



## Review Article

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# Covid 19 Gadgets and Equipments for A Dental Clinic-An Overview and Update

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## Abstract

COVID-19 is a viral disease caused by a specific variant of corona virus family which had started in Wuhan province of China in December 2019 and became a pandemic now. This virus is of zoonotic origin and continued its spread through human-human transmission. One of the serious suspected route of transmission is through the droplets and also air which makes the dental professional highly vulnerable, who most commonly deal with saliva related treatments and to be therefore, more responsible in avoiding or reducing cross infection/ nosocomial infection. This literature overview provides the information about the current armamentarium and gadgets requirements in a dental clinic so as to enable practicing dentists to follