

Coronavirus and Its Impact on Dental Fraternity

Krishna Prasad D.¹ Anupama Prasad D.^{1,✉} Mayank Kumar Parakh¹

¹Department of Prosthodontics, A.B. Shetty Memorial Institute of Dental Sciences, Nitte (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India

Address for correspondence Anupama Prasad D., MDS, PhD, Department of Prosthodontics, A.B. Shetty Memorial Institute of Dental Sciences, Nitte (Deemed to be University), Deralakatte, Mangaluru, Karnataka 575018, India (e-mail: dranupamaprasad@nitte.edu.in).

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Abstract

The coronavirus disease-2019 (COVID-19) is a pandemic the world is currently facing head on. It is a viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). No current vaccine is available nor a curative treatment option is available at present, thus making it even more important to prevent the disease. Since dentists are in very close contact with their patients and there is aerosol production in various dental treatments, they are at a heightened risk of contracting the disease. To prevent the disease, strict hand and respiratory hygiene needs to be followed. Personal protective equipment should be used for any emergency procedures and thorough history must be taken of every patient. Digitalization of seminars and classes has been adopted by various dental institutions. With high infectivity of the virus, social distancing and stringent prevention protocols can help in controlling this severe global threat.

Keywords

- ▶ coronavirus
- ▶ COVID-19
- ▶ dentistry
- ▶ infectious disease

Introduction

The coronavirus disease-2019 (COVID-19) is a pandemic the world is currently battling against. COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was named SARS-CoV-2 as it was related to the virus that caused the severe acute respiratory syndrome (SARS) outbreak in 2003.¹ The pandemic reported its first few cases in Wuhan City, Hubei Province of China, and later spread to almost all the nations in the world. The World Health Organization (WHO) declared the corona outbreak as a Public Health Emergency of International Concern on January 30, 2020, and later recognized it as a pandemic on March 11, 2020.^{2,3}

On April 7, 2020, the global risk level by WHO still remains very high for this pandemic.⁴ WHO's current strategic response for COVID-19 include: interrupting human-to-human transmission; preventing events that can amplify the transmission; identifying, isolating, and treating patients early in the disease phase; providing optimal care for patients; identifying and reducing source of transmission via animals; communicating any critical risk and/or important information to all people; countering any form of misinformation; and minimizing global, economic, and social impacts.⁴

The dental fraternity is exposed to various infectious diseases such as the human immunodeficiency virus (HIV), hepatitis-B, tuberculosis, but the current COVID-19 has a much higher infectivity than most viral diseases and a high human-to-human transmission rate, which is of serious concern. The incubation period of COVID-19 ranges from 2 to 12 days with a mean of ~6.4 days. Older age group, especially those above 65 years, and people with comorbidities such as diabetes mellitus and systemic hypertension are more likely to develop an infection and severe symptoms.⁵

The COVID-19 virus spreads primarily through droplets and fomite. The nasal discharge or saliva from an infected person, when he/she coughs or sneezes, causes the spread. The virus can remain on contaminated surfaces from 2 hours to 9 days.⁶ Dentists are at a heightened risk as procedures such as ultrasonic scalers and airtors produce aerosol and if these are used on an infected patient the potential transmission is significantly increased.⁷ Prosthodontists mostly deal with geriatric patients and hence are thereby at an even more heightened risk. This article aims to describe how the coronavirus has impacted the dental community in India and what precautions must be taken once the situation comes under control.



