Review Article

Dental Clinical Practice Changes Needed during the COVID-19 Pandemic : The 'New Normal'

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In December 2019, a novel coronavirus (2019-nCOV) emerged in Wuhan, China. It has affected the entire globe causing the ongoing pandemic. The SARS-CoV-2 infection could be asymptomatic or mildly symptomatic in most cases of COVID-19. Therefore, there is a difficulty in diagnosis of SARS-Cov-2 infection based only on the clinical findings and hence requires the confirmatory laboratory testing. In dental clinical practice, there is a very high risk of transmission of SARS-Cov-2 infection. Therefore, there is an urgent need to assess and minimize the risk in dental care settings. Each patient in dental clinical practice needs to be considered as the potentially infectious and managed accordingly with the use of appropriate infection prevention and control measures. The approaches and measures for risk alleviation need to be emphasized and practiced appropriately to prevent the infection. This review presents the important changes needed in routine and emergency dental practice in the current pandemic.

[*J Indian Med Assoc* 2020; **118(8):** 29-35]

Key words **: COVID-19, Dental practice, Infection prevention control, emergency dental treatment, aerosol transmission.**

There were only four coronaviruses known to cause human disease before the current coronavirus emerged in China in 2019. However their virulence was not very much significant[1]. The severe acute respiratory syndrome (SARS) outbreak reported from the East Asia during the years 2002-03 was the first major pandemic associated with coronavirus[2]. Since the year 2012, the Middle East respiratory syndrome (MERS) coronavirus outbreaks were reported in Saudi Arabia[3]. These are the only two most prominent outbreaks of coronaviruses in history.

In December 2019, emergence of 2019 novel coronavirus (2019-nCOV) happened in Wuhan, China[4]. It was named subsequently as the SARS-CoV-2 virus[5]. It is the seventh member of the large family of coronaviruses affecting humans, thereby affecting the entire globe causing COVID-19 pandemic declaration by the WHO[6]. Coronaviruses are commonly associated with respiratory illnesses like common cold, flu-like illness or pneumonia. However very few patients may also present with the gastrointestinal symptoms. The laboratory diagnostic tests are performed on nasopharyngeal, oropharyngeal and blood samples. However, the SARS-CoV-2 infection could be asymptomatic or mildly symptomatic in most cases. Therefore, there is difficulty in diagnosis of infection based on clinical findings unless the laboratory testing is done[6]. There is a need to consider each dental patient in clinical practice as the potentially infectious one[7]. The dental practice needs to be managed accordingly with the use of appropriate infection prevention and control measures[8].

Editor's Comment :

- **The oral medicine and healthcare professionals are at the heightened risks of the COVID-19.**
- **Each patient needs to be considered infectious with the need for infection prevention measures.**
- **Strict adherence of infection prevention practices would be very critical in pandemic situation.**

Purpose of the Review :

In dental clinical practice, there is a very high risk of transmission of SARS-Cov-2 infection. Therefore, there is an urgent need to assess and minimize the risk in dental care. The approaches and measures for risk alleviation need to be emphasized and practiced properly. There are various guidelines and recommendations for the risk alleviation. This review presents the important changes needed in routine and emergency dental practice in the current pandemic.

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Received on : 01/06/2020

Accepted on : 30/07/2020

Literature search :

We searched the PubMed using the search term 'COVID-19' and 'dental' in the text word. We could identify 61 references using the search terms combination. The major article types identified were original articles (14), review articles (23) and other articles (24) - including letters (6), editorials (5), perspectives (3), and 2 each of communication, opinion and guidance and 1 each of correspondence, highlights, interview and recommendation. All publications were critically reviewed for title, abstract and full text. The publications were then appraised for the major thematic areas or aspects and utilized for deciding the structure of the literature review and is presented in the following sections.

