

PRECAUTIONS AND CONSIDERATIONS AMONG DENTAL HEALTH PROFESSIONALS THROUGHOUT THE HAPPENING OF COVID-19

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ABSTRACT

Novel corona virus 2019 (COVID 19) is becoming a public health emergency in the whole world and has created a state of panic crisis in almost every country. It becomes an additional requirement during the lockdown period to update our learning's with the aim of how to prevent the epidemic.

Dentists have been shut out their clinics and hospitals due to this epidemic, but a capacious amount of emergency patients are still moving to dental clinics and hospitals for treatment. Medical students and dentists are mandatory to update their information about this kind of epidemic infection so that they know about the precautions and considerations. We have summarized the possible 2019-nCov referral routes that might take place in the dentistry. The purpose of this document is to provide a clear and appropriate guide to the safe operation of dentists so that they can deal with COVID 19 by updating their knowledge and information.

Key words: Aerosol infection, Coronavirus, COVID 19, Dentists, Virus infection

INTRODUCTION

Middle East Respiratory Syndrome (MERS) is a respiratory disease caused by a corona virus called the Middle East Respiratory Syndrome Coronavirus (MERS-CoV). MERS-CoV was come to know in April 2012 and the virus had never been seen in humans before. MERS-CoV was commonly referred to as the novel corona virus (Corona virus was named because of the crown like spikes above the surface virus).

A recent study by Wang Q, et al supported the origin of the MERS-CoV from bat and revealed that the bat coronavirus has a similar hCD26-binding mode in MERS-CoV. HCD26 is a human binding site that initiates viral entry processes in human cells.

Coronaviruses (CoVs) are large, covered, positive sense RNA viruses composed of a few structured proteins that encode a long (around 30 kb) genome-stranded line that infects birds and a wide range of mammals, including humans. They occur all over the world and can cause very important medical and animal diseases. Generally, infections are localized to the respiratory, enteric and/ or nervous systems, although systemic disease has been observed in a number of host species. To date, six CoVs have been identified that have infected people.

CHARACTERISTICS OF 2019 NOVEL CORONAVIRUS

Coronaviruses are members of the Coronaviridae family, order of Nidovirales, with large, single, stranded RNA genome. Currently, there are four types of Coronavirus strains: α -CoV, β -CoV, γ -CoV, and δ -CoV. Most Coronaviruses can cause infectious diseases in humans and other vertebrates. α -CoV and β -CoV primarily affect the respiratory system, gastrointestinal, and the central nervous system of humans and mammals, while γ -CoV and δ -CoV mainly infect birds. Usually, several members of Coronavirus cause mild respiratory disease in humans; however, SARS-CoV and Middle East respiratory syndrome Coronavirus (MERS-CoV) caused the most deadly respiratory diseases. SARS-CoV and MERS-CoV belong to β -CoV. The 2019-nCoV tested in Wuhan is also β -CoV based on phylogenetic analysis on virus type. Although the overall nucleotide similarity is less than 80% between 2019-nCoV and SARS-CoV (approximately 79%) or MERS-CoV (approximately 50%), 2019-nCoV can cause Fetal infection and spread faster than the other two Coronaviruses. The genome nucleotide sequence identity between Coronavirus (BatCoV RaTG13) obtained from bat *Rhinolophus affinis* from Yunnan province, China, and 2019-nCoV, was 96.2%, indicating that the 2019-nCoV gene may also be from *Rhinolophus affinis* bat. However, the difference can also mean that there is one or more catch between the bat and the person. A team of researchers from the South China Agricultural University investigated over 1000

metagenomic samples from the pangolins, and found that 70% of the pangolins contain β -CoV. One of the Coronaviruses isolated from pangolins contained the genome that was very similar to the one from 2019-nCoV, and the sequence similarity of the genome was 99%, indicating that pangolin may be the host of 2019-nCoV. 2019-nCoV comprised the structure like typical Coronavirus with a "spike protein" in the envelope of the membrane, and contain other proteins, nucleoproteins, and membrane proteins, such as RNA polymerase, 3-chymotrypsin-protein, protein-like protein, helicase, glycoproteins, and proteins. The S protein from Coronavirus can bind to the host receptors to activate the entry of viruses into the target cells. Although there are four types of amino acid of the S protein between 2019-nCoV and SARSCoV, 2019-nCoV that can also bind to angiotensin converting enzyme 2 (ACE2), the same host receptor for SARS-CoV as in 2019-nCoV can bind the ACE2 receptor from cells of human, bat, civet cat, and pig, but it cannot bind to cells without ACE2. The monoclonal antibody ACE2-Ig antibody, a monoclonal specific anti-SV-CoV antibody, and serum from a SARS-CoV-infected patient, which can shut down the potential in 2019-nCoV, confirmed ACE2 as a receptor of the 2019-nCoV recipient. The high association between ACE2 and 2019-nCoV S proteins also suggests that the population with high ACE2 expression may be more affected by 2019-nCoV. The cellular serine proteinase TMPRSS2 also contributed to the 2019-nCoV S-protein increase, indicating that the TMPRSS2 inhibitor may be a potential therapeutic option.