Classification

There are currently 26 known species of coronaviruses that infect 36 species of animals (► Fig. 1).⁸ Coronaviruses are large in size, enveloped, and belong to positive single strand ribonucleic acid (RNA) viruses. They can be divided into four genera: α , β , delta, and gamma. Only the α and β genera are associated with human infections.⁹

Mode of Transmission

According to current literature evidence, COVID-19 virus is transmitted primarily between humans via respiratory droplets and through contact routes.¹⁰ Droplet transmission of the virus occurs when a healthy person comes in contact with an infected person who has symptoms such as coughing or sneezing. The droplet spread occurs around 1 m of the infected individual. The spread occurs when these infected droplets contact respiratory, conjunctival, or oral mucosa mainly mouth, eyes, and nose (MEN). Transmission of the virus also occurs through fomites around the infected person. Thus, the transmission of the COVID-19 virus can occur either by direct contact with an infected patient or by means

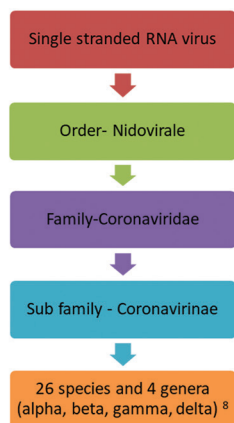


Fig. 1 Classification order.

of indirect contact with surfaces.¹¹ There has been a study that showed COVID-19 can cause intestinal infection and the virus was isolated in feces of infected individuals, but a fecal-oral route of transmission has not been established to date.¹²

Signs and Symptoms

The symptoms in COVID-19 infected patients appear after an incubation period of ~5.2 days.¹³ The most common symptoms of COVID-19 include fever, dry cough, and tiredness. Some patients may also have body pain, runny nose, nasal congestion, or sore throat. Some of the patients have an occult infection and do not develop any symptoms.¹⁴ On admission of patients, a chest X-ray is taken and cases showing infiltrate in the upper lobe of the lung showed increased incidence of dyspnea with hypoxemia.¹⁵ Symptoms can range from mild to severe. Patients with milder symptoms tend to recover after 1 week of treatment while severe cases often reported progressive respiratory failure, which was the result of alveolar damage caused by the virus, which may be fatal as well. About 80% of infected people recover from the disease without any special treatment¹⁶ (► Fig. 2).

Diagnosis and Management

Diagnosis of a coronavirus patient involves detection of SARS-CoV-2 RNA with aid of reverse transcription polymerase chain reaction (RT-PCR). The detection of the viral RNA is better with nasopharyngeal sample than throat sample.¹⁷ SARS-CoV-2 RNA has also been detected in stool and blood samples.¹⁸

Currently, no drug or any therapeutic has been approved by the U.S. Food and Drug Administration to prevent or treat COVID-19. Remdesivir is currently under investigation as an intravenous drug, as it has broad spectrum of activity. Remdesivir inhibits the replication of virus, by premature termination of RNA transcription, and the drug has proven effective in in-vitro studies. Hydroxychloroquine and chloroquine are drugs that are used for treatment of malaria.

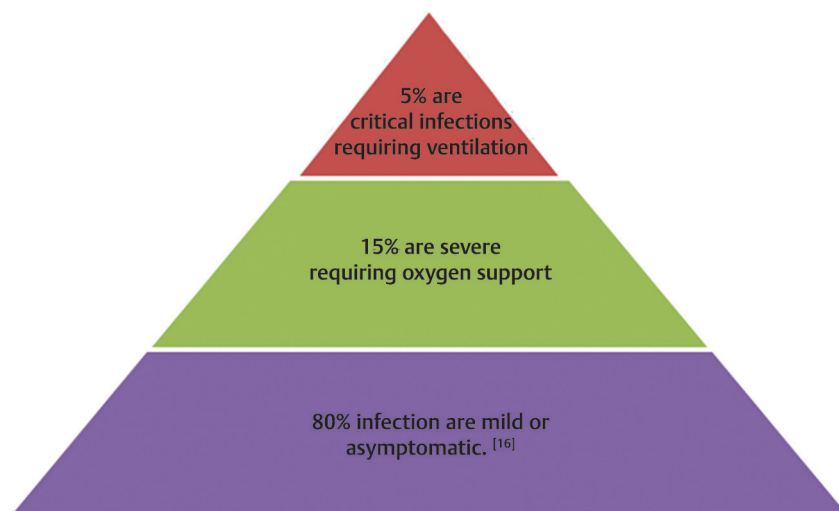


Fig. 2 Severity of coronavirus disease-2019.

