



Review Article

COVID-19 Outbreak: An overview on dental perspective

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ABSTRACT

A pandemic of novel coronavirus started in China causing pneumonia like acute respiratory syndrome and rapidly spread to other countries of the world. It was declared a public health emergency of international concern by the World Health Organization. Due to lack of accepted therapies and vaccines, the prevention of COVID-19 infection has become an uphill task. As the infection is associated with human to human transmission and is highly communicable so medical professionals are at greater risk especially dentists who work in oral cavities and are exposed to aerosols. Dental practices and hospitals should utilise the available information and properly execute the recommended management protocols strictly and effectively. The purpose of this literature review is to summarize the available information to act as a resource for Dental health care professionals to follow guidelines for safe practice and decrease the risk of transmission of covid-19 among health care professionals during treatment in covid-19 pandemic till any positive outcome of ongoing clinical trials is anticipated.

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1. Introduction

With the beginning of 2020, an outbreak started in Wuhan city of China and very soon spread to almost all countries of the world,^{1,2} similar to the pandemics that have occurred previously in the history like Plaque, smallpox, spanish flu etc.³ The disease was first identified as 'virus induced' infection on December 30, 2019 after the isolation from bronchoalveolar lavage fluid of COVID-19 infected patients and when clinical manifestations, blood test and chest radiograph were evaluated.^{4,5} This virus belongs to the same family of coronavirus of Severe Acute Respiratory Syndrome (SARS-CoV) and Middle East Respiratory Syndrome (MERS-CoV) which infects humans, but it was milder in terms of morbidity and mortality.⁶ It was officially declared as the causative pathogen of coronavirus disease (COVID-19) on January 8, 2020, by the Chinese Centre for Disease Control and Prevention.⁷ On 11th February 2020,

WHO named it as "CoronaVirus Disease (COVID19)", while the international Committee on Taxonomy of Viruses (ICTV) named it as "SARSCoV-2".⁸

All human CoVs are of zoonotic origin, and the bats are supposed to be their natural host because they shows 96.2% genome identity to bat CoVs such as BatCoV RaTG13 (bat *Rhinolophus Affinis* virus), but bats cannot directly infect humans unless they undergo mutation in intermediate hosts.⁶⁻⁹ Now as the similarity between pangolin origin CoVs and SARS-CoV-2 is 99%, pangolin is suspected as intermediate host. Research on identifying other potential animal hosts of SARS-CoV-2 are still going on, which will be helpful in the prevention and control of COVID-19.⁵

As the virus is new and the researches are still going on, the main challenge which the world is facing is due to the lack of accepted therapies and treatment guidelines. Symptoms of SARS-CoV-2 infection include fever, dry cough, fatigue, diarrhoea, headache dyspnoea, upper respiratory infections (sneezing, rhinorrhoea, sore throat) and bilateral ground-glass opacities on chest

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CT scans.¹⁰ Infection can have five different outcomes: asymptotically infected persons, mild to medium cases, severe cases, critical case, and death. COVID-19 in most cases with mild symptoms can recover in 1–2 weeks. The treatment of patients is purely symptomatic, based on underlying medical conditions. The infection is still continuously spreading, and since there are no specific antiviral treatments or vaccines known till date, so thousands of cases die every day worldwide and thus it has become a serious threat to public health. Presently, prevention of community spread is our main goal and Quarantine and social distancing is the best weapon in the present situation.

As COVID-19 virus is related with human-to-human transmission^{3,11,12} and a research confirmed the presence of Covid-19 virus in salivary fluids of infected patients, so the transmission through droplets and aerosols generated during dental clinical procedures is greatly anticipated.^{12,13} and thus the possibility of cross infection is very high in dental practice. Now the biggest challenge in dental practice is to prevent cross infection among healthcare professionals and patients. The first dental case diagnosed positive for COVID-19 was on 23 January 2020 in Wuhan University Dental Hospital. Later eight new oral healthcare professionals were reported positive.² A Kuwait based 54 year old Indian dentist died due to corona infection on 9th May. Dentists are at greater risk for themselves and for patients in terms of transmission due to face to face communication thus the safety protocol in dental clinics must be executed strictly and properly to prevent this transmission.

