

Orofacial Manifestations in COVID-19 Patients, Health Challenges and Dental Practice Recommendations during COVID-19 Pandemic: A Clinical Update

Shaveta Sood¹, Monia Sharma², Shalini Gugnani³, Sonia B Bhardwaj⁴

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ABSTRACT

The coronavirus disease-2019 (COVID-19) pandemic has posed a challenge to healthcare system globally; dentistry being no exception. As the duration of a pandemic is increasing and new strains of the virus are being detected in various parts of the world, the dentist should be familiar with the list of oral manifestations and implications of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). This will not only play an important role in diagnosing carriers but also equip the dental fraternity to deal with a surge of otherwise not-so-common oral diseases. Viruses are not new to the oral cavity, but here oral manifestations have importance in the detection of asymptomatic carriers of SARS-CoV-2. This article aims to compile available literature relevant to the oral health perspective in the era of COVID-19.

Keywords: Coronavirus disease-2019 pandemic, Oral manifestation, Severe acute respiratory syndrome coronavirus-2.

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INTRODUCTION

What is SARS-CoV-2?

As per World Health Organization (WHO) coronavirus disease-2019 (COVID-19) was considered a pandemic on March 11, 2020. Since then, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has globally affected many world's economies, and jeopardized health care system. Being highly contagious, transmission of the COVID-19 virus by droplets, aerosols, and airborne, has posed a high risk of transmission to dentists and head and neck health care workers. World Health Organization limited the medical treatment to the management of emergencies, thus deferring the elective and non-urgent therapies to prevent healthcare facilities from becoming transmission centers of COVID-19.¹ The oral cavity is not only the entry point of various pathogens but also a mirror of systemic health. The presence of the COVID-19 virus in saliva and abundant angiotensin converting enzyme-2 (ACE-2) receptors within the oral mucosa implies that it acts as a SARS-CoV-2 reservoir. The oral cavity can be an entry port for both respiratory and gastrointestinal tract pathogens (oral-tract-axes). This can have an impact on the clinical manifestations of the disease. Severe acute respiratory syndrome coronavirus-2 infected patients have disturbed oral microbiome, i.e., increase in oral pathogens, thereby influencing respiratory and GIT manifestations. As reported by Xiang et al., oral cavity has an important role in establishing SARS-CoV-2 infection.² Both COVID-19 infection and medications used in its management led to certain oral changes. Taste alterations, non-specific oral ulcerations, desquamative gingivitis, petechiae, and opportunistic infections like candidiasis, and mucormycosis have now been associated with COVID-19. The close proximity of the dentist and his team with the patient, exposure to saliva and blood, and aerosol generation makes dental treatment in COVID-19 times challenging.³

¹Department of Periodontics, Dr. Harvansh Singh Judge Institute of Dental Sciences & Hospital, Panjab University, Chandigarh, India

^{2,3}Department of Periodontology and Implantology, J.N. Kapoor D.A.V. (C) Dental College, Yamuna Nagar, Haryana, India

⁴Department of Microbiology, Dr. Harvansh Singh Judge Institute of Dental Sciences & Hospital, Panjab University, Chandigarh, India

Corresponding Author: Shaveta Sood, Department of Periodontics, Dr. Harvansh Singh Judge Institute of Dental Sciences & Hospital, Panjab University, Chandigarh, India, Phone: +91 9417623584, e-mail: drshavetasood@yahoo.com

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This paper aims to discuss the impact of SARS-CoV-2 infection on oral health as oral manifestations, during COVID-19 and post-recovery complications along with various dental practice recommendations during the COVID-19 pandemic.

What is Coronavirus?

Coronaviruses belong to coronaviridae family, having positive sense RNA viruses. They are so named because their surface has crown-like spikes. Severe acute respiratory syndrome coronavirus-2, in 2002–2004 was responsible for causing SARS with 10% mortality. Another variety of coronavirus identified as a novel coronavirus originated from Wuhan in late 2019, with 79.5% of its genetic sequence being similar to SARS-CoV-1. This was renamed by the International Committee on Taxonomy of Viruses as SARS-CoV-2 (Pathogen).⁴

Another variant of coronavirus, B.11.529 was designated as a variant of concern by WHO's technical advisory group on virus evolution (TAG-VE) on 26 November 2021 and is named Omicron.¹

How COVID-19 Effects at Cellular Level?

