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Dental clinic management in between/after COVID-19 Pandemic

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Abstract

The ongoing spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (commonly called COVID-19) has gripped the entire India and other international community and caused widespread public health concerns. Despite global efforts to contain the disease spread, the outbreak is still on a rise because of the community spread pattern of this infection. Therefore, measures for prevention, identification, and management must be in place for appropriate mitigation of further spread.

With the widespread transmission of SARS-CoV-2 and reports of its spread to health care providers, dental professionals are at high risk for nosocomial infection and can become potential carriers of the disease. These risks can be attributed to the unique nature of dental interventions, which include aerosol generation, handling of sharps, and proximity of the provider to the patient's oropharyngeal region. In addition, if adequate precautions are not taken, the dental office can potentially expose patients to cross contamination. As the understanding of this novel disease is evolving, dental practices should be better prepared to identify a possible COVID-19 infection.

With our experience of outbreak so far and handling of patients during this period, certain specific protocols are discussed and recommendations for dental patient management in this pandemic period and afterwards COVID-19.

Keywords: Corona, covid-19, aerosols, SARS-CoV-2, dentistry in covid-19, covid-19 in India

Introduction

The group coronavirus include wide variety of respiratory viruses and their manifestations may vary from mild to severe. The virus named after its microscopic appearance, specified by the presence of pointed structures on the surface, resembling a crown were identified in the mid-1960s and are known to infect humans and a variety of animals (including birds and mammals). Since 2002, two coronaviruses infecting animals have evolved and caused outbreaks in humans: SARS-CoV (Severe Acute Respiratory Syndrome) identified in southern China in 2003, and MERS-CoV (Middle East Respiratory Syndrome), identified in Saudi Arabia in 2012.

Coronavirus disease 2019, called Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) and popularly known as COVID-19, is the latest infectious disease to rapidly spreading worldwide, was first discovered in 2019 in Wuhan. According to WHO COVID 19 affected most of the countries with 8274587 infected patients and 446390 deaths globally. In India according to the Ministry of health and family welfare (MOHFW) situation report (June 16, 2020) update on COVID-19, there have been more than 354161 reported cases and 11921 deaths and this number continues to increase. According to the WHO mortality rate of COVID 19 is 3-4% and was declared a pandemic on 11 March 2020.

Centers for Disease Control and Prevention (CDC) outlines symptoms of COVID-19 infection including Cough, Shortness of breath or difficulty breathing. Recently 6 new symptoms added include: Fever, Chills, Repeated shaking with chills, Muscle pain, Headache, Sore throat, New loss of taste or smell and suggested that at least two from 6 new symptoms could be a suspect of COVID 19. Symptoms may appear 2-14 days after exposure to the virus. However, some reports suggests incubation period could be as long as 27 days. In addition abnormal, chest x-ray findings such as patchy or diffuse airspace opacities and computed tomography findings such as ground glass opacities are found in patients.

The novel corona virus belongs to Coronaviridae, a single stranded RNA virus family.

Responsible for pulmonary, intestinal, hepatic and CNS disease. There are four main sub-groupings of coronaviruses, known as alpha, beta, gamma, and delta. SARS-CoV-2 is a member of the Betacoronavirus genus. Other members of Betacoronavirus are SARS-CoV and MERS-CoV. Interestingly this family of viruses are zoonotic or transmitted from animals to humans. There are strong evidence that SARS-CoV-2 has similarity to coronavirus species, that are found in bats and pangolins, proves the zoonotic nature of this new deadly virus. SARS-CoV-2 and SARS-CoV shares same host receptor i.e human angiotensin-converting enzyme 2 (ACE2) but difference lies in the greater binding affinity for ACE2 in SARSCoV2 than SARS-CoV. COVID 19 uses ACE2 as a receptor to enter cells, which is thought to promote human-to-human transmission.

