



**DENTISTRY AFTER COVID-19**

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**ABSTRACT**

The outbreak of Coronavirus in the past three months has become a public health crisis of global concern. It is a zoonotic infection that is believed to be originated from bats and pangolins and later transmitted to humans. Human transmission occurs via respiratory droplet/contact. WHO declared COVID-19 as a pandemic due to the alarming levels of spread and severity. In response to the current threat, many countries have employed various containment strategies to protect people from health risk and avoid strain on the national healthcare systems worldwide. However despite the extensive efforts, this outbreak is still on the rise due to the community spread. In such a scenario, due to direct communication and consistent exposure to body fluids such as blood and saliva, the risk of cross infection can be very high among the dental health care workers. Therefore, this article highlights the information pertaining to possible source of spread of COVID 19 among clinical operator. In addition, it provides information regarding the infection control strategies and patient management protocols to provide optimum dental care and simultaneously prevent nosocomial infection in dental settings.

**KEYWORDS:** Coronavirus, Covid19, Dentistry, Public Health, Dental Care.

**INTRODUCTION**

The recent outbreak of the coronavirus diseases (COVID 19) in the area of Wuhan, China has led to public health crisis and its expansion into many countries. The novel coronavirus belongs to a family of single-stranded RNA viruses known as Coronaviridae. This family of viruses are known to be zoonotic or transmitted from animals to humans.<sup>[1]</sup>

The World Health Organization (WHO) declared it as a pandemic in March 2020 due to the alarming levels of spread and severity. In response to the current threat, many countries have employed various containment strategies to protect people from health risk and avoid strain on the national healthcare systems worldwide. However despite the extensive efforts, this outbreak is still on the rise due to the community spread.<sup>[2]</sup>

Following the widespread transmission of SARS-CoV-2 and the unique characteristics of dental office, both the dental healthcare professionals as well as the patients have an increased risk of cross infection. These risks can be attributed to the unique nature of dental interventions, which include aerosol generation, and proximity of the provider to the patient's oropharyngeal region.<sup>[3]</sup> In addition, if adequate precautions are not taken, the dental

office can potentially expose patients to cross contamination. Majority of the dental treatment demands multiple visits by patients, which throws a unique challenge to ensure bilateral safety at every visit.<sup>[4]</sup>

Therefore this article is aimed to provide brief information pertaining to possible source of spread of COVID-19 in a dental clinic and recommendations regarding patient management and clinical strategies.

**SYMPTOMS<sup>[5]</sup>**

- Patients with COVID-19 usually present with clinical symptoms of fever, dry cough, and myalgia, reduced sense of smell (hyposmia), and abnormal taste sensation (dysguesia) have also been reported.
- Notably, about 80% of these patients have only mild symptoms that resemble flulike symptoms and seasonal allergies, which might lead to an increased number of undiagnosed cases. These asymptomatic patients can act as "carriers" and also serve as reservoir for reemergence of infection.

**POSSIBLE TRANSMISSION ROUTES OF COVID-19 IN DENTAL CLINICS<sup>[4,5]</sup>**

Spread of infection from patient to doctor or vice versa can be divided as following.

### 1. Air-borne spread

The pathogenic microorganisms can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods, generated from an infected individual and propelled a short distance by coughing, sneezing or talking without a mask.<sup>[4,5]</sup>

### 2. Contact spread

A dental professional's frequent direct or indirect contact with human fluids, patient materials, and contaminated dental instruments makes a possible route to the spread of viruses.

### 3. Contaminated surface spread

When dental devices such as high-speed dental hand-piece work in the patient's oral cavity, a large amount of aerosol and droplets mixed with the patient's saliva or even blood are generated which are small enough to stay airborne for an extended period before they settle on environmental surfaces and become a positive source of infection.<sup>[5]</sup>

## TRANSMISSION DYNAMICS IN DENTISTRY

2019-nCov invades the cells through the angiotensin-converting enzyme 2 (ACE2) receptor in the same way as the SARS coronavirus. ACE2+ cells are abundantly present all over the respiratory tract and in the salivary glands. Using the same mechanism to induce infection, 2019-nCoV effectively uses ACE2 receptor for cell invasion and can promote human-to-human transmission, although definitive judgment regarding this issue needs further study.<sup>[5,6]</sup>