The SARS-CoV-2 is transmitted via respiratory aerosols. These aerosols contain viruses which bind to the host nasal epithelial cells having ACE-2 receptors for viral spike protein. Here the virus undergoes local replication, also infecting the ciliated cells in conducting airways. This phase lasts for a few days with a controlled host immune response, and low viral load but is highly infectious and detectable in nasal swab tests. In the majority of the cases (80%) viral clearance occurs in 14 days. In other cases, this initial phase is followed by invasion and infection of the upper respiratory tract. Approximately, one-fifth of the patients deteriorate due to the involvement of conducting airways, and upper and lower respiratory tract leading to infection and invasion of type II pulmonary alveolar epithelial cells via ACE-2 receptors. Such extension causes cytokine storm and viral replication and release of viral particles resulting in apoptosis of host cells. As the name indicates – Cytokine Storm, there is excessive release of various interleukins and cytokines predominantly IL-1 and IL-6. This lead to the differentiation of B-cells as well as shows chemo-attraction for neutrophils, CD4, and CD8 cells. The result of this would be sequestration by inflammatory cells into the pulmonary tissue; CD-4 mediated cytotoxicity and finally lung injury. It is a part of the host defense mechanism and also shows an effort by the host to clear the viral infection. Hence, resulting in diffuse alveolar damage or acute respiratory distress syndrome (ARDS).⁵

What is the Clinical Spectrum?

The incubation period of COVID-19 is 5–6 days but can extend up to 14 days. During the incubation period, host is contagious and is capable of transmitting the virus to the rest of the population. Clinical presentation includes fever, body aches, breathlessness, malaise, and dry cough. Most of the patients were in the range of 40–70 years of age who contracted COVID-19 infection. It is not a single presenting feature but a spectrum or a range where symptoms will correspond to the stage and host reaction to the pathogen. Initial 4–5 days patient is usually asymptomatic, followed by mild illness where the patient might experience fever, sore throat, dry cough, malaise, and body aches. Some patients reported gastrointestinal symptoms diarrhea, abdominal pains, nausea, and vomiting. It can be of moderate illness having persistent fever and cough without hypoxia. In severe cases, hypoxia develops and finally in a critical state acute respiratory distress syndrome occurs. This may be associated with shock, certain coagulation defects, and involvement of other systems like that of CNS (encephalopathy), CVS (heart failure), and excretory system (acute kidney injury).⁵

What are the Oral Manifestations in COVID-19 Patients?

Oral manifestations of COVID-19 can occur either due to the direct impact of the virus super-infection or secondary infections or as the result of side effects of therapeutic management of COVID-19. In 2020, Amorim Dos Santos J and his team reported some oral manifestations in COVID-19 patients such as recurrent herpes simplex, candidiasis and geographic tongue. This can be due to deteriorating systemic conditions or due to side-effects of the treatment of COVID-19. In their report, authors supported the view

that dental surgeons should be part of the multidisciplinary team involved in the Intensive Care Unit (ICU) team.⁶

Oral Ulcers

As reported by Brandao T Betal, SARS-CoV-2 has the ability to transmit as well as infect and replicate in oral mucosa like various other viruses, e.g., herpes simplex virus (HSV), cytomegalovirus (CMV), and Zika virus manifesting as oral painful ulcers. Severe acute respiratory syndrome coronavirus-2 can affect epithelial cells of the tongue, salivary glands, oral keratinocytes, and also fibroblasts. It can infect and replicate causing superficial necrosis. They also presented a series of 8 cases of COVID-19 infection with oral necrotic ulcers and aphthous-like ulcerations which were followed by dysgeusia developing at the tongue, lips, palate, and oropharynx. These findings are supported by the presence of ACE-2 receptors in oral mucosa.⁷

According to Joseph Katz et al., HSV-1 and varicella zoster virus are strongly associated with COVID-19 and have prognostic implications as they are related to poor prognosis. Both HSV-1 and VZV are DNA viruses of the human herpes virus subfamily (HHV). They get reactivated after primary infection from their dormant state. In immunocompromised conditions, reactivation of these opportunistic viruses results in significant damage to various organs like the brain, kidneys, and liver. The association of HHV with COVID-19 is life-threatening. Few studies suggested that VZV cutaneous eruptions are indicators of latent COVID-19 infection.⁸

