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Coronavirus disease 19 (COVID-19): Recommendations for dental care setting

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Abstract

The global outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused widespread public health concerns including dental health care and also led to economic crisis. Many healthcare professionals have infected by the virus and many have died. Among the healthcare providers, dental professionals are at high risk of infection owing to the nature of their profession which requires close proximity to the patient's mouth and nose, contact with saliva and blood and also use of aerosol generating instruments such as high-speed handpiece, ultrasonic instrument, three-way syringe, air abrasive device and intra-oral sand blaster. Dental professionals need specific guidelines to protect them and also the patients and at the same time to provide the needed treatment during the coronavirus disease 2019 (COVID-19) pandemic. This article aimed to provide specific recommendations for patient triage, risk assessment, infection control strategies and patient management protocol to provide optimum dental care along with prevention of cross-infection during the COVID-19 pandemic. This article based on the available evidence about COVID-19 provides fundamental knowledge about the disease and specific recommendation to prevent nosocomial spread of infection in dental setting.

Keywords: Coronavirus, COVID-19, dental, infection control

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly around the world despite global efforts to contain the disease spread. There is second wave of infection in many parts of the world. The virus is present in nasopharyngeal and salivary secretions of an infected person and the primary route of transmission occurs by contaminated respiratory droplet or aerosols from an infected person to other who are in close contact.[1] Many of the infected persons are asymptomatic or with mild symptoms and there are high chances that healthcare professionals treat them unknowingly adding the risk of infection.[2,3] Dental professionals are at high risk of infection due to their nature of work and routes of

transmission of SARS-CoV-2. Lockdown and restrictions in public movement is implemented in many parts with the intent to curtain the spread of coronavirus disease 2019 (COVID-19) leading the potential to increase dental-related emergency visit.

The World Health Organization (WHO) declared COVID-19 outbreak as a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 and a global pandemic on March 11, 2020. Different vaccines have administered around the globe with the aim of mass vaccination. As on June 10, 2021, WHO reported a total of 173,989,093 confirmed COVID-19 cases including 3,756,947 deaths and as on June 7, 2021, a total of 2,092,863,229 vaccine doses have been administered.[4] Different new strains of the virus have evolved and many of them are more infectious than the earlier one.[5] The efficacy of the currently used vaccines against the new strains are not well known.[6] Antibody that are produced against this infection provide immunity lasting for months after the infection is cured.[7] There are reported cases of reinfection among persons who had previous infection and recovered.[8] There are also cases of infection after full course of vaccination.[9] All these clearly suggest that the disease is going to stay for some years and healthcare professionals need to follow specific guidelines and strictly adhered to them during this pandemic.

Every patient should be considered as a SARS-CoV-2 carrier as there is possibility of infection from asymptomatic patients.[3] Necessary precautions should be taken to prevent cross-infection in order to preserve the number and prevent exhaustion of health care professionals. It is high time for dental professionals to review their infection control measures, update with any new information regarding this disease and always use the recommended personal protective equipment.

The aim of this paper is to provide specific recommendations for patient triage, risk assessment, infection control strategies and patient management protocol to provide optimum dental care along with prevention of cross-infection.

Materials and Method

Literature search was conducted using electronic databases such as PubMed, MEDLINE, Embase, Scopus and Google search engine. Relevant literatures written in English were screened and was limited up to June 10, 2021 to provide a relevant guideline for dental care setting during the COVID-19 pandemic.

Aetiology and Pathogenesis

A. Naming

In the month of December 2019, cases of pneumonia of unknown aetiology were detected in Wuhan City, Hubei Province of China. On January 7, 2020, the Chinese Centre for Disease Control and Prevention identified a new type of coronavirus (a novel coronavirus) as the causative agent from throat swab samples and was officially announced on January 8, 2020.[10] On January 12, 2020, the virus was temporarily named 2019 novel coronavirus (2019-nCoV) by the World Health Organization (WHO). On February 11, 2020, the WHO officially named the 2019 novel coronavirus outbreak disease as coronavirus disease 2019 (COVID-19) and the International Committee on Taxonomy of Viruses (ICTV) named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) to the novel virus.[11]