## STANDARD DENTAL OFFICE PROTOCOLS

The first step a dentist can do to ensure the well being of his/her patients is prepare a digital written/audio/video message detailing a few common problems faced by the patients. Such a set protocol by the clinician, psychologically comforts the patients and also helps guiding the patient virtually through this unfortunate situation.<sup>[1,4,5,7,8]</sup>

### A. Patient care protocols

1. Initial tele-screening of dental patients to identify suspected COVID-19 carriers. Upon patient arrival in dental practice, patients should complete a detailed medical history form, COVID-19 screening questionnaire and assesment of a true emergency questionnaire. (Fig 1, 2,3)
2. Maintenance of proper record, address, contact details are of paramount importance. Since the incubation period of SARS-CoV-2 may extend over 2 weeks, a positive response any of the above queries mandates deferring the appointment for at least 2 weeks.
3. Additionally the patients should be encouraged to self quarantine at home and contact their primary care physician for tele-consultation.
4. Those patient who seem fit for appointment scheduling should be advised to wear surgical face mask and preferably come alone or with a single attendant at the time of their dental visit.
5. Dental office and the waiting area should be well ventilated at all times along with spaced out seating of patients.
6. Patients should be instructed to arrive on time for their appointments.
7. Remove magazines, reading materials, toys and other objects.
8. Schedule appointments to minimize possible contact with other patients in the waiting room.
9. Use of contact less thermal screen and pulse oximeter device should be considered even if the patient answers no to the COVID symptoms questions.
10. Use of pulse oximeter can be expanded in general dental office screening procedures during this pandemic. An oxygen saturation of below 90% is a good marker for some form of oxidative distress in the body.
11. Patients should be instructed for hand sanitization and proper hand washing as soon as he/she enters the clinic.
12. The patient must be made to do a pre-procedural mouth rinse using Betadine or 1% Hydrogen peroxide/ 2% w/v Povidone-Iodine mouth wash for at least 15 seconds, just before treatment is initiated and also after the procedure is over.<sup>[1,9,10,11]</sup>
13. Patients should also be covered with a full length drape with their hands tucked in and a head cap and goggles and the immediate extra oral area may be wiped with Betadine solution or a disposable disinfectant face wipe before commencing the procedure.
14. Rubber dams must be made mandatory, along with adequate training of its usage will form the best barrier to prevent aerosol formation.
15. After the patient gets off the dental chair, the assistant must ensure that all surfaces with which the patient or aerosolized particles may have come in contact are sprayed with surface disinfectant and wiped clean.
16. The PPE is to be disposed of as per laid down protocols on completion of the treatment of each and every patient.
17. Encourage minimal follow-up visits.
18. Encourage and educate the patients to pay the fees by Digital routes.
19. High vacuum extra oral suctions used in conjunction with high speed saliva ejectors, should be mandatory to minimize aerosol dissemination.
20. Intraoral imaging should be restricted and extra oral radiographs should be utilized to reduce the excessive salivation and gag reflex associated with intraoral radiographs. However if intraoral sensors are to be used, they should have double barriers to avoid cross contamination.<sup>[12]</sup>

21. Patients using Removable Prosthesis should be given additional hygiene recommendations and guidelines for disinfection of the prosthesis. Specially if a patient using prosthesis develops Covid infection the use of the prosthesis must be discontinued as the prosthesis can be source of spread.
22. The dentist in his clinic should ensure that entire team is well versed with the universal precautions.