Hydroxychloroquine and chloroquine are currently being investigated for their role in pre- or postexposure prophylaxis of coronavirus infection, and in treatment of patients with all severity of COVID-19 infection.¹⁹

Prevention of Spread and Precautions

All the patients should be assessed at admission, thereby aiding in early recognition of a possible COVID-19 case. In dental clinics, patients should be asked about their travel history, and symptoms if any before scheduling any appointments. All universal precautions should be followed for all patients irrespective of their disease status. Medical professionals should wear personal protective equipment (PPE) while treating all patients. The consistent and timely use of PPE helps reduce the spread of COVID-19.²⁰ Hand hygiene measures must be strictly followed; this includes cleansing hands with copious amounts of alcohol-based hand rub or washing hands with soap and water. Alcohol-based hand rubs are preferred over soap and water if the hands are not visibly soiled.²¹ An N-95 mask should be preferably used. Suspected patients should be offered a medical mask while they are in the waiting area. It must be ensured that all patients must cover their nose and mouth with tissue or elbow when they cough or sneeze.²²

Managing Health Care Waste

If the health care waste is managed poorly, it exposes all health care workers and health care waste handlers to various infections and injuries.²³ All the waste generated during treatment of COVID-19 patients should be safely collected in designated bags and containers, treated, and then safely disposed off and/or treated, or both. The management of medical waste should be done preferably onsite. All personnel who handle these wastes should wear appropriate PPE and must perform meticulous hand hygiene after removing the PPE.²⁴ Center for Disease Control and Prevention (CDC) has recommended to treat all COVID-19-related medical waste no differently from the medical waste coming from hospitals and facilities without COVID-19 cases.²⁵

Dentists at Heightened Risk

According to Indian Dental Association (IDA), dental procedures carry additional risk of coronavirus infection due face-to-face communication of the dentist with the patients and frequent exposure to patient's saliva, blood, and other body fluids. The COVID-19 can be transmitted in dental settings via the inhalation route or by direct contact with infected blood, oral fluids, or other patient materials, or through contact of nasal, conjunctival, or oral mucosa with droplets and aerosols containing viral particles generated from an infected individual. These particles are propelled to a short distance of ~1 m by coughing and talking without a protective mask, and also spread through indirect contact with contaminated instruments and/or environmental surfaces.²⁶ Moreover, recently, Xu et al have pointed that ACE2 expression is higher

in minor salivary glands than in lungs. This could mean that salivary glands could be a potential target for COVID-19, especially in the asymptomatic individuals.²⁷

Dental Procedures Producing Aerosol

Dental procedures involving the use of mechanical instrumentation such as dental hand pieces, air polishers, ultrasonic scalers, and air abrasion units produce visible aerosol. These instruments remove material from the oral cavity, which gets aerosolized. These instruments use rotator movement, ultrasonic vibrations, or a combination of both, and this motion on combination with water and compressed air produces aerosol. These aerosols are visible to naked eye and are noticed by both dental personnel and the patients. Various infections such as tuberculosis, influenza, Legionnaires' disease are known to spread from aerosol spray. In addition to this, the current COVID-19's primary mode of spread is aerosol.⁷

How to Prevent Aerosol in Dentistry?

