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Practicing sheltered dentistry during COVID-19 era –A review

[1]Dr. Amrutha.B, MDS, Reader, Department of Pediatric and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore, India.

[2]Dr.Prasanna Kumar Bhat, MDS, Reader, Department of Pediatric and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore, India.

[3]Dr.Aishwarya.N, MDS, Senior Lecturer, Department of Pediatric and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore, India.

Corresponding Author: Dr. Amrutha. B, MDS, Reader, Department of Pediatric and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore, India.

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Abstract

The outbreak of coronavirus disease 2019 (COVID-19) rapidly escalated into a worldwide pandemic. The COVID-19 has been the greatest challenge faced by every nation today. The community pattern of spread was alarming and it alerted each and every individual especially the health care providers. All the health care professionals during treatment procedure should follow strict measures to prevent the spread of infection. Due to the characteristics of dental settings, the risk of cross infection between dental health care personnel (DHCP) and patients can be very high. Understanding as well as knowing the etiology, clinical manifestations, route of transmission of virus, general and specific infection control protocols to protect the dental health care professionals and patients from COVID 19 disease is very much crucial especially while providing emergency dental care.

Keywords: COVID-19, dental, pandemic, PPE, SARS-CoV-2, emergency dental care, WHO, CDC

Introduction

The novel coronavirus disease (COVID-19) pandemic has emerged as a community health crisis and is spreading rapidly across the globe. The first case was reported in Wuhan City, of China, in late December 2019.[1] The WHO named the novel viral pneumonia as "Corona Virus Disease (COVID-19)" while the International Committee on Taxonomy of Viruses (ICTV) named this novel virus as "SARS-CoV-2" following phylogenetic and taxonomic analysis.[2] Coronavirus is from a family of single-stranded RNA viruses known as Coronaviridae.[3] SARS-CoV-2 is a disease of animal origin, most probably from Chinese horseshoe bats (Rhinolophus sinicus) with Malayan

pangolins as the potential intermediate host.[4,5]. Inside the human body, this virus is present abundantly in nasopharyngeal and salivary secretions of affected patients.[6]The predominant route of spread of COVID-19 is via respiratory droplet.[7] Dentists and Dental setups are more vulnerable and invariably carry the risk of COVID-19 infection due to the specific procedures especially the aerosol producing treatment procedures, proximity to the oropharyngeal region, and frequent exposure to saliva. Lack of or failure to take appropriate precautions lead to definite exposure of patients to cross-contamination.

COVID-19 infection mainly spreads through respiratory droplets or through contact. Air-borne spread occurs when the infected person coughs or sneeze (radius approximately 6 feet).[7]And it can also through infected inanimate objects. Various studies suggest that the virus can be viable at room temperature for up to 3 days on inanimate surfaces.[8] COVID-19 virus has been isolated from both saliva and feces of infected persons.[6,9,10] SARS-CoV-2 can bind to human angiotensin-converting enzyme 2 (ACE-2) cells of human salivary glands.[11,12] The risk of vertical transmission (mother to fetus) is still to be confirmed.[13,14]

Transmission of virus is mainly through symptomatic patients. However recent studies suggest that patients during their incubation period and asymptomatic patients also have high chances of carrying SARS-CoV-2.[15,16]

The average incubation period is estimated to be around 0–14 days. These 14 days are considered as duration period for quarantine or self-isolation and potentially exposed persons supposed to be kept under constant medical observation.[17]

According to research, high risk group of people include health care workers and people who are in close contact with symptomatic or asymptomatic patients and it is observed that people of all age groups can be susceptible to infection. Especially people of older age groups with underlying diseased conditions such as diabetes, hypertension, respiratory or cardiovascular disease as well as immunosuppressed individuals are associated with very poor prognosis.[18, 19]

Clinical Manifestations of covid 19

- Fever and dry cough,
- Headache,
- Sore throat,
- Anosmia,
- Fatigue,
- Shortness of breath,
- Other atypical symptoms like muscle pain, confusion, diarrhea, and vomiting.[20,21]

Oral manifestations

- Dysgeusia[22]/amblygeustia.[23,24]
- Ageusia/dysgeusia i.e loss of taste sensation (Centers for Disease Control and Preventions -CDC) - early symptom of COVID-19.
- Oral unspecific ulcerations (affecting both keratinized and nonkeratinized epithelium),
- Xerostomia,
- Opportunistic fungal infections,
- Recurrent oral herpes simplex virus-1 infection,
- Fixed drug eruptions,
- Gingivitis.