### **B. Clinic and operator protocols<sup>[1-4,7,8]</sup>**

1. All the clinical and auxiliary staff should be provided proper PPE and should be trained in sterilization and infection-control protocols.
2. With respect to the dental personnel a specified work flow is required to be maintained while in the sterile zone. For efficient work flow, a separate screening, donning and doffing room should be designated. Donning & doffing should be regularly practiced as improper donning/doffing will lead to cross-contamination.<sup>[9]</sup>
3. It is preferable to work with minimal staff or use a rotation of your existing staff.
4. A hand sanitizer or facility to scrub hands with soap and water along with instructions should be made available outside the clinic just before the patient is to enter the reception or waiting area. The patient may also be instructed to strictly keep the foot wear outside and may be requested to wear a disposable foot cover and gown as soon as he/ she enter the clinic.
5. Covid related disinfection and personal care protocol might be displayed using posters or audio video means in your clinic for the patients benefit.
6. After every splatter related /aerosol generating treatment, strict fumigation need to be done.
7. To reduce the viral load in the dental laboratory, High efficiency particulate air (HEPA) filters and negative ion generators have also shown promising results in removal of particulates from the air of the size as small as 0.3 microns.<sup>[4,13]</sup>
8. Hand pieces, burs, diagnostic instruments, etc., have to be stringently autoclaved, in sealed pouches. Overlooked practices such as scrubbing the hand piece with a disinfectant and working on multiple patients at a time must be avoided under all circumstances. Used burs should be soaked in a proper disinfectant solution after scrubbing prior to autoclaving. When ever possible dispose the burs after single use. Scrubbing the diagnostic instruments and hand instruments in a concentrated soa solution for 20 seconds prior to autoclaving may be a good practice as soap is one of the best antiviral means.<sup>[1,2]</sup>
9. Impressions should be thoroughly disinfected before pouring or sending to the laboratory as a standard protocol(Septodent spray, Cidex-Glutaraldehyde).
  - Alginate -0.5% Sodium Hypochlorite or iodophors
  - Zinc-oxide eugenol impression paste-2% Glutaraldehyde or Chlorine compounds
  - Rubber-base impression materials -2% Glutaraldehyde or Cidex.

10. Prefer using disposable trays for taking impressions, however if metal trays are to be used should be autoclaved. The plastic trays or bite rim should be disinfected with 2% glutaraldehyde solution for 10 minutes.

11. All dental equipment with waterlines (such as hand pieces, scalers and air/water syringes) are to be fitted with an anti-retraction valve to minimize backflow of contaminated fluids from the oral cavity. Flush air and waterlines for at least two minutes at the start and end of each day, and for 30 seconds between patients.

12. The patients may be educated at the reception regarding the PPE kits that are being used for the patients safety as well as that of the operator and of the minimal additional charges that may result from its use.

### **C. Hand hygiene and personal protective equipment (ppe) instructions<sup>[2-5,7,8,13]</sup>**

- 1) The importance of hand hygiene for both the practitioner and associated staffs is very important. The term hand hygiene includes both hand washing with liquid soap and the use of an alcohol based hand rub (ABHR). The use of an ABHR is the preferred method of hand hygiene in health care settings when hands are visibly and clinically clean (no visible bioburden).
- 2) Hand hygiene should be practised at the following key stages in the decontamination process so as to minimise the risk of contamination<sup>[13]</sup>
  - before and after each treatment session;
  - before and after the removal of PPE;
  - following the washing of dental instruments;
  - before contact with instruments that have been steam-sterilized (whether or not these instruments are wrapped);
  - after cleaning or maintaining decontamination devices used on dental instruments;
  - at the completion of decontamination work.
- 3) Mild soap should be used when washing hands. Ordinarily, the hand-wash rubbing action should be maintained for about 20 seconds. After the exercise, the hands should be visibly clean. Where this is not the case, the hand hygiene procedure should be repeated.
- 4) Drying of hands: Effective drying of hands after washing is important because wet surfaces transfer microorganisms more easily than when they are dry, and inadequately dried hands are prone to skin damage. To prevent recontamination of washed hands, disposable paper towels should be used.
- 5) Fingernails should be kept clean, short and smooth. When viewed from the palm side, no nail should be visible beyond the fingertip. Staff undertaking dental procedures should not wear nail varnish and false fingernails.
- 6) Rings, bracelets and wristwatches should not be worn by staff undertaking clinical procedures and should be removed prior to carrying out hand hygiene.

**Personal Protective Equipment (PPE)**

The dentist should ensure that he and his associated staffs have adequate and appropriate PPE during interaction with patient in case a condition arises needing consultation at the clinic. The PPE should involve :

- 1) Shoe covers
- 2) Cap/ hood
- 3) Gloves
- 4) Gowns/ aprons
- 5) Masks and respirators
- 6) Goggles
- 7) Face shields

The ideal protocol demands the donning and doffing of the entire PPE kit after each patient. The reception staff should also be equipped with a head cap and N95 mask as basic equipment while getting the formalities done by the patient.