Aerosol prevention is not a practical approach in dentistry, but it is possible to produce aerosol free of viruses. Povidone-iodine antiseptic solution has demonstrated >99.99% activity against both enveloped and nonenveloped viruses including Ebola, Middle East respiratory syndrome, severe acute respiratory syndrome, coronavirus, and influenza.²⁶ A recommended irrigant in the ultrasonic scaler is 10% povidone-iodine diluted 1:9 with water. Povidone-iodine can be directly added in 1:9 ratio to the bottles attached to dental chairs and be used even in high-speed hand pieces.²⁸ The use of saliva ejectors and suctions, low and/or high volume, can enable reducing the production of droplets and aerosols and thereby preventing cross infection.²⁹

Extra oral suction has recently received widespread acknowledgment. These suction units prevent cross infection and significantly reduce the aerosol during procedures. These units have a strong vacuum suction that helps reduce aerosol during dental procedures.³⁰ The settle time of coronavirus is different in each room, as the rooms vary in their sizes, temperature, humidity, and ventilation capacity. The settle time is determined by the air changes per hour (ACH), which is affected by the aforementioned factors. If the ACH of a room is not known, it is assumed to be 120 minutes.³¹

Screening and Measures to Curb COVID-19 Spread in India

The government of India has been actively screening international passengers and their contacts, home quarantining them, or providing them with appropriate treatment. The government imposed a lockdown of 70 days to curb the spread of the virus and break the chain of transmission. India has imposed a social distancing protocol as well.³² Kalamaserry Medical College in Ernakulam, Kerala, has started a kiosk to collect throat swabs of coronavirus patients. This consists of two openings in the front with hand gloves attached to it.

The kiosk has an advantage that the personnel collecting the samples does not have to wear PPE.³³ The Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) has developed a “Disinfection Gateway” that is designed to decontaminate people. The gateway consists of an ultraviolet (UV) system and hydrogen peroxide mist. The system generates hydrogen peroxide mist that decontaminates the body, hands, and clothes of a person.³⁴ The UV system decontaminates the chamber. India is also ramping up testing measures all across to detect, isolate, and treat all COVID-19 cases at early stages. As of April 26, 2020, India has screened 2,27,919 patients.³⁵

Impact of COVID on Dental Fraternity

Currently, all dental colleges across India are only treating emergency patients, dental clinics are not functioning or only treating emergency cases as suggested by the IDA, and consultants and dental assistants are unable to travel due to travel restrictions, and thus the dental care is significantly impacted.³⁶ The pandemic is going to have a severe impact on the income of dentists and also increase cost of dental treatment; some of the good-quality PPE cost ~1,500 rupees, which is more than some treatments offered by dentists, and thus a huge impact will be seen in the near future.^{36,37}

At Institution Level

The lectures and seminars have been arranged online in various dental colleges across India. Various examinations to be held in April have been postponed due to COVID-19. The faculty at colleges are switching to online seminars, classes, and exams in the wake of this pandemic.³⁶ The patients undergoing emergency treatment will have to bear additional cost of PPE and some institutes have to raise their treatment fee for this added cost. The numbers of patients currently being treated are very less and this has impacted the revenue generation of dental institutions.^{36,37}

At the Level of Private Dental Clinics

The dental clinics are significantly impacted as the IDA has suggested to only take up emergency dental treatments.²⁶

The dentists who worked as consultants are no longer called in due to travel restrictions imposed across India and also as no elective procedures are being done. The dental assistants have been impacted significantly as well, as most of them are out of jobs due to the pandemic. Furthermore, the patients will have to bear additional costs due to PPE kits, N-95 masks, and goggles that the dentists and the assistants would wear while treating patients. Also, with the newer recommendations the clinics have to be fumigated after every patient, and additional walls are to be constructed in such a way that the dental chairs are separate from each other. Also, repeated fumigation and sanitization of the dental clinics will impact the number of patients treated each day.³⁷

The Dental Council of India (DCI) has issued its latest guidelines on May 7, 2020, in which they have asked all clinics to only schedule appointments by phone, and then categorize the case according to emergency, urgent, and elective. Also, if the patient has dental symptoms, the patient is asked to take medicines for 2 to 3 days and if no relief in symptoms is noted, only then the patient should be treated. Temperature readings of the patients need to be taken and social distancing is to be maintained. They have recommended use of 1% hydrogen peroxide for 30 seconds as an oral rinse prior to procedures. They have recommended use of PPE for the dentist and the assistant and a surgical mask for all patients in waiting area.³⁸ These changes when implemented are going to increase the cost significantly for both patients and the dentists. These protocols will reduce the number of patients treated and will also enhance prevention of cross infection at dental clinics.

