

## Are Dentists At High Risk To Corona? – A Review

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**Abstract:** COVID-19 infection, the latest outbreak which has originally started in Wuhan, China has spread across the globe and turned into a pandemic. SARS-CoV2 is a member of Beta coronaviruses and is known to predominantly cause respiratory illness. The spread of virus was initially from animals especially bats infected pangolins to humans, but however, due to the wide spread nature of the disease through contact, it has now turned into a man-to-man transmission. The mode of transmission is through direct mucosal contact from an infected person, through droplets in the air as well as through aerosol spread while treating the infected person. The available information clearly indicates that Health Care Providers especially Dentists are at greatest risk to expose themselves for this infection. There is a great need to reinforce the Universal Standard Precautionary guidelines suggested by the Centre for Disease Control and Prevention(2003). WHO declared that isolation is the best precautionary step to prevent the spread of COVID-19.

The aim of this review paper is to provide information regarding the COVID-19 spread and necessary measures to be taken up by the Dental fraternity to ensure safety of the Dental Health Care Providers as well as the patients.

**Keywords:** Zoonotic, SARS-CoV2, Pandemic, Quarantine, Centre for Disease Control, Dental Health Care Providers.

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### I. Introduction

Coronaviruses are a large group of viruses that cause illness ranging from common cold to more serious respiratory conditions like Severe Acute Respiratory Syndrome (SARS-CoV) in 2002, Middle East Respiratory Syndrome(MERS-CoV) in 2012 and the latest COVID-19. They were first discovered in 1960s but were not considered to be highly pathogenic to humans until the SARS outbreak in 2002. However, immunocompetent people occasionally suffered from mild infections due to the earlier forms of these viruses. Coronaviruses are zoonotic, which means they are transmitted from animals to humans. Interestingly, these viruses have probably originated from bats and then moving into other mammalian hosts — the Himalayan palm civet for SARS-CoV, the dromedary camel for MERS-CoV and the suspected pangolins for the COVID-19 before jumping to humans.<sup>[1][2]</sup>

Coronaviruses are members of the subfamily Coronavirinae in the family Coronaviridae and the order Nidovirales. This subfamily consists of four genera — Alphacoronavirus, Beta coronavirus, Gamma coronavirus and Delta coronavirus — on the basis of their phylogenetic relationships<sup>[3]</sup> and genomic structures. The alphacoronaviruses and beta coronaviruses infect only mammals. The gamma coronaviruses and delta coronaviruses infect birds, but some of them can also infect mammals.<sup>[4]</sup> The name Corona is derived from its structural appearance - the spiked protein envelope surrounds the inner genetic core material resembling a crown under electron microscope and hence the name Corona(In Latin, Coronam = crown).<sup>[5]</sup>

### COVID-19:

COVID-19 infection has as its etiologic agent the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The 2019 coronavirus is different from SARS-CoV, but it has the same host receptor: human angiotensin-converting enzyme 2 (ACE2) and hence the name SARS-CoV2.<sup>[6]</sup> This was first discovered in 2019 in Wuhan, China and unfortunately extending its wings across globally, ultimately resulting in the 2019-20 pandemic as declared by WHO.

As on 15<sup>th</sup> April 2020, more than 20,06,513 cases were confirmed with 1,28,886 deaths and 5,01,758 recovered from COVID-19 as recorded globally with United States followed by Italy being most affected.