Ageusia/Dysgeusia

Dysgeusia or ageusia is a common oral complaint to be addressed by dentists. Vaira et al from Italy in April 2020 reported ageusia in 5.6% of cases which were later diagnosed with COVID-19 infection. No other respiratory symptoms were present like nasal congestion or rhinitis whilst 35% patients had a fever and 5.1% patients had anosmia. The findings suggest that COVID-19 infection should be considered before further investigating the cases.⁹

Printza A et al. reported 88% of olfactory defect recovery by 2 months (median:11.5 days) and for 23% of cases, it took more than a month. For most patients regaining lost smell and taste is fast but recovery for more severe conditions is delayed, 1 out of 10 takes up to 2 months.¹⁰

To objectively test anosmia and ageusia, an olfactory function assessment was carried out by means of the Connecticut Chemosensory Clinical Research Center orthonasal olfaction test (CCCRC) which is a simple, validated, and widely used test that includes butanol threshold assessment and an odor assessment test using common odors. For testing gustatory function, a standardized and validated test for primary tastes (sweet, salty, sour, and bitter) was used. Solutions of table salt, refined sugar, 100% lemon juice, and unsweetened decaffeinated coffee in deionized water were used in fixed concentrations. Test was performed by putting 1 mL of each solution randomly in the center of the tongue different cotton swabs were used to clean and bitter was tested at the end as it affects the perception of other tastes. Perception was noted as correct or incorrect (1 for each correct and 0 for incorrect and then adding all the scores) and given a score ranging from 0 to 4. Thus, segregating the patients as normal (score 4), mild hypogeusia (score 3), moderate hypogeusia (score 2), severe hypogeusia (score 1) and ageusia (score 0). This simple test goes a long way in the identification of plausible symptomatic patients thereby isolating them and preventing transmission.¹⁰

Xerostomia

Fatehi Y et al. reported xerostomia to manifest before the common symptoms of COVID-19 as an early suspicion of infection.¹¹ This fact can help in containing the infectious disease transmission by preventing the transmission, quarantining the patient, and good treatment outcomes. Fatehi and his team also studied dry mouth symptoms, which were evaluated on a VAS scale from 0 to 10 (0 for no dryness, normal, and 10 for very severe dryness of the mouth). They found that in 60% cases, xerostomia started 3–4 days before general symptoms of fever and respiratory problems. However, in other patients, it was a simultaneous finding with general symptoms and had higher degrees of VAS. In all the cases, the patients recovered with treatment, initially symptoms of dry mouth started diminishing. Most patients (8 patients of case series) recovered completely in a few days (2–13 days), and only 2 patients complained of mild dryness of mouth even after 3 weeks. Bagley et al., also found that ACE-2 receptors on salivary glands have an affinity for SARS-CoV-2, thus salivary glands act as a reservoir for the virus and patients reporting with a chief concern of dryness of the mouth.¹²

Candidiasis

Riad A et al. in their study on oral candidiasis in patients of non-severe COVID-19 infection reported overprescription of broad-spectrum antibiotics resulting in complications like oropharyngeal candidiasis leading to life-threatening candidemia. Thus, they highlighted the role of dentists in diagnosing and managing oral candidiasis in COVID-19.¹³

In another study by Katz J, it was concluded that systemic candidiasis was significantly associated with increased risk for COVID-19, however, oral candidiasis had an insignificant association. Unexplained oral and systemic candidiasis is an indicator of T and B cell immunosuppression associated with viral infection.¹⁴

Jairo Corchuelo and FC Ulloa reported that oral candidiasis in a patient with an asymptomatic history of COVID-19 was evaluated by teleconsultation, confirmed by successful treatment response to the nystatin regimen. This case report pointed towards two aspects—one, dentists can be early detectors of any immunosuppressant condition like COVID-19; secondly, teleconsultation helps in relieving the patient as well as preventing the transmission of COVID-19.¹⁵

Mucormycosis

There has been a surge in cases of mucormycosis in COVID-19 patients especially in those with a history of diabetes mellitus and prolonged steroid therapy, i.e., immunosuppressant. In a systematic review done by Singh A et al. who reported the presence of pre-existing diabetes mellitus in 80% of cases and steroid intake in 76.3% of cases among 101 total cases studied were found suffering from mucormycosis. Their study revealed 88.9% involvement of the nose and sinuses and 56.7% of rhino-orbital involvement. The mortality rate was reported to be 30.7%.¹⁶ As per Indian Council of Medical Research (ICMR) guidelines early diagnosis and treatment initiation reduced mortality. Clinical presentation included—pain over the face, sinuses, in teeth and gums, paresthesia or numbness over half of the face, discoloration of the skin over the nasolabial groove, blackish or blood-tinged nasal discharge, loosening of teeth, palatal discoloration and ulceration and perioral swelling. It can involve the orbit resulting in diplopia, periorbital swelling conjunctival infection, or chemosis along with headache, respiratory symptoms,

hemoptysis, chest pain, and altered consciousness. Due to dental symptoms, patients may approach the dentist first and their diagnosis can make a lot of difference in the final outcome.¹⁷