Diagnosis: Rapid and accurate detection of COVID-19 is very important to control outbreaks in the community and in hospitals. Currently, diagnostic tests for COVID 19 include reverse transcription loop-mediated isothermal amplification (RT-LAMP), reverse-transcription polymerase chain reaction (RT-PCR), real-time RT-PCR (rRT-PCR). RT-LAMP has similar sensitivity to Real Time-PCR but high specificity and is used to detect MERS-CoV. According to CDC nasopharyngeal and oropharyngeal swab tests, have become a standard assessment for diagnosis of COVID-19 infection. For early diagnosis, two one-step quantitative RT-PCR (qRT-PCR) assays were developed to detect two different regions (ORF1b and N) of the SARS-CoV-2 genome. Three novel RT-PCR assays targeting the RNA-dependent RNA polymerase (RdRp)/helicase (Hel), spike (S), and nucleocapsid (N) genes of SARS-CoV-2 were developed. The current laboratory test is time taking (approximately 24hours), and a shortage of commercial kits delays diagnosis. Another recently developed method for diagnosis of COVID 19 is rapid diagnostic test (RDT). The main benefit is availability of result within minutes. They are based on two types, firstly detects the presence of viral proteins (antigens) expressed by the COVID-19 virus and secondly based on host antibody detection.

Routes of transmission of virus

According to WHO, the most common transmission routes of COVID 19 include direct transmission (cough, sneeze, and droplet inhalation transmission) and contact transmission (contact with oral, nasal, and eye mucous membranes). COVID 19 can be transmitted through droplets of different sizes: when the droplet particles are >5-10 µm in diameter they are referred to as respiratory droplets, and when then are <5µm in diameter, they are referred to as droplet nuclei. According to current evidence, COVID-19 virus is primarily transmitted between people through respiratory droplets, aerosol, saliva and contact transmission (by indirect contact with a contaminated surface, such as contaminated door handles, seat lift surface). In an analysis of 75,465 COVID-19 cases in China, airborne transmission was not reported. However, WHO state ^[23] that “airborne transmission of COVID 19 may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed; i.e., endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation”. In

addition, studies have shown that COVID 19 can be transmitted from person to person through direct or indirect contact and contact with asymptomatic patients. In addition airborne transmission in dental setting cannot be ruled out. The aerosol within 1m distance of patient’s mouth is estimated to be ineffective because particles of large size remain suspended in the air for short duration of time and settle within 1m where as particles of smaller size evaporate rapidly, while dry residues slowly settle and remain suspended for a variable amount of time. There is some evidence that COVID-19 infection may lead to intestinal infection and be present in faeces. However, to date only one study has cultured the COVID-19 virus from a single stool specimen. There have been no reports of fecal-oral transmission of the COVID-19 virus to date. This virus is stable on plastic, glass and stainless steel up to 72 hours and cardboard, paper and fabric up to 24 hours.

Risk of COVID 19 in Dental Practice

No cases of COVID 19 transmission in a dental setting are identified yet. However, there are high chances of transmissibility of the disease due to specificity of procedures, which includes dentist and patient face to face communication, frequent saliva exposure. In our routine dental procedures usually generate aerosols. So, during the course of this pandemic, there is a necessity for alterations to dental treatment to maintain a healthy environment for the patients and the dental team. SARS-CoV-2 has been isolated from the saliva of COVID19 patients. In literature it is documented that SAR CoV can potentially infect epithelial cells lining of salivary gland and become a major source of the virus in saliva. Therefore, multiple direct exposure of saliva is dangerous to dentist. One infected patient, can infect not only dentist but also to other patients. In dental setting this deadly virus can be transmitted through

Air borne

The airborne spread of SARS-CoV is well documented in the literature. This is reported in the literature that COVID 19 remain suspended in the air for long periods so there is a possibility that COVID 19 spread through aerosols. Thus, transmission through aerosols is the most important concern in dental clinics, because it is impossible to avoid the generation of large amounts of aerosol and droplet mixed with the patient’s saliva and even blood during dental practice. Particles of aerosols are soo small that they stay in the air for a longer time duration before settling on any surfaces or inhaled by a healthy person.

Also, if infected patient sitting in the waiting area, can produce droplets that propelled a short Distance by coughing and talking without a mask and can infect other individuals sitting in waiting area.

Contact spread

Another possible route for spread to dental care professionals is through direct or indirect contact with human fluids, contaminated dental instruments or environmental surfaces ^[37].

Contaminated surfaces

It is documented that SARS-CoV 2 can persist on surfaces like metal, glass, or plastic for a few days. Therefore, contaminated surfaces that are frequently contacted in dental settings are a possible route for transmission of COVID 19 ^[33].