B. Aetiology

The SARS-CoV-2, the causative microorganism of COVID-19 is an enveloped positive-sense single-stranded RNA, (+)ssRNA virus belonging to the beta

coronavirus genus and is the seventh member of the family of coronaviruses that infect human.[12] Coronaviruses are so called for the presence of crown-like spikes on their surface. There are four genera of coronaviruses which are alpha, beta, gamma and delta. Alpha and beta coronaviruses mostly infect mammals whereas the gamma and delta coronaviruses mostly infect birds. Under electron microscope, the SARS-CoV-2 is spherical or pleomorphic and 60-140 nanometre (nm) in diameter with glycoproteins spikes of about 9-12 nm on the envelope giving the characteristic crown-like appearance.[13] The virus is different from severe acute respiratory syndrome coronavirus (SARS-CoV), first identified in 2002, and Middle East respiratory syndrome coronavirus (MERS-CoV), first identified in 2012, in genome sequence and its spike protein structure.[10,13] The spike protein of SARS-CoV-2 binds to angiotensin converting enzyme 2 (ACE2) present in cell membrane. All cells expressing ACE2 are susceptible to SARS-CoV-2 infection.[10] There are several tissues and organs that express ACE2 such as the lung, oral mucosa, salivary glands, eye, heart, kidney, intestine, arterial and venous endothelium.[14,15] Oral cavity is a route of entry for the virus as there is high expression of ACE2 on the epithelial cells of oral mucosa such as tongue, buccal mucosa, gingiva and palate.[14]

C. Possible routes of transmission

Based on the genetic and epidemiological studies, the SARS-CoV-2 is believed to have zoonotic origin from bat[10] and pangolins as the most likely intermediate host.[16] Infected person whether symptomatic or asymptomatic can transmit the virus**.** The virus mainly spreads by respiratory droplets from an infected person to other who are in direct, indirect or close contact (less than one metre apart). This occur when oral or nasal or eye mucosa is exposed to contaminated droplets and aerosols from an infected person's mouth or nose when the person cough, sneeze, speak, sing or breath.[1] Moreover, the use of high-speed handpiece and ultrasonic instruments with water spray generate aerosols that get suspended in the air for a long time.[17] Larger size droplet, 50µm or more settle down quickly on the surface or object whereas smaller size droplet and aerosol remain suspended in the air for an extended time and can travel from few feet to several metres.[18,19] The virus can survive for hours to several days on different surfaces such as plastic, glass, metal, paper, soil and clothes, depending on the temperature and humidity.[17,20] One can be infected by touching these contaminated surfaces or objects and then touching their mouth, nose or eye prior to proper hand hygiene.

The virus is detected from the air in and around the hospital.[21] There is high possibility of airborne transmission of SARS-CoV-2.[22] Moreover, there is also possibility of faecal-oral transmission as the virus is detectable in stools and anal swabs.[23] All these contribute to nosocomial spread in the dental clinic. Vertical transmission, from mother to foetus or to newborn, of the virus is also possible.[24,25] The possible routes of transmission in dental clinic are summarised in Fig. 1.

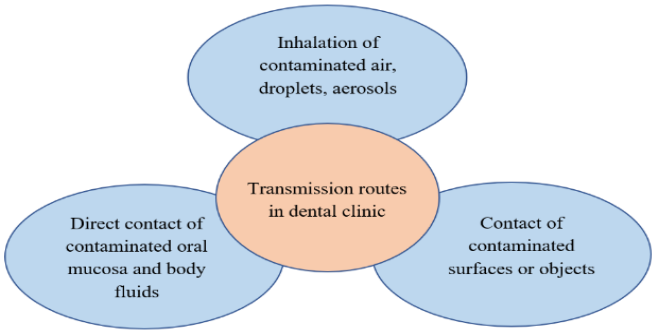

Fig. 1: Transmission routes of COVID-19 in dental clinic.

Close contact, crowded place, closed space and prolonged exposure have a positive impact on COVID-19 transmission.[1] So, providing proper ventilation by natural or mechanical or by combination plays an important role to improve air quality by continuously refreshing and significantly reduces exposure to the virus. Setting negative pressure room can also decrease the risk of transmission of the virus and prevent cross-contamination from room to room. Wearing mask, hand hygiene, physical distancing and proper disinfection of contaminated objects play a great role in preventing transmission.