Transmission Risks :

Healthcare workers on the frontlines are the most vulnerable to the SARS-CoV-2 infection[9]. The dentists working with the patients are at the greatest risk[8]. They can also become potential carriers and thereby act as the source of infection for their patients[9]. Chances of cross infection between the dental clinician and patient increases because of typical dental clinic setting[10]. The asymptomatic phase or the incubation period has been reported to be between 2 and 14 days, however a few are reported with symptoms even after 24 days of exposure[11]. The asymptomatic spread of virus is also confirmed[12]. Therefore, there is an urgent need for infection control protocols to be implemented strictly and effectively for avoiding spread in dental clinical practices[10].

The most common transmission route is the direct transmission[11]. It is mostly by coughing, sneezing, and droplet inhalation. Also, the contact with oral, nasal, mucous membranes and eye is also an important route[13]. Coronavirus has the affinity for ACE2 receptors, which are abundant throughout respiratory tract and salivary gland duct epithelium in humans. Saliva has been reported to have high viral loads with significant role in human-to-human transmission[15]. Also, the face-to-face communication is the most common route during the patient management in dental clinics. The aerosols generated during various dental procedures are predominant way of spread[7]. The dental procedures use handpieces under irrigation. These procedures may lead to handling of instruments and diffusion of aerosols of saliva, blood and body fluids[13]. Therefore, contamination of environment is high with such instruments, apparatuses and surfaces in the dental clinics. Hence, dentists are likely to face a very high risk of acquiring infection if proper infection prevention control precautions are not implemented in clinical practice[12]. Therefore, the chains of transmission need to be broken for prevention of SARS-CoV-2 infections by applying prevention measures targeted at the source of infection, mode of transmission and the practices of dental professionals (Table 1).

There are 9 cases of SARS-CoV-2 infection reported among 169 dental practitioners[10]. This signifies the high risk of transmission in dental practice. Therefore, dentists have an important role to play in preventing SARS-CoV-2 transmission in dental clinics. The toothbrushing has been indicated to be emphasized for prevention of infection[16].

Oral Manifestations :

There are no obvious oral manifestations of SARS-CoV-2 infection. These may be very nonspecific, like loss or altered taste or smell sensations, thereby unlikely to be reported or enquired during the dental evaluations. The inflammatory process in oral cavity would be mostly unremarkable. Therefore, there are great chances of missing the detections of potentially infectious person based on history and oral examination. This risk is even accentuated with the reports of most infections being asymptomatic. Additionally, the transmission risk is potentially more in asymptomatic, pre-symptomatic and mildly-symptomatic phases of infection[17]. Thus, the dental practice faces the heightened risk without having tools to identify the infection without high index of suspicion with laboratory testing.

Also, saliva and other oral secretions are highly viraemic with higher viral loads reported than even recommended and usually collected respiratory specimens like nasal, pharyngeal and lower respiratory

Table 1 — *Transmission Chain in Dental Clinical Practice with Prevention Opportunities*

Transmission chain elements	Transmission risk - events, practices and procedures
Source of infection	• Infected patient – asymptomatic, pre-symptomatic, mild symptomatic • Surfaces, objects and instruments • Infected staff working in the clinic
Mode of transmission	• Droplets and aerosols - from the infected source patient or procedures • Contact (direct/indirect) - surfaces, objects, equipments, instruments • Airborne transmission - during dental procedures
Susceptible humans	• Clinic attendees - patients, visitors • Clinic staff - dentists, clinic staff and assistants, receptionists

specimens[15]. Therefore, a very high risk of transmission is likely in the absence of obvious oral manifestations. Additionally, there could be underreporting and even hiding of important exposures and symptoms due to fear and panic of isolation and quarantine.

Occupational Health :

There are very important issues in routine dental clinical practice that are relevant to infection risk prevention and control associated with transmission of hepatitis B, hepatitis C and HIV. The universal precautions for control of cross-infections are very well known in dental practice. The risk is the highest during the current times of COVID-19 pandemic situation. The risk assessment needs to be considered along with all possible measures to reduce the risk. However, the dentists need to address the risk assessment critically in the current situation. This aspect needs to be considered importantly after lifting of lockdown restrictions as the transmission could be widespread with most asymptomatic infections. The decision-making on the prevention measures has been recommended to be based on moral than evidence[8].