Personal Care to Be Taken by Dentists

Personal care to be taken by the dentists encompasses when to select a case, sterilization protocol of clinic, proper usage of PPE kits, and periodic self-assessment³⁹ (► Fig. 3).

Assistant Care

Assistants at a dental clinic include the clinical assistant, the receptionist, and the housekeeping staff. Assistants must take all necessary precautions and perform their responsibilities according to the established guidelines^{38,40} (► Table 1).

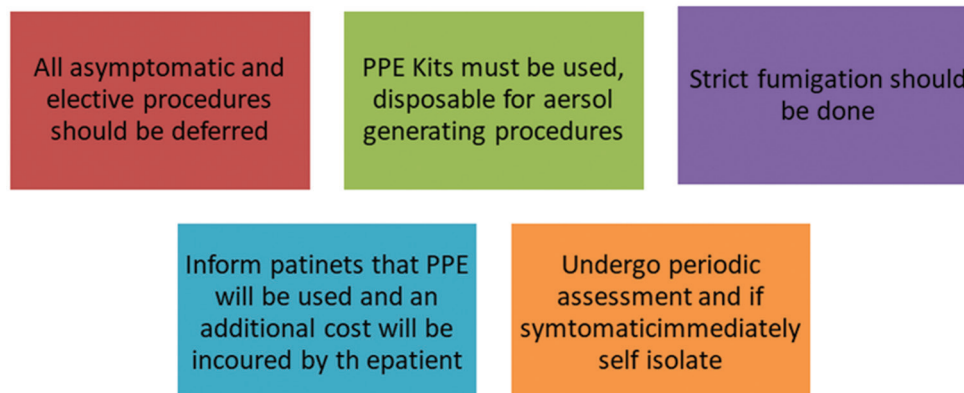


Fig. 3 Measures of personal care to be taken by dentists. PPE, personal protective equipment.

Table 1 Responsibilities of the assistant and precautions to be taken

Type of assistant	Responsibilities	Precautions
Clinical assistant	<ol style="list-style-type: none"> 1. Assist the dentist in four-handed dentistry 2. Ask patients to gargle with a mouthwash, either hydrogen peroxide or povidone-iodine 3. Clean the extraoral area immediately next to the mouth with povidone-iodine 4. Clean all the operatory areas with a disinfectant, such as handles, dental chair, counters 5. Dispose the PPE appropriately 	<ol style="list-style-type: none"> 1. Wear PPE at all times and change them after every appointment 2. Wash hands before and after every appointment
Reception staff	<ol style="list-style-type: none"> 3. Help in scheduling appointments and only provide appointments for emergency care 4. Ask patients in waiting area to wear masks 5. Ensure social distancing in waiting area 6. Encourage digital payment methods 	<ol style="list-style-type: none"> 1. Wear masks and gloves at all times 2. Maintain a minimum of 1 m distance with the patients 3. Avoid bringing paper work into operatory area 4. Wash hands with soap or alcohol (70%) frequently
Housekeeping	<ol style="list-style-type: none"> 1. All biomedical waste pertaining to patient care should be carefully disposed as per the Bio-Medical Waste Rules 2. Clean the floors and walls of the operatory area using disinfection solutions 	<ol style="list-style-type: none"> 1. Wear mask and appropriate gloves 2. Avoid direct contact with patient fluids 3. Wash hands frequently

Abbreviation: PPE, personal protective equipment.