Mucormycosis is a rare, saprophytic, opportunistic fungal infection affecting mainly nasal and paranasal sinuses, oral cavity, and brain. It's angio-invasive nature is responsible for rapid progression.¹⁸

Januja et al. in their review mentioned six major presentations based on the part of the body affected. Rhino-orbital-cerebral mucormycosis (ROCM): Usually affects the nose, maxillary sinus with maxillary teeth, orbit, and ethmoidal sinuses; common in uncontrolled diabetic patients or after kidney transplant. Pulmonary mucormycosis, gastrointestinal, burn or skin damage, and disseminated and kidney mucormycosis are different presentations. Rhino-orbital-cerebral mucormycosis if diagnosed at an earlier stage and treated vigorously results in a good prognosis, and better prognosis if not invaded beyond the sinus before surgical intervention.¹⁹

Necrotizing Periodontitis

Bardan Z et al. reported the presence of SARS-CoV-2 in the periodontal pocket indicating it to be the reservoir of the virus.²⁰ Wang K et al. indicated cells expressing CD147 can get infected by SARS-CoV-2 using its spike protein, making it another risk group apart from ACE-2 receptor cells. It has already been proved that the cells of the buccal and sub-gingival regions of the periodontal pocket have expression of CD147 making these regions to be researched further in detail. In patients with periodontitis, the gingival epithelium has more expression of CD147, thereby increasing the risk of CoV-2.²¹

Periodontitis

Periodontal diseases are multi-factorial in etiology and host-mediated immune mechanisms play an important role in their pathogenesis. Poor oral hygiene favors the growth of pathogens. Severe acute respiratory syndrome coronavirus-2 expresses a high affinity for angiotensin-converting enzyme-2 receptors, found in oral mucosal tissues; this makes the oral cavity an entry port for SARS-COV-2. Moreover, pro-inflammatory mediators associated with periodontitis have the potential to cause alteration of respiratory epithelium making it more susceptible to invasion by respiratory pathogens.²²

How to Manage Dental Patients in COVID-19 Pandemic?

As a preventive measure to control the spread of COVID-19, lockdowns were imposed. During that period dental practices were advised to shut down. This helped in reducing the number of affected individuals but proved to be detrimental for patients in need of urgent dental care. Moreover, closing dental practices burdened hospital emergency departments that were already overwhelmed with patients having systemic emergency conditions or respiratory complications associated with COVID-19. These circumstances enhance the importance of general awareness and following guidelines to treat patients in pandemic and/or local epidemic outbreaks. Treating every patient as a potential asymptomatic carrier of COVID-19.²³

Guo et al. found a reduction of 38% in patient count attending Dental Emergency Departments in China during the COVID-19 spread.²⁴ As most dental procedures are associated with aerosol

generation, it was necessary to control the transmission of viral infection. The study reported that the dental pulpal or periapical lesions and cellulitis or abscess were the most common reasons for seeking emergency dental care. Not surprisingly, with the reduction of outdoor activities, there was a reduction in cases of trauma.²²

The specific precautions to be taken during the pandemic are categorized in two main headings-modification at patient screening and examination level and modification of the dental procedures. It is necessary to understand and follow these precautions elaborately because a recent study by Parvaie and Osmani in 2022 showed that only 44.6% of dental patients were satisfied with the health protocols for COVID-19 during dental treatment. So, we need some more attention to completely satisfy the demands of all dental patients regarding COVID-19 prevention protocol.²⁵

Ministry of Health and Family Welfare (MOHFW), India (2021) composed specific guidelines and has played an important role in constantly updating them with changing dynamics of the disease.²⁶

Firstly, to limit the gathering of patients in dental OPD/clinics by giving prior appointment has been an important step in this direction. Moreover, limiting the number of people in the examination area by discouraging the presence of attendants. Patients with co-morbidities or other vulnerable groups to be appointed at a separate time or early morning slot. No patient is to be attended to without prior appointments.