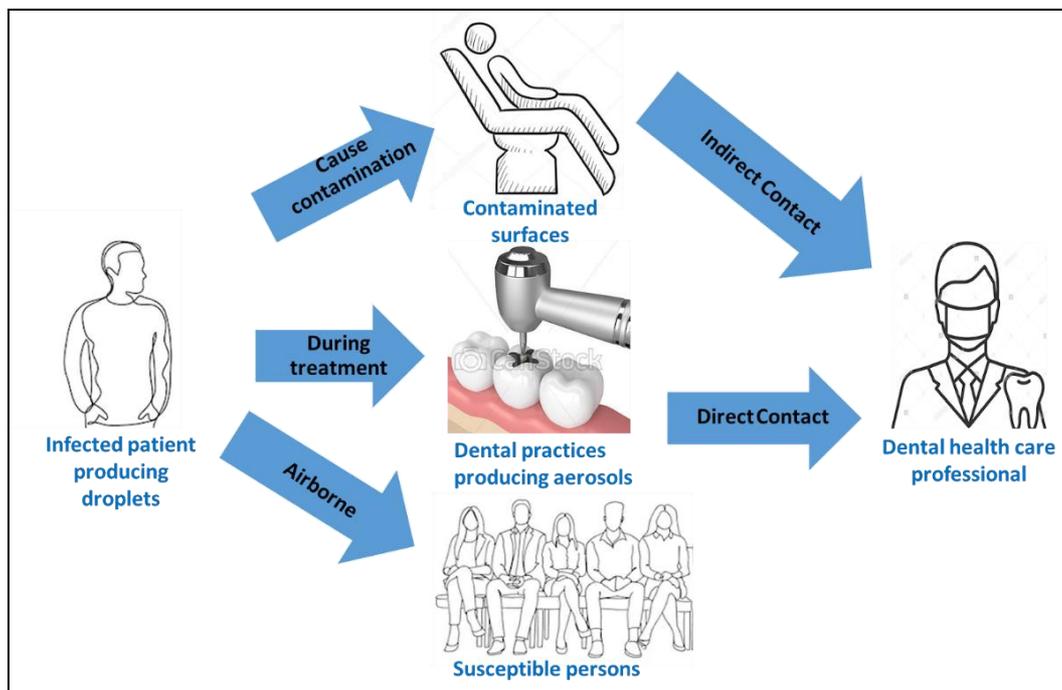


Fig 1: Transmission routes of COVID 19 in Dental setup

Patient Evaluation

- To reduce the risk of exposure and community spread it is very important to reduce physical walk-ins in the clinic. This can be done effectively by tele-screening and triaging by phone. Triage is defined as determining the priority of patients treatment requirements based on the severity of their condition. In telephone triage, dentist must effectively assess the patient's symptoms and provide directives based on the urgency
- On arrival in dental clinic, patients must complete a

detailed medical history, COVID 19 screening questionnaire (Table 1) and assessment of an emergency questionnaire (Table 2). On entrance of dental clinic, temperature of patient is to be measured, using non-contact forehead thermometer. If patient present with fever (>100.4 F =38 C) and/or respiratory disease symptoms, cough, Chills, Repeated shaking with chills, Muscle pain, Headache, Sore throat, New loss of taste or smell, their elective procedure should be delayed by 2 weeks.

Table 1: COVID 19 screening questionnaire

Yes	No	COVID 19 Screening Questions
		Do you have any history of fever in last 14 days
		Do you travelled to any COVID 19 affected area
		In last 14 days, have you or your family member come in contact with any known COVID 19 infected patient
		Do you have symptoms Chills, Repeated shaking with chills, Muscle pain, Headache, Sore throat, New loss of taste or smell, difficulty in breathing in last 14 days
		Have you or your family member have history of exposure to COVID 19 infected material

Table 2: Assessment of emergency questionnaire

Symptoms
Do you have pain yes no
Severity of pain mild moderate severe
When did pain started ___ days
Do you have dental swelling yes no
If yes, when notice first notice the swelling _ days

Centers for Disease Control and Prevention guidelines

According to the Centers for Disease Control and Prevention guidelines

- Individuals with suspected COVID-19 infection should be seated in a separate and well-ventilated waiting area at least 6 ft from unaffected patients seeking care. Patients should be requested to wear a surgical mask and follow proper respiratory hygiene, such as covering the mouth and nose with a tissue before coughing and sneezing and then discarding the tissue.
- Use personal protective equipment (PPE) appropriately,

including a fit-tested NIOSH-approved N95 or higher level respirator for healthcare personnel.