Infection Control :

The American Dental Association (ADA) recommends that all palliative dental care and non-emergency treatments may be postponed during the COVID-19 pandemic. However, dental professionals are recommended to remain available for potentially life-threatening dental emergencies[18]. They are required to remain vigilant during and even after the pandemic. The dental care needs to be provided only after a thorough case history and screening for COVID-19. All dental patients must be screened first via telephone with consultation provided through messages and video communications, whenever possible[19]. The checklist of information to be enquired is provided in the boxes below.

Prevention Measures :

The patients suspected or confirmed for COVID-19, who are requiring emergency treatments for complaints like severe tooth pain and/or swelling should be managed primarily with analgesics and antibiotics[20]. This will help them temporarily in having symptomatic relief so as to refer them to a dental specialist with all appropriate measures to manage COVID-19 positive cases. Patients not responding to pharmacological management must be screened and treatment provided with the PPE and proper infection control protocol[21].

Triages can be set up at the entrance for measuring temperature of the patients using an infrared thermometer along with the case history of the patients. The signs and posters with instructions about respiratory hygiene including cough etiquette and also hand hygiene may be helpful. These could be pasted at the entrance, in waiting areas, elevators, cafeterias, etc. The patients need to be provided instructions to use hand sanitizers before entering the clinics. Patients with cough and sneezing need to be taken to a separate waiting room and face masks offered to them if they aren't already wearing so as to minimize the spread of infection[22].

The indicative flowchart for screening, triaging and management of practice is provided in Fig 1.

Hand Hygiene :

Hand hygiene is critical and must not be overlooked. Hand washing needs to be followed with its proper technique for 20-30 seconds. Even though hand hygiene is considered a part of the normal routine practice, it

Symptoms Checklist for last 14 days or currently

RESPIRATORY	GASTROINTESTINAL	GENERAL
- Cough (Dry)	- Diarrhea	- Fever
- Breathing problem	- Vomiting	- Conjunctivitis
- Sorethroat	- Stomach pain	- Fatigue
- Nasal catarrh / discharge/ stuffiness / congestion	- Nausea	- Muscle aches
	- Taste changes	- Body pains
	- Smell changes	- Malaise

Exposure Checklist for last 14 days

- Contact with COVID-19 OR SARS-CoV-2 confirmed patient during caring or within 1 metre
- Contact with people in quarantine for being likely exposed (Institution/Facility, Home/Self)
- Contact with people from hotspot / epidemic areas, attended crowded public places

