

Practising dentistry during and after COVID 19.

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Abstract

In late December 2019, a novel coronavirus (SARS- CoV 2) was identified to be the causative agent of the pandemic COVID 19. The SARS-CoV-2 belongs to β -coronavirus genera of the group coronaviruses. It originated from Wuhan, China and has spread exponentially to all the parts of the world, becoming a major public health crisis. This virus is reported to have a strong affinity towards

angiotensin – converting enzyme 2 (ACE2) receptors which are present abundantly in the respiratory tract and the cells of salivary glands making saliva a potential mediator of transmission. It shows person – to – person route of transmission through direct contact by coughing, sneezing, droplet inhalation, and through contact transmission with oral, nasal and eye mucous membrane. Given the widespread routes of transmission of COVID 19

and characteristics of dental settings, the chances for cross contamination between patients and dental practitioners are high. Hence, a strict sterilization and disinfection protocol must be followed by all dental professionals to prevent it. Despite the risks associated with dental interventions, the public will always need to undergo dental treatments. It is recommended to treat patients presenting with dental emergencies only. By following all these protocols, a dentist can successfully break the chain of transmission of COVID 19. To implement safe dental practice, dentists must protect themselves as well as their patients from the cross contamination. For this purpose, we have recommended few guidelines to be followed by each and every dental practitioner and dental student, practising dentistry during and after COVID 19.

Keywords: COVID 19, Cross contamination, Dentistry, Dental professionals, Dental students, Disinfection, Preventive measures, Saliva, Sterilization, Transmission.

Introduction

The outbreak of coronavirus disease 2019 (COVID 19) in the area of Wuhan, China, has evolved rapidly into an public health crisis¹ and has spread exponentially to other parts of the world². It has become a major challenging public health problem for not only China but also countries around the world³. On 11 February 2020, WHO announced a name for the new coronavirus disease: COVID-19. On 11th March 2020 WHO characterised it as pandemic⁴.

What is Covid 19?

Coronaviruses (CoVs) are named for the crown-like spikes on their surface and belong to the family Coronaviridae within the order Nidovirales⁵. Coronaviruses (CoV) are divided into four groups, namely, α / β / γ / δ -CoV. It has been reported that, α - and β -CoV tend to infect mammals, while γ - and δ -CoV tend to infect birds. The two known β -CoVs are SARS-CoV

and MERS-CoV which can lead to severe and potentially fatal respiratory tract infections⁶. The SARS-CoV-2 belongs to β -coronavirus, which is enveloped non-segmented RNA virus (subgenus sarbecovirus, Orthocoronavirinae subfamily)⁷. It was found that the genome sequence of SARS-CoV-2 is 96.2% identical to a bat CoV RaTG13, whereas it shares 79.5% identity to SARS-CoV. Based on virus genome sequencing results and evolutionary analysis, bat has been suspected as natural host of virus origin, and SARSCoV-2 might be transmitted from bats via unknown intermediate hosts to infect humans. It is clear now that SARS-CoV-2 could use angiotensin-converting enzyme 2 (ACE2), the same receptor as SARS-CoV⁸, to infect humans.

Transmission routes

The common transmission routes of novel coronavirus include direct transmission (cough, sneeze, and droplet inhalation transmission) and contact transmission (contact with oral, nasal, and eye mucous membranes)⁹.

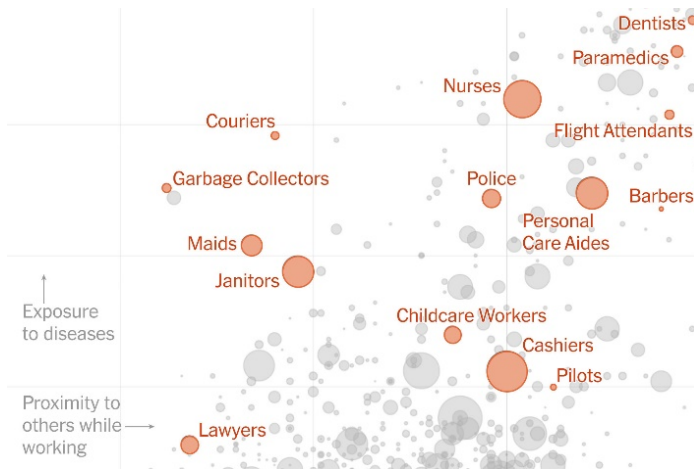
Some studies have shown that respiratory viruses can be transmitted from person to person through direct or indirect contact, or through coarse or small droplets. 2019-nCoV can also be transmitted directly or indirectly through saliva^{10,11}.