- Perform proper hand hygiene, When hands are visibly soiled or After barehanded touching of instruments, equipment, materials, and other objects likely to be contaminated by blood, saliva, or respiratory secretions. Use soap and water for atleast 20 seconds, when hands are visibly soiled (e.g., blood, body fluids); otherwise an alcohol-based hand rub (with atleast 70% alcohol) [41] may be used.
- Limit transport and movement of patients outside of the room to medically-necessary purposes. If transport or movement outside of the room is necessary, instruct patient to wear a mask.
- Prioritize cleaning and disinfection of the rooms of patients on contact precautions ensuring rooms are frequently cleaned and disinfected (e.g., at least daily or prior to use by another patient if outpatient setting) focusing on frequently-touched surfaces and equipment

in the immediate vicinity of the patient. Public areas and appliances should also be frequently cleaned and disinfected, including door handles, chairs, and desks. (mopped with a disinfectant with 1% sodium hypochlorite or phenolic disinfectants but its main disadvantage is irritant to skin and eyes and its unpleasant odour. Hydrogen peroxide can be used as alternative to sodium hypochlorite.)

- Ensure appropriate patient placement in an airborne infection isolation room (AIIR) constructed according to the Guideline for Isolation Precautions. In settings where Airborne Precautions cannot be implemented due to limited engineering resources, masking the patient and placing the patient in a private room with the door closed will reduce the likelihood of airborne transmission until

the patient is either transferred to a facility with an AIIR or returned home.

- To disinfect air and environmental surfaces in dental setup, fumigation can be an alternate method. Chemicals used in fumigation are formaldehyde, phenol based agents or quaternary ammonium compounds. As per CDC, fumigation is not recommended in daily routine basis.
- In India, Ministry of Health and Family Welfare Directorate General of Health Services outlined guidelines for treating Non COVID 19 patients. This includes mandatory to use N-95 mask, Goggles, Latex examination gloves. Face shield is optional and used only when a splash of body fluid is expected.

