Corona Virus – Dentist's Perspective

K.M.K. Masthan[1], E.P. Sridevi Anjuga[2], N.Aravindha Babu[3], E.Rajesh[4]

[1]Head of the Department, [2]Post Graduate Student, [3]Professor, [4]Reader, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Pallikaranai, Chennai

Abstract

A novel coronavirus (COVID-19) contributes to human-to - human transmission. The COVID-19 has been recently identified in infected patient's saliva. Transmission of COVID-19 via contact with droplets and aerosols generated during clinical dental procedures is predicted. There is a need to start up investigations into the identification of COVID-19 in oral fluids and its effects on the transmission of this virus, which is necessary for improving successful preventive strategies, in health care professionals particular for dentists who perform aerosol-generating procedures.In addition to the standard precautions, some special precautions that should be implemented during an outbreak have been raised in this review.

Keywords: *COVID 19, Dentist, Aerosol,Saliva, Xerostromia.*

Introduction

At the end of 2019, a pneumonia outbreak with unknown etiology occurred in Wuhan, China.The pathogen was identified and named as novel coronavirus 2019(nCoV- 2019), which stands for coronavirus disease 2019[1].As of mid-April 2020, the infection has spread to over 185 countries, infectedmore than two million people and resulted in over 127,000 deaths globally[1].(SARS-CoV-2), which spread primarily through droplets, respiratory secretions and direct contact[1]. The most possible route of transmission of disease in dental clinic is aerosol transmission because of exposure to high concentrations of aerosols in a relatively closed environment[1]. Routine dental procedures generate aerosols, which pose potential risks to the dental care personnel and patients[1].Although no corona virus transmitted cases were reported in a dental setting, given the high transmissibility of thedisease, dental teams should be alert and maintain a healthy environment for both the patients and themselves[1]. Therefore, understanding aerosol transmission and its implications in dentistry is necessary[1]. Apart from standard precautions, some special precautions should also be implemented during this period[1].

TRANSMISSION:

Droplets and aerosols and their role in the transmission of diseases:

· When an individual coughs, sneezes, laughs, or talks, large (>5 µm diameter) and small (≤5 µm diameter) droplets or aerosols are generated. Because of its gravity, larger droplets rapidly fall to the ground; thus, droplet transmission involves close physical contact between an infected person and a susceptible person[1].

· On the other hand, small droplets or small particle residues of evaporated droplets have a low settling velocity, so they may remain in the air for a longer time and travel further before they can enter the respiratory tract or contaminate surfaces[1].

· Results from some studies have shown that aerosols from highly virulent pathogens like severe acute respiratory syndrome-coronavirus (SARSCoV) can travel three to six feet distance[1].

Droplets and aerosols in dental setting:

· When performing dental procedures with a highspeed handpiece, friction between the tooth and the rapidly rotating bur would generate excessive heat. Without a coolant, the heat could cause damage

to hard dental tissue and lead to pathological changes to the dental pulp[1]. So we have to use a water coolant while performing dental procedures, including tooth preparation, oral prophylaxis, and oral surgery to prevent heat gain[1].

· The water coolant, however, could generate aerosols. When combined with bodily fluids in the oral cavity, such as blood and saliva, bioaerosols are created[1].

· The water coolant, however, could generate aerosols. When combined with bodily fluids in the oral cavity, such as blood and saliva, bioaerosols are created[1].

SIGNS AND SYMPTOMS:

· COVID-19 incubation period is 1-14 days (mean 5-7 day duration), with peak viraemia occurring before the onset of symptoms.This highlights the potential for transmission of asymptomatic or minimally symptomatic patients[2,3].

· Fever, cough, and dyspnoea are the most common presenting symptoms of COVID-19 infection. Other presenting signs include myalgia or tiredness, sore throat, nasal congestion, headache , nausea , vomiting and diarrhoea[2].

· Any one of the this signs like Breathlessness / respiratory rate > 24 / min, oxygen saturation (SpO2) 110 / bpm Systolic blood pressure1 were associated with fever and upper respiratory symptoms lasting > 5 days[2].