ACE2⁺ cells were found to be abundantly present throughout the respiratory tract, as well as the cells morphologically compatible with salivary gland duct epithelium in human mouth. ACE2⁺ epithelial cells of salivary gland ducts were demonstrated to be early targets of SARS-CoV infection¹². To et al. reported that live viruses were present in the saliva of infected individuals by viral culture method¹³.

The New York Times published an article entitled “The Workers Who Face the Greatest Coronavirus Risk” on march 15, 2020 where an impressive schematic figure described that dentists are the health care workers most

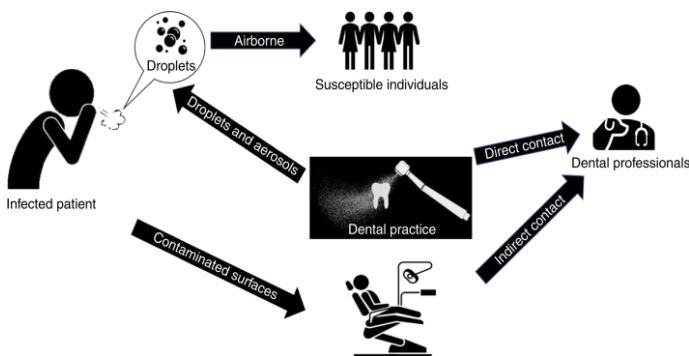
exposed to the risk of being affected by COVID-19. (fig. 1)

Fig. 1: Image taken from the NYT article: “The Workers Who Face the Greatest Coronavirus Risk”



Considering the widespread transmission of SARS-CoV2, and reports of its spread amongst the health care professionals, dental professionals are at a high risk. The unique nature of dental treatments, which includes, aerosol production, contact with the patient’s saliva and blood, proximity to oropharyngeal region, handling the sharps, contributes to the risks for dental professionals. If adequate measures are not taken to prevent the spread of infection by the dental professionals, dental clinics can become potential sites for cross contamination. (fig. 2)

Fig. 2: Image taken from: Peng, X., Xu, X., Li, Y. et al. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci 12, 9 (2020).



Incubation period

The incubation period of COVID-19 has been estimated to be 5 to 6 days on average, but there is evidence that it can be 14 days, which is now the commonly adopted duration for medical observation and quarantine of (potentially) exposed or suspected persons ¹⁴.

Symptoms

A recent study led by Prof. Nan-Shan Zhong’s team, by sampling 1099 laboratory-confirmed cases, found that the common clinical manifestations included fever (88.7%), cough (67.8%), fatigue (38.1%), sputum production (33.4%), shortness of breath (18.6%), sore throat (13.9%), and headache (13.6%)¹⁵.

According to radiographic examination, 74 (75%) patients showed bilateral pneumonia, 14 (14%) patients showed multiple mottling and ground-glass opacity, and one (1%) patient had pneumothorax. 17 (17%) patients developed acute respiratory distress syndrome and, among them, 11 (11%) patients worsened in a short period of time and died of multiple organ failure ¹⁶.

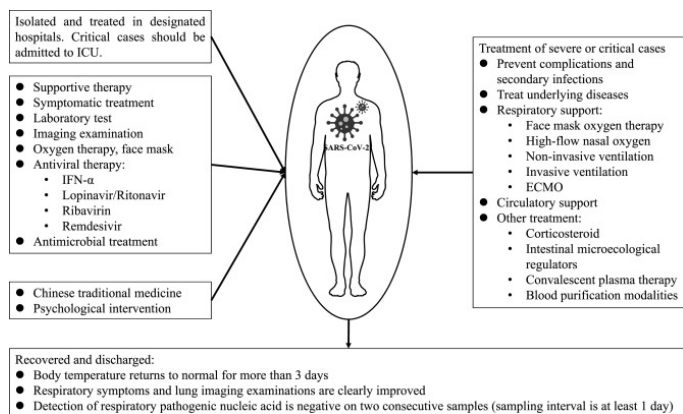
It was observed that a greater number of men than women were affected in the 99 cases of 2019-nCoV infection. It was also found that MERS-CoV and SARS-CoV infect more males than females ¹⁶. The reduced susceptibility of females to viral infections could be attributed to the protection from X chromosome and sex hormones, which play an important role in innate and adaptive immunity ¹⁷.

