup>, *Guidelines for use of Medical Protective Equipment in the Prevention and Control of Novel Coronavirus Pneumonia*<sup>28</sup>, *China and Indian Dental Association*<sup>25</sup>

At this hour, each dental professional is encouraged to avoid elective procedures and only provide treatment and consultation in case of a dire emergency. The conventional methods of sterilization and disinfection though effective in controlling diseases and infection transmission in day-to-day practice, fall short of being completely potent. Additional provisions are necessary to provide defence against COVID-19. The following steps prove to be the tools required for safeguarding one's self and the patient from the potential contraction or transmission of this disease in a dental setup.

#### Hand Hygiene

Hand hygiene is a prerequisite for dental practitioners in general practice, however, it has become an absolute necessity to wash hands properly to prevent disease transmission. The CDC recommends use of (ADHR) alcohol based hand rub (alcohol content upto 60%) and soap and water as the primary method for hand hygiene in clinical situations

Infection Control Department of West China Hospital of Stomatology, Sichuan University proposed a *two before and three after* hand hygiene guideline<sup>29</sup>. Which means, a dentist should wash their hands before patient examination, before dental procedure, after touching the patient, after touching the surrounding and equipment without disinfection and after touching oral mucosa, wound, blood or any other body secretions.

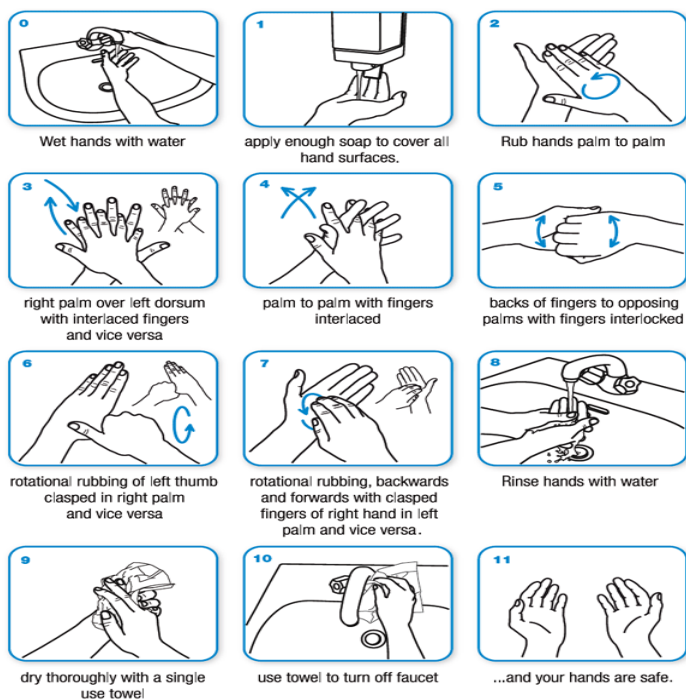


Fig.4: showing proper procedure to be followed for washing hands by WHO

### Personal Protective Equipments (PPE)

PPE refers to protective clothing, mask, eye protection gear or other garments or equipment to protect the wearers body from injury or infection. Amidst COVID-19 PPE serves as the main source of protection for healthcare workers against medical hazards. PPE generally comprises of the following equipment.

- Face masks- Different types of masks are available however, the 2 types of masks recommended for treatment of COVID-19 are the Triple layer medical mask and N-95 Respirator mask. Proper disposal of the mask should be done in a closed bin immediately after use, as it can be a source of transmission of infection.
- Disposable working cap and latex gloves- During examination and dental procedures, disposable working cap and latex or non latex gloves must be properly worn and removed. Attention must be given while changing the gloves and their proper disposal.

- Gowns and coveralls- protective gowns create a barrier to reduce or eliminate contact and droplet exposure. After treatment, the soiled gown must be removed as soon as possible and hand hygiene should be performed. They should be sterilised after use and before reuse.
- Shoe covers- impermeable fabric are used to make shoe cover which helps to provide protection against decontamination.



Fig. 5: showing PPE (Personal Protective Equipment) for COVID-19 by CDC.

### Mouthrinse Before Dental Procedure

As novel Coronavirus is vulnerable to oxidation, pre procedural mouthrinse containing oxidative agents like 1% hydrogen peroxide or 0.2% povidone may, decrease the number of pathogens present in the oral cavity, therefore reducing the risk of transmission<sup>13</sup>.

### Reduction of Aerosols<sup>30</sup>-

The production of aerosols or airborne contamination is quite frequent during dental procedures and are contaminated with bacteria and blood, thus increasing the chance of infection transmission. The 2 proposed methods of reducing airborne contamination- include-

1. use of devices which prevent the spread of aerosols, for example- HVE (High Volume Evacuators) and Extraoral Suctions.
2. use devices which will remove contaminated materials once they become airborne, for example- HEPA filter

(high efficiency particulate air), or UV chambers in the ventilation system.

#### **Isolation of Mouth**

Procedure involving high speed handpiece and ultrasonic devices must be done under rubber dam application to avoid production of contaminated aerosol and spatter. In cases where rubber dam cannot be applied, manual devices should be used.

#### **Disinfection & Disposal of Contaminated Waste**

Correct Medical waste disposal is perhaps one of the most important steps in our war against COVID-19. Improper waste disposal by one individual affects the entire citizenry, thus disposal of contaminant must be handled with extra care. Several approaches of attaining effective disposal of the contaminated waste and appropriate disinfection of the dental setting is done have been devised. One such device that is the V safe tunnel should be installed outside the dental office, which helps sanitize people within 20 seconds from any possible bacteria or virus. The disinfect consists of a combination of water-soluble polymer and iodine. Safe management of waste should be ensured.

Disposable protective equipment and wastes with blood, saliva or other contaminants should be discarded after every single use. Waste contaminated with blood, saliva or any other body secretion generated during treatment of a suspected patient should be discarded in double layered package bags, with the neck of the bag ligated tightly and put in a closed bin before sending the waste for disposal. Reusable instruments should be cleaned, sterilised after single use. Current WHO recommendations are to clean utility gloves or heavy duty, reusable aprons with soap and water and then decontaminate them with 0.5% sodium hypochlorite after each use<sup>31</sup>. WHO also recommends for using 70% ethyl alcohol to disinfect small areas between uses, such as reusable instruments and sodium

hypochlorite at 0.5% (equivalent to 5000 ppm) for disinfecting surfaces<sup>31</sup>.

#### **Conclusion**

As COVID-19 sweeps across our planet, leaving death and mayhem in its wake, a rise in global unity and medical discoveries is evident. This disease has challenged each and every one to participate in a unified battle against Coronavirus. To win, we must be well equipped and well informed about every aspect of this disease. Simple precautions such as handwashing, use of PPE, and correct isolation are essential to curb the disease. As part of the medical fraternity, every dentist and dental setting are responsible for protecting their patients and themselves from this fatal disease and play their part in the community and prevail.

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