**Sequence for donning on and doffing off the PPE is as follows****1) Gown****Donning On**

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

**Doffing/ Removing Gown**

- Unfasten ties
- Peel gown away from neck and shoulder
- Turn contaminated area outside toward inside
- Fold or roll into a bundle
- Discard and perform hand hygiene

**2) Mask or respirator****How to wear N95 mask or respirator?**

- Hold N95 in cupped hand
- Place over nose, mouth and chin
- Fit nose piece over nose bridge
- Pull lower elastic over head
- Next pull upper elastic over the head and adjust to it.
- Perform a fit test : Inhale : mask should collapse; Exhale: check for leakage around face

**Removing / Doffing a respirator?**

- Never touch the outside of the mask
- Lift the bottom elastic over your head first
- Then lift off the top elastic
- Discard and perform hand hygiene

**3) Face protectors.****Donning On - Goggles.**

- Protect the eyes
- Should fit snugly over and around the eyes
- Personal glasses not a substitute for goggles.

**Donning On – Face Shields**

- For protection of the facial area and mucous membranes from splashes, sprays, and spatter of body fluids.

- Face shields are generally not used alone, but in conjunction with PPE.

**Removing/ Doffing Goggles or Face shields.**

- Grasp ear or headpiece with ungloved hands
- Lift away from face
- Place in designated receptacle for disposal
- Perform hand hygiene.

**4) Gloves****How to wear gloves?**

- Wear gloves last
- Select correct type and size
- Insert hands into gloves
- Extend gloves over isolation gown cuffs

**Removing/ Doffing Goggles or Face shields.**

- Grasp outside edge near wrist.
- Peel away from hand, turning gloves inside-out.
- Hold in opposite gloved hand.
- Slide ungloved finger under the wrist of remaining gloves.
- Peel off from inside, creating a bag for both the gloves.
- Discard.

**Hand hygiene is always the final step after removing and disposing of PPE****D. Laboratory protocols**<sup>[2-8]</sup>

Another very crucial aspect in dental practice is lab service. It is very important to consider the fact that lab work involves multiple people in a chain starting from the doctor, assistant, runner, lab supervisor, laboratory technician to runner and doctor again. More human in chain, more is the probability of possible contamination

**A) Guidelines for laboratory personnel**

A dentist works in close collaboration with the dental laboratory. It is of utmost importance to maintain strict sanitization & disinfection protocols for the dental lab as well as the lab technicians. The proposed guidelines for the laboratory personnel includes.

- 1) Minimal staff required for the work.
- 2) Practice social distancing.
- 3) Routine temperature checks as well as pulse oximeter readings.
- 4) Hand sanitizers are to be placed at vantage points.
- 5) All lab equipments as well as clinic transfers, including impressions, casts and frameworks, should be handled strictly through gloves.
- 6) Hands need to be washed thoroughly with soap and water after every case and avoid touching the face while in the lab.
- 7) All lab personnel without exception should observe the proper infection control protocols, including wearing personal protective equipment.
- 8) The protective garment, mask and eyewear that is worn in the lab need to be left in the lab itself and

not taken out of the lab and also should be discarded through proper channel.

- 9) While using the trimmers and buff other than using the PPE see that flints or fragments are sucked out using high vacuum.

### B) Guidelines for disinfection of laboratory

Proposed guidelines for sterilization and disinfection of all the machinery and laboratory equipments.

- 1) All the dental impressions, casts, prosthesis or appliances should be thoroughly disinfected prior to handling both at the clinic or operatory, on acceptance of the work at the lab and prior to delivery.
- 2) Dental prostheses should be stored in diluted mouthwash and not in disinfectant before insertion.
- 3) Laboratory surfaces can be disinfected using the disinfectant spray or surface wipes.
- 4) The dental laboratory should be fumigated on a regular basis.
- 5) If burs, polishing points, rag wheels, or laboratory knives are used on contaminated or potentially contaminated appliances, prostheses, or other material, they should be heat-sterilized.
- 6) Separate polishing attachments should be kept for all cases coming in the lab.
- 7) The lathe machine should be cleaned and disinfected daily.
- 8) Pumice must not be used for more than one case and must be discarded after use.
- 9) Non-sterilizable equipments such as some face bow components must be cleaned with soap.
- 10) Laundry service should be organized for regular cleaning after every patient.