This article is based on our observation, research conducted till date and appropriate guidelines about COVID-19. The objective of this literature review is to utilise the available information regarding relevant safety protocols (SOP), in dental settings and to properly execute the recommended management protocols thus decreasing the risk of transmission of covid-19 among health care professionals as much as possible.

2. Method

The authors searched Medline for articles using the MesH words- COVID-19, coronavirus infection, dental and dentistry. All types of studies were assessed including reviews, case -studies, and clinical guidelines. The references of incorporated studies were also checked for additional sources. Only studies written in English were considered. In the beginning 72 articles were assessed, of which 22 articles were included in this review. In this review, we summarized the latest research regarding COVID-19, and discussed the safety protocols and current treatment guidelines to combat pandemic of SARS CoV-2 during dental practice.

3. Recommended safety protocols for dental practice during COVID-19 outbreak

Before dental procedure antimicrobial mouth rinse with 1% hydrogen peroxide or 0.2% Povidone is recommended. Chlorhexidine which is commonly used as mouth rinse is not effective for COVID-19 virus.⁸ Dental approach should be such that it should not induce coughing. Aerosol-generating procedures should be avoided as far as possible, extraoral dental radiographies, such as panoramic radiography and cone beam CT should be used instead of intraoral radiograph. Although coronavirus infection does not include eye symptoms, but presence of COVID-19 virus in conjunctival samples suggests that eye exposure can be a possible route for the virus to enter the body.¹⁴

Facemasks or cloth face coverings are must for everyone entering the dental setting, regardless of whether they have COVID-19 symptoms. Pre-screening of everyone should be done for fever and symptoms of COVID-19 before entering the dental setting.¹⁵ If the patient has respiratory illness, dental treatment should be postponed till the patient recovers. Patient's dental condition should be assessed on the phone and if there is an emergency then only they should be seen in the dental clinic. Use of Tele-conferencing or Tele-dentistry as alternatives and should focus on three A's: (a) Advice (b) Analgesia (c) Antimicrobials (where needed)

Health care workers (HCW) are on the front lines to care for patients with COVID-19 while putting themselves at risk for infection. According to an update on 13 May 2020, more than 1000 HCW have already died all around the world due to this infection. COVID-19 due to its high communicability makes the health care professionals highly susceptible to hospital-associated transmission.¹⁶ Most common cause for rapid spread can be asymptomatic infected individuals and lack of use of personal protective equipment (PPE). Cases recorded in Italy occurred among health workers was double that recorded in China in which lack of PPE was the main reason.¹⁷ Current approach to this disease is use of personal protection precaution to reduce the risk of transmission, early diagnosis, isolation, and supportive treatments for affected patients. Antibacterial agents are ineffective for covid-19. People most at risk are those who are in contact with or care for patients with COVID-19. This inevitably places health care workers (HCWs) at high risk of infection.^{18,19}

Personal protective equipment (PPE) is mandatory now and comprises of Goggles / face shield (Both to be used, fitting goggles with a soft tissue seal), Triple layer surgical mask, N95 respirator during routine dental procedures, FFP3 (Standard mask should be used during treatment of COVID19 positive patients), Surgical gloves, Disposable coverall / gown with hood /waterproof lining to be changed daily. If a respirator is not available, use a combination of a surgical mask and full-face shield. Ensure that the mask is cleared by the US Food and Drug Administration (FDA)

as a surgical mask. National institute for occupational safety and health NIOSH Classifies respirators depending on the degree of oil resistance.^{20,21} Detailed plan for use of personal protective equipment in health care settings (CDC Recommendation)¹⁵ is shown in Table 1.

4. Provision of Emergency Care to Patients in a Dental Clinic

If a patient is to be seen in the dental clinic for emergency care, they should be properly assessed at the time of check-in regarding presence of symptoms of a respiratory infection and history of travel to areas having infection of COVID-19 or contact with possible patients with COVID-19. If the patient is afebrile (temperature < 100.4°F) and without symptoms related to COVID-19, then emergency dental care may be provided using appropriate infection control practices. Ultrasonic scalers should not be used during this time and all aerosol generating procedures should be avoided. Minimally invasive/atraumatic restorative techniques (hand instruments only) should be practised. If aerosol generating procedures are necessary for emergency care, then use four-handed dentistry, high evacuation suction and dental dams, in order to minimize droplet spatter and aerosols. The number of DHCP present during the procedure should be limited to only those essential for patient care and procedure support.

