

8. Covid 19 Pandemic: Dental Implications and Challenges

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Abstract:

The rapid spread of coronavirus disease (COVID-19) across the world has posed a significant clinical and academic demand on the dental profession, dental schools and students of dentistry in addition to the dental laboratories. Dentists are more susceptible as they work in proximity around the oral and nasal regions. Dental personnel are exposed to the patient's breath, secretions from oro-pharyngeal region at close quarters. To compound this situation further, dental procedures are performed with high speed devices utilizing compressed air, water, high power drills to prepare the teeth. This chapter is aimed at highlighting the risks and challenges posed to the dentists and ways to manage dental diseases during the pandemic.

Keywords:

COVID 19, SARS-CoV-2, Dental Practice Management, Infection Control, Dental Public Health.

8.1 Introduction:

COVID-19 (acronym for Corona virus disease) as named by the World Health Organization is a highly infectious disease that emerged as a global pandemic affecting more than 149 million people around the world. 3.15 million Have succumbed to the disease so far. SARS-CoV-2 virus (severe acute respiratory syndrome coronavirus 2) is the causative organism of

COVID-19; a novel member of human corona virus family. The outbreak of COVID 19 remains an enigma till date, due to its higher rate of spread and little is known about the management of the disease. In India, COVID-19 has affected more than 18 million people till date causing around two lakh deaths. The symptoms of the disease include fever, cough, tiredness, myalgia, headache, diarrhea, loss of taste and dry mouth. Among the health care workers, the dental professionals run the highest risk of contracting air borne diseases such as COVID-19. (Ather, Patel, Ruparel, Diogenes, Hargreaves 2020). The spread of COVID 19 among dental professionals can be attributed majorly due to aerosol generating procedures performed in the dental clinics and also due to close contact with asymptomatic carriers. The asymptomatic carriers pose a threat to the spread of infection from 20% to 80%. Asymptomatic carriers when in close contact with the dentists during the operatory procedure are known to spread the disease either through droplet infection or sometimes even due to the stagnation of the infectious agents in the air (airborne). In a recent study, ten strong reasons substantiating the air borne transmission of SARS-CoV-2 virus have been published. 2(Greenhalgh, Jimenez, Prather, Tufekci, Fisman, Schooley 2021). The increasing challenges faced by the dentists since the outbreak of this disease is due to the increased morbidity and mortality rates.

Thus, mitigation of the disease transmission by following appropriate preventive measures takes an upper hand than facing the consequences after disease transmission. The several measures followed in dental clinical set up starting from design of dental office, planning the elective dental procedures, proper sterilization protocols, use of personal protective equipment, limiting dental procedures, alternatives to aerosol generating procedures to control the spread of infectious agents during the pandemic have been discussed. This chapter is aimed at providing an overview of the challenges posed by COVID-19, specific to dental practitioners and possible ways to continue managing dental diseases during these times.

8.2 Dental Office Setting:

The mode of transmission of COVID-19 is possibly airborne (droplet nuclei that are inhaled), droplets that travel to a susceptible host directly or by contact with contaminated surfaces.³ Transmission occurs in close contact or long range also. Occurrence of close-range contact (3-6 feet via respiratory droplets) is through cough or sneeze or through contaminated surfaces. Long range transmission is via small droplets airborne in poorly ventilated enclosed spaces.

The transmission of SARS-CoV-2 is of major concern to the dentists and dental personnel as they examine the oral cavity. The greatest risk in a dental office is from aerosol generating procedures. (Tran, K., Cimon, K., Severn, M., Pessoa-Silva, C. L., & Conly, J. 2012). The various aerosol generating procedures usually include the usage of rotary instruments, dental hand piece, scalers and the three-way syringes.