ORAL MANIFESTATION:

· Presence of white plaque on the dorsum of tongue, multiple pinpoint yellowish ulcers on the tongue dorsum resembling the late stage of herpetic recurrent oral lesion[4].

· Comorbidities are highly associated with a poor prognosis in COVID19 patients; thus, it is more likely that fear and emotional stress were the underlying cause that triggered herpetic lesions on the palate[5]. The current literature supports the evidence that dysgeusia is the only oral symptom of COVID-19[5].

· In one case herpetic recurrentstomatitis; however, it was the first time the patient had them[6]. Then the was advised to take valaciclovir 500 mg every 8 hr for 10 days, and topical antiseptics with chlorhexidine and hyaluronic acid. After 10 days, there was a complete recovery of the oral lesions[6]. The patients presented ulcers or blisters, those are common elementary lesions seen in other viral infection, such as aphthous fever, hand, foot, and mouth disease and herpetic gingivostomatitis,[6].

· The current analysis strongly confirms the high prevalence of olfactory and gustatory disorders in COVID-19 infection[6].

· Loss of smell and taste may be used as indicators of potential contagion and early identification may help to decrease the risk of spread, especially by paucisymptomatic cases[7].

· The most common feature is painful ulceration in the buccal mucosa[8]. Oral examination showed besides multiple reddish macules are radiated along the hard palate, tongue, and lips[8]. The biopsied lesion was microscopically diagnosed with severe vacuolization and occasionally exocytosis of the epithelium[8]. Within the lamina propria a diffuse chronic inflammatory infiltrate was associated with focal areas of necrosis and hemorrhage. superficial and deep small vessels were obliterated by evident thrombi[8]. Small thrombi seemed to consist primarily of endothelial cells, while the larger cells were made up of fibrin and endothelial cells and in either cases CD34 was positive for cells in the luminal component[8]. Adjacent minor salivary glands showed an intense lymphocytic infiltration, mostly positive for CD3 and CD8 and some of these cells were also found in the basal layer of the epithelium[8].

· Coronavirus disease 2019 is associated with a variable inflammatory reaction that can induce vascular inflammation[9]. Erythematous rash has been described [2] and could also be explained by an inflammatory reaction[9]. Thus, an irregular oral ulcer could be an inaugural symptom of Covid-19 which needs to be proven in larger cohorts of patients[9].

· It is known that the oral cavity may exhibit manifestations of underlying diseases such as oral ulcerations, gingival bleeding, glossitis, oral pain, or halitosis[10].

· Viral infections usually manifest as either ulceration or blistering presentation of oral tissues[10].

· Recurrent oral ulcers could be an inaugural

symptom of COVID-19[10]. Some cases showed that pain and intraoral manifestations such as oral ulcers or blisters before seeking medical advice was a common finding in COVID-19[10]. Thus, it was encouraged to perform intraoral examinations in patients suspected of SARS-CoV-2[10].

· As these oral findings are still new in the literature, their occurrence may vary significantly among COVID-19 patients and, thus, the associated systemic diseases and/or poor oral health may be a contributory factor to the oral presentations+10. Given the possibility of immunocompromised statuses of the patients, it is also possible that the oral manifestations may be related to other viruses or bacteria[10].

a) Hyposalivation :

· The salivary gland secretion is dependent on several factors, including temperature, circadian rhythm and intensity, and type of taste and on chemosensory, masticatory, or tactile stimulation[10].

· Hyposalivation, the reduction of unstimulated salivary flow rate, is a common finding in patients mainly reported as a consequence of the use of medication and psychological processes[10].

· Dry mouth was shown to be manifested in a relatively high proportion of COVID19 patients [23]. A recent communication has drawn attention to hyposalivation as responsible for exposing patients to a higher risk of getting coronavirus disease (COVID19) once the presence of many proteins with antiviral properties in saliva could be reduced[10].

· Interestingly, the SARS-CoV-2 infection is more severe in individuals over 50 years of age and with the presence of associated comorbidities such as diabetes, cardiovascular problems and diseases involving the nervous system[10].