If a patient who is suspected or confirmed to have COVID-19, defer dental treatment. Give the patient a mask to cover his/ her nose and mouth, and send the patient home. If acutely sick refer the patient to a medical facility. If emergency dental care is necessary then Airborne Precautions should be followed strictly and should be treated in a hospital or facility that has appropriate precautions.

Following protocols must be strictly followed before entering the patient room/care area:

1. Wear an N95 respirator or a respirator that offers a higher level of protection such as other disposable filtering face piece respirators, powered air-purifying respirators (PAPRs), or elastomeric respirators.
2. Eye protection (i.e., goggles or a full-face shield that covers the front and sides of the face). If respirators are not available and surgical masks are used, wear a full-face shield.
3. Wear clean, non-sterile gloves.
4. Enrobe a clean isolation gown. Discard disposable gowns after use. Launder cloth gowns after each use.

Strict adherence to hand hygiene, including before and after all patient contact, contact with potentially infectious material, and before putting on and after removing PPE, including gloves, perform hand hygiene and use of alcohol-based hand rub (ABHR) with 60-95% alcohol or washing hands with soap and water for at least 20 seconds. If hands

are visibly soiled, use soap and water before returning to ABHR.

4.1. Management in clinic and hospital areas

1. Every patient who enters and exits the clinic should be provided hand sanitizers
2. The waiting room/clinic including the handles and doors as well as dental chairs and other surfaces should be wiped several times in a day with alcohol-based disinfectant. Thoroughly cleaning environmental surfaces with water and detergent or hospital-level disinfectants (such as sodium hypochlorite, standard bleach in a dilution of 1:50) are effective. For the disinfection of small surfaces ethanol 70% is recommended by WHO.²²
3. Social distancing should be followed especially in the clinical waiting area. Maintain at least a 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing.
4. Donning and doffing should have separate rooms
5. Staff and doctors should avoid touching their face specially the ear, nose and mouth
6. If a surgical mask and a full-face shield are not available, do not perform any emergency dental care. Refer the patient to a clinician who has the appropriate PPE.
7. Cleaning and disinfection procedures for the room and equipment should be followed strictly according to the Guidelines for Infection Control in Dental Health-Care Settings.
8. Adequate ventilation should be provided in clinical areas so as to minimize the risk of infection by removing infectious particles through air exchange thus reducing the transmission of airborne infections.
9. All instruments pertaining to dental procedures to be disinfected, cleaned and sterilized as per standard infection control (CDC, 2003)
10. All biomedical waste should be properly disposed as per the Bio-Medical Waste (Management and Handling) Rules, 1998.

4.2. Dental treatment considerations

During aerosol-generating procedures (e.g. use of dental hand piece, air/water syringe, ultrasonic scalers) the following precautionary measures should be strictly enforced:

1. Separate clinical areas for aerosol and non-aerosol control dental treatments, preferably negative pressure chambers
2. Use 1.5% hydrogen peroxide or 0.2% povidone as a pre-procedural mouth rinse
3. Apply rubber dams during any aerosol-producing procedure to minimize spread of infection via aerosol

Table 1: Detailed plan for use of personal protective equipment in health care settings

Personal protective Equipment	Level 1	Triage area	Level 2	Non-aerosol generation area	Level 3	Aerosol generation area
Overall for Dental Personnel	✓	✓	✓	✓	✓	✓
Medical/Surgical Cap	✓	✓	✓	✓	✓	✓
Surgical Mask	✓	✓	✓			
N95 or High Level Respirators				✓	✓	✓
Eye Shield		✓	✓	✓	✓	✓
Surgical Gown		✓	✓	✓	✓	✓
Surgical Gloves	✓	✓	✓		✓	✓
Face shield			✓	✓	✓	✓
Disposable Shoe Cover			✓	✓	✓	✓

Level 1: Pre-Screening and Triage Area

Level 2: Non-Aerosol Generation Procedures

Level 3: Aerosol Generation Procedures

or spatter.