During these procedures a splatter of water, blood or saliva is created which is highly contagious and is more likely to contain the infectious agents. Protective equipment such as mask and face shield can protect the dentists from the splatter, however less is known about the presence of infectious agents in the air and its risk of inhalation. Studies have been carried out to check for the presence of the virus in aerosols and also on potential surfaces in the dental clinical settings (Greenhalgh, Jimenez, Prather, Tufekci, Fisman, and Schooley 2021). However asymptomatic carriers can also be a silent source of disease transmission.

8.3 Risks Specific to a Dental Set Up:

Respiratory secretion can range from 5-20 micrometer in diameter to aerosolized droplets (<5 micrometer). (Tellier, R., Li, Y., Cowling, B. J., & Tang, J. W 2019). As the diameter and mass decreases, the influence of air diffusion increases. Larger droplets drop down to the floor quickly due to gravity whereas tiny ones drop at a slower rate (Jayaweera, M., Perera, H., Gunawardana, B., & Manatunge, J 2020) and some may not drop for a long time. They remain suspended in the air as aerosol. During expiration, this kind of an aerosol is generated by dental staff and patients at all times in the dental office set up.

An aerosol is a suspension of fine solid or liquid droplets in air or some other gas. Aerosols can be generated during respiration, speech or a during dental procedure. Dental aerosols are a mixture. Aerosol generating procedure in dental offices almost always has been from the use of high speed air-turbine handpieces, ultrasonic scalers, air-water syringes, high speed drills, polishing devices and the use of anaesthetic sprays. They are a combination of the clean water from the dental units, mixed with pools of saliva, tongue surface, teeth, respiratory secretions from post nasal drip, blood, gingival crevicular fluid. To this there would be an addition of viral particles, bacterial toxin, plaque biofilm, restorative materials and enamel/dentin particulates. The primary concern is the possible carriage of infected droplets into the aerosols as a result of the use of dental devices. Currently the term Aerosol generating procedures (AGPs) has gained popularity that patients visiting dental offices are insecure about their dental visits. WHO has produced list of AGPs in healthcare and surprisingly dentistry has no mention. There has been disagreement in classifying dental treatment as AGP, probably so, as they consist of a heterogeneous group of procedures with /without aerosol generation. A splatter is large drops scattered everywhere, would always generate aerosols. Whereas, slow speed hand pieces (burs, prophylaxis, water syringe used alone, air abrasion units, laser surgical equipments and electro surgery) generate splatters (Burke 2020). However, aerosols in a dental office can be reduced by utilizing preoperative mouth rinses like Hydrogen peroxide 1.5%, Povidone Iodine 1% or Hypochlorous acid 0.05%. (O'Hooley, D 2020). Rubber dam use is associated with substantial reduction, high volume aspiration removes majority of droplets and aerosol. External oral suction apparatus available as a free-standing wheeled unit with a large orifice can be positioned in front of the patient's mouth as they substantially reduce aerosols in the operatory. Keeping the risk of transmission in mind and the need to provide essential dental services, the dental practice must be carried out according to the guidelines given by the respective local and state officials.

Guidelines have been proposed for the dental clinical practice during the COVID-19 pandemic for routine dental treatment and for dental treatment of COVID-19 patients. (CDC, 2020).

8.4 Routine Dental Care:

Tele-dentistry, Video consultations, Triage

Tele-dentistry is an option wherein remote consultations can reduce the number of patients attending a dental office. (Rahman, N., Nathwani, S. and Kandiah 2020). However, this requires to be used with caution as misuse of antibiotics or waiting for a longer time to treat cysts/tumors/abscess/space infections would result in adverse outcomes. Clinical photographs can aid in diagnosis in the absence of patient examination.

COVID-19 Pandemic Current Status

Prior to dental visit, every patient can be screened through a telephone call. The patients' complaints, severity of disease and need for treatment can be assessed. Patients with emergency treatment can be prioritized and called upon to the dental clinics. Other patients seeking non-emergency routine treatment can be scheduled for a later date. The patient must be informed about limited visitors accompanying them. The patient and visitors' medical conditions must be assessed on the telephone call itself, prior to giving appointments. (McNee, D 2020). This can be supplemented with video consultation to assess the clinical picture.