· It is known that salivary flow reduces with age and is not explained based on medications used by older adults[10]. Besides, diabetes and medications for systemic disorders have also been associated with hyposalivation[10].

· It is known that infectious and inflammatory processes might also lead to hyposalivation and, thus, the possibility of qualitative and quantitative disturbances in saliva secretion by SARS-CoV-2 infection in the salivary gland should not be discarded[10].

· Human saliva is a complicated fluid and plays a crucial role in preventing from a viral infection, especially through the innate immune system, which is a notable first-line defense[11].

Two possible explanations for enhancing the incidence rate of this infection are as follows:

• Lowered saliva secretion can disrupt the oral and airway mucosal surfaces as a physical barrier, thereby enhancing the viral colonization and adhesion[11].

• This decrease may also hinder the secretion of antimicrobial peptides and proteins[11].

Considering the existence of various proteins with established antiviral characteristics in saliva such as lysozyme, mucins, cathelicidin (LL-37), lactoferrin, peroxidase, sIgA SLPI, salivary agglutinin (gp340, DMBT1), alpha-defensins, beta-defensins, and cystatins, some of which may potentially impede virus replication especially SARS-CoV-2[11].A possible risk factor for severe respiratory infection could be hyposalivation. It can leave patients at a significant risk of getting COVID-19[11].

b) **Taste disorders**:

· Taste disorders have been reported in a variety of clinical problems [34]. Amblygeustia, a diminished sensitivity of taste, was shown to be manifested by a relatively high proportion of COVID-19[10].

· In a study in which patients with influenza- like symptoms underwent Covid-19 testing, smell and taste loss were reported in 68% (40/59) and 71% (42/59), respectively, of COVID-19-positive patients suggesting that chemosensory dysfunction should be considered when screening symptoms[10].

· Possible taste alterations as result of the direct effect of SARS-CoV-2 infection in sensory neurons or other components of the peripheral gustatory system should also be considered[10].

c) SARS-CoV-2 may cause acute and chronic sialadenitis:

· Wang et al. proposed that SARS-CoV-2 might induce acute sialadenitis and associated symptoms, such as pain, discomfort, inflammation, and secretory dysfunction in salivary glands. SARS-CoV-2 can attach to ACE-2 receptors on the epithelium of salivary glands, fuse with them, replicate, and lyse cells to trigger apparent signs and symptoms, such as discomfort, inflammation, and pain in major salivary glands[11].

· After the cytolytic activity of SARS-CoV-2 lyses the acinar cells, salivary amylase is unleashed into the peripheral blood. It can be inferred that the amylase rises in peripheral blood during the early contamination process[11].

· Secreted inflammatory cytokines facilitate the inflammatory reaction that destroys the tissue of the salivary glands as the immunopathological process continues[11].

· Fibrogenesis and granulation can restore the inflammatory damage by reducing immunoreaction[11]. After the severe stage, the function of salivary glands can be anomalous due to contamination with SARSCoV-2, which may induce chronic sialadenitis[11].

Current COVID-19 diagnosis :

The main strategy of identification for COVID-19 is Reverse Transcription quantitative Polymerase Chain Reaction (RT-qPCR), which is commonly used to extract viral RNA from oropharyngeal and nasopharyngeal swabs or sputum samples[11]. In addition, a chest X-ray may be an invaluable diagnostic method for identifying bilateral pneumonia, displaying as multi-lobar ground-glass opacities with an asymmetric, peripheral, and posterior distribution[11].

Salivary diagnostics :

· Saliva is now widely established as a reservoir for biological indicators that range from modifications in nucleic acids, proteins, and biochemicals to the microflora[11]. As a diagnostic fluid, saliva has tremendous potential and advantage over other biological fluids because the sampling process of saliva does not entail an invasive intervention, and it is inexpensive and helpful for controlling the systemic health[11]. In the near future, designing accurate and responsive salivary diagnostic instruments and the implementation of established guidelines following meticulous testing will enable the use of salivary diagnostic as chairside tests for diversified oral and systemic diseases[11].