D. Incubation period and symptoms

The incubation period of COVID-19, the time between exposure to the virus and onset of symptom, ranges from 0 to 14 days with an average of five-six days.[26] Transmission can occur before any symptoms are present. Fourteen days is adopted as the duration of quarantine, corresponding with the incubation period of the virus, after contact with confirmed or suspected COVID-19 person to decrease transmission of the virus. Most common symptoms include fever, cough and fatigue. Other symptoms which may include are difficulty in breathing, loss of smell or taste, sore throat, headache, rash on skin, discolouration of finger or toe, conjunctivitis, diarrhoea, aches and pain. Complications leading to death may include respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, thromboembolism, and/or multiorgan failure.[27] Ground-glass opacities is the typical finding on chest X-ray and computed tomography.[28]

The disease manifested as mild in 81% (mild symptoms up to mild pneumonia), severe in 14% (dyspnoea, respiratory frequency ≥30/min., blood oxygen saturation ≤93%, partial pressure of arterial oxygen to fraction of inspired oxygen ratio <300, and/or lung infiltrates >50% within 24 to 48 hours) and critical in 5% (respiratory failure, septic shock, and/or multiple organ dysfunction or failure).[29] Another classification is mild (mild symptoms and no signs of pneumonia on radiograph), moderate (fever, respiratory symptoms and signs of pneumonia on radiograph), severe (respiratory rate ≥30/min., oxygen saturation ≤93% at rest, partial pressure of arterial oxygen to fraction of inspired oxygen ratio <300) and very severe/critical (respiratory failure or shock or other organ failure needing intensive care unit monitoring and treatment).[30] Among those who develop symptoms, about 80% recover without needing hospital treatment, 15% become seriously ill which need oxygen support and 5% become critically ill needing intensive care.[27] The mortality for COVID-19 is around 3.4%.[31] Any age group can get infected with COVID-19 and become seriously ill or die. However, 60 years and above and also people with any of the underlying medical problems such as cancer, diabetes, high blood pressure, heart problem, lung problem or/and obesity are at higher risk of developing serious illness.[28]

IV. Recommendations for Dental Professionals

Adequate measures for prevention, identification and management are very important otherwise there will be cross-infection in dental clinic thereby exposing the patient and dental professionals to the virus. We put a set of recommendations under the following headings in order to keep the healthcare system running effectively which will enable to provide dental treatment and prevent nosocomial spread of infection.

A. Recommendation for tele-screening, risk assessment and triaging of patient

B. Recommendation for infection control and preventive measures

C. Recommendation for dental procedure

A. Tele-screening, risk assessment and triaging of patient

A triage system should be established in the pandemic area prior to dental appointment or before treatment through telecommunication or other form of non-contact means. Initial tele-screening should be done through telephonic (audio or visual) questionnaire (Table 1) to determine the infectious risk of COVID-19 (Table 2) and dental problem of the patient. A decision should be made base on the questionnaire whether the patient needs to be examined in the clinic. This can avoid crowding in the waiting area and also reduce the risk of cross-infection. The WHO advised to postpone non-urgent dental care in areas of COVID-19 community transmission.[32] One can follow what constitutes dental emergency and urgent dental care as recommended by the American Dental Association.[33] Above this, the clinician should follow the recommendations framed by the concerned authority or can decide depending on the case.

Table 1: COVID-19 screening questionnaire.

Sn.	Questions	No	Yes
1	Did you have any of the symptoms- fever, cough, breathing problems in the past 14 days?		
2	Did you have contact with suspected or confirmed COVID-19 person in the past 14 days?		
3	Did you have contact with people coming from COVID-19 outbreak area in the past 14 days?		
4	Did you travel to any COVID-19 outbreak area in the past 14 days?		
5	Are you staying in a community of COVID-19 outbreak area?		

Table 2: COVID-19 risk factor.

Risk factor	COVID-19 symptoms	Exposure	Area of stay
High	Present	Present	Community transmission
	Present	No	Community transmission
	No	Present	Community transmission
	Present	Present	No community transmission
	No	Present	No community transmission
	No	No	Community transmission
	Present	No	No community transmission
Low	No	No	No community transmission

Body temperature should be measured and hand hygiene should be carried out before entering the building and the same risk assessment questionnaire (Table 1) can be repeated. The appointment and dental treatment must be preferably postponed for at least two weeks if any of the questionnaire is positive or body temperature is above 100 F or 37.5^{0}C. They should be quarantine, contact physician or concerned authority and if required be tested to rule out the possibility of COVID-19 infection. Dental examination and treatment should be carried out only when the patient is expected to be free of COVID-19 infection or recovered from