Everyone entering the dental clinic must be checked for their body temperature, respiratory condition (oxygen saturation) and must strictly adhere to hand sanitization protocols. Proper visual alerts and signs must be posted in the dental clinic. Physical barriers made of glass or plastic must be installed in the reception area to ensure less contact between the patients and the dental office staff. There should be adequate supply of hand sanitizers, masks to both the dental professionals and patients. It must be ensured that dentists, auxiliaries, patients and visitors wear masks at all times in the dental office. The clinical setting at these times must be devoid of all possible fomites such as magazines, newspapers, toys and any such substances that might hold on the infectious agent for a longer duration. Professional fee collection must be in digital contactless mode only.

A thorough patient history must be undertaken including travel history, contacts, medical conditions and occupation. The need for treatment must be evaluated. It must be seen if the patient is in need of any emergency pain relieving procedure or if the elective procedure could be postponed to decrease the risk of transmission. If dental procedure has to be performed then it must be made sure that the dentist is well equipped with the personal protective equipment. Keeping oneself informed of the daily case counts and deaths in the particular region is of utmost importance.

If the patient presents with fever pertaining to dental infection, then proper dental care should be provided based on CDC guidelines for recommended infection prevention and control (IPC) for routine health care delivery during the pandemic.

If any of the dental health care personnel have symptoms of fever and are unwell, they must thoroughly monitor themselves at home and abstain themselves from work until such time they are well. They must contact the primary health care provider and make sure if any evaluation is necessary. They must get themselves tested for COVID-19 if necessary. All the patients must be advised to contact the dental clinics back if they develop any signs and symptoms within two days of clinic visit. The dental personnel who were in contact with the patient must be further monitored for symptoms and must be quarantined if they are suspected of having acquired the disease.

The dental professionals must wear a mask regularly in dental office premises while they perform dental cases and also during break times and in changing rooms. Cloth face masks are generally not preferred over the surgical masks. The cloth masks do not provide resistance against splatter of water or saliva during procedures. Dental team in the working area would require respiratory protective devices like face piece respirators FFP2, FFP3 or N95 type masks. Dental office personnel not involved in performing the dental procedures and working in laboratory or reception areas can carry ahead with cloth face coverings. A full face visor is good practice to reduce the chances of transmission of the disease.

The dental professionals must follow the practice of hand hygiene and sanitization while changing from their respirator mask to cloth masks after the dental procedures while leaving the clinics. The patients must also be educated on the need to follow hand sanitization protocols after contact with masks while changing masks or during mask removal at home. Professional judgment should be exercised during the use of personal protective equipments.

Proper physical distancing must be ensured in dental clinics. A minimum of six feet distance maintenance is one of the strategies followed to ensure safety during the COVID-19 pandemic. It is of prime importance to reduce the visitors accompanying the patient. Emotional assurance to the patients can be achieved through video call facilities using mobile phones.

8.5 Reception Area and Waiting Halls:

The waiting halls in dental office must be well aerated and the chairs must be placed at a distance of six feet apart. Patient must be given the option to wait outside in their vehicles and called upon during their appointments. Appointments must be planned and scheduled to minimize the number of patients waiting in the reception area.

The dentists must focus on providing treatment to one patient at a time. The instruments needed to perform the procedure must be well sterilized. The other instruments that are not required at the time of treatment must be placed in a closed storage placed and should be kept away from exposure.

Aerosol generating procedures must be avoided as much as possible or limited to emergency cases. Hand instruments must be the choice of treatment procedure in most of the cases. Atraumatic procedures and minimally invasive treatment procedures must be followed to control the spread of infectious agents. Even the number of dental assistants in the operatory should be minimized to those needed for the operatory procedure and immediate patient care. Usage of pre procedural mouth rinses can reduce the risk of transmission. The pre procedural mouth rinses are known to contain antimicrobial agents such as Povidone iodine, chlorhexidine gluconate, essential oils etc. However, the efficacy of using these mouth rinses in reduction of SARS-CoV-2 load or prevention of transmission is still not proven.