· The benefits of salivary diagnostic tests are economical, noninvasive, healthier to apply than serum sampling, diagnostic values in real-time, no requirement for specialized healthcare workers, numerous samples are simple to obtain,collecting and monitoring are doable at home, minimizing the possibility of cross-infection, better shipping and storage than serum sampling, lesser agitation during the diagnostic process, screening assays are commercially available, and saliva does not clot and can be handled more efficiently than blood[11].

· Some virus strains have been detected in saliva as long as 29 days after infection, indicating that a non-invasive platform to rapidly differentiate the biomarkers using saliva could enhance disease detection[11]. Saliva samples could be collected in patients who present with oropharyngeal secretions as a symptom[11]. Given the need for close contact between healthcare workers and infected patients to collect nasopharyngeal or oropharyngeal samples, the possibility of self-collection of saliva can significantly reduce the risk of COVID-19 transmission. Besides, the nasopharyngeal and oropharyngeal collection promotes discomfort and may promote bleeding especially in infected patients with thrombocytopenia[11].

· We suggest that there is a minimum of three different pathways for COVID-19 to present in saliva: firstly, from COVID-19 in the lower and upper respiratory tract that enters the oral cavity together with the liquid droplets frequently exchanged by these organs[11]. Second, COVID-19 present in the blood can enter the mouth through crevicular fluid, an oral cavity-specific exudate containing local proteins derived from extracellular matrix and serum derived proteins[11]. Finally, another way for COVID19 to occur in the oral cavity is by major- and minor-salivary gland infection, with subsequent release of particles in salivavia salivary ducts[11].

· It is essential to point out that salivary gland epithelial cells can be infected by SARS-CoV a short time after infection in rhesus macaques, suggesting that salivary gland cells could be a pivotal source of this virus in saliva[11]. Additionally, the production of SARS-

CoV-specific secretory immunoglobulin A (sIgA) in the saliva of animal models intranasally immunized was previously shown[11]. Considering the similarity of both strains, we speculate that salivary diagnosis of COVID-19 could also be performed using specific antibodies to this virus. Thus, salivary diagnostic testing can offer a convenient and cost-effective mechanism for early-diagnosis of Covid[11].

· Further researches are required to investigate the potential diagnostic of COVID-19 in saliva and its role in transmission of this virus, which is crucial to improve its effective strategies for prevention, especially for dentist and healthcare professionals that perform aerosol-generating procedures[12].

Evaluation and treatment of patients with salivary gland disease in this pandemic situation. A three-step guideline to survey patients with salivary gland disease is as follows:

1) Primary telemedicine examination[11]:

· Recognize patients having touchable or visible lesions, mass presence in the majority of salivary gland region, and neoplasm symptoms

· Ask the history of skin cancer of the head and neck, lymphoma, etc.

· Ask the clinical symptoms and history of inflammatory salivary gland disease

2) Diagnostic examination for patients suspected of having salivary gland neoplasm[11]:

· COVID-19 screening 2

· FNA biopsy

· Ultrasound of salivary gland

· Extra imaging such as MRI, if needed

· Make sure of the existence of salivary gland disorder

· Identify signs and symptoms of non-neoplastic illness

3**) Patient counseling and recommendations for treatment[11]:**

· Survey FNA biopsy outcomes

· Assess treatment options and prognosis

· Prescribe COVID-19 test before any surgery

· Pay attention to age comorbidities of the patient

· Radiation oncology and hematology consultations, if required

· Considering the outbreak situation.

DENTISTRY VS COVID-19:

TRANSMISSION OF COVID-19 IN DENTAL CLINIC:

CONTACT SPREAD:

Transmission of 2019-nCoV in dental clinics occurs through four major routes:

(1) Direct contact of droplets, blood, saliva or other patient material to respiratory secretions[3];

(2) Indirect exposure to infected surfaces and/or instruments[3];

(3) Inhalation of airborne virus[3];

(4) Mucosal (oral,nasal and conjunctival) interaction with infected droplets and aerosols that are driven by coughing and speaking without using mask[3].