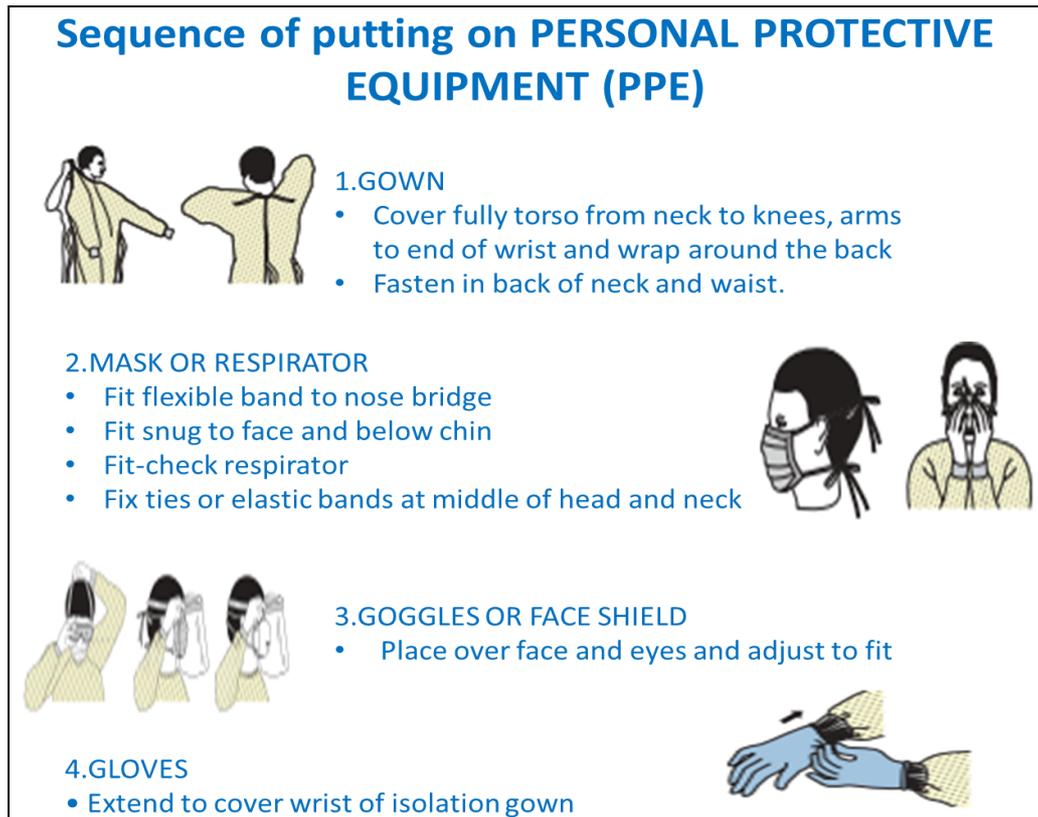
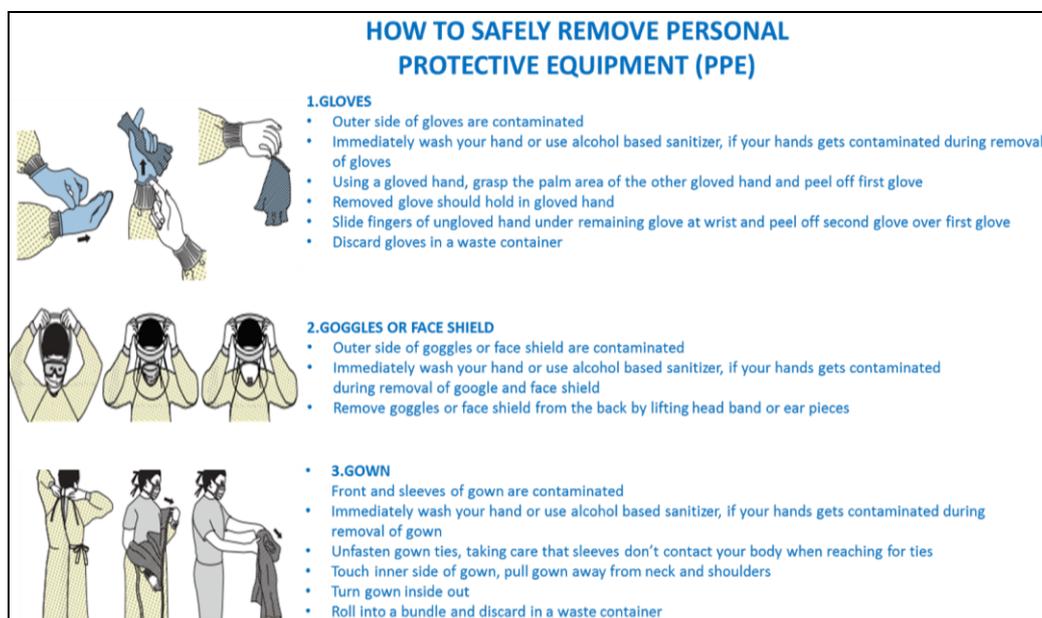


Fig 2: Sequence of putting on Personal Protective Equipment (PPE) (as per CDC guidelines)