Until now there is no evidence that oral lesions associated with COVID19 are typical of direct viral invasion or occurring as a result of systemic deterioration or following adverse drug reactions.[25] The probable reason could be associated with the fact that oral tissues (salivary glands and tongue) show high degree of ACE2 expression and to the presence of FURIN (an enzyme that facilitates cellular entry of SARS-CoV-2).[26]

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Role of saliva in covid-19 infection

It has been found that there is a high concentration of SARS CoV 2 in saliva of infected patients, making saliva as a potential route of virus transmission. Salivary droplets consist of droplet nuclei of microorganisms in a mixture of moisture, generated by an infected person during coughing, sneezing, talking, or exhalation.[26]

For confirmatory diagnosis of COVID-19 infection throat swabs are used. However, throat swabs are relatively invasive, induce cough and bleeding and there is increase chance of risk of infection to healthcare workers. Besides, collection of saliva is less invasive, more acceptable to patients and less hazardous to health care workers. Collection of saliva is done by following three methods: deep throat saliva, salivary swabs, and directly from salivary gland duct. One of the recent study concluded that deep throat saliva has the highest rate of positive virus detection.[26]

Dental Care during COVID-19 Pandemic

Modification of dental clinic

A. Reception/Waiting area[27]

- Visual alerts/boards should be displayed at the entrance of the clinic and reception area regarding social distancing, hand hygiene, hygiene of respiratory system, wearing of mask, cough protocols and waste disposal.
- Recording of patient's body temperature using noncontact forehead thermometer should be mandatory and included as a part of routine patient assessment before performing any dental procedure.[12] Patients presenting with fever or respiratory disease/ symptoms should be registered and referred to designated hospitals.
- Patients must also be enquired for any history of fever/respiratory illness, including cough or difficulty in breathing in the last 14 days. And also for any history of contact with any household member or colleague at work place or any person with a known COVID-19 infection as well as any history of International travel to areas of suspected community spread in the past 14 days.[12]
- Remove magazines, articles, toys, and other objects from the reception area that may be touched by others and are difficult to disinfect.
- Glass/plastic barrier must be installed at the reception desk. Cashless/ contactless payment methods to be encouraged. Avoid usage of commercial split/centralized/window air conditioners unless equipped with high-efficiency particulate air (HEPA) filters. It is recommended to use natural and mechanical ventilation using fans and exhaust.

B. Operatory Area

- High vacuum extra oral suction devices preferably installed.
- Circulation of natural air must be maintained within the operatory, through frequent opening of windows and by using an exhaust blower to extract the room air into the atmosphere.
- Place a table fan behind the operator and let the air flow toward the patient.
- A strong exhaust fan is recommended to create a unidirectional flow of air away from the patient.
- Avoid the use of a ceiling fan while performing procedure. The window air condition system/split AC should be frequently serviced, and filters cleaned. Commercially available electrostatic air conditioner filters can be used. Use of indoor portable air cleaning system equipped with HEPA filter and UV light may be used.

C. Changing Room

- Changing room to be available for staff and all workers.

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- Separate area for donning and doffing of personal protective equipment (PPE).

Dental Patient Management

A. Triaging and screening

- Triaging should facilitate the scheduling of patients based on the level of need. This will help in limiting the number of incoming patients while emergency care/treatment is given priority and also facilitate pharmacological management of patients requiring urgent dental care (**Table 1**)
- According to recent research, the role of antibiotics in reducing pain associated with irreversible pulpitis seems questionable. But, if the patient presents with features of acute apical abscess/ cellulitis, then appropriate antibiotic medications must be given.[28]

In addition to this, classification of dental treatments has been done based on zones of COVID-19 spread. This is in accordance with updated notification given by Ministry of Health and Family Welfare (MOHFW) (**Table 2**)

B. Guidelines to dental Health Care Professionals

- Hand hygiene protocols should be followed.[29]
- The highest level of PPE, i.e., gloves, gown, goggles, face shields, and an N95 or higher-level respirator must be used during emergency dental care.[29,30]
- N-95 masks by the national institute for occupational safety and health.[31,32]
- If available FFP3 (N-99) standard mask should be used and, in COVID-19 positive patients, this would be considered essential. Recommend protocol to be followed for PPE by dental staff (**Table 3**)

C. Preprocedural Modifications

- Drape the patient preferably with single-use, disposable plastic apron.[27]
- Ask the patient to remove the mask.
- Preprocedural mouth rinse: Effective reduction in salivary microbial load can be achieved by rinsing with 0.2% povidone-iodine or 1% hydrogen peroxide before the procedure.[14,33] Studies conclude that chlorhexidine is ineffective against COVID-19.[12]

D. Procedural modifications

- Procedure modifications and practice modifications to be adopted during Covid times for emergency, urgent care, and specialty wise modification to be adopted as and when regular services resume (**Tables 4 and 5**) [33-37]

E. Emergency treatment protocol for the management of high-risk patients

- All elective procedures, surgeries, and no urgent dental visits, while prioritizing urgent, emergency visits and procedures now and for the coming several weeks must be postponed according to CDC as on 8th April 2020.[30]