CONTAMINATED SURFACE SPREAD:

Research has shown that coronaviruses can stay several days on metal, glass, and plastic surfaces16. As surfaces in dental clinics thus serve as places for droplets and aerosols mixed with saliva and/or blood of patients, they can effectively continue to spread infection[3]. Coronaviruses can keep their virulence active from 2 h to 9 days at room temperature[3]. Their operation was substantially higher than 30 per cent at 50 per cent humidity[3]. Thus, it seems in the dental setting that surfaces are holding clean and dry will play a significant role in preventing transmission to 2019-nCoV[3].

SPECIAL PRECAUTIONS IN DENTAL PRACTICE:

Dentists should be familiar with how 2019-nCoV is spread, how patients with 2019-nCoV infection are

identified and what extra-protective steps need to be taken in practice to prevent 2019-nCoV transmission[3].

Patient at reception:

· Provide them a surgical face mask and sanitizer[3].

· The patient's body temperature should be checked by using contact free thermometer[3].

· Equipment such as blood pressure cuffs and thermometers must be cleaned and disinfected after every use with 70 per cent ethyl alcohol[3].

· Maintain social distance between the patient and dental personnel[3].

· To avoid close contact with potentially infectious patients, install physical barriers (e.g., glass or plastic windows) at the reception areas[3].

· When verifying and scheduling appointments, take a comprehensive history of travel and health[3].

· Ask for recent medical history (cough, sore throat, fever, respiratory illness). If there is any evident symptom persists dental personnel should inform the dentist and then case must be local or public health authorities[3].

· Reschedule appointments if your patients have traveled outside India within the last two weeks to a coronavirus-affected area[13].

· Take contact information and address of all treated patients[13].

INSIDE DENTAL ROOM:

· It is commonly believed the preoperative antimicrobial mouthrinse can reduce the number of oral microbes[3,13].

· Use of rubber dams will significantly reduce production of aerosol or spatter tainted with the saliva and blood, in particular high-speed handpieces and ultrasonic dental appliances are used[3,13].

· Dental anti-retraction handpiece with specially built anti-retractive valves or other anti-reflux designs is highly recommended as an extra preventive Cross-Infection assessment[3,13].

· Autoclave hand-pieces after each procedure[3,13].

· Public areas are also washed and disinfected like door handles, chairs and bathrooms[3,13].

DENTIST'S SAFETY precautions:

· Ensure that the personal protection equipment used is appropriate for the procedures being undertaken[13].

· Clinically, COVID-19 can also be transmitted by contact with the mucous membranes in the eyes, since infectious droplets can easily contaminate the human conjunctival epithelium. So, Protective eyewear or face mask should be worn and disinfected for patients during the whole procedure[13].

· During practices that are likely to cause splashes or blood sprays, body fluids, secretions or excretions, wear to protect skin and avoid soiling of clothes[13].

· Clean hands with soap and water for at least 20 seconds following patient touch or using an alcohol-based hand sanitizer with at least 60 percent alcohol if no soap and water are available[13].

· Dental personnel should use N95 respirators or respirators which provide a higher level of protection when performing or presenting an aerosol-generating procedure rather than a facemask[13].

· After each patient visit, surfaces are disinfected, particularly surfaces located close to the operating areas[13].

SPECIAL SAFETY PRECAUTIONS:

· Dental hospitals and clinics across China are temporarily closed to avoid the possible risk of transmission due to the unique characteristics of dentistry and the high transmissibility of COVID-19[1].However, there are some dental emergencies that needs immediate treatment and control, such as trauma, facial space infection, and carcinoma. Therefore, special precautions should be followed when treating dental emergencies[1].

· Surgery will be postponed for any patients with abnormal chest CT results, those either with symptoms of COVID-19 or confirmed cases of COVID-19[12]. If dental surgery is an emergency, dentists must address the possibility of aerosolization[12]. Sinonasal area and

pharynx, suitable PPE of the whole operating room team are strongly advised for minor salivary gland tumors of the oral cavity. The number of staff in the operating room must be minimized[12].