THE POSSIBLE TRANSMISSION ROUTES OF 2019-NCOV

Dental treatment care facilities are already closed due to this epidemic; many emergency patients still go to dental clinics and hospitals for treatment. It is imperative that medical members, medical students and dentists have knowledge and awareness of the diagnosis, precautions and management of any epidemic infections. Studies have suggested that 2019-nCoV is likely to be airborne through droplet aerosols. Common methods of transmission of a novel coronavirus include direct transmission (cough, sneezing, and droplet inhalation transmission) as well as contact transmission (contact with the oral, nasal, and eye mucous membrane). The 2019-nCoV transmission is not only limited to the respiratory tract, but also eye exposure may provide an effective way for the virus to enter the body. The duration of incubation period in people infected asymptomatic with 2019-nCoV was reported to be 1 - 14 days, and it was confirmed that those cases without symptoms could spread the virus. To et al. live viruses have been reported to be present in infected people saliva by viral culture method. Dental patients and professionals can be exposed to pathogenic microorganisms, including bacteria and viruses that infect the oral cavity and respiratory tract. Dental care settings remain at risk for infection in 2019-nCoV due to the specificity of its procedures, which include face-to-face contact with patients, as well as frequent exposure to saliva, blood, and other body fluids, and handling of sharp instruments. Pathogenic microorganisms can be transmitted to dental settings through the inhalation of airborne microorganisms that can remain suspended in the air for a long time. Infection can occur in any of these cases involving an infected person at a dental clinic. In addition to the coughing and breathing of an infected patient, dental equipment such as high-speed dental hand piece uses high-speed air to drive the turbine to rotate at high speed and work with running water. When dental devices work in the patient's oral cavity, large amounts of aerosol and droplets mixed with the patient's saliva or blood will be generated. The minute particle of droplets and aerosols are small enough to stay in the air for a long period of time before settling into the environment or entering the respiratory tract. A dental professional's regular direct or indirect contact with human fluids, patient materials, and contaminated dental instruments or environmental surfaces makes a possible route to the spread of viruses. Appropriate infection control strategies are needed to prevent the spread of 2019-nCoV through these contact processes. Human Coronaviruses (HCoV) can persist on the surface such as iron, glass, or plastic for several days. Therefore, contaminated surfaces that are frequently contacted in healthcare settings are a potential source of Coronavirus transmission. Dental practices might get a lot of droplets and aerosols from infected patients, which likely contaminate the whole surface in dental offices. (Figure 1)

PATIENT MANAGEMENT AND PREVENTION OF NOSOCOMIAL INFECTION

Based on information gained from previous outbreaks of SARS-CoV and data obtained from SARS-CoV-2 and related disease (COVID-19), various specific steps are discussed for the management of dental patients during this period of COVID-19.