COVID-19 or after a negative COVID-19 test result whichever is applicable. For suspected or confirmed COVID-19 patient requiring urgent dental care, tele-medication to control the symptoms should be considered as the primary treatment approach and treatment for emergency dental care should be performed or referred to clinic or hospital where there is airborne infection isolation room (AIIR) with well-equipped dental care facility so that strict isolation and infection control can be carried out. During treatment, they should be in semi-supine or upright position to avoid respiratory depression. Oxygen saturation in the blood should be monitored and if required should be supplemented. If possible, treatment done in this patient should be elective/definitive and not palliative.[34]

B. Infection control and preventive measures

B.1. Staff skill and mental health

Dental professionals should have adequate knowledge about the disease and skills for screening, diagnosis, prevention and infection control. If required they should be properly trained in a targeted manner. Highly contagious and rapid spread of the virus with large number of fatalities and limited knowledge about transmission, prevention and treatment have caused much anxiety, confusion and fear in the public and healthcare professionals. During this pandemic, some health care professionals may undergo mental health problems. This needs to be addressed and they should be encouraged to work with a positive attitude. They should regularly monitor for fever and COVID-19 symptoms and if suspected, stay at home and quarantine or visit nearby healthcare provider.

B.2. Personal protective equipment

There should be adequate number of standard quality personal protective equipment (PPE) that covers the whole body. This should include hand gloves, gown, shoe cover, head cap, N-95 or equivalent or superior mask and google or face shield. Proper way of donning and doffing is very important otherwise will increase the risk of infection. Staff should be vaccinated to ensure safety.

B.3. Dental office set up

The dental clinic should be set up to prevent contamination and cross-infection and also to provide knowledge about its preventive measures. Signs and posters should be posted at the entrance, elevator and waiting area to provide instructions about hand hygiene, respiratory hygiene and cough etiquette.[35] Instructions should include wearing a face mask, to cover nose and mouth with a flexed elbow or tissue when sneezing and coughing, to dispose used tissues in wastebin and how and when to perform hand hygiene. Items that cannot be frequently disinfected should be removed. Appointment should be scheduled to prevent crowding and maintain physical distancing. Seats in waiting rooms can be arranged so that patients are at least six feet (two metres) apart when seated. They can also wait in their personal vehicle or outside the building and contacted by mobile phone when their turn for dental care comes. Every patient and attendant or whoever enter the clinic should wear a mask. Waiting area should be well ventilated and preferably only one patient be treated in one room at a time.

B.4. Hand hygiene

Hand hygiene is one of the important measures for prevention of infection and should be carried out with proper technique. When hands are visibly dirty or soiled with blood or body fluids, they should be washed with soap and water for 40-60 seconds using the appropriate technique. If hands are not visibly dirty or soiled, use an alcohol-based hand rub (60% to 80%) for 20-30 seconds using the appropriate technique. ‘‘My

five moments for hand hygiene" are before touching a patient, before clean/aseptic procedure, after body fluid exposure/risk, after touching a patient and after touching patient's surrounding. In addition, hand hygiene should be performed before donning and after doffing of PPE; when changing gloves; after any contact with a patient with confirmed or suspected SARS-CoV-2 infection, their waste or the environment in that patient's immediate surrounding; after contact with respiratory secretion; before food preparation and consumption; and after using the toilet.[36] One should avoid touching their eyes, mouth, nose and mask and if required, perform hand hygiene before and after touching.

C. Recommendations for Dental Procedure

The recommendations for dental procedure are summarised in Table 3.

Table 3: Recommendations for dental practitioners during the COVID-19 pandemic.

Sn.	Procedure	Recommendation	Purpose
1	Pre-treatment	Initial telephonic screening and triage. Instructions about hand hygiene, respiratory hygiene etc.Schedule appointments.	To determine risk factor of infection.To determine whether the patient needs to be examined in the dental clinic.To avoid crowding.
2	Before entering the building/ clinic	Wearing mask compulsory. Measure body temperature. Repeat screening questionnaire. Avoid unnecessary objects and accompanying person inside the clinic unless deemed necessary. Hand hygiene for patient and accompanying person.	To prevent contamination and cross-infection.
3	Counter and waiting room areas	Remove objects that cannot be frequently disinfected. Foot operated wastebin. Provide adequate ventilation. Wearing masks compulsory.Limit people inside the clinic. Maintain physical distancing (at least six feet/two metres).Short waiting time.	To prevent contamination and cross-infection.
4	Dental professionals including assistants	Consider every patient a COVID-19 carrier and follow proper infection control measures. Hand hygiene.Use personal protective equipment (PPE).	To prevent contamination and cross-infection.
5	Pre-procedure	Mouth rinse with 0.2% povidone-iodine or 0.5-1% hydrogen peroxide or 0.05% to 0.1% cetylpyridinium chloride.	Reduce the viral load. Chlorhexidine digluconate (0.02%) is ineffective.[20]
6	Radiograph	Prefer extra-oral radiographs (Orthopantomagram,	Intra-oral radiographs induce