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 d prior to symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g., reverse transcriptase polymerase chain reaction [RT-PCR] tests on respiratory tract specimens) according to standards of either the WHO (2020a) or the National Health Commission of China

(2020a). It should be noted that a single negative RT-PCR test result from suspected patients does not exclude the presence of 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 supportive¹⁸. (fig.3)

Fig. 3: Image taken from: Yongshi Yang, et al., Journal of Autoimmunity, <https://doi.org/10.1016/j.jaut.2020.102434>



Lu reported that remdesivir may have the greatest potential for the successful treatment of SARS-CoV-2, but the efficacy and safety of remdesivir in COVID-19 needs further evaluation¹⁹.

Preventive measures to be adopted by dental practitioners to limit the transmission

Despite the community transmission of COVID-19 on the large-scale in China during the epidemic; demand for dental emergency treatment decreased by only 38%²⁰. This shows the need to the public for dental treatments even during the pandemic.

Shutting the dental practices might decrease the transmission of the pandemic but it would not suffice the need of the public who require urgent dental care.

Hence, care must be taken by dental professionals to follow a safe dental practice and prevent the transmission of the disease.

Infection control

Given the widespread routes of transmission of SARS-CoV2, dentists should be aware about diagnosis and spread of the disease. A patient with the symptoms of COVID-19, in general, is not allowed to visit a dental clinic. Even if such patient visits a dental clinic to seek dental care, dentist must be able to identify the suspected and any dental procedure must not be carried out in the dental clinic. Suspected should be immediately quarantined and reported for further medical interventions.

Patient evaluation

Telescreening must be adopted as primary screening method for any patient seeking dental care. Primarily the patient must be asked about the history of travel, febrile conditions or exposure to any COVID-19 suspected patients. If the patient gives a positive response to any of the questions, dental treatment should not be carried out for at least 2 weeks and the patient should be asked to engage in self quarantine and seek medical care by contacting their physician via email or telephone.

If the patient gives negative response to any of these questions, then the patient can be called to the dental clinic. The patient should be screened again upon arrival in dental clinic. A detailed medical history of the patient should be noted and the patient should be checked for the symptoms of the disease. The dentist should check the temperature of the patient using contact – free forehead thermometer and ask for the history of any febrile or respiratory conditions within past 14 days.

If a patient responds “yes” to any of the screening questions, and his/her body temperature is below 37.3 °C, the dentist should defer the treatment until 14 days after the exposure event. The patient should be instructed to self-quarantine at home and report any fever experience or respiratory illness to the local health department.

If a patient responds “yes” to any of the screening questions, and his/her body temperature is not less than 37.3 °C, the patient should be immediately quarantined, and the dental professionals should report immediately to the infection control department of the hospital or the local health department.

If a patient responds “no” to all the screening questions, and his/her body temperature is below 37.3 °C, the dentist can treat the patient with extra protective measures, and avoid spatter or aerosol-generating procedures.

If a patient responds “no” to all the screening questions, but his/her body temperature is not less than 37.3 °C, the patient should be instructed to the fever clinics or special clinics for COVID-19 for further medical care²¹.

Hand disinfection is recommended for patients too. Regular and appropriate disinfection of the ventilation system and a frequent opening of windows should be ensured. It is recommended to avert patients from staying long in the waiting room and to remove all the objects which can potentially cause cross contamination (i.e., tables, magazines, toys). It is also important to limit the number of patients in the waiting room and to keep the recommended distance of at least 1 m between adjacent chairs. Person accompanying with the patient should be advised to wait outside the dental office²². The patients should be called strictly on the appointment basis unless it is a case of dental emergency. Cashless mode of payment should be considered most of the times.