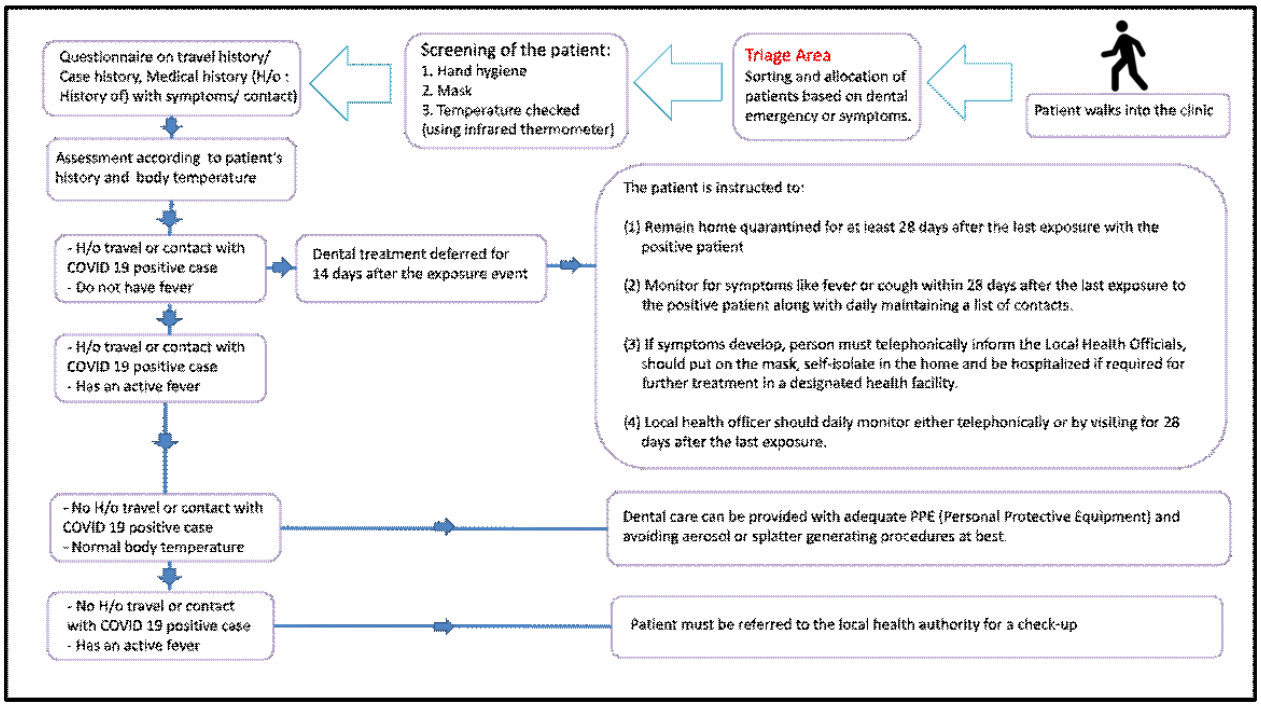

Fig 1 — Screening, Triage and Patient Management in Dental Clinics

must be strictly reinforced among the operators and the dental clinic staff. Washing of hands by the dentists needs to be followed before patient examination, before and also after dental treatment, after touching surrounding or undisinfected equipments and when hands are visibly soiled. One must be especially watchful to not touch eyes, mouth and nose[23].

Table 2 — *Needs for Changes in Dental Clinic*

Setting	Timing	Activities needed	Tools/ resources needed
Outside the clinic	Before the clinic visit (At Home)	Enquiry Symptoms and exposures Appointment	Telephone, Contact log Questionnaire checklist Registration (Electronic)
In the clinic/ Waiting area/ room	At the entry in the clinic	Temperature Hand hygiene Waiting area Disinfection of area Protection of patients	Infrared thermometer Soap / Sanitizer Arrangements for distancing Disinfectant chemicals Surgical mask
Clinic procedures/ work area	Before dental treatment	Patient preparations Staff hand wash Staff use masks	Shoe covers, mouth rise Soap / sanitizer N-95 Mask, goggle, face shield, gloves, gown, head cover, shoe cover
	During dental Treatment	Instruments Surfaces Procedures	Disinfection, sterilization Disinfection, barrier, UV Non-aerosol, PPE, face shield, Rubber dam, Anti-retraction handpiece, HEPA filter
	After dental treatment	Ventilation Instruments Protection of staff Hand hygiene	Avoid ACs, cross ventilation Disinfection, Sterilization PPE for waste segregation Frequent and thorough wash

PPE (Personal Protective Equipments) :

The ADA guidelines recommend PPE for dental facilities - in asymptomatic patients, patients with history of exposure, negative patients or recovered positive cases. The operator and staff should use N95 respirators with fit testing on the face, along with full-face shields, and eye protection. They should also follow disinfection procedures immediately after every procedure in cases with chances of aerosol generation. In non-aerosol generating procedures and without use of three way syringes, the operator and staff may use 3 ply face masks, with the PPE including eye protection, and approved disinfection procedures. New pair of gloves is must while donning

and doffing the N95 respirators and PPE[24].

The qualitative fit test (QLFT) must be performed after wearing the N95 respirators to ensure the proper fit to prevent any air leaks. User seal check is performed by positive and negative pressure. In positive pressure seal check, user exhales gently blocking exit paths for air from the facepiece. The successful check should provide slight pressure before outward leakage on increased pressure. In negative pressure seal check, user inhales forcefully after blocking air entry in the facepiece. The successful seal happens when the facepiece slightly collapses under negative pressure[25].