4. Use a 4-handed technique to minimize infection
5. High-volume suction or saliva ejectors are mandatory during aerosol based procedures
6. Minimize the use of a 3-in-1 syringe as this may create droplets due to forcible ejection of water/air.
7. Restrict the number of para-dental staff and patients who enter the clinical as well as waiting area of the clinics.
8. Perform pre and post operative infection control protocols and regular fumigation of clinical areas

5. Prosthetic Intervention

Dental impression disinfection procedures in clinics as well as laboratories should be followed properly. Washing the impression under running water and immersing it into disinfectant solution for 10mins. Then without hand contact packing the impression in to a zip-lock bag with client id and details. Now packaging of impressions should be done and contactless pickup by delivery executives should be done. In laboratories, also the disinfection protocol should be strictly followed.

The impression should be disinfected with benzalkonium chloride based disinfectant.

Since conventional sterilization methods, such as dry heat sterilization, cannot be used for eliminating potential pathogen microorganisms that are present on the dental impression surface, liquid chemical immersion disinfection is currently the most widely accepted method. Current commercially available immersion disinfection solutions contain sodium

hypochlorite (0.525%), quaternary ammonium compounds, glutaraldehyde, phenols and iodophors in various concentrations and immersion times. Apart from immersion disinfection, alternative methods have been suggested, such as spray disinfection, steam

autoclave, ozone, microwave, ultraviolet light etc. The 10 minute disinfection time for the 0.525% sodium hypochlorite immersion disinfection was selected according to ADA specifications and 2 minute disinfection time with the 0.3% benzalkonium Chloride, while 5 to 15 minute is sufficient for ozone disinfection. Also as we cannot prevent aerosol generation in dental clinics, but can we minimise the viral load in the Aerosols by using Povidone-Iodine as an irrigant in high-speed handpieces too, as it has already been a recommended irrigant in the ultrasonic scaler. The recommendation is to use 10% povidone-iodine diluted 1:9 with water which means that if a half litre bottle attached to the dental Chair, then 50 ml of 10 % Povidone Iodine solution Should be added and then water is to filled in the bottle. So this dilution will be 50: 450 = 1:9.

All the above said precautions should be taken while performing Prosthodontic intervention like making impression, jaw relation, insertion and even doing cementation.

6. Covid-19 Post Recovery Dental Intervention

People suffering from COVID-19 who have ended home isolation can receive emergency dental care. This is decided using two strategies: a non-test-based strategy and a test-based-strategy: Non-test-based-strategy: At least 3 days (72 hours) have passed since recovery (resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms such as cough or shortness of breath), and at least 10 days have passed since symptoms first appeared. Test-based-strategy: Persons who have COVID-19 symptoms: Resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (cough, shortness of breath) and negative results of an FDA Emergency Use Authorized molecular assay for COVID-19 from at least two consecutive upper respiratory swab

specimens collected ≥ 24 hours apart total of two negative specimens). Persons with laboratory-confirmed COVID-19: At least 10 days have passed since the date of the first positive COVID-19 viral test and have had no subsequent illness.

7. Conclusion

Although routine clinics have been closed during the pandemic, a large number of emergency patients still visit dental clinics and hospitals for treatment. We have summarized the possible transmission routes of 2019-nCoV, such as the airborne spread, contact spread, and contaminated surface spread. We also reviewed several detailed practical strategies to block virus transmission to provide a reference for preventing the transmission of 2019-nCoV during dental diagnosis and treatment, including patient evaluation, hand hygiene, personal protective measures for the dental professionals, mouth rinse before dental procedures, rubber dam isolation, anti-retraction handpiece, disinfection of the clinic settings, and management of medical waste. If a dental facility is not able to follow this interim guidance, dental personnel and medical providers should work together to determine an appropriate facility for treatment. Dental professionals must be well informed of possible threats that may challenge the current infection control regimen. This is an emerging, rapidly evolving situation and CDC will continue to update as and when new information is added. The purpose of this literature review is to summarize the available information as a resource for dental professionals during dental treatment in covid-19 pandemics till any positive outcome of ongoing clinical trials is anticipated.

8. Source of Funding

None.

9. Conflicts of Interest

None.

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