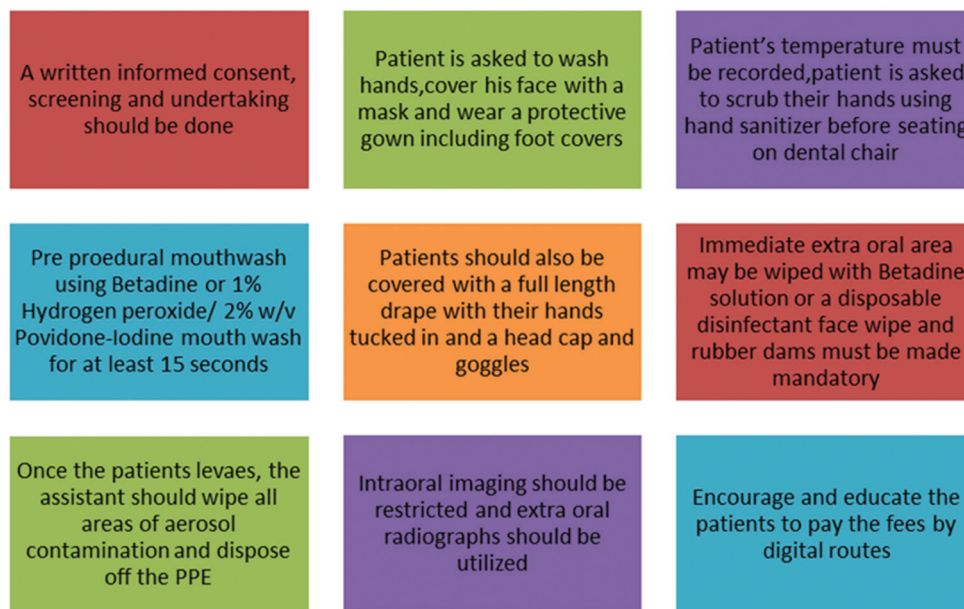


Fig. 4 Steps for patient care.

Patient Care

Patient care must be of utmost importance to the dentist and all necessary precautions, such as hand hygiene, temperature recording, preprocedural mouthwash, protective wear must be appropriately taken³⁹ (→ Fig. 4).

Clinic and Operatory Care

Dental clinics/operatories should be cleaned after every patient and the aerosol settling time should be calculated and only post the timing of settling of the aerosol should the

housekeeping staff clean the operatory. Appropriate disinfection of the impression must be done to prevent cross infection^{31,39} (→ Fig. 5).

Laboratory Care³⁹

Laboratory personnel should follow all appropriate guidelines, and all personnel should wear full PPE while handling patient work. They should also maintain meticulous hand hygiene and should self-quarantine if any symptoms develop (→ Fig. 6).

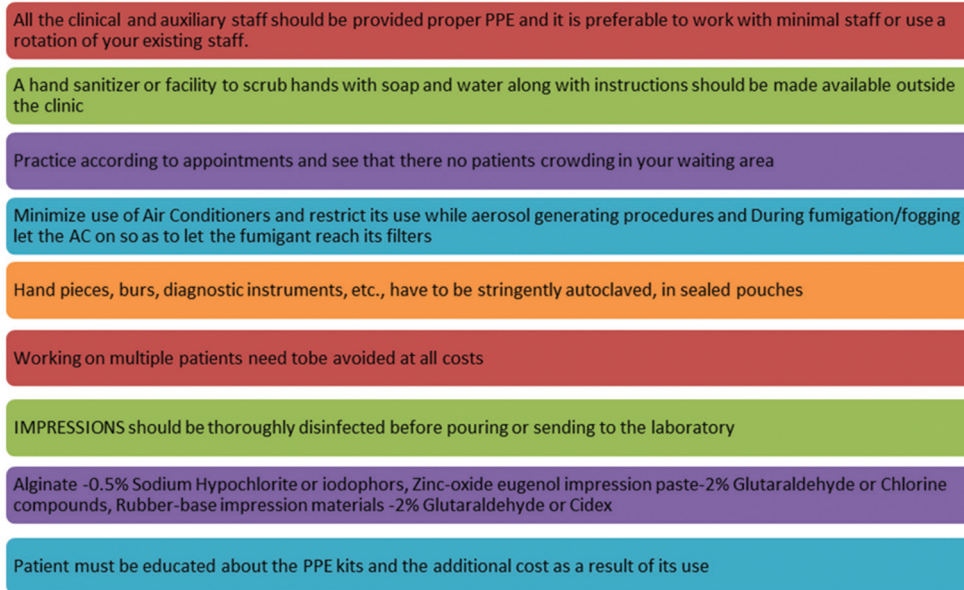


Fig. 5 Steps to be taken for clinic care.



