



## Covid-19 and Oral Health: A Review

Remonda Raouf Ibrahim<sup>1</sup>, Vikasdeep Singh Sidhu<sup>2</sup>

1. BSc, Oral and Dental Medicine, NAHDA University, Beni Suef, Egypt.
2. BDS, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India

**Corresponding Author: Remonda Raouf Ibrahim**, BSc, Oral and Dental Medicine, NAHDA University Beni Suef, Egypt.

**Copy Right:** © 2022 Remonda Raouf Ibrahim, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Received Date: March 02, 2022**

**Published Date: March 07, 2022**

### **ABSTRACT**

*Novel Corona virus infections have caused a pandemic. Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), the agent, is a single-chain RNA virus that is the cause of novel corona virus disease known as COVID-19. The most common clinical symptoms seen are fever, headache, sore throat, shortness of breath, dry cough, abdominal pain, vomiting, and diarrhoea. Some patients reportedly present with oral manifestations of corona virus disease 2019. The aim of present review of literature is to discuss about oral manifestation of covid-19 and maintenance of oral health during pandemic in detail.*

**Keywords:** Covid-19, Oral health, Oral manifestation

## Introduction

A pandemic according to the WHO is “The worldwide spread of a new disease.”<sup>1</sup> COVID-19 is a highly contagious infectious disease caused by a recently discovered coronavirus.<sup>2</sup> Considering the dreadful situation, the WHO announced that the COVID-19 outbreak had become an unforeseen circumstance of international concern on January 31, 2020, and then categorized it as a “pandemic” on March 11th 2020. COVID-19 patients were either asymptomatic or with mild symptoms of pharyngodynia, severe symptoms of loss of taste and smell, upper respiratory tract infection (RTI), dyspnoea, severe viral pneumonia and even death.<sup>3</sup>

COVID-19 has as its etiologic agent the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The present corona virus is different from SARS-CoV, but it has the same host receptor: human angiotensin converting enzyme 2 (ACE2). These viruses are common in animals with the potential of transmission to humans.<sup>4</sup> They are composed of an envelope, a lipid layer, and single-stranded large RNA. The name “corona” (“crown” in latin) is attributed to the spherical shape and surface projections. Four subfamilies have been identified: alpha-, beta-, gamma-, and delta-coronaviruses.<sup>5</sup> Beta-corona viruses seem to originate from mammals, namely bats; it was found that the genome sequence of SARS-CoV-2, the virus responsible for COVID-19, is >90% identical to a bat corona virus RaTG13. In fact, bats represent a natural reservoir for a wide variety of corona viruses including SARS-CoV-like and MERS-CoV-like viruses. SARSCoV-2 is closely related to the SARS-CoV virus, and it belongs to the B lineage of the beta-corona viruses, which are known to cause severe disease and fatalities.<sup>6</sup>

At the start of the COVID-19 pandemic, it was assumed that lack of oral involvement is a distinguishing feature of COVID-19 exanthema as compared to other viral exanthemas. But recently, SARS-CoV-2 has been detected from saliva of the patients and it has been shown that reverse transcriptase-polymerase chain reaction (RT-PCR) from saliva can be a more sensitive test in comparison with nasopharyngeal swab testing.<sup>7</sup> Also, now many newer manifestations are reported in these infections, and oral lesions are also commonly seen. With regard to oral mucosa, ACE2 receptors are commonly seen in dorsum of tongue and salivary glands.<sup>8</sup> Immuno-inflammatory processes have been associated with hyperpigmentation of melanin from the oral mucosa.<sup>9</sup> Symptoms such as mucositis, candidiasis, HSV-1 (Herpes simplex virus) infections, petechiae, xerostomia, geographic tongue, dysgeusia do occur. The oral manifestations can be appreciated through two ways. One may be direct sequelae of COVID-19 infection and the other may be secondary to suppression of human immune system or adverse effects of potential therapeutic drugs given for COVID-19 treatment.<sup>10</sup>

## Oral Manifestation of Covid-19

The common symptoms that patients report to the dental office even at the pre-symptomatic stage are loss of taste (ageusia), loss of smell (anosmia), and hyposalivation. Few literature state that along with

unexplained ulcers in the oral cavity, desquamative gingivitis, herpetiform ulcers on attached gingiva, blisters/irregular ulcers on the tongue's dorsal surface, enlargement of submandibular glands, and cervical lymph node enlargement. These oral manifestations may be associated with an erythematous rash on the face or viral enanthema. Dysgeusia or ageusia and anosmia are found to be common in COVID-19 patients, and the range varies from 5.6%– 88.8% of patients. These symptoms are more common in young individuals and females, and these symptoms usually get resolved in 03 weeks.<sup>11</sup>