### C) Guidelines for delivery/pick up personnel

The clinician should instruct the dental assistant and lab delivery / pick up staff about the hygiene protocol during the procuring & dropping of the lab work from the clinic.

Instructions to the delivery/ pick up person should be as follows.

- 1) If the delivery/pick up person who picks up the impression from the dentist is a part of the lab, then he need to follow strict hygiene & packaging protocols with labelling.
- 2) He should always be wearing mask and gloves while travelling.
- 3) The delivery person should avoid entering the lab or the clinic.
- 4) All packets containing the models etc needs to be disposed off with the biomedical waste management protocols.
- 5) Prosthetic appliances received from a lab rotary should be disinfected prior to insertion in the patients mouth.
- 6) The work to be sent to the lab should be disinfected and sealed in a single use plastic bag/cardboard box with the lab instruction sheet visible over the container.
- 7) The clinic staff should come in minimum contact with the delivery/pick up person.

### E. Management of medical waste<sup>[5,7,8]</sup>

- 1) Prior to any inappropriate accumulation, dental office waste should be routinely transported to the institution's temporary storage facility.
- 2) Dental waste resulting from the treatment of suspected or confirmed 2019- nCoV patients is considered medically infectious waste that must be strictly disposed of in accordance with the official instructions using double-layer yellow medical waste package bags and "goose-neck" ligation.
- 3) Follow all OSHA and the local municipal guidelines for biohazard waste. Burn sharps immediately. Store in closed container.
- 4) Treat waste contaminated with blood, body fluids, secretions and excretions as clinical waste, in accordance with local regulations. Discard single use items properly.

## QUESTIONNAIRES

Date: _____
Name (first name/lastname) : _____
Date of birth (DD/MM/YY) : _____

**Fig 1: Covid 19 screening questionnaire.**

YES	NO	COVID 19 SCREENING QUESTIONNAIRE
		In the past 14 days have you or any household member travelled to areas with known cases of COVID 19? If yes, pls mention the location:
		In the past 14 days have you or any household member hhave you or aad nay contact with the known COVID 19 patient?
		Have you or any household member have a history of exposure to COVID 19 biologic material ?
		Have you had any history of fever in the last 14 days?
		Have you had any symptoms such as fever, cough, difficulty breathing, nausea, diarrrohea, body ache or loss of smell or loss of taste in the last 14 days?
		Urgent dental need question: do you have any uncontrolled dental or oral pain , infection, swelling or bleeding or trauma to your mouth?