8.6 Use of Personal Protective Equipment:

For dental health care personnel working in areas with minimal or no risk of community transmission they should wear a surgical mask, goggles for eye protection, gap between the glasses and eye must be adequate to protect the eye from the splatter of aerosols, water, saliva and blood.

For personnel working in areas with risk of moderate to substantial community transmission, must ensure to wear protective eye wear compulsorily to prevent the splatter. They must wear N95 respirators, elastomeric respirators, and powered air purifying respirators etc, for providing a higher level of protection. Wherever possible, this is supplemented with face shields/visor. Respirators with exhalation valves are not recommended as the infected air if passes away from the exhaled valve it may further contaminate the outside air. If there is no option other than a respirator with exhalation valve, then the exhalation valve must be covered for further protection with a face mask such that it does not affect the fit of the respirator.

8.7 Sequence of Personal Protective Equipment Wear (Donning and Doffing):

Before Entering Treatment Room:

- a. Appropriate mask is already worn
- b. Proper hand hygiene (hand washing and sanitization) must be done before entering the patient room.
- c. Clean gown should be worn covering the personal clothing and skin.
- d. Goggles for eye protection and face shield must be worn to cover all sides of the face from the splatter.
- e. Clean non sterile gloves are worn.
- f. Patient room or care area can be entered.

After Performing Dental Procedure:

- a) Gloves are removed
- b) Removal of gown or protective cloth. The disposable gown must be discarded in the bins assigned for them separately.
- c) Exiting the patient room or care area.
- d) Performing hand hygiene (hand washing and sanitization).
- e) The protective eye wear must be removed carefully by pulling out the strap.
- f) Removal of the surgical mask or respirator. The mask must be untied carefully and the front portion must not be touched.
- g) Hand hygiene must be performed.

The dental personnel must be aware of the basic knowledge of using PPEs as to how and when PPEs should be used. They must be aware of the method to dispose the infected PPE.

8.8 Hand hygiene:

Proper hand hygiene must be followed to prevent the transmission of disease. (Rundle, C. W., Presley, C. L., Militello, M., Barber, C., Powell, D. L., Jacob, S. E. ... & Dunnick, C. A 2020). It must be done before and after patient contact and before and after donning and doffing the PPEs. Alcohol based hand rub must be used with more than 60% alcohol content. Hand wash must be done for at least 20 seconds with soap and water. (CDC, 2020). The hand hygiene products must be readily available in the dental office.

8.9 Maintenance of Dental Equipments:

The quality of dental equipment used in the dental clinics must be maintained from a time-to-time period.

Manufacturer's instructions must be carefully noted and used.

- a. Dental unit water lines must be checked for the quality of safe drinking water.
- b. The autoclaves must be checked with biological indicators and serviced.
- c. The vacuum lines, air compressors, suction lines, radiography units etc, must be maintained according to the guidelines given by the manufacturers.

8.10 Ventilation:

Proper ventilation must be ensured to allow passage of clean air in the dental office. Clean air from the corridors must reach the workstation and less clean air from the work space must be carried away through return air vents. HVAC professionals must be consulted for maintaining the air flow quality in a dental clinic. A simple and efficient way of managing air flow in the dental operatory is by utilizing a pedestal/tower fan behind the patient and installing an exhaust in the window in front of the patient. The bathroom exhaust must be run continuously during the operatory hours to provide a proper vent to the air inside the clinic. The use of High efficiency particulate air (HEPA) filters is recommended during aerosol generating procedures being done in the dental clinics. (Kumar, P. S., Geisinger, M. L., & Avila Ortiz, G 2020). The HEPA filters reduce the aerosol content in the air. It is placed near the patient operatory space. It should be made sure that the HEPA filters are not placed behind the dental assistants. The dental assistants should not be placed between the operatory space and the HEPA unit. The position of HEPA filters should not affect the breathing zone of dental personnel. Only one patient procedure must be performed in operatory room. There must be minimal of 6 feet distance between the patient chairs. Operatories should be placed parallel to direction of air flow. Patient's head should be placed near the return air vent for optimal outflow of the unclean air.