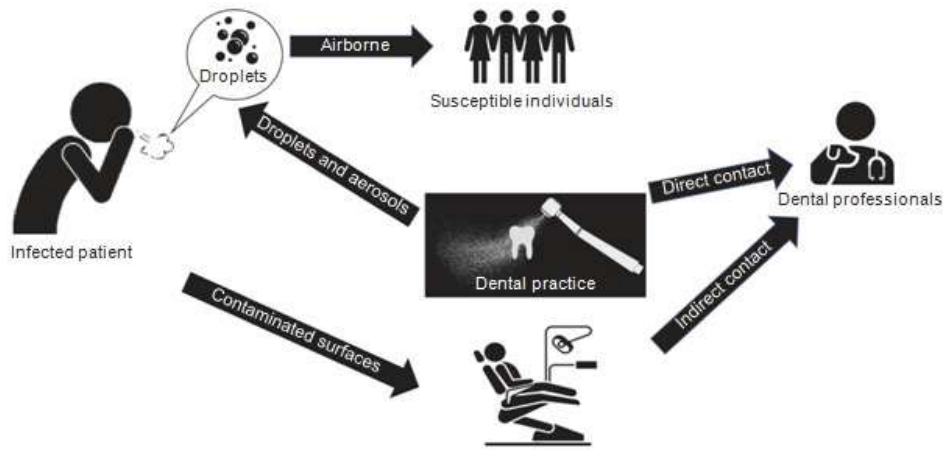


Figure 1 Showing Possible Transmission

Telescreening and Triaging

A preliminary telephone screening to identify suspected or potentially COVID-19-infected patients can be performed remotely at the time of appointment (Fig. 2). The 3 most relevant questions for initial screening should include any exposure to a person with known or suspected COVID-19 presentation, any recent travel history to an area with high incidence of COVID-19 or presence of any symptoms of febrile respiratory illness such as fever or cough. Importantly, to identify high-risk areas, live global tracking of reported cases can be done using the dashboard made accessible by the Centre for Systems Science and Engineering at Johns Hopkins University. A positive response to any of the 3 questions should raise initial concern, and elective dental care should be deferred for at least 2 weeks (Note: As mentioned previously, the incubation period for SARS-CoV-2 can range from 0–14 days). These patients should be encouraged to engage in self-quarantine and contact their primary care physician by telephone or email.

Patient Evaluation and Cohorting

Upon arrival of patients in dental practice, patients should complete a detailed medical history with the COVID-19 consent form with screening and assessment of true emergency questionnaire (Fig. 3). Dentists should measure the patient's body temperature using a non-contact for head thermometer or cameras with thermal sensors.

Patients presenting with a fever (.100.4_F 38_C) and / or symptoms of respiratory disease should have elective delayed dental care for at least 2 weeks.

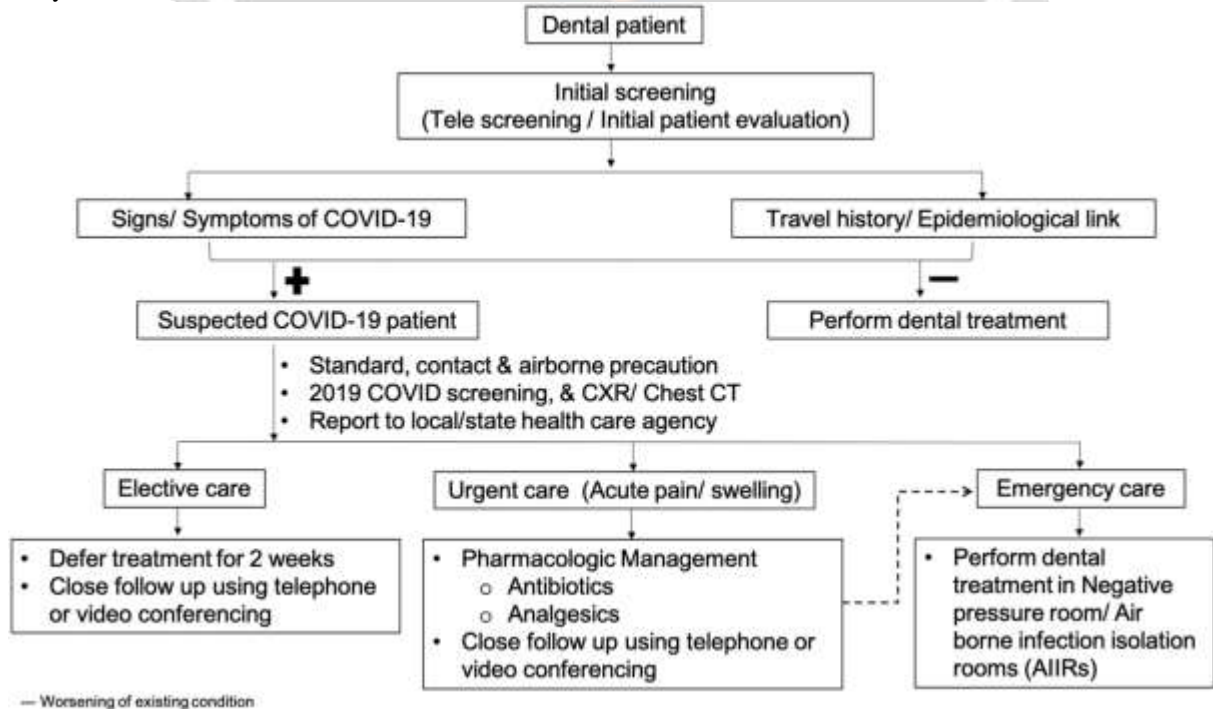


Figure 2 - An overview of patient screening for COVID-19 and dental management.

According to the Centres for Disease Control and Prevention guidelines, people with suspected COVID-19 should be seated in a separate, ventilated area for at least 6 ft from unaffected patients seeking care. Patients should be asked to wear a surgical mask and follow proper respiratory hygiene, such as covering the mouth and nose with a tissue before coughing and sneezing and then disposing of the tissue. . After informing the patients to self-quarantine themselves, dentists should advise patients to contact their doctor to rule out the possibility of COVID-19.

