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RESEARCH ARTICLE

CORONAVIRUS DISEASE (COVID- 19): PREVENTIVE MEASURES IN DENTAL CARE

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ABSTRACT

The pandemic of coronavirus disease 2019 (COVID-19), originated in China, has become a major public health challenge for all the countries around the world. The World Health Organization has declared this happening as a public health emergency of international concern. As of April 20, 2020, COVID-19 has been recognized to spread globally, with a total of 2,314,621 laboratory-confirmed cases and 1, 57, 847 deaths. Infection control measures are necessary to prevent the virus from spreading further. Considering dental practice, the risk of spreading this infection is very high between patients and dentists. In this regard, for dental clinics and hospitals in affected areas with COVID-19, strict and effective infection control protocols are urgently needed. This article highlights essential knowledge about Covid-19, its spread in dental settings, preventive measures for it and management protocols for dental practitioners, based on relevant guidelines and research.

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INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) in the area of Wuhan, China, has evolved rapidly into a public health crisis and has spread exponentially to other parts of the world (Centers for Disease Control and Prevention 2020, Dong E, Du H, Gardner L 2020, Gorbalenya AE, Baker SC 2020). The novel coronavirus belongs to a family of single-stranded RNA viruses known as Coronaviridae (Baric et al., 2019). These viruses are known to be zoonotic or transmitted from animals to humans. Symptoms include severe acute respiratory syndrome coronavirus (SARS-CoV). There is study proof that this novel coronavirus has similarity to coronavirus species found in bats and potentially pangolins, confirming the zoonotic nature of this new cross-species viral-mediated disease (Zhou, Yang Wang, et al, 2020, Wahba, Jain Fire et al., 2020). As the published genome sequence for coronavirus has a close resemblance with other beta-coronaviruses such as SARS-CoV and MERS-CoV, the Coronavirus Study Group of the International Committee on Taxonomy of Viruses has given it the scientific name SARS-CoV-2, even though it is popularly called the COVID-19 virus. In January 2020, the World Health Organization (WHO) declared the rampant spread of SARS-CoV-2, a public health emergency (Zhu N, Zhang D, Wang W, et al 2019, Gorbalenya AE 2020). According to the WHO situation report (April 20, 2020) update on COVID-19, there have been more than 2,314,621 reported cases and 1,57,847 deaths worldwide and this number continues to increase.

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Therefore, measures for identification, prevention, and management must be taken in avoidance of further spread. Dental professionals indeed are at a high risk of contagion due to the exposure to saliva, blood, and aerosol production during the majority of dental procedures. SARS-CoV-2 transmission during dental procedures can therefore happen through inhalation of aerosol from infected individuals or direct contact with mucous membranes, oral fluids, and contaminated instruments and surfaces (Li ZY, Meng LY 2020). Given the exposure risk for different working categories, dental practitioners are the workers facing the greatest coronavirus risk. In addition, if adequate precautions are not taken, the dental office can potentially expose patients to contamination. Because the understanding of this novel malady is evolving, dental practices ought to be completely ready to spot a doable COVID-19 infection, and refer patients with suspected, confirmed, or a history of COVID-19 infection to applicable treatment centres (Liu K, Fang YY, Deng Y, Liu W, Wang MF, Ma JP, Xiao W, Wang YN, Zhong MH, Li CH, et al. 2020).

Route of transmission: SARS-CoV-2 infections typically spread through respiratory droplets or by direct contact (Centres for Disease Control and Prevention 2020). Therefore, coughing or sneezing by an infected person can render SARS-CoV-2 airborne, potentially infecting individuals in close contact (within a radius of approximately 6 ft). This led to the recent recommendation of social distancing to minimize community spread of the disease. Another important route of transmission is of aerosol/ droplets of infected individual land on inanimate objects located nearby and are subsequently



Figure 1- Centres for Disease Control and Prevention recommendations for putting on and removing personal protective equipment for treating COVID-19 patients. From: [https:// www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf](https://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf)