· The risk of aerosolized mucosal secretions is only found during intubation and extubation for parotid and submandibular neoplasm surgeries. During intubation and extubation, all the staff in the room must wear suitable PPE while all unneeded staff must leave the room[12]. Controlling the obstructive salivary gland disease can be remotely conducted in most cases[12]. In rare situations, intraoperative drainage and biopsy or office-based assessment and treatment procedures may be needed for handling an abscess, detecting cancer, relieving acute pain which has not been treated with proper medical care[12].

· Due to irrigation and aerosolization, sialendoscopy should be stopped during the outbreak of COVID-19[12]. In addition, all dentists should know that the use of a mouthrinse and/or local nasal products, which include beta-cyclodextrins in conjunction with flavonoid agents, might provide invaluable adjunctive care to minimize the viral load of saliva and nasopharyngeal microbiota, including SARS-CoV-2[12]. Therefore, dental professionals can create a safer atmosphere for themselves as well as their patients[12].

Conclusion

Dentists, by nature, are at highly prone to infectious diseases. The emergence of COVID-19 has brought new challenges and responsibilities to dental professionals The Sars-CoV-2 infection is responsible for several events in the mouth.A better understanding of aerosol transmission and its implication in dentistry can help us identify and rectify negligence in daily dental practice.In addition to the standard precautions, implementation of special precautions could prevent disease transmission from asymptomatic carriers. These are thesome special precautions would not only help to control the spread of COVID-19 but also serve as a guide for managing other respiratory diseases.

Ethical Clearance – Not required since it is a review article

Source of Funding – Nil

Conflict of interest – nil

References

1. Ge ZY, Yang LM, Xia JJ, Fu XH, Zhang YZ. Possible aerosol transmission of COVID-19 and special precautions in dentistry. Journal of Zhejiang University-SCIENCE B. 2020 Mar 16:1-8.
2. Varghese GM, John R, Manesh A, Karthik R, Abraham O C. Clinical management of COVID-19. Indian J Med Res 2020;151:401-10
3. Fallahi HR, Keyhan SO, Zandian D, Kim SG, Cheshmi B. Being a front-line dentist during the Covid-19 pandemic: A literature review. Maxillofacial Plastic and Reconstructive Surgery. 2020 Dec;42:1-9.
4. Dos Santos JA, Normando AG, da Silva RL, De Paula RM, Cembranel AC, Santos-Silva AR, Guerra EN. Oral mucosal lesions in a COVID-19 patient: new signs or secondary manifestations?. International Journal of Infectious Diseases. 2020 Jun 9.
5. Al-Khatib A. Oral manifestations in COVID-19 patients. Oral diseases. 2020 Jun 10.
6. Martín Carreras-Presas C, Amaro Sánchez J, López-Sánchez AF, Jané-Salas E, Somacarrera Pérez ML. Oral vesiculobullous lesions associated with SARS-CoV-2 infection. Oral Diseases. 2020.
7. Dell'Era V, Farri F, Garzaro G, Gatto M, Aluffi Valletti P, Garzaro M. Smell and taste disorders during COVID-19 outbreak: A cross-sectional study on 355 patients. Head & Neck. 2020 Jun 11.
8. Soares CD, de Carvalho RA, de Carvalho KA, de Carvalho MG, de Almeida OP. Letter to Editor: Oral lesions in a patient with Covid-19. Medicina oral, patologia oral y cirugia bucal. 2020 Jul;25(4):e563.
9. Chaux-Bodard AG, Deneuve S, Desoutter A. Oral manifestation of Covid-19 as an inaugural symptom?. Journal of Oral Medicine and Oral Surgery. 2020;26(2):18.
10. Pedrosa M, Sipert CR, Nogueira FN. Salivary Glands, Saliva and Oral Presentations in COVID-19 infection.
11. Fini MB. Oral saliva and CVID-19. Oral Oncology. 2020 May 27:104821.
12. Sabino-Silva R, Jardim AC, Siqueira WL. Coronavirus COVID-19 impacts to dentistry and potential salivary diagnosis. Clinical Oral

Investigations. 2020 Apr;24(4):1619-21.

13. Indian Dental Association. Indian Dental Association's Preventive Guidelines for Dental Professionals on the Coronavirus Threat.