Patient assessment/screening: Assuming every patient to be a carrier needed to be segregated as patients with unknown COVID-19 infection and known for COVID-19 infection. Unknown cases to be categorized as asymptomatic or having symptoms of COVID-19. For those with symptoms, emergency treatment needs to be rendered, and elective or non-emergency treatment to be postponed.

- Alharbi A et al. divided dental OPD patients after screening into 5 categories:²³
 - Asymptomatic and unsuspected, unconfirmed COVID-19 case
 - Symptomatic and/or suspected unconfirmed case of COVID-19
 - Stable confirmed case of COVID-19 (mild symptoms, need no hospitalization or oxygen)
 - Unstable confirmed COVID-19 cases (severe and critical cases)
 - Recovered confirmed COVID-19 case (Confirmed recovery indicated by asymptomatic period of 30 days after last negative laboratory test)
- As the patient entered the dental OPD, a plastic or glass shield between the patient and the receptionist needed to be placed. 6 feet distance and triple layer mask to be mandatory. The patient was advised to visit directly from home rather than in the sequence of other public places like malls and offices or using public transport. Digital exchange of money is preferred. Hand sanitizers are to be used on entry.
- Extra oral imaging is preferred to reduce excessive salivation and gag reflex. Intraoral radiographs increase the risk to technicians as contamination of film with saliva is imperative and saliva has been reported to contain SARS-CoV-2.
- Rinse with 10 mL of 0.5% povidone-iodine diluted in 1:20 in water. Povidone being anti-viral, anti-fungal, and anti-bacterial is a good choice for pre-procedural rinse. Using 0.5% povidone-iodine for 30 seconds is capable of reducing SARS-CoV-2 virus infectivity significantly. It also interferes with the transmission of the virus by preventing the attachment to nasal as well as pharyngeal tissues and thus reducing its load in salivary and

respiratory droplets.²⁷ Other pre-procedural mouthwashes include chlorhexidine, and chloride dioxide for at least 15 seconds, which may be helpful in transient reduction of viral load.²⁶

- Disposable and single-use instruments and devices are preferred to prevent cross-contamination. The use of barriers like face shields, and rubber-dam significantly reduces disease transmission but also increases the efficiency of the operator and reduces chair-side time. The use of high vacuum suction with a minimum suction capacity of 6.6 liters per minute is suggested.
- Whenever pain management is required, dentist needs to avoid the prescription of Ibuprofen in cases where there is suspicion or confirmation of infection with COVID-19.
- The dental procedures that can be done in general dentistry are divided into 5 categories:²⁵
 1. Emergency management of life-threatening conditions
 2. Urgent conditions manageable with minimally invasive procedures and without aerosol generation
 3. Urgent conditions that need to be managed with invasive and/or aerosol-generating procedures.
 4. Non-urgent procedures
 5. Elective procedures
- Dental treatment should be as minimally invasive as possible and aerosol-generating procedures should be avoided. Use of hand instruments, high pressure suction helps in controlling the transmission of SARS-CoV-2 virus. Clean and disinfect equipment and operatory surfaces with 1% sodium hypochlorite or 70% alcohol for appropriate contact times.
- For patients with COVID-19 symptoms or those who tested positive, level 3 personal protective equipment PPE that includes respiratory protective equipment, gloves, safety glasses, shoes, earplugs or muffs, vests and full body suits is recommended. The emergency procedures only needed to be undertaken with level 3 PPE with standard COVID-19 protocol listed for surgeries. In case of inadequate facilities at dental clinics, referral to the center should be considered.

SUMMARY

Though the manifestations of COVID-19 are mimicking other viral fever, in some cases its severity is immense causing a high rate of mortality. The dilemma is that as a few patients land in the ICU, others may recover at home quarantine while still others are asymptomatic. To interrupt viral transmission in COVID-19, it is critical to recognize carriers of COVID-19 as they may be asymptomatic or partially symptomatic. Diagnosing a fulminating case of SARS-CoV-2 is not a challenge in a pandemic. Therefore, being aware of the oral presenting conditions of COVID-19 is critical. Some highly prevalent oral manifestations are oral aphthous ulcers, dysgeusia or ageusia, xerostomia, candidiasis, mucormycosis, and necrotizing periodontitis which are clinically relevant to both the medical physician and a dental surgeon.

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