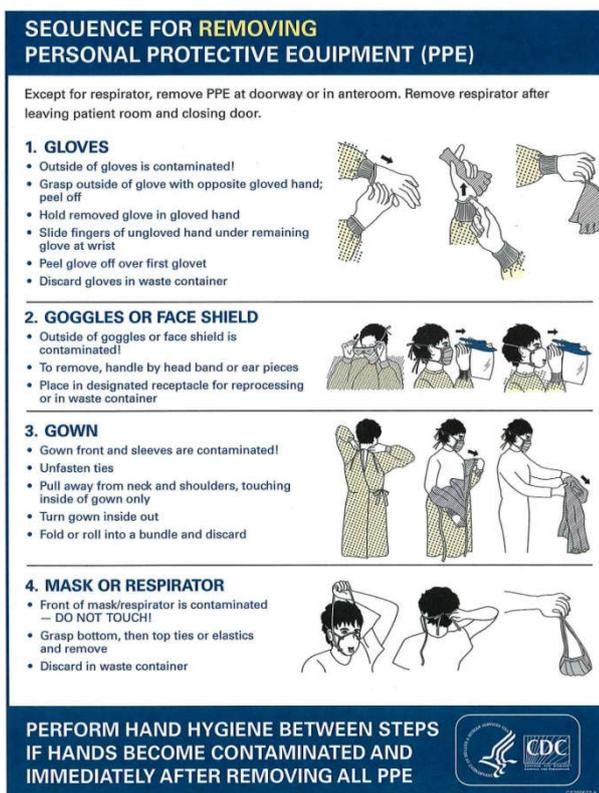


Figure 2- Sequence of removing PPE properly according to CDC.

touched by other individuals (Centres for Disease Control and Prevention). Thus, disinfection of objects and hand washing are essential for halting the spread of this disease. This recommendation is strengthened considering that people touch their face on an average of 23 times per hour, with 44% of these occurrences involving the mucous membranes of the mouth and/or nose (Kwok et al., 2015). In addition, studies have shown the presence of SARS-CoV-2 in both saliva and feces of the affected individual (Tsang OT, Yi et al., 2020, Zhang J, Wang S, Xue Y 2020).

It is known that SARS-CoV-2 can bind to humanangiotensin converting enzyme 2 receptors, which are highly concentrated in salivary glands; this may be a possible explanation for the presence of SARS-CoV-2 in secretor saliva (Hoffmann M, Kleine-Weber H, Schroeder S, et al 2020, Sabino-Silva R, Jardim ACG, Siqueira WL 2020). Therefore, there is a potential for transmission of COVID-19 via aerosol, fomites, or the fecal-oral route that may contribute to nosocomial spread in the dental office setting (Peng et al., 2020).

Incubation Period: The incubation period of COVID-19 has been estimated at 5 to 6 days(average), but there is evidence that it could be as long as 14 days, which is now the commonly adopted duration for medical observation and quarantine of (potentially)exposed persons (Backer et al. 2020).

Symptoms: Patients with COVID-19 usually present clinical symptoms of fever, dry cough, and myalgia. Also, less obvious symptoms such as nausea, diarrhea, hyposmia, and dysgeusia have also been reported (Giacomelli A, Laura Pezzati L, Conti F, et al).To note, about 80% of these patients have mild symptoms resembling flulike symptoms and seasonal allergies, which might lead to an increased number of undiagnosed cases (Guan W, Ni Z, Hu Y, et al, 2019). These asymptomatic patients may act as “carriers” and also serve as reservoir for re-emergence of infection. Although incubation period can range from 0 to 14 days, transmission can occur before any symptoms are apparent (Rothe C, Schunk M, Sothmann P, et al 2019). Severe forms of this disease have a predilection with individuals having pre-existing chronic illnesses such as any cardiovascular disease or immunosuppression. The higher-risk patient population manifests symptoms typical of pneumonia or acute respiratory distress syndrome (Guan et al., 2019).