### **Impact of Covid-19 on Oral Health**

The impact of COVID-19 on oral health can be viewed in a bidirectional manner. On one hand, COVID-19 can affect the oral tissues and instigate several oral diseases and on the other hand, the rising cases and evolving strains of the virus can impede the oral health care availing behavior of individual, due to the fear of contracting the disease. As per numerous research, the neurotropic and mucotropic properties of the SARS-CoV-2 virus can significantly affect the salivary gland functions, alter the taste sensations, integrity of the oral mucosa causing an imbalance in the oral environment dynamics. Individuals can thus be predisposed to a variety of oral problems like xerostomia, opportunistic fungal infections, ulcerations, and gingival infections. The cytokine storm that is caused by the impaired humoral mechanism and cellular mechanism can magnify the autoimmune disorders well within the oropharyngeal region, which can be of great concern.<sup>24</sup> Apart from the virus impingement, the after effects of the treatment can also predispose the individuals to various infections. Uncontrolled diabetes mellitus or systemic illness and rampant use of corticosteroids during the treatment of COVID-19, extensive use of ventilation and oxygen therapies in the background appear to be silent triggers in the rising cases of mucormycosis. India appears to account for around 81% of the total cases of mucormycosis, wherein 88.9% of the cases are seen involving the nose and sinus area and 56.7% cases involve the rhino-orbital region.<sup>12,13</sup>

### **Pharmacotherapy in Covid-19 and Oral Health**

Medications used routinely and experimentally in the treatment of COVID-19 patients cause side effects, however their benefits outweigh the disadvantages. As a consequence of intense pharmacotherapy, some of patients even after full recovery from COVID-10 may suffer from dental/oral problem associated with soft tissues, saliva production, neurological-based oral sensations, etc. As specific pharmacological treatment for COVID-19 is still undefined, the World Health Organization recently commenced SOLIDARITY trial to validate various medications for potential treatment of severe COVID-19 complications. They comprise remdesivir, chloroquine/hydroxychloroquine, combined lopinavir and ritonavir, and interferon- $\beta$ .<sup>14</sup>

These anti-viral drugs may be responsible for side effects (<2%) affecting oral cavity among the other parts of gastrointestinal track, such as stomatitis, mouth ulcers and dry mouth.<sup>15</sup>

### **Oral Hygiene and Severity of Covid-19**

The oral cavity is well represented as “the window to general health. Patients with poor oral hygiene and periodontal infections tend to suffer from recurrent gingival inflammation and bacteremia, which activate the host inflammatory response. This chronic inflammatory condition elicits the release of multiple proinflammatory cytokines such as CRP, TNF- $\alpha$ , IL-1 $\beta$  and IL-6, in association with bacteremia. These responses tend to increase the susceptibility of the vascular endothelium for injury, thus leading to atherosclerosis. The recent studies have established that the periodontal infection and poor oral hygiene have a strong connection with the risk of acute myocardial infarction and coronary heart disease.<sup>16</sup> Increased cytokine release is another important characteristic feature of severe COVID-19 cases, which exhibit an extreme elevation in inflammatory cytokines including IL-1 $\beta$ , IL-2, IL-6, IL-7, IL-8, IL-10, granulocyte macrophage-colony stimulating factor (CSF), granulocyte-CSF, monocyte chemoattractant protein 1, macrophage inflammation protein-1 $\alpha$ , IFN- $\gamma$  and TNF- $\alpha$ , 2, 3, 12, and 15 establishing a “cytokine storm.”<sup>17</sup> A spectacular increase in these cytokines levels over a short time period leads to a series of adverse reactions in the human body which initiate viral sepsis and inflammation-mediated lung injury, leading to respiratory distress, organ failure, shock and potentially death.<sup>18</sup> Furthermore, in severe COVID-19 cases, elevated levels of inflammatory cytokines may result in shock and multiple organ failure. The constant release of increased levels of cytokines such as CXCL10, CCL7 and IL-1RA is related to lung dysfunction as well as poor prognosis, resulting in fatal outcome. Patients with poor oral hygiene status can elicit such immune responses which may result in the progression of thromboembolic complications. In other words, good oral hygiene and regular dental visits reduce the chances of incidence and progression of pulmonary diseases.<sup>19</sup>

### **Routine Oral Care Treatment during the Era of COVID-19**

#### **Initial screening of the patients:**

Dental professionals, before initiating the treatment must be able to identify and sort patients with high risk of infection. The first interaction with the patient must be on the phone in the form of teleconsultation. On the basis of the telephonic triage, it should be decided if the condition is an emergency or not. If the condition isn't an emergency then the desired medicinal prescription must be given to avoid any unnecessary visit to the dental clinic.<sup>20</sup>

**Scheduling of appointments:**

Dental appointments should be planned in such a way that there is no crowding at the clinic. Estimated treatment time should exceed by 30 minutes deliberately to organize and disinfect the operator for next patient.