### **ROUTE OF TRANSMISSION:**

Zoonotic mode of transmission was thought to be the main source as the earlier cases of COVID-19 infection reported direct exposure to the Huanan Seafood Wholesale Market of Wuhan. This was not the same with the latter cases suggesting that the transmission of virus could be from human-to-human, especially symptomatic individuals are the most frequent source of spread. Although the possibility of transmission before developing symptoms is unlikely, it cannot be ruled out. There are opinions further that asymptomatic individuals could transmit the virus. Taking this into consideration, WHO has declared that Isolation and Quarantining are the top solutions to control this Pandemic.<sup>[7]</sup> Though WHO does not contradict air-borne route of spread of COVID-19, however emphasizes on stringent isolation and PPE protocols. At the same time, other countries and organizations, including the US Centers for Diseases Control and Prevention and the European Centre for Disease Prevention and Control, recommend airborne precautions for any situation involving the care of COVID-19 patients, and consider the use of medical masks as an acceptable option in case of shortages of respirators (N95, FFP2 or FFP3).<sup>[8-9]</sup> Dental healthcare personnel assessing a patient with influenza-like or other respiratory illness should wear disposable surgical facemask, non-sterile gloves, gown, and eye protection (e.g., goggles) to prevent exposure.

Dental Practitioners and their clinics carry a great risk of infection due to the kind of aerosol generated procedures, involving **direct transmission** (cough, sneeze, and droplet inhalation transmission), **contact transmission** (contact with oral, nasal, and eye mucous membrane) and **fomites**. Also, Salivary viral load cannot be ignored especially the highest during the first week of symptom onset. Accordingly, the importance of posterior oropharyngeal salivary specimens for detecting COVID-19 was evaluated with much ease attributing to its non-invasive nature.<sup>[10]</sup>

### **PATHOPHYSIOLOGY ALONG WITH ACE-2 RECEPTORS :**

ACE-2 is a type I transmembrane metalloproteinase with homology to ACE (Angiotensin Converting Enzyme), an enzyme long-known to be a key player in the Renin-Angiotensin system (RAS) and a target for the treatment of hypertension.<sup>[11]</sup> High ACE2 expression was identified in type II alveolar cells (AT2) of lung<sup>[12]</sup>, esophagus upper and stratified epithelial cells, absorptive enterocytes from ileum and colon, cholangiocytes<sup>[13]</sup>, myocardial cells, kidney proximal tubule cells, and bladder urothelial cells. These findings indicate that those epithelia with high ACE2-expressing cells should be considered as potential high risk for 2019-nCoV infection.<sup>[14]</sup>

An observation made by Xu.H et al (2020)<sup>[15]</sup> using bulk RNA-seq profiles from two public databases indicated the ACE-2 expression on Oral mucosa. ACE-2 expression was higher in the epithelial cells of the tongue than from the buccal and gingival tissues highlighting the high risk route of infection.

Based on this information, an article was also published in Newyork Times on 15<sup>th</sup> March 2020 conveying that Dentists hold the greatest risk of being infected with Covid-19 when compared to nurses and general physicians<sup>[16]</sup> as they are exposed to direct mucosal contact and saliva droplets. Point to remember that the virus can survive on hands, objects or surfaces that were exposed to infected saliva in the previous nine days.<sup>[17-18]</sup>

### **CLINICAL CHARACTERISTICS:**

COVID-19 clinical presentation varies from being asymptomatic to septic shock and multi-organ dysfunction.<sup>[7]</sup> The disease may be classified as mild, moderate, severe and critical based on the severity of presentation. The most common symptoms include fever (98.6%), fatigue (69.6%), dry cough. Some might also present with aches and pains, runny nose, nasal congestion and diarrhea.<sup>[19]</sup> The incubation period of COVID-19 is between 1 to 14 days.

At the outset, it is important to screen for fever and cold symptoms and ask for a proper travel history and contacts in the dental office during case history evaluation. It is advisable to offer a disposable surgical mask to persons who are coughing; and provide tissues and no-touch receptacles for used tissue disposal in the office. According to the present scenario, it is even essential to ask about their quarantining period completion and isolation details.

Suspected patients can be advised medication and asked to reschedule their appointments accordingly. Elective procedures should be post-poned and emergency cases must also be taken up with adherence to Universal precautions.