SPECIFIC DENTAL TREATMENT RECOMMENDATIONS

Dental Surgeons should follow recommended ways to control infection, including standard, contact, and airborne protection, while managing symptomatic contacts and patients who are under investigation or who have probable or confirmed. Dental treatment should be postponed if possible If patients are suspected with any signs and symptoms of MERS infection. . Emergency dental treatment should be delivered in an environment with proper air exchange, proper mask filtration etc. It is important to note that droplets protection should be included in standard precautions when treating all dental patients with symptoms of acute respiratory infection. Eye protection and preventative measures should be added to the dental clinic setup. Airborne precautions should be applied while performing the aerosol-generating procedures.

Patients with active febrile and respiratory illness are more likely to be absent from dental practice. Clinicians can rule out the severity of the dental condition and make an informed decision to either provide or defer dental care. 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 may be a shortage of personal protective equipment. Therefore, it is best to use them fairly and follow the Centres for Disease Control and Prevention guidelines for use and reuse of the N95. Previous studies have shown that SARS-CoV and MERS-CoV were more vulnerable to povidone mouth cleansing. Therefore, pre-procedural mouth rinse with 0.2% povidone-iodine can reduce the load of corona viruses in saliva or another alternative is to use a 0.5 % hydrogen peroxide, because it has non specific virucidal activity against corona viruses.

Self Declaration & Special COVID-19 Consent

Date: _____ Day: _____ Time: _____

Patient's Name: _____

Age: _____ Sex: _____ Fair No.: _____

Address: _____

Hospital Name: _____ Hospital No.: _____

1) Do you have Fever/Cough/Tiredness/Difficulty in Breathing? Yes/No

2) Have you travelled outside India and come back during pandemic of COVID 19 or have you come from other country during pandemic of COVID 19? Yes/No

3) Have you travelled anywhere in India in last 60 days? Yes/No

4) Any Personal or Family History of Positive COVID 19 or Quarantine? Yes/No

5) Any history of known case of Positive COVID 19 or Quarantine patient in your House/Apartment/Society area? Yes/No

6) Are you suffering from any following diseases? Yes/No

Diabetes/Hypertension/Lung Disease/Heart Disease

7) Are you a healthcare worker or interacted/lived with Positive COVID 19 patients? Yes/No

During the Lockdown period and with current situation of Pandemic of COVID 19, I come to this hospital to avail for Hospital/Emergency treatment e.g. Consulting, Admission, Surgical Treatment or Anesthesia.

If I am an asymptomatic carrier or undiagnosed patient of COVID 19, it is my responsibility to take appropriate precautions and follow the protocols advised by my Doctors. I may be referred for further advance treatment of same disease in designated nearby COVID 19 centers.

I also know that I may get infection from the hospital or from doctors, and I will take every precaution to prevent this from happening. For that I will never hold doctors or hospital staffs accountable if such infection occurs to me or my accompanying persons.

Above information is true to the best of my knowledge, I understand that giving false information or hiding the facts or any type of violence in the hospital are punishable offences in IPC.

Patient's Signature with Name _____ Patient's Thumb Impression _____ Patient's Mobile No. _____

Witness Signature & Name _____ Witness Mobile No. _____ Doctor's Signature & Name _____

Scanned with CamScanner

Figure 3 – Patient History and Consent Form

The use of discarded devices (single use) such as a mouthpiece, syringe, and cuff for blood pressure to prevent contamination is recommended.

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 barrier to prevent perforation and cross contamination.

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 beneficial to place the rubber dam so that it covers the nose.

Dentists should limit the use of ultrasonic instruments, high-speed hand pieces, and 3 way syringes to reduce the risk of generating contaminated aerosols. At this time of public health crisis, endodontic practices can dilute the sodium hypochlorite irrigation solution to 1% concentration, to surge the supplies without compromising on treatment outcomes.

SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

- #### 1. GOWN

 - Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
 - Fasten in back of neck and waist

- #### 2. MASK OR RESPIRATOR

 - Secure ties or elastic bands at middle of head and neck
 - Fit flexible band to nose bridge
 - Fit snug to face and below chin
 - Fit-check respirator

- #### 3. GOGGLES OR FACE SHIELD

 - Place over face and eyes and adjust to fit

- #### 4. GLOVES

 - Extend to cover wrist of isolation gown

USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene



Figure 4 Centres for Disease Control and Prevention recommendations for putting on and removing personal protective equipment for treating COVID-19 patients.