Fig. 6 Steps to be followed in a laboratory. COVID-19, coronavirus disease-2019.

Dental Treatments Classification

Dental treatments can be classified as emergency, urgent, and elective (–Table 2). Emergency conditions may be life threatening and must be handled without any due.³⁸

Measures for Prevention of COVID-19 Spread at Dental Clinics and Institutions^{26,41,42}

1. Patient should be asked to sanitize their hand before entering the clinic.
2. Getting a detailed case and travel history from the patients along with their written consent should be ensured.
3. The entire dental operatory should be disinfected with alcohol-based scrub before and after each patient.
4. Patient should be asked to avoid touching any place in the operatory unless absolutely necessary.
5. Ask the patient to gargle with povidone-iodine; this avoids cross infection.
6. All elective procedures be delayed until the epidemic ends or dentist should make well-planned decisions about patient care.
7. Wear all PPE including an N-95 mask or at least a three-layered mask.
8. Use rubber dam in procedures to reduce the splatter from saliva and blood.
9. Procedures involving aerosol release should be done with fully disposable PPE and be scheduled at end of the day.
10. Addition of 1% hydrogen peroxide or povidone-iodine 1:9 ratio into the water bottle of dental chair is recommended.
11. Hand pieces, preparation burrs, all diagnostic instruments, etc. must be autoclaved, in sealed pouches, and reuse without autoclaving should be avoided at all cost.

Table 2 Dental treatment classification

Emergency	Urgent	Elective
• Uncontrolled bleeding	• Acute dental pain (pulpitis)	• Cosmetic procedures
• Cellulitis or diffuse bacterial infections leading to intra-oral or extra-oral	• Pericoronitis	• Initial or periodic examination
• Edemas and potential risk of damage to airways	• Alveolitis	• Routine dental cleaning
• Facial bones trauma, which may damage the patient's airways	• Dental or periodontal abscesses	• Extraction of asymptomatic tooth
	• Dental care needed for another critical medical procedure	• Asymptomatic carious lesion
	• Cementation-fixed prosthodontics or crowns	
	• Biopsies	
	• Adjustments of orthosis and prosthesis that cause pain and compromise chewing function	
	• Changing intracanal medication	
	• Removal of extensive dental caries or restorations that cause pain	
	• Mucositis	
	• Dental trauma with avulsion or luxation	

12. Dental impressions must be thoroughly disinfected.
13. Wash the dental impression under running water after it is removed from the mouth, and then gently scrub with camel hair brush and some liquid detergent under running water. This is recommended for alginate and polyether.
14. Polysiloxane impressions should be immersed in 5.25% sodium hypochlorite with 1:10 dilution for effective disinfection.
15. Wash hands regularly before and after each procedure.
16. Dental operatory should be fumigated on regular basis.
17. Encourage paying of fee through digital route.

Conclusion

The pandemic of coronavirus is rapidly penetrating the population of India. The dental community and especially the students are facing challenges as dental education requires a lot of hands-on training and are missing out on valuable time in their curriculum, though online classes are being conducted. The health care professionals, especially the medical and nursing divisions, are trying their best to cater to the patients. Screen them correctly and if positive treat them with appropriate medicines. Dentists in India are not currently involved in helping the medical professionals treat COVID-19 patients, though in the near future if the need arises the dental community can be an excellent reserve of doctors.

Conflict of Interest
None declared.

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