Emergency dental treatment for a confirmed/suspected COVID-19 patient if warranted medically, it should only be provided in a hospital or dental setup with adequate airborne precautions (negative pressure or AIIR and an N95 mask).[29]

F. Managing COVID-19 recovered patients

The emergency dental care for resolved COVID-19 patients is decided using two techniques a nontest-based strategy and a test-based-strategy.[30]

- **Nontest-Based-Strategy:** At least 3 days (72 h) 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 7 days have passed since symptoms first occurred.
- **Test-Based-Strategy**
  - **Symptomatic COVID-19 patients**: Resolution of fever without the use of fever-reducing medications

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and improvement in respiratory symptoms (e.g., cough, shortness of breath) and negative results from at least two consecutive nasopharyngeal swab specimens collected ≥24 h apart.

- **Asymptomatic laboratory-confirmed COVID-19 patients:** At least 7 days have passed since the date of the first positive COVID-19 diagnostic test and have had no subsequent illness.

G. Protocol for discharging of patients[27]

- Patient drape to be removed by the assistant.
- Hand hygiene has to be maintained by patient.
- Prescription has to be noted,
- Follow up instructions to be given only after doffing PPE.

Clinic area/settings disinfection [27,39]

Disinfection protocols are mandatory as COVID-19 virus can potentially survive in the environment for several hours/days.

A. Floor

1. Clinical arear floor must be mopped with 1% sodium hypochlorite solution with a contact time of 10 min. Separate mops to be kept for clinical area.

2. Mopping is done from inner to outer area following unidirectional mopping technique.

3. Floor should be cleaned after every patient or after a major splash or after every two hrs.

4. Mop that is used must be washed with clean water and disinfected with 1% sodium hypochlorite and leave it for sun-drying.

B. Other surfaces

- Freshly prepared 1% sodium hypochlorite (contact time: 10 min) is used.
- Disinfection should be done daily before starting work, after every procedure, and at the end of the day.

C. Electronic equipment

Should be wiped with alcohol-based rub/spirit (60%–90% alcohol) swab before treatment procedure.

D. Fogging

- This method is also called as "No-touch surface disinfection."
- 20% (w/v) working solution of hydrogen peroxide (stabilized by 0.01% of silver nitrate) is prepared. The amount of solution required is approximately 1000 mL per 1000 cubic feet.
- After every clinical procedure, all should exit the room and close the operatory for half hour.
- This results in settling down the aerosols/ droplets following which surface cleaning is done.
- Fogging is done for 45 min followed by a dwell time of 1 h.
- The room can then be opened and fans switched on for aeration. Wet surfaces can be dried/cleaned using a sterile cloth or clean cloth.

Management of waste/waste disposal

- The infectious medical and domestic waste of suspected or confirmed COVID-19 patients should be disposed of in double-layered yellow color bags with gooseneck ligation.[12]
- The bags should be marked and disposed of in accordance with the Biomedical Waste Management and Handling Rules, 2018.[40]

Conclusion

Preventive measures against COVID-19 in dental practice include clinical triage supported by a questionnaire on recent symptoms and movements, body temperature measurement, use of oral rinses with 1% hydrogen peroxide, and the use of specific PPEs. All patients should be considered potentially infectious.

During viral epidemics, dental practitioners are one of the most threatened groups. Close contact with patients,

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exposure to body fluids, and handling of sharp instruments all increase the risk of infection. This becomes mandatory for dental practitioners to revise their infection control protocols and must keep themselves updated about this evolving disease which in turn help implement safety dental measures in daily practice.

The time has come to look beyond treating urgent dental care needs and start planning for resumption of routine dental care and finding creative ways to care for dental patients who are reluctant to come to the dental office for the foreseeable future.

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Legend Tables

Table 1: Drugs recommended for pharmacological management

Analgesics	Antibiotics23
• Acetaminophen 1000mg(every 6-8hrs) • Ketorolac Tromethamine10mg(every 6hrs) • Piroxicam 20mg(every 12hrs) • Ibuprofen 600mg(every 6hrs)*	• Amoxicillian 500mg 8th hourly • Amoxicillin + Clavulanic acid 8th hourly • Metranidazole 400mg 8th hourly • Clindamycin300mg 8th hourly

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Table 2: Classification of dental treatment according to Zones

Zones	Treatment protocols
Containment zone	• Dental Clinics will remain closed • Teletriaging and referral to designated hospital for emergency dental treatment via ambulance
Red zone	Emergency dental procedures only
Orange and green zone	• Emergency and urgent procedures can be done • All routine and elective dental procedures should be deferred until services resume. • Defer oral cancer screening until new policy/guidelines are issued