8.11 Environmental Infection Control:

The dental personnel should look after the cleaning and disinfection of the surgical instruments and proper sterilization of operatory units must be maintained. The cleaning and disinfection of the operatory rooms and equipments must be done according to guidelines. The Environment Protection agency (EPA) focuses on cleaning surfaces for effective protection. The various methods of sterilization such as ultrasonic waves, LED blue light and high intensity UV radiation and their efficacy against SARS-CoV-2 is not yet conclusively studied.

8.12 Education and Training:

The dental personnel must be trained adequately on sterilization methods, usage of PPEs and further educating the patients on the protocols to be followed during COVID-19 for the health and safety of all.

8.13 Infected Waste Management:

Simplified segregation of wastes in dental clinic (Baghele, O. N., Phadke, S., Deshpande, A. A., Deshpande, J. P., & Baghele, M. O 2013) includes use of color coded disposable bags. Red colored bag is for disposable injection syringes, iv set without needle saline bottles plastic suction tips toothbrushes, denture brushes disposable plastic/fiber instrument, plastic/rubber tubes rubber lids of any vial used plastic drape. Yellow colored bag is utilized for anything contaminated by blood or body fluids body parts any item which have been in contact with the patient bandages, cotton teeth dressings and swabs disposables such as gloves, aprons, masks, drapes, contaminated wipes, throat packs discarded crowns, bridges and cast partial dentures waxes, gutta percha points, absorbent points. Blue colored bag is for glass bottles discarded medicines antiseptics, disinfectants (not contaminated by body fluid). Black bag is for unused sharp needles without syringes, scalpel blades and metal objects.

The waste management guidelines of used PPEs according to Central Pollution Control Board (CPCB), are as follows:

- a) Face-shield, goggles, plastic coverall, splash proof apron, nitrile gloves, hazmat suit – RED BAG.
- b) Masks (including triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen gown, non-plastic or semi-plastic coverall – YELLOW BAG.

The disposal of these color coded plastic bags is done in the same way as that for biomedical waste management.

Recommendations for providing dental healthcare for patients with suspected or confirmed COVID 19 infection

If the patient does not have signs for any emergency treatment, then the patient must be sent back home. Patient must be provided with surgical mask if he is already wearing a cloth mask, and proper hand hygiene maintenance supplies.

If the patient needs emergency dental care it must be provided with standard operating procedures with minimal contamination in the dental operator. The dental procedure should be performed at a separate operator; the appointment must be scheduled usually at the end of the day and no other patient appointments must be given at that particular time period. The dental personnel should follow standard precautions using N95 respirators, gloves, gown, eye protectors, proper hand hygiene maintenance and proper donning and doffing of the PPEs. Aerosol generating procedures must be avoided to the best. If aerosol generating procedures are to be followed then it must be done in airborne infection isolation room. The number of dental personnel in the operator room should be limited. The patient movement to other places in the dental clinic should be limited.

The cleaning and disinfection of the operator room or entry of other dental care personnel into the room must be delayed as much as possible so that there is adequate air change in the operator space after the procedure. The aerosols in the room should also be given time to settle down (15-30 minutes). Utilizing UV germicidal lamps can be included as a practice between patient appointments after cleaning the room can make the environment safe, though there is no evidence based study at present. At the end of the day, the dental operator should be fumigated.