### **CENTRE FOR DISEASE CONTROL AND PREVENTION(CDC) RECOMMENDATIONS TO DENTISTS:**

The practice of dentistry involves huge release of aerosols through usage of hand-pieces, ultra-sonic scalers, air-water syringes etc. This splatter contains large droplets of water, saliva, blood, micro-organisms and other debris. It travels only a short distance and settles out quickly, landing on the floor, nearby operatory surfaces, dental health care personnel, or the patient. Attending patients requiring Transmission-Based

Precautions is not possible in most dental settings as they are not designed for or equipped to provide the required standard of care. Henceforth, CDC has come out with few great inputs to enhance the safety of our Dental practice.

- To Postpone Elective Procedures, Surgeries, and Non-urgent Dental Visits
- To stay at home if sick
- Call all patients before their scheduled appointments and screen for fever and other respiratory symptoms over phone.

People with COVID-19 who have **completed home isolation clearance** can receive **emergency dental care**. This is defined as:

- i. At least 3 days (72 hours) have passed since recovery (resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms, e.g., cough, shortness of breath), and at least 7 days have passed since symptoms first occurred.

OR

- ii. For individuals with laboratory-confirmed COVID-19 who have not had any symptoms, at least 7 days have passed since the date of the first positive COVID-19 diagnostic test and have had no subsequent illness.
- Know Actions to Take if a patient has **Suspected/Confirmed COVID-19**

If a patient at your facility is suspected or confirmed to have COVID-19, take the following actions:

- Defer non-urgent procedures
- Give the patient a mask to cover his or her mouth
- Send the patient home if not acutely sick
- Refer the patient to a medical facility if acutely sick (e.g., trouble breathing)
- If treatment is urgently needed, refer to an appropriate facility
- Clean and disinfect the room and equipment according to the Guidelines for Infection Control in Dental Health-Care Settings—2003.<sup>[20]</sup>
- Clean, disinfect, or discard the surface, supplies, or equipment located within 6 feet of symptomatic patients
- Handpieces, ultrasonic scaler inserts/tips and air-water syringe tips where detachable should be flushed for 30 seconds, dismantled, cleaned, oiled where required, and autoclaved between patients.<sup>[21]</sup> This procedure is intended to help physically flush out patient material that might have entered the turbine and air and waterlines (Handpieces, etc. left overnight should be allowed to discharge water for two minutes at the beginning of the day). Handpieces which cannot be autoclaved are disinfected with an appropriate viricidal agent.
- Between clinical sessions, work surfaces should be thoroughly cleaned and decontaminated with ethyl alcohol (70%). If there is visible blood or pus, the surface should be cleaned and disinfected with sodium hypochlorite (0.5%), followed by water rinse. Protective gloves should be worn and care taken to minimize direct skin, mucosal or eye contact with these disinfectants.
- Since the viral load contained in the human saliva is very high, Pre procedural rinsing with antiseptic mouthwashes can only reduce the infectious amount but are not able to eliminate the virus in the saliva.<sup>[7]</sup>
- Use products with EPA-approved emerging viral pathogens claims—EPA-registered disinfectants that have qualified under EPA's emerging viral pathogens program for use against SARS-CoV-2 like Hydrogen Peroxide, Quaternary Ammonium compounds etc.<sup>[22]</sup>

A recent study by Van Doremalen N et al (2020)<sup>[23]</sup> stated that copper and paper can allow the virus to survive for 4 to over 24 hours whereas steel and plastic can contain the virus for at least 48hrs and 72hrs respectively. Now, this means that the virus stays for a longer time on steel instrument and disposables exposed to the aerosol contaminated air than on a magazine in the waiting room. Surface disinfection of the doors, handles etc. and the Personal hygiene measures like hand washing or Sanitizing must be given utmost care as the virus is completely inactivated by water, soap, and other detergents.<sup>[24]</sup>

#### **WHO Recommendations for Preventive measures against COVID-19 infection.**<sup>[25,26]</sup>

1. Stay up to date with the latest information on the COVID-19 outbreak through WHO updates or your local and national public health authority.
2. Perform hand hygiene frequently with an alcohol-based hand rub if your hands are not visibly dirty or with soap and water if hands are dirty.
3. Avoid touching your eyes, nose and mouth.
4. Practice respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then immediately disposing of the tissue.
5. Wear a medical mask if you have respiratory symptoms and perform hand hygiene after disposing of the mask.
6. Maintain social distancing (approximately 2 meters) from individuals with respiratory symptoms.