Emergency Guidelines :

All dental emergencies must be handled through telephone or video communications controlled with pharmacological approach. ADA recommends that management of emergency must focus on relieving severe pain along with efforts for decreasing infection risks. The conditions to be considered for emergency care include acute pain from pulpal inflammation, pericoronitis or third-molar pericoronitis, post-operative osteitis, dry socket, abscess, or localized bacterial infection, traumatic injuries, avulsion/luxation, procedures prior to critical medical procedures, fractured restoration related trauma[26].

During treatment of emergency cases, the patient must be instructed to perform hand hygiene and rinse mouth with 0.2% povidone iodine solution. It is recommended to use extra-oral radiographs such as panoramic radiograph, CBCT, etc rather than intra-oral radiographs to avoid saliva splatter. On application of the N95 respirator, the operator and the staff must check the seal of the mask by holding and exhaling to check for any leaks. The PPE must be examined for any tear or visible soiling before the use. Application of rubber dam isolation with high ejection saliva should be reinforced in every case. Aerosol generating procedures must be avoided as much as possible. It is advised against treating the patient if the clinic/ hospital lacks enough PPE equipment and consider to refer the patient to the appropriate clinic/ hospital after pharmacologically controlling the emergency[26].

Oral and maxillofacial compound injuries, which are life threatening cases, should be hospitalized and chest CT prescribed immediately. In life-threatening maxillofacial compound injury, there is a need to rule out the suspected infection instead of PCR test which is time consuming, patient is advised immediate chest CT / X-ray[27].

Rationalization and Reuse of Masks :

Reuse strategy for N-95 is not recommended for aerosol producing procedures and if visibly soiled. CDC recommends following measures for optimizing the supply of N95 respirators[28].

- Cleaning of hands before and after touching or adjusting the N95 or Filtering Facepiece Respirator (FFR) by using soap and water or alcohol-based hand sanitizer.
- Avoiding touch to the inside of the N95 or FFR.
- Using of a pair of new pair of gloves for donning and doffing.
- Making seal check by user to check if respirators are being properly worn.
- Inspecting the N95 or FFR to determine integrity.

Rubber dam application

Other infection control practices include pre-procedural mouth rinse with 0.2% povidone- iodine along with the use of rubber dam application with high volume saliva ejector which can help minimize the aerosol generation and splatter. Use of CariSolv and hand scalers can be implemented for caries removal and periodontal scaling[28].

Anti-retraction Handpiece :

To prevent cross-infection, anti-retraction dental handpieces are strongly recommended during the COVID-19 pandemic. The anti-retraction valves present in these handpieces will prevent aspiration of fluids and debris during dental procedures. Dental unit may get contaminated with bacteria and viruses. The use of three way syringe needs to be avoided to prevent unnecessary splatter. Implementation of four handed dentistry is recommended.

All unnecessary personnel must be at least 6 feet away from the patient[28].

Sterilization and Disinfection Practices :

Once the curve starts to move down, aerosol-generating procedures can be initiated, with strict sterilization and disinfection procedures. All critical, heat-resistant semi-critical instruments and handpieces should be cleaned and sterilized after each use or discarded. Heat sensitive semi-critical items need to be disinfected with 2% Glutaraldehyde[18].

The frequently touched clinical contact surfaces get contaminated directly by aerosols or by contaminated gloved hands of dental health care professionals. The high-touch clinical surfaces those are difficult to clean must be covered using a physical barrier for every patient or disinfected using 1% Sodium hypochlorite or 70% alcohol between patients. The barrier protection can prevent contamination of clinical contact surfaces and equipment that are difficult to

clean. The barriers may be done by using materials impervious to moisture including plastic wrap, bags, sheets, tubing, and plastic-backed paper. These barrier coverings should be removed and discarded between patients by the professionals using gloves. The well-trained dental professional is essential for proper disinfection protocol[18].