All the patients visiting the clinic should be strictly advised to wear face masks and shoe covers upon their entry to the clinic. Upon the arrival of the patients in the dental setup, an initial temperature check should be done.<sup>22</sup>

**Hand hygiene:**

WHO states that washing hands properly with soap and water can effectively eradicate the virus from skin of hands and prevent transmission of infection. They also state that if the hands aren't visibly soiled then cleaning the hands with 60-70% alcohol based hand rub can be equally effective.<sup>23</sup>

**Personal protective equipment:**

Due to the close proximity of face of the patient and the dentist while performing dental treatment procedures, there is high chance of transmission of infection. Dental professional are hence advised to wear full PPE kit while performing the procedure. Face Mask: While performing aerosol generating procedure, N 95 (National Institute for Occupational Safety and Health-certified) respirator should be worn.<sup>24</sup>

**Pre-Procedural Rinse:**

Use of oxidizing agents such as 1% hydrogen peroxide or 0.2% povidone for pre-procedural mouth rinse to reduce the viral load in oral cavity.

Reduction of aerosols in dental operator: Aerosols aren't just a threat in spread of coronavirus infection but can also cause spread of various other infectious disease including influenza, tuberculosis; etc. Air filters can be installed, along with the use of rubber dam to reduce the amount of contaminated air in the operator. Two most easily available and cheapest options for air filtration are: high-volume evacuator (HVE) and high-efficiency particulate arrestor (HEPA) filters.<sup>23</sup>

**Disinfection of the operator and contaminated surfaces:**

Viral particles diffused in air can settle on surfaces, making them contaminated. Different studies suggest that COVID- 19 can remain active on hard surfaces for from 2 hours to 9 days. It has also been seen that virus can survive for longer at a temperature less than 30 degrees Celsius and its rate of presence is better at relative humidity of 50% in compare to that of 30%. Due to such prolonged survival of virus on hard surfaces under these mentioned conditions, it is essential to disinfect these surfaces.

All the hard surfaces can be efficiently cleaned using 62–71% ethanol/ 0.5% hydrogen peroxide/ 0.1% sodium hypochlorite for 1 minute.<sup>25</sup>

**After the completion of the treatment:**

After the treatment is completed, PPE of the patient, doctor and other staff is supposed to be collected by the assistant and disposed off according to the guidelines of government under the category of biomedical waste. Used instruments should be cleaned using alcohol based solution and then sent for autoclave. Operatory should be disinfected properly after all the treatments are done, so that there is no contamination left for early morning appointments. Entire working staff and doctors are advised to sanitize and wash their hands thoroughly before leaving the clinic.<sup>26</sup>

**Conclusion**

The principal oral manifestations of Covid-19 are dysgeusia, anosmia, and ulcers, which may be associated with the patient’s systemic diseases or the administration of drugs. Most patients with severe symptoms exhibit underlying comorbidities such as diabetes, hypertension and obesity. Alternatively, there is an existing evidence for an association between oral health and nonoral systemic diseases. Since the oral cavity is a significant pool for many respiratory pathogens, patients with oral infections are more likely to develop pneumonia as a complication. Therefore, improving oral hygiene and reducing gingival and periodontal inflammation may reduce the risk of complications arising due to COVID-19 disease.

**References**

1. WHO database [https://www.who.int/csr/disease/swineflu/frequently\\_asked\\_questions/pandemic/en](https://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en), accessed on 15 February 2021.
2. WHO database. [https://www.who.int/health-topics/coronavirus#tab = tab\\_1](https://www.who.int/health-topics/coronavirus#tab=tab_1), accessed on 15 February 2021.
3. Shakir A, Talukdar M, Manohar PS, et al. Knowledge, attitude and practices of parents in Bangalore regarding the oral health of children during covid-19 pandemic. *J Evolution Med Dent Sci* 2021;10(38):3346-3350, DOI: 10.14260/jemds/2021/679
4. Bains SK, Bhatia A, Mehta R. COVID-19 & Dentistry- A Review. *J Adv Med Dent Scie Res* 2020;8(7):1-5.
5. Drexler, J.F. et al. Genomic characterization of severe acute respiratory syndrome-related coronavirus in European bats and classification of coronaviruses based on partial RNA-dependent RNA polymerase gene sequences. *J. Virol*, 2010; 84: 11336–11349.