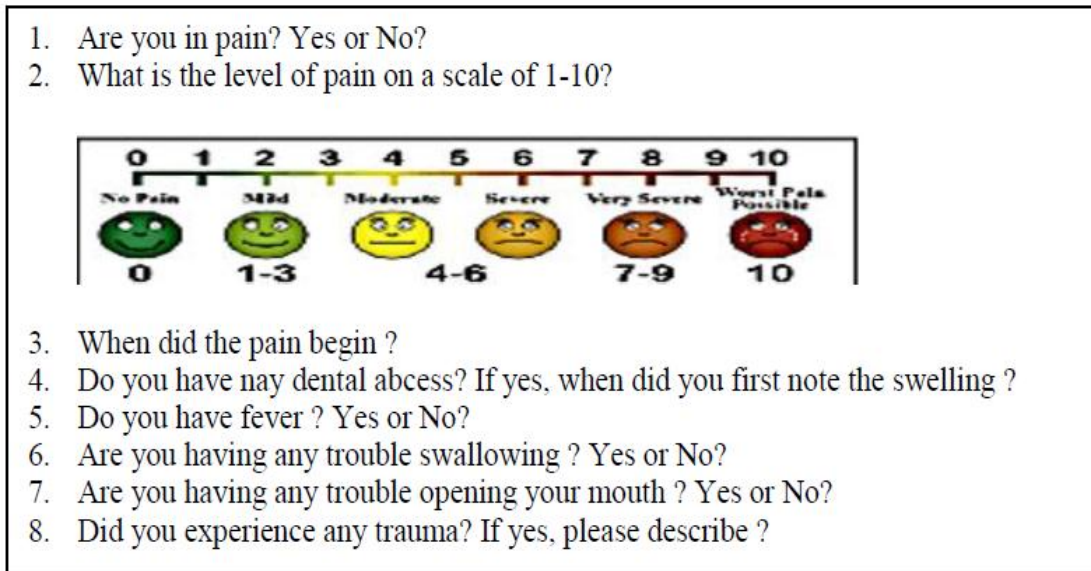


Fig 2: Assessment of a true emergency questionnaire.

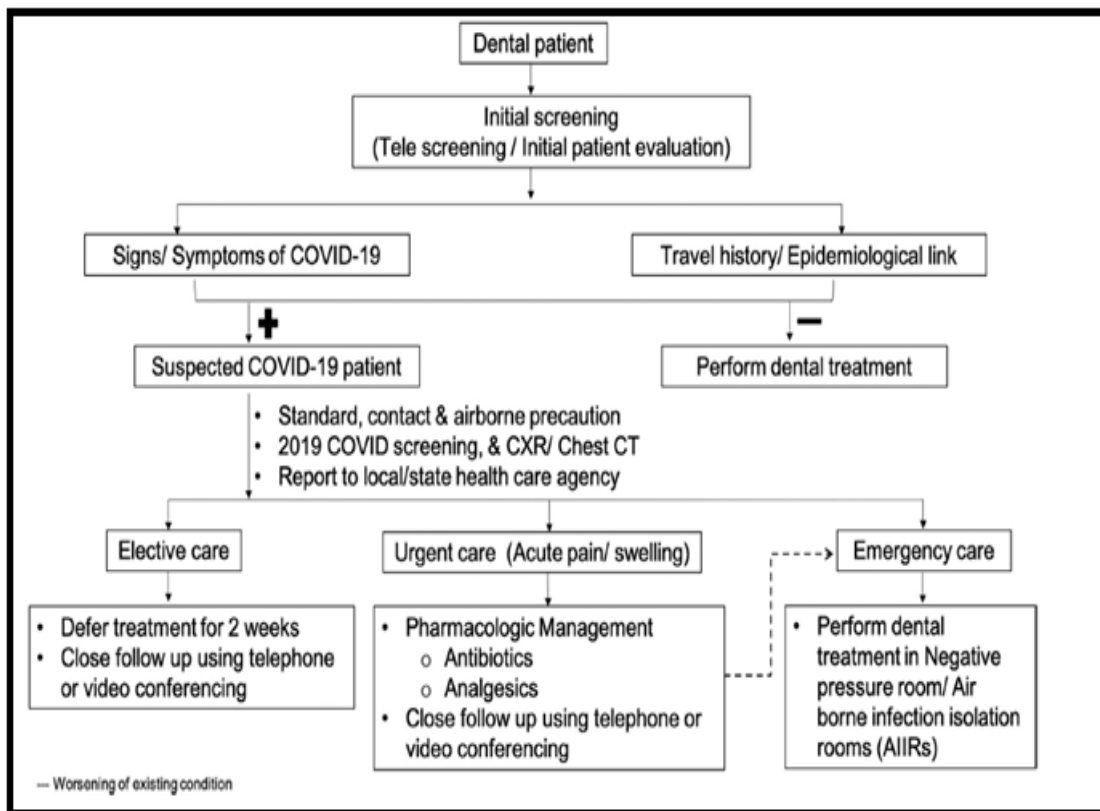


Fig 3: An overview of patient screening for Covid-19.

**CONCLUSION**

Progressive spread of COVID-19 pandemic is associated with increased possibility that dental clinicians will be exposed to COVID-19 infected patients. Every patient should be considered potentially infected by the virus and all dental practices need to review their infection control policies.

Therefore it has become all the more important for dental professionals to incorporate all precautions in their routine practice and additional safety measures if treatment of patients with COVID-19 becomes necessary. It is also mandatory 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.

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