7. If you have a fever, cough and difficulty breathing seek medical care.

### Summary of the Safety measures for minimizing risk exposure for Dental Health Care Providers

- Post necessary visual alerts at the entrance of the Dental clinic highlighting the hand scrubbing methods, sneeze and cough etiquettes etc. to increase the awareness amongst patients.
- Reschedule appointments for next 2 weeks if the patients have travelled to any of the COVID-19 infected countries.
- Elaborate case-histories on the details of medical history with proper screening for fever and other respiratory illness with due mention of their travel history.
- Strict adherence to Personal Protection Equipment like wearing a gown, medical mask (N95 respirators during procedures), double gloves and protective eye wear or goggles. Use of Face-shield is appreciable. Hand scrubbing protocol before wearing the gloves as well as after degloving.
- Compulsory use of Rubber-dam whenever required. Use of high speed evacuators during aerosol generated procedures.
- Proper instrument sterilization as well as clinical surface disinfection including the doors and handles.
- Use of Pre-procedural rinses with 1% Hydrogen Peroxide before each procedure.

### II. Conclusion:

Attending emergencies and avoiding elective procedures by health Care Providers has shown a very big impact in the prevention of spread of COVID-19 infection. It's the time to strictly adhere to stringent Universal precautions and as always said better to treat every patient as potentially infected and uphold the practice of Dentistry. At this point of time, it is wise to respect the policies and prophylactic measures taken up by the Government and the CDC and strict implementation of them in our day-to-day practice until a vaccine or drug becomes available.

### References

- [1]. Perlman S, Netland J, Coronaviruses post-SARS: update on replication and pathogenesis. *Nature reviews. Microbiology*. 2009 Jun [PubMed PMID: 19430490] (<http://www.ncbi.nlm.nih.gov/pubmed/19430490>)
- [2]. T. T.-Y. Lam et al. Identifying SARS-CoV-2 related coronaviruses in Malayan pangolins. *Nature*. Published online March 26, 2020. doi: 10.1038/s41586-020-2169-0.
- [3]. Pillaiyar, T. et al. Recent discovery and development of inhibitors targeting coronaviruses, *Drug Discov Today* (2020), <https://doi.org/10.1016/j.drudis.2020.01.015>
- [4]. Woo, P. C. et al. Discovery of seven novel mammalian and avian coronaviruses in the genus deltacoronavirus supports bat coronaviruses as the gene source of alphacoronavirus and betacoronavirus and avian coronaviruses as the gene source of gammacoronavirus and deltacoronavirus. *J. Virol*. 86, 3995–4008 (2012).
- [5]. Cotton, M. et al. (2013) Transmission and evolution of the Middle East respiratory syndrome coronavirus in Saudi Arabia: a descriptive genomic study. *Lancet* 382 (1993), 2002
- [6]. Chen Y, Shan K, Qian W. Asians do not exhibit elevated expression or unique genetic polymorphisms for ACE2, the cell-entry receptor of SARS-CoV-2. Feb 25, 2020.
- [7]. Cascella M, Rajnik M, Cuomo A, et al. Features, Evaluation and Treatment Coronavirus (COVID-19) [Updated 2020 Mar 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554776/>
- [8]. Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. Available online <https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html>
- [9]. Infection prevention and control for COVID-19 in healthcare settings. Available online <https://www.ecdc.europa.eu/en/publications-data/infection-prevention-and-control-covid-19-healthcare-settings>
- [10]. Kai-Wang, Tak-Tsang, Wai-Leung et al.. Temporal profiles of viral load in posterior oropharyngeal saliva samples and serum antibody responses during infection by SARS-CoV-2: an observational cohort study. Published online March 23, 2020. Available online [https://doi.org/10.1016/S1473-3099\(20\)30196-1](https://doi.org/10.1016/S1473-3099(20)30196-1).
- [11]. Riordan, J.F. Angiotensin-I-converting enzyme and its relatives. *Genome Biol* 4, 225 (2003). <https://doi.org/10.1186/gb-2003-4-8-225>
- [12]. Zhang, H. et al. The digestive system is a potential route of 2019-nCoV infection: a bioinformatics analysis based on single-cell transcriptomes. Preprint at <https://www.biorxiv.org/content/10.1101/2020.01.30.927806v1> (2020).
- [13]. Chai, X. et al. Specific ACE2 expression in cholangiocytes may cause liver damage after 2019-nCoV infection. Preprint at <https://www.biorxiv.org/content/10.1101/2020.02.03.931766v1> (2020).
- [14]. Zou, X. et al. The single-cell RNA-seq data analysis on the receptor ACE2 expression reveals the potential risk of different human organs vulnerable to Wuhan 2019-nCoV infection. *Front. Med.* <http://journal.hep.com.cn/fmd/EN> CDC. Recommended infection-control practices for dentistry, 1993. *MMWR* 1993;42(No. RR-8). /10.1007/s11684-020-0754-0 (2020).
- [15]. Xu, H., Zhong, L., Deng, J. et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. *Int J Oral Sci* 12, 8 (2020). <https://doi.org/10.1038/s41368-020-0074-x>.