8.14 Specific Considerations:

The various therapeutic considerations in clinical specialties of dentistry that can be followed:

8.14.1 Endodontics and Conservative Dentistry:

To prevent disease transmission, alternative treatment options can be performed that involve reduced chances of the virus spreading. Non cavitated dental caries lesions not involving the pulp can be managed with fissure sealants, proximal sealing with minimal aerosol production. Carious lesions with that are shallow to deep and not involving the pulp can be managed with selective caries removal and atraumatic restorative treatment (ART) without the use of rotary.

Broken teeth can be restored with stainless steel crowns with no preparation. If there is pulpal involvement, minimally invasive endodontic treatment can be performed.

Chemo-mechanical caries removal and hand instrumentation must be followed rather than rotary instruments to prevent droplet infection. In case of symptomatic irreversible pulpitis, pulpotomy, pulpectomy or vital pulp therapy must be done utilizing rubber dam isolation and high-volume saliva ejectors. Conventional root canal therapy can be deferred. (Shamszadeh S, Parhizkar A, Mardani M, Asgary S, 2019), (Dave M, Seoudi N, Coulthard P, 2020).

8.14.2 Periodontics:

Hand scaling and polishing is preferred over ultra-sonic scaling procedures. Surgical procedures can be deferred wherever possible.

8.14.3 Prosthodontics:

All Prosthodontic materials and instruments must be properly disinfected to avoid cross infection to the dental laboratories. Aerosol generating procedures such as crown preparation must be delayed.

Loose temporary crowns can be cemented. Soft removable liners can help temporarily in case of discomfort due to removable prosthesis. Prosthetic part of implant treatment can be carried out with precautions while the surgical phase of implant placement must be delayed.

8.14.4 Oral and Maxillofacial surgery:

To relieve the patient from pain, extraction is preferred over conventional root canal therapy along with high volume saliva ejectors. In case of impaction pain, patient is relieved of the symptoms with medications and adequate mouth rinsing is advised.

Tooth removal procedures in impaction procedures involving bone cutting must be kept at bay. (Santacroce L, Passarelli PC, Passarelli G, Charitos IA, Rella E, D'Addona A, 2020).

8.14.5 Oral Medicine and Radiology:

Extra oral radiographs such as dental panoramic radiographs and Cone Beam Computed Tomography (CBCT) is preferred over intra oral radiographs to avoid direct contact with oral secretions. (Meng L, Hua F, Bian Z, 2020).

Caution must be exercised in referring patients to scan centers which may be overcrowded. Diagnosing and recommending medications through tele-dentistry method is gaining more attention recently.

8.14.6 Pedodontics and Preventive Dentistry:

Emergency procedures alleviating pain such as extractions are performed. Pulpotomy, pulpectomy procedures are preferred over rotary procedures.

8.14.7 Orthodontics:

They are mostly aerosol free and hence can be carried out with slight modifications. Rubber dam isolation can be used wherever possible. Cotton pellets can be used for drying teeth in place of air-water syringe.

8.15 Conclusion:

Scientific research is providing us details of the evolving nature of the virus. This in turn has improved the understanding of SARS-CoV-2; as a result, dental care recommendations would also change from time to time. COVID-19 is likely to remain with us in the long term. As we face the second and third waves of this pandemic, dental practitioners must be careful of the risks and benefits of any procedure that is undertaken and continue to update on the latest developments and possible ways to mitigate spread of the disease from the dental office.

Developing a good rapport with patient, explaining the need of emergency procedures to be performed and delaying other procedures that protects the patient from harmful exposure to SARS-CoV-2 infection is essential. Dental care must be provided with utmost care following appropriate guidelines to prevent infection spread. It is imperative that dental professionals communicate with the patients and dental office personnel to stay home when sick and provide critical dental care to the patient with COVID-19 symptoms. Thus, dental practice during the pandemic is a balance between providing adequate treatment at the same time following proper safety precautions to control the infection spread.

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