Hand hygiene

Hand hygiene is one of the most important factor to prevent the transmission of SARS-CoV 2^{21,23}. 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 2020c)²⁴. Hence an appropriate hand hygiene is of utmost importance should be followed strictly. A protocol

involving 5 hand washings (2 before and 3 after treatment) was proposed by the infection control department of the West China Hospital of Stomatology, Sichuan University to reinforce hand washing compliance²¹.

It is recommended that the dental practitioner should perform careful hand washing for at least 60 s, employing a 60% to 85% hydroalcoholic solution, prior to wearing gloves²². Utmost care should be taken by dental professionals by washing their hands before patient examination, after touching the patient while doing oral examination, before and after doing any dental procedure, after touching the surrounding instruments or surfaces which are not disinfected. Care must be taken to avoid direct contact with patient’s wound or damaged skin or any bodily fluid. Caution must be taken by dental professionals to avoid touching their own eyes, nose or mouth.

Personal protection

Since airborne droplet transmission of infection is considered as the main route of spread, particularly in dental clinics and hospitals, it is strongly recommended to use barrier-protection equipment, including protective eyewear, masks, gloves, caps, face shields, and protective outdoor, for all healthcare workers practising during the epidemic period of 2019-nCoV^{21,23}.

Changing rooms should be made available for dental professionals, assistant and other staff members of the clinic for donning and doffing of PPE.

Patient protocols in clinical settings

Once the patient enters the clinical settings, patient should also be provided with a mask followed by hand hygiene protocols. Patient should be advised to avoid contact within the clinical settings.

Once the patient is positioned on the dental chair, he/she must be draped properly by a dental assistant prior to commencing any dental procedure. The patient must also

be provided with protective eyewear and a surgical cap. After completion of the treatment, all the protective equipment worn by the patient must be removed by an assistant only. They should be disposed off according to the sterilization protocols. Use of disposable drapes, surgical caps or masks for the patients should be preferred for easy disposal and prevent further cross contamination.

Mouthrinse prior to any dental procedure

It is generally believed that a preoperational antimicrobial mouthrinse reduce the number of oral microbes thus decreasing the viral load of the patient's oral cavity. As per the Guideline for the Diagnosis and Treatment of Novel Coronavirus Pneumonia (the 5th edition) released by the National Health Commission of the People's Republic of China, chlorhexidine, a commonly used mouthrinse in dental practice, may not be effective to kill 2019-nCoV. Since 2019-nCoV is vulnerable to oxidation, preprocedural mouthrinse containing oxidative agents such as 1% hydrogen peroxide or 0.2% povidone are recommended, for the purpose of reducing the salivary load of oral microbes, including the potential for 2019-nCoV transmission²¹. It should be practised as a mandatory procedure before commencing any dental intervention.

Oral examination

While conducting oral examination of any patient, care must be taken by the dentist by using head cap, masks, face shield, gloves and other protective measures, strictly. The instruments and equipment used during the procedures must be sterilized or disinfected prior to reuse. Caution must be taken by dental professionals and their assistants by avoiding direct contact with the used instruments.

According to WHO 2020a, procedures that are likely to induce coughing should be avoided (if possible) or performed cautiously¹⁸. It has been reported that, intraoral

x-ray examination is the most common radiographic technique practised in dental imaging; however, it can stimulate saliva secretion and coughing²⁵. Hence during this outbreak of COVID – 19, extraoral radiography, panoramic imaging or CBCT should be used to reduce the chances of aerosol production. Instruments generating aerosols such as 3 - way syringe should not be used as much as possible to prevent the risk of transmission²³.

Rubber dam isolation

It has been reported that the use of rubber dam during dental treatments could significantly reduce airborne particles in ~3-foot diameter of the operational field by 70%²⁶. Hence, to prevent the generation of blood and/or saliva contained aerosols or spatter, rubber dam could be significantly helpful, particularly in cases where high speed handpieces and ultrasonic devices are used.

When rubber dam is applied, it is recommended that an extra high-volume suction should be used along with regular suction to prevent the transmission through the generated aerosol or spatter. In such cases, it is recommended to practice four handed dentistry. In some cases where rubber dam isolation is not possible, procedures like carries removal and periodontal scaling should be done manually in order to prevent the generation and transmission of the aerosols²¹.