In any operatory, from the dental chair, aerosols can travel up to 10 feet. Ideally, the use of negative pressure room is recommended. Another alternative is use of air filters. The aerosols generated in dental clinics can be reduced by devices like High-Efficiency Particulate Arrestor Air Filters (HEPA) filters as they decrease the concentration of airborne infectious pathogens, trap bioaerosols as small as 0.3 micron (which is the tiniest particle size to get into your lungs) with 99.97% efficiency, thereby reducing the spread of diseases. As HEPA 13 and HEPA 14 have efficiency of 99.97%, they are recommended for medical purpose[29].

Germicidal lamps (UVGI / UV-C) destroy and inactivate airborne microorganisms on frequently exposed surfaces. UV-C gives off light at the short end of the wavelength band of 253.7 nm. UV-C lamps are used in air, water purification and also decontamination of rooms and surfaces. However exposure of the light on skin and eyes can cause skin and eye lesions[29].

The floor must be disinfected with 1% Sodium hypochlorite, 3% hydrogen peroxide or EPA approved agents. Mop heads and cleaning cloth must be laundered (heat disinfection) with detergent and drying at 80ºC and changed frequently.

Waterborne infections with dental water systems are reported in literature. The potential for transmission of waterborne infections and related diseases is verified in hospital settings and in the community. The transmission in dental practice may occur by inhalation of infectious aerosols from the respiratory equipment. Hence, the dental waterlines must be cleaned by use of 1 ml of 5% NaOCl mixed in 5 liters of dental waterline or 1 ml of 3% NaOCl mixed in 3 liters of dental waterline regularly[30].

Waste Management :

Infectious waste in dental practice could be solid waste gauze saturated with blood or saliva, hard and soft tissues, extracted teeth and contaminated sharp items like needles, scalpel blades, and wires. The careful containment for treatment or disposal is required for regulated medical waste[18]. The non-sharp regulated medical waste needs to be managed by using a sturdy leak-resistant biohazard bag. A second biohazard bag may be used for preventing exterior contamination or puncturing of the bag. The sharps need to be managed by using puncture-resistant containers using biohazard label[18].

Hydroxychloroquine Prophylaxis :

Hydrochloroquine is a derivative of chloroquine used in treatment of malaria since many years. It has been recommended for empiric use in treatment and prophylaxis of COVID-19. The antiviral activity of hydroxychloroquine sulphate is based on inhibition of SARS-CoV-2 viral replication in vitro along with early human clinical application utility. Some in vitro studies suggest that approved doses of hydroxychloroquine sulphate could prevent SARS-CoV-2 infection if taken prophylactically among healthcare workers and close contacts[31].

The drug is considered safe; however there are some serious side effects such as retinopathy and immunosuppression. Therefore, it is recommended to be used only on physician advice and requirement of closed observation of side effects as recommended for emergency use[31].

Use of Non-steroidal Anti-inflammatory Drugs (NSAIDS) :

Many patients will get relief on using analgesics and NSAIDs. The use of ibuprofen is warned in COVID patients, as it is believed that virus binds to ACE2 receptor and it increases accelerated expression of this protein[23]. Hence, it may potentiate and enhance infection even though there is no strong epidemiological evidence to suggest a harmful effect of ibuprofen on COVID-19 patients. Paracetamol can be used as the first line of treatment in such cases[17].

Monetary Implications :

In the pandemic situation, there is a need to use PPE and all other additional infection prevention measures in dental practice, although the cost of dental care is likely to go high[32]. This would ultimately be shifted to the patients as the dentists would not be able to bear the same on their part. This will increase the expenses on patients thereby increasing the costs of the treatment.

Summary :

The health care workers should make the society aware on the possible risks of the COVID-19 disease in dentistry practice and also take the proper actions. The consideration should be given to treat each patient as likely infectious and take utmost measures to prevent infection. The protection of healthcare workers should be the key aspect during the COVID-19

pandemic. Therefore, strict adherence of infection prevention and control measures is an important aspect that needs to be inculcated in dental clinical practice during the pandemic.

Acknowledgements :

We acknowledge Dr. Babasaheb V. Tandale (MD), for his guidance, critical inputs and revision of draft manuscript. Also, we are thankful to Miss. Revati Avadhut Bangar for the help in searching literature, compilation and listing of references.

Funding : None

Conflict of Interest : None

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