- [16]. Gamio, L. The Workers Who Face the Greatest Coronavirus Risk. Available online: <https://www.nytimes.com/interactive/2020/03/15/business/economy/coronavirus-worker-risk>. (accessed on 15 March 2020).
- [17]. Meng, L.; Hua, F.; Bian, Z. Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine. *J. Dent. Res.* 2020. [CrossRef]
- [18]. Peng, X.; Xu, X.; Li, Y.; Cheng, L.; Zhou, X.; Ren, B. Transmission routes of 2019-nCoV and controls in dental practice. *Int. J. Oral Sci.* 2020, 12, 9. [CrossRef]
- [19]. Wang Y, Wang Y, Chen Y, Qin Q: Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures [Epub ahead of print]. *J Med Virol.* 2020, 10.1002/jmv.25748
- [20]. Centers for Disease Control and Prevention. Guidelines for Infection Control in Dental Health-Care Settings — 2003. *MMWR* 2003;52(No. RR-17)
- [21]. CDC. Recommended infection-control practices for dentistry, 1993. *MMWR* 1993;42(No. RR-8).
- [22]. ECRI Institute. Disinfectant concentrations and contact times for EPA's list of products effective against novel coronavirus SARS-CoV-2, the cause of COVID-19. *Health Devices* 2020 Mar 10.
- [23]. Van Doremalen, N.; Bushmaker, T.; Morris, D.; Holbrook, M.; Gamble, A.; Williamson, B.; Tamin, A.; Harcourt, J.; Thornburg, N.; Gerber, S.; et al. Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. *N. Engl. J Med.* 2020.
- [24]. Spagnuolo, G.; De Vito, D.; Rengo, S.; Tatullo, M. COVID-19 Outbreak: An Overview on Dentistry. *Int. J. Environ. Res. Public Health* 2020, 17, 2094.
- [25]. World Health Organization. Coronavirus disease (COVID-19) advice for the public. Available online <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public> Accessed 14 March 2020.
- [26]. World Health Organization. Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19). Available online [https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE\\_use-2020.1-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf) Accessed 14 March 2020

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