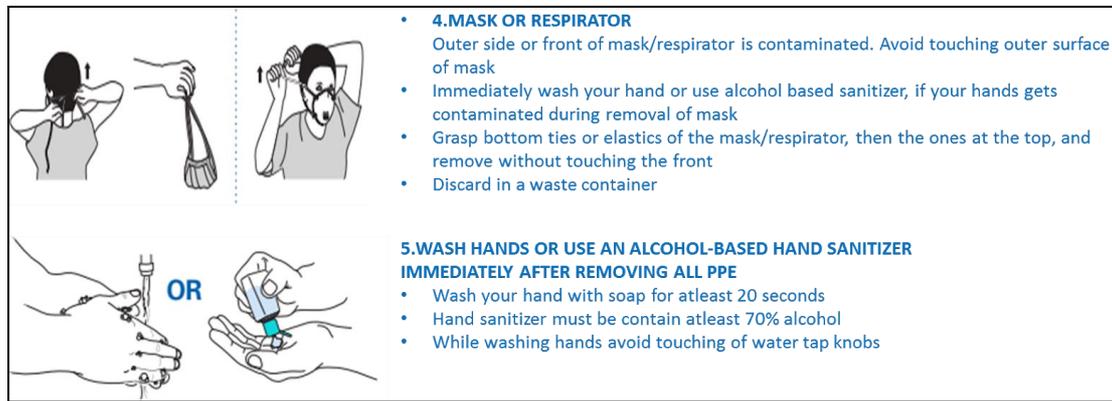


Fig 3: How To Safely Remove Personal Protective Equipment (Ppe)(As Per Cdc Guidelines)

Treatment considerations

- To avoid excess salivation and gag reflex intraoral radiographs must be restricted and extra oral radiographs should be utilized. If intraoral radiographs are mandated, sensors should be double insulated to avoid perforation and cross contamination.
- Aerosol generation must be avoided by using high-volume evacuator's (HVE) large diameter (> 8 mm), which allows removal of high volumes of air in a short time, which reduces the amount of bioaerosols by up to 90%.
- Preprocedural mouth rinse: Previous studies conducted on SARS Cov and MERS states that they are susceptible to 0.2% povidone mouth rinse. or alternative method would be to use 0.5-1% hydrogen peroxide mouth rinse, as it has non specific virucidal activity against coronaviruses therefore pre procedural rinse with 0.2% povidine iodine or hydrogen peroxide mouthwash for 15 sec, may reduce viral load in saliva.
- Use of disposable and single use instruments and devices, this may help in reduction of cross infection risk. If use of disposable instruments is not possible then proper sterilization should be done. For sterilization of dental instruments both chemical method and physical method can be used. In chemical sterilization use of phenols, halogens, aldehydes. In physical method use of dry heat and moist heat is recommended. Moist heat in the form of saturated steam under pressure is the most widely used and the most dependable. The two common steam-sterilizing temperatures are 121°C (250°F) and 132°C (270°F).
- Use of Rubber Dam must be mandatory, as reduce spread of microorganisms, saliva- and blood-contaminated aerosol or spatter. It is documented in literature that use of rubber dam could significantly reduce airborne particles in ~3-foot diameter of the operational field by 70%.
- The dental treatment must be as minimally invasive as possible. If not possible in cases such as root canal treatment and dental restoration and extraction of symptomatic teeth, procedure should be carried out after wearing personal protective equipment.
- For pain management, Ibuprofen should be avoided in suspected and confirmed COVID-19 cases
- For disinfection of air and environmental surfaces in dental setup, fumigation can be method. Chemicals used in fumigation are formaldehyde, phenol based agents or quaternary ammonium compounds.
- For protection of shoes in infected environment, boot

covers should be used. All areas of foot should be covered and boot or shoe covers are snug over your ankle and calf. Try to avoid touching floor or other areas with your hands while putting shoe covers. If your hands contaminated while wearing shoe cover, immediately wash your hand with soap or hand sanitizer.

- Indian Dental Association suggested guidelines for Indian Dental professionals
- Install physical barriers (e.g., glass or plastic windows) at reception areas to limit close contact with potentially infectious patients. Take temperature readings as part of the routine assessment of patients before performing dental procedures.
- Take a detailed travel and health history when confirming and scheduling patients
- Perform only emergency treatment during this pandemic. Reschedule all elective procedures
- Make sure the personal protective equipment being used is appropriate for the procedures being performed.
- Use a rubber dam when appropriate to decrease possible exposure to infectious agents.
- Use high-speed evacuation for dental procedures producing an aerosol.
- Autoclave hand-pieces after each patient.
- Have patients rinse with a 1% hydrogen peroxide solution before each appointment.
- Clean and disinfect public areas frequently, including door handles, chairs and bathrooms.