Diagnosis and Treatment: The diagnosis of COVID-19 can be based on a combination of epidemiologic information (e.g., a history of travel to or residence in affected region 14 days prior to symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g., reverse transcriptase polymerase chain reaction [RT-PCR] testson respiratory tract specimens) in keeping with standards of either the World Health Organization (2020) or the National Health Commission of China (2020). It should be mentioned that a single negative RT-PCR test result from suspected patients does not exclude infection. Clinically, we should be alert of patients with an epidemiologic history, COVID-19–related symptoms, and/or positive CT imaging results. So far, there has been no evidence from randomized controlled trials to recommend any specific anti-nCoV treatment, so the management of COVID-19 has been largely supportive (WHO 2020a). Currently, the approach to COVID-19 is to control the source of infection; use infection prevention and control measures to lower the risk of transmission; and provide early diagnosis, isolation, and supportive care for affected patients (Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, et al. 2020). A series of clinical trials are being carried out to investigate interventions that are potentially more effective (e.g., lopinavir, remdesivir) (Del Rio C, Malani PN. 2020).

Preventive measures given by Indian Dental Association (IDA) to minimize the chances of exposure to Covid-19 are

- Post a sign at the entrance to the dental practice which instructs patients having symptoms of a respiratory

- infection (e.g., cough, sore throat, fever, sneezing, or shortness of breath) to reschedule their dental appointment and consult their physician.
- Reschedule appointments if your patients have travelled outside India in the last two weeks to an area affected by the coronavirus disease. This includes any other COVID19 affected country (China, Hong Kong, Iran, Italy, France, Spain, Germany, Japan, Singapore, South Korea, Taiwan, Thailand, Vietnam etc)
 - Take a detailed travel and health history when confirming and scheduling patients. Non-emergent or cosmetic treatment to the above patients should be postponed and they should be reported to the health department immediately.
 - Incorporate questions about new onset of respiratory symptoms into daily assessments of all patients.
 - Take temperature readings as part of the routine assessment of patients before performing dental procedures.
 - Take the contact details and address of all patients treated.
 - Install physical barriers (e.g., glass or plastic windows) at reception areas to limit close contact with potentially infectious patients.
 - Make sure the personal protective equipment being used is appropriate for the procedures being performed.
 - Use a rubber dam when appropriate to decrease possible exposure to infectious agents.
 - Use high-speed evacuation for dental procedures producing an aerosol.
 - Autoclave hand-pieces after each patient.
 - Have patients rinse with a 1% hydrogen peroxide solution before each appointment.
 - Clean and disinfect public areas frequently, including door handles, chairs and bathrooms.
- Preprocedural mouth rinse: Previous studies have shown that SARS-CoV and MERS-CoV were highly susceptible to povidone mouth rinse ((Eggers M, Koburger-Janssen T, Eickmann M, Zorn J 2018). Therefore, preprocedural mouth rinse with 0.2% povidone-iodine might reduce the load of viruses in saliva. Another alternative would be to use 0.5-1% hydrogen peroxide mouth rinse, as it has non specific virucidal activity against coronaviruses (Kariwa H, Fujii N, Takashima 2004, Kampf G, Todt D, Pfaender S, Steinmann E 2020). Use of disposable (single-use) devices such as mouth mirror, syringes, and blood pressure cuff to prevent cross contamination is encouraged.
 - Radiographs: extra oral imaging such as panoramic radiography or cone-beam computed tomographic imaging should be used to avoid gag or cough reflex that may occur with intraoral imaging. When intraoral imaging is mandated, sensors should be double barriered to prevent perforation and cross contamination (Hokett SD, Honey JR, Ruiz F, et al 2000).
 - Dentists should use a rubber dam to minimize splatter generation (of course, this is the standard of care for nonsurgical endodontic treatment). It may be advantageous to place the rubber dam so that it covers the nose.
 - Dentists should minimize the use of ultrasonic instruments, high-speed hand pieces, and 3-way syringes to reduce the risk of generating contaminated aerosols. In this time of public health crisis, endodontic practices can dilute the sodium hypochlorite irrigant solution to 1% concentration, to extend the supplies without compromising on treatment outcome (Verma N, Sang wan P, Tewari S, Duhan J 2019).
 - Negative-pressure treatment rooms/airborne infection isolation rooms (AIIRs): it is worth noting that patients with suspected or confirmed COVID-19 infection should not be treated in a routine dental practice setting. Instead, this subset of patients should only be treated in negative-pressure rooms or AIIRs. Therefore, anticipatory knowledge of health care centres with provision for AIIRs would help dentists to provide emergent dental care if the need arises (Centres for Disease Control and Prevention).
 - SARS CoV-2 can remain viable in aerosol and survive up to 3 days on inanimate surfaces at room temperature, with a greater preference for humid conditions (van Doremalen N, Bushmaker T, Morris DH, et al 2020). Therefore, clinic staff should make sure to disinfect inanimate surfaces using chemicals recently approved for COVID-19 and maintain a dry environment to curb the spread of SARS-CoV-2 (EPA's registered antimicrobial products for use against novel coronavirus SARS-CoV-2, the cause of COVID-19).