Care must be taken by dental professionals to include the use of rubber dam isolation in all the cases where it is possible to protect themselves and prevent the transmission of the disease.

Anti-retraction handpiece

The usage of high- speed handpiece without anti retraction valves in dental clinics, may lead to aspiration and expulsion of debris and fluids during dental procedures. This would further contaminate the air and water tubes within the dental unit, and can potentially cause cross contamination in the dental clinic²¹.

It has been reported that, when anti-retraction high-speed dental handpiece is used, the backflow of oral microbes and HBV into the tubes of the handpiece and dental unit is significantly reduced as compared to the handpiece without anti-retraction function²⁷. Hence, dental professionals should forbid the use of such handpieces during the time of pandemic COVID – 19 and include the use of anti-retraction handpiece in their practice to prevent cross contamination.

Maintaining disinfection in the clinical settings

Strict and effective disinfection protocols should be followed by all dental and medical institutions. The clinical settings including waiting area, dental chair and all its components, walls of the clinic and the entire areas of the dental clinic should be frequently cleaned and disinfected. Particular attention should be given to the door handles, chairs and desk^{21,23}. People appointed for cleaning and disinfecting the clinical items and surroundings, should take care of themselves by wearing masks, gloves, goggles and other protective equipment. Direct contact with any of the surfaces should be avoided.

The instrument and items which are reusable should be pre-treated, cleaned, sterilized, and properly stored in according to the Protocol for the Disinfection and Sterilization of Dental Instrument (WS 506-2016) given by the National Health Commission of the People's Republic of China²¹. A separate room should be dedicated for carrying out all the sterilization and disinfection procedures.

After concluding the procedure, all the disposable protections should be removed and high-level disinfection should be performed. It has been suggested that all the surfaces that may have come in contact with the patient or his/her belongings especially dental chair should be disinfected with sodium hypochlorite 0.1% or 70% isopropyl alcohol. Protective safety glasses and shields

used during the procedure, should undergo thorough disinfection with 70% isopropyl after each procedure. After completing the treatment of each patient, at least a 5-min air change is recommended. It is recommended not to remove personal protective equipment prior to exiting the contaminated area, since the virus tends to remain in the airborne particles²².

The medical and domestic waste which will be generated by the treatment of patients with suspected or confirmed 2019-nCoV infection are regarded as infectious medical waste, thus it should be packed in a double-layer yellow colour medical waste package bags. The surface of such package bags should be marked and disposed according to the medical waste management protocols.

Recommendations for dental educational institutions

During the pandemic COVID-19, it is significant to have education- related challenges for dental and medical institutions as wells as their affiliated hospitals. Given the circumstances due to COVID-19, all around the world, it is expected to have affect the students creating confusion and concern amongst them regarding their academics.

On the basis of their experience with SARS and other relevant highly infectious diseases, Meng et al has provided 3 basic recommendations for dental education during this outbreak of pandemic COVID-19.

First, to avoid unnecessary aggregation of people and risk of infection associated with it, online lectures, case studies, and problem-based learning tutorials should be adopted. With the use of existing smart devices and applications, student can have access to online learning exercises whenever and wherever possible.

Second, students should be encouraged to engage themselves in self learning by making full use of online resources, and learning about the latest academic developments.

Third, during this period, it is expected from the students to be affected by disease-associated fear and pressure, thus dental schools should be prepared to provide psychological services and assistance to those who need them²³.

Care must be taken that during these tough times the world is experiencing, students should not be neglected and tormented.

Conclusion

Despite the outbreak of COVID-19 and considering its airborne route of transmission, dental care will always be an essential concern to the public. Dentists being at a high risk to acquire this infection, can play a significant role in disrupting this chain of transmission simply by following appropriate protective measures. All the non-emergency procedures can be postponed and pharmacologic management of the pain or infection should be considered. Emergency procedures should be done by following all the safety protocols. All dentists must be aware about signs and symptoms of COVID-19 and should be able to identify the patient. Most importantly a dentist must take all self-protection measures to protect themselves and to prevent further transmission of the disease.

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