Discussion

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly infectious infection with an outbreak in China in December 2019. Now, this virus has spread to 215 countries all over the globe with 3,094,964 infected patients. With an exponential increase in infected patients day by day, there are high chances that dentists will treat this subset of the patient population. This review article main aim on general guidelines for the dentist, while treating patients during this pandemic. As outlined in this review, extra precautions are necessary that include careful prescreening of patients and protocols are mandatory to be taken in the treatment of patients with confirmed COVID-19. In addition to increasing the affected populations suffering, this will also incense the burden on hospitals emergency departments already struggle with the pandemic. The lack of awareness can also increase the COVID-19 spread through dental health care setup. Standard or Universal precautions are important to minimize the spread of this virus. Centers for Disease Control and Prevention recommended Universal precautions include Hand hygiene, Use of personal protective equipment (e.g., gloves,

masks, eye wear), Respiratory hygiene/cough etiquette, Sharps safety (engineering and work practice controls), Safe injection practices (i.e., aseptic technique for parenteral medications), Sterile instruments and devices, Clean and disinfected environmental surfaces. But in this COVID 19 pandemic following universal precautions may not be sufficient. So Transmission based precautions are mandatory to be taken to limit the spread of this virus. Transmission based precautions include contact precautions, droplet precautions, airborne precautions. Droplet precautions mainly includes source control by provide mask to suspected patients. Ensure appropriate patient placement in a single room if possible. Use personal protective equipment (PPE) appropriately. Limit transport and movement of patients outside of the room to medically-necessary purposes. Air borne precautions includes source control, ensure appropriate patient placement in an airborne infection isolation room (AIIR), use of PPE and restrict susceptible healthcare personnel from entering the room of suspected patients. Contact precautions includes use disposable or dedicated patient-care equipment, cleaning and disinfection of the rooms of patients on contact precautions ensuring rooms are frequently cleaned and disinfected and use of PPE.

If a patient requires dental treatment, initial screening on the telephone is mandatory. In the initial screening, patient's complete information regarding travel history, epidemiological link, and signs and symptoms is collected. None of these is present, we can treat patient. If travel history and signs and symptoms of COVID 19 are present, first local health officials should be informed about the patient. For suspected patients, elective procedures should be delayed by 2 weeks.

If patients complain of swelling and pain, prescribe antibiotics, and analgesics on the telephone. Even then if suspected patient needs emergency treatment to be performed, it should be taken in a negative pressure room.

Use of personal protective equipment acts like a shield for dental professionals from being infected by COVID 19. CDC recommended proper method for wearing PPE is shown in Fig: 2. CDC, also suggested the proper method for removal of PPE. (Fig 3). Control and Prevention guidelines for putting on and removing personal protective equipment. Due to the severity of this outbreak, there might be a shortage of personal protective equipment. Therefore, it is advisable to use them judiciously and follow the

Centers for Disease Control and Prevention guidelines for N95 respirator use and reuse. Dentists should try to keep the dental procedure as noninvasive as possible because, with the increase in the secretions, there are high chances of dentists for exposure to the virus. One of the disadvantages of dental procedure is the production of aerosols, during this pandemic, there is a need reduction in the production of aerosols. Aerosol production can be reduced by using high-volume evacuator's. Also pre procedural rinse with povidine iodine and hydrogen peroxide decrease load of virus in saliva. Dental health professionals should avoid large gatherings of the patient and their attendants in the waiting area. The dentist tries to convince the patient to arrive on time for dental treatment. Social distancing must be maintained in the waiting area.

Regular Sanitization is key for fighting with COVID-19, so dental clinics should take effective and strict disinfection measures in both clinic settings and public area. Dental instrument should be autoclaved properly. Public areas and appliances should also be frequently cleaned and disinfected,

including door handles, chairs, and desks

Conclusion

In conclusion, dental health care professional have duty to protect their clinic and maintain standards of infection control. With time SARS-CoV-2 threat could become more common infection in the worldwide population. This is predicted to persist in our population as a less virulent infection with milder symptoms, if it follows the same pattern of the other coronavirus infections (ie, SARS-CoV and MERS-CoV). This is important to take proper clinical decisions. Dentists must take care in surgeries and waiting area and lots to prevent infection and cross infection between patient and public to prevent panic while promoting the health and well-being of our patients during these challenging times. The guidelines developed in article are general guidelines and the final decision always rests with the practitioner's judgment.

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