6. Marwaha J, Shah K. Safety & preventive measures for dental health care professionals on COVID-19. *International Journal of Science & Healthcare Research*. 2020; 5(2): 1-4.
7. Bhattacharyya SG, Bhattacharyya S. Oral Manifestations of Covid-19 In Children and Adults. *Inter Ped Dent Open Acc J* 5(5)-2021. IPDOAJ.MS.ID.000225
8. Amorim Dos Santos J, Normando AGC, Carvalho da Silva RL, De Paula RM, Cembranel AC, et al. Oral mucosal lesions in a COVID-19 patient: New signs or secondary manifestations? *Int J Infect Dis*. 2020; 97: 326-328. PubMed: <https://pubmed.ncbi.nlm.nih.gov/32526392/>
9. Chandran R, Feller L, Lemmer J, Khammissa RAG. HIV-associated oral mucosal melanin hyperpigmentation: a clinical study in a South African population sample. *AIDS Res Treat*. 2016; 8: 1-5. PubMed: <https://pubmed.ncbi.nlm.nih.gov/27006825/>
10. Finsterer J, Stollberger C. Causes of hypogeusia/hyposmia in SARSCoV2 infected patients. *J Med Virol*. 2020; 92: 1793-1794. PubMed: <https://pubmed.ncbi.nlm.nih.gov/32311107/>
11. Singh G, Priya H, Mishra D, Kumar H, Monga N, Kumari K. Oral manifestations and dental practice recommendations during COVID-19 pandemic. *J Family Med Prim Care*. 2021 Jan;10(1):102-109. doi: 10.4103/jfmpc.jfmpc\_1605\_20. Epub 2021 Jan 30. PMID: 34017710; PMCID: PMC8132769.
12. Dziedzic A, Wojtyczka R. The impact of coronavirus infectious disease 19 (COVID-19) on oral health. *Oral Dis* 2021 Apr;27 (Suppl 3):703–706.
13. Kamel AHM, Basuoni A, Salem ZA, AbuBakr N. The impact of oral health status on COVID-19 severity, recovery period and C reactive protein values. *Br Dent J* 2021 (e-pub ahead of print). Doi: 10.1038/s41415-021-2656-1
14. Dziedzic A, Wojtyczka R. The impact of coronavirus infectious disease 19 (COVID-19) on oral health. *Oral Dis*. 2021 Apr;27 Suppl 3:703-706. doi: 10.1111/odi.13359. Epub 2020 May 6. PMID: 32304276; PMCID: PMC7264805.
15. Pubchem(2020). Rotonavir Retrieved from <https://pubchem.ncbi.nlm.nih.gov/compound/Ritonavir>
16. Boyapati R, Dhulipalla R, Kolaparthi LK, Bodduru R. COVID-19 and oral implications: An updated review. *J Oral Maxillofac Pathol* 2021;25:400-3.
17. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395:497-506.
18. Prompetchara E, Ketloy C, Palaga T. Immune responses in COVID-19 and potential vaccines: Lessons learned from SARS and MERS epidemic. *Asian Pac J Allergy Immunol* 2020;38:1-9.
19. Vaninov N. In the eye of the COVID-19 cytokine storm. *Nat Rev Immunol* 2020;20:277.

20. Barabari P, Moharamzadeh K. Novel Coronavirus (COVID-19) and Dentistry–A Comprehensive Review of Literature. *Dent J.* 2020;8(2):53.
21. Spagnuolo G, Vito DD, Rengo S, Tatullo M. COVID-19 Outbreak: An Overview on Dentistry. *Int J Environ Res Public Health.* 2020;17(6):2094
22. Liu J, Liao X, Qian S, Yuan J, Wang F, Liu Y, et al. Community Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, Shenzhen, China, 2020. . *Emerg Infect Dis.* 2020;26(6):1320–3.
23. Ge ZY, Yang LM, Xia JJ, Fu XH, Zhang YZ. Possible aerosol transmission of COVID-19 and special precautions in dentistry. *J Zhejiang Univ Sci B.* 2020;21(5):361–8.
24. Chuaybamroong P, Chotigawin R, Supothina S, Sribenjalux P, Larпкиattaworn S, Wu CY. Efficacy of photocatalytic HEPA filter on microorganism removal. *Indoor Air.* 2010;20:246–54.
25. Ijaz MK, Brunner AH, Sattar SA, Nair RC, Lussenburg CMJ. Survival Characteristics of Airborne Human Coronavirus 229E. *J Gen Virol.* 1985;66(12):2743–8.
26. Khanduja V, Sharma H. Dental practice during the era of COVID-19. *J Community Health Manag* 2020;7(4):106-112.