Table 3: Recommend protocol to be followed for PPE by dental staff

Dental setting	Risk factor	Type of PPF
Registration counter	Mild	Three layered mask and latex examination gloves
Dental and auxiliary staff	• Patient examination • Moderate risk (Nonaerosol procedures) • High and very high-risk procedures (Aerosol generating procedures)	Three layered mask, Protective eyewear Face shield, gloves N-95 mask, Protective eyewear Face shield, gloves and surgical gown N-95 mask, Protective eyewear Face shield, gloves and surgical gown

Table 4: Procedural modifications

Specialty	Can be performed	Cannot be performed
Oral medicine and radiology	Medicinal treatment of oral precancerous lesions	•Intraoral periapical radiographs. •Extraoral radiographs and cone-beam computed tomography except in case of emergency
Prosthodontics	• Minor adjustment/occlusal equilibration in the existing complete/partial denture • Removal of crown/fractured segment of prosthesis. • Recementation of dislodged crown /	• Biomechanical tooth preparation for receiving crown/bridge. • Placement/removal of dental implant. • Impression making for removable/

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	bridge. • Removable complete/partial denture insertion.	fixed prosthesis. • Removal of faulty prosthesis/ complicated crown/bridge.
Oral surgery	• Suturing of bleeding wound • Incision and drainage of severe space infection • Emergency extraction of tooth • Correction of acute TMJ dislocation • Conservative management of fracture	• Definitive management of soft and hard tissue trauma • Mild and moderate space infections • Planned tooth extraction/impacted tooth • Biopsy/wire; suture material/bone plate removal • TMJ/Orthognathic/Pathology/Dental Implant surgery
Periodontics	• Management of gingival/periodontal/ pericoronal abscess. • Management of ulcerative/ desquamative lesions. • Management of food impaction / coronoplasty of plunger • cusps. • Topical application of desensitizing agent. • Cauterization of periodontal pocket/ pericoronal flap/pulp • polyp.	• Use of ultrasonic scaler/ micromotor/ airotor. • Surgical/laser excision of gingival overgrowth. • Scaling and root planing. • Planned periodontal surgery and implant surgery.
Pedodontics	• Severe dental pain/pulpitis in mixed dentition • Management of acute dentofacial trauma • Management cleft lip and palate • Management of cellulitis/facial swelling	• Airotor/Aerosol use for any procedure except emergency • Root Canal Openings • Elective surgical procedures
Conservative and endodontics	• Caries hand excavation and dressing • Glass ionomer restoration in cervical abrasion • Emergency root canal opening if swelling/abscess/pain in • tooth	• Airotor/Aerosol use for any procedure except emergency • RCO • Surgical endodontics • Ultrasonic use in endodontics

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	• Recementation of inlay	
Oral pathology	• Hemogram for emergency dental extractions.	• Hemogram for elective surgical procedures
Orthodontics	• Hanging or dislodged molar tube or dislodgement of • appliance/ components • Wire pricking or any other component of fixed appliance • injuring soft tissue • TPA, TADs, and Class II correctors which are likely to be • ingested or inhaled	• Use of micromotor/airotor • Removal of any residual composite from debonded enamel • Bracket bonding, change of wires, E-chains, modules • Broken removable appliances

Table 5: Practice modifications

Speciality	Modifications
Oral medicine and radiology	• Perform OPD procedures only • Radiology section to cater only extraoral radiography. • Intraoral radiographs-double barrier technique.[34]
Prosthodontics	• Preprocedural mouth rinse with 0.2% povidone iodine, or 1% hydrogen peroxide before crown preparation. • Use high vacuum suction tips during tooth preparation. • Use disposable airotor or anti retraction handpiece.[35] • Disinfection of dental impression using appropriate disinfectants (glutaraldehyde, sodium hypochlorite, or CHX for 10 min). • Disinfection of dental cast using disinfectant spray, immersion in disinfectant solution, or incorporation of disinfectant in stone at the time of mixing. • Schedule aerosol producing procedures at the end of the day.
Oral surgery	• Preprocedural mouth rinse with 0.2% povidone iodine or 1%hydrogen peroxide. • Use a high vacuum suction tip.
Periodontics	• Preprocedural mouth rinse with 0.2% povidone iodine or 1% hydrogen peroxide.[33] • Use high vacuum suction tip. • Use hand instruments for scaling

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Pedodontics	• Use hand instruments for caries excavation. • Use high vacuum suction tip. • Use disposable airotor or anti retraction handpiece
Conservative and endodontics	• Preprocedural mouth rinse with 0.2% povidone iodine, or 1% hydrogen peroxide. • Use of rubber dam.[36] • Use hand instruments for caries excavation. • Use high vacuum suction tip. • Use disposable airotor or anti retraction handpiece.[35]
Orthododntics	• Bonding the metal brackets using dual cure GIC. • Microetching or Sandblasting technique can be used to modify enamel surface for bonding without etching. • Self-etching primers eliminate rinsing and drying steps.

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