Effective Infection Control Protocols: Hand hygiene has been considered the most critical measure for reducing the risk of transmitting microorganism to patients (Larson EL, Early E, Cloonan P, Sugrue S, Parides M. 2000). SARS-CoV-2 can persist on surfaces for a few hours or up to several days, depending on the type of surface, the temperature, or the humidity of the environment (WHO 2020a). This reinforces the need for good hand hygiene and the importance of thorough disinfection of all surfaces within the dental clinic. The use of personal protective equipment, including masks, gloves, gowns, and goggles or faces shields, is recommended to protect skin and mucosa from infected blood or secretion. As respiratory droplets are the main route of SARS-CoV-2 transmission, particulate respirators (e.g., N-95 masks authenticated by the National Institute for Occupational Safety and Health or FFP2-standard masks set by the European Union) are recommended for routine dental practice.

According to American Dental Association, list of recommendations for dentists:

• Dentists should follow standard, contact, and airborne precautions including the appropriate use of personal protective equipment and hand hygiene practices. Due to the uncertainty of this outbreak, there is shortage of personal protective equipment. Therefore, it is advisable to use them judiciously and follow the Centres for Disease Control and Prevention guidelines for N95 respirator use and reuse. (Fig 1, 2). (Centres for Disease Control and Prevention)

DISCUSSION

This fast spread of SARS-CoV-2 worldwide will increase the likelihood that dental health care professionals will treat this subset of the patient population. Universal precautions are crucial to minimize the spread of this virus and its associated disease. As of 1st April 2020, the new interim recommendation from the American Dental Association is that dentists keep their offices closed to all except urgent and emergency procedures until April 30 at the earliest. It is advisable to assess the emergencies on a case-by-case basis and use clinical judgement to aid in decision-making (ADA recommending dentists postpone elective procedures, 1st may 2020). Consultant dentists are in a unique situation as they may be called upon for the assessment and management of

odontogenic pain, swelling, and dental alveolar trauma in suspected or known COVID-19 patients. It is worth noting that case presentations can be dynamic, and there is a good chance that dental practices might treat some of the patients with asymptomatic COVID-19 infections since the incubation period can range from 0 to 14 days and most patients only develop mild symptoms (Guan W, Ni Z, Hu Y, et al 2019, Rothe C, Schunk M, Sothmann P, et al 2020). Thus, every patient should be considered as potentially infected by this virus, and all dental practices need to review their infection control policies, engineering controls, and supplies. Health care providers must keep themselves up-to-date about this evolving disease and provide adequate training to their staff to promote many levels of screening and preventive measures, allowing dental care to be provided while mitigating the spread of this novel infection. In conclusion, health care professionals have the duty to protect the public and maintain high standards of care and infection control. This new emerging SARS-CoV-2 threat could become a less pathogenic and more common infection in the worldwide population. Indeed, it is predicted to persist in our population as a less virulent infection with milder symptoms, if it follows the same evolutionary pattern of the other coronavirus infections (ie, SARS-CoV and MERS-CoV). Thus, it is important to make informed clinical decisions and educate the public to prevent panic while promoting the health and well-being of our patients during these challenging times. The prudent practitioner will use this review as a starting point and continue to update themselves with useful online information as this outbreak continues.

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