		OPG and cone beam computed tomography, CBCT).Avoid or minimise intra-oral radiographs.	coughing and stimulate saliva secretion.[37]
7	Treatment	Avoid or minimise aerosol generating procedures.Schedule aerosol generating procedure as the last appointment of the day.Avoid use of three-way syringe.Use evacuators preferably high-volume.Use rubber dam if possible. Prefer four-hands technique.Only doctor and assistant should be present during treatment.Patient who cannot wear a mask should be scheduled at the end of the day.	To avoid aerosol generation. Aerosol generating procedures should ideally be performed in negative pressure room or airborne infection isolation room (AIIR).Aerosol generating procedures when combined with rubber dam and high-volume evacuators effectively minimise airborne particles in a three-feet diameter of the operational field.[38]
8	Suspected or confirmed COVID-19 patient (urgent dental care)	Telemedicine. They should be self-quarantine, contact physician or concerned authority.Follow the government guidelines.	Control dental related symptoms until the COVID-19 is cured.To avoid transmission.
9	Suspected or confirmed COVID-19 patient (dental emergencies)	Perform treatment if negative pressure room or airborne infection isolation room with well-equipped dental care facility is available or refer to clinic or hospital where such facility is available.[35]	Strict isolation and infection control can be carried out.
10	Disinfection	Use air filtration unit (high-efficiency particulate air filter, HEPA filter) in dental clinic.[35]Between consecutive patients, proper disinfection and sufficient room ventilation. Disinfection of frequently touched surfaces with sodium hypochlorite, NaOCl (0.1% NaOCl for general environmental disinfection and 0.5% NaOCl for blood and body fluid spills) or ethanol (70%-90%).[36,39]	To disinfect and prevent cross-infection.Sodium hypochlorite (NaOCl) is not preferred for metal surfaces as it causes corrosion.

		Fumigation of clinic preferably after every patient.	
11	Waste management	Waste marked and disposed in accordance with the Biomedical Waste Management and Handing Rules given by the concerned authority.	To prevent contamination and cross-infection.

Discussion

During this COVID-19 pandemic, there is redistribution of manpower and resources to meet the demands and many of the healthcare professionals have been affected and scumbled. A time may come of scarcity of health care professionals, personal protective equipments, ventilators and negative pressure rooms and also, a situation may come for the need of management of dental emergencies in suspected or confirmed COVID-19 patient. Moreover, the elective/definitive treatment cannot be postponed for so long.

Management of patients during this pandemic should include screening of patients by pre-treatment telephonic triage to know risk factor of infection and dental treatment needs which will help in proper scheduling to avoid crowding and reduce exposure to the virus. The dental clinic setup may require some modifications to provide proper ventilation and physical distancing. Disinfection of the dental clinic before and after treatment should be strictly followed. For high-risk patients, testing can be advised and treatment be performed when the result is negative. However, the current testing methods may demonstrate false negative result which is high with the rapid COVID-19 detection test kits. Hence, it will be a safer side to avoid dental treatment if symptoms are present even if testing result is negative unless adequate infrastructure and standard, contact and airborne infection control measures are not possible. There is high need of adequate infrastructure to set up at some hospital or clinic by the government or private sector because there may be times when confirmed or suspected COVID-19 patients need emergency dental treatment.

The current situation may be difficult and quite challenging to the dental professionals to adapt to the new norms and at the same time is expensive to the patient, which is to be informed and explained. Dental professionals must keep up-to-date knowledge of this disease, required infrastructure, instruments/equipments, materials and skills in order to provide the high standards of dental care, protect the patient by preventing cross-infection and educate the public about the disease and its preventive measures.

Conclusion

The recommendation proposed in this paper is to prevent cross-infection to patient and dental professionals in order to keep the healthcare system running effectively which will enable to provide the needed treatment. Dental professionals may consider this recommendation as long as it does not contradict the guidelines issued by local authority and/or government. Hope the pandemic end soon and the normal life be back until then vaccination, strict adherence to government prescribed COVID-19 appropriate behaviour and standard operating procedures (SOPs) have to be followed in order to fight and put an end to the pandemic.

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