It is recommended that patients with suspicious or suspicious COVID-19 should not be treated in routine dental settings. Instead, this patient support should only be treated in the negative air pressure rooms or in the AIIRs. . Therefore, anticipatory knowledge of health care centers with provision for AIIRs would help dentists to provide emergent dental care if the need arises.

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. 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.

Now a day with the status of quarantine in the most of countries, dentists should only be concerned about the emergency cases of non-infected patients (infected patients should be treated in hospital) and according to the specialty we classified emergency as shown in table 1.

In the circumstances of Pandemic of the COVID 19, if the dentists are not able to apply the instruction recommended for dealing with COVID 19 in dental clinic. It is urgent to refer the patients to the hospital where the protocol of protection is more applicable.

DISCUSSION

The worldwide spread of SARS-CoV-2 is increasing the likelihood that dental health care providers will treat this type of patient population.

Universal precautionary measures are essential to reduce the spread of the virus and related diseases. As highlighted in this review, precautions need to be taken that include careful patient involvement and additional steps in the treatment of patients are considered mandatory. With the increase in the number of COVID-19 cases, it is quite possible that this deferment might be extended. Therefore, to assist dentists at this time; we have put together a collection of recommendations for dental emergency management. It is suggested to assess the emergency of each case and use clinical judgment to aid in making decisions.

It is recognized that case presentations can be dynamic, and there is a good chance that dental practices may treat some patients with asymptomatic COVID-19 because incubation period can range from 0 to 14 days and most patients develop few mild symptoms. Therefore, all patients should be considered infected and all dental practices need to review their infection control policies, engineering controls, and supplies. Health care providers must keep themselves informed of this disease and provide adequate training to their staff to encourage more levels of screening and preventive measures, allowing dental care to be provided while reducing the spread of this novel disease.

CONCLUSION

Health care professionals are responsible for protecting the public and maintaining high levels of care and infection control. This new emerging threat of SARS-CoV-2 may become the less pathologic but the most common disease in the world 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 (i.e., SARS-CoV and MERS-CoV). Therefore, it is important to make informed clinical decisions and educate the public to prevent panic while improving the health and well-being of our patients during these difficult times. The cautious practitioners will use this review as a starting point and continue to update itself with helpful online information as this outbreak continues.

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| DIAGNOSIS | PRIMARY MANAGEMENT | SECONDARY MANAGEMENT |
|---|--|--|
| Symptomatic Irreversible pulpitis/ Symptomatic Apical Periodontitis | Pain Management: <ul style="list-style-type: none"> 1st line: Ibuprofen 600mg + Acetaminophen 325-500mg^{33,34,35} 2nd line: Dexamethasone 0.07- 0.09mg/kg³⁵ Consideration for supplementation with long acting local anesthetic - 0.5% Bupivacaine for immediate pain relief ³⁷ | Full Pulpotomy ^{38,39} |
| Acute Apical Abscess | Intraoral Swelling: <ul style="list-style-type: none"> Incision and Drainage Augmentin 500mg b.i.d. x 5 days/ Clindamycin 300mg q.i.d. x 5 days⁴⁰ Ibuprofen 600mg + Acetaminophen 325-500mg^{33,34,35} Consideration for supplementation with long acting local anesthetic - 0.5% Bupivacaine for immediate pain relief ³⁷ Extraoral Swelling: <ul style="list-style-type: none"> Augmentin 500mg b.i.d. x 5 days/ Clindamycin 300mg q.i.d. x 5 days⁴⁰ Ibuprofen 600mg + Acetaminophen 325-500mg^{33,34,35} | Call Oral & Maxillofacial Surgery for further instructions for a possible referral |
| Avulsion/ Luxation | If tooth is replanted, follow pain management protocol: Pain Management- dependent on age <ul style="list-style-type: none"> 1st line: Ibuprofen 600mg + Acetaminophen 325-500mg^{33,34,35} | If tooth is not replanted, replant and follow IADT guidelines ^{41,42} as best as possible |
| Tooth fracture resulting in pain | Pain management : <ul style="list-style-type: none"> Ibuprofen 600mg + Acetaminophen 325-500mg^{33,34,35} | Vital Pulp Therapy ^{38,39,43} |
| Trauma involving facial bones, potentially compromising the patient's airway | Refer to Oral & Maxillofacial Surgery | |
| Cellulitis or a diffuse soft tissue bacterial infection with intra-oral or extra-oral swelling that can potentially compromise the patient's airway | Refer to Oral & Maxillofacial Surgery | |

Table 1 Recommendations for Dental emergency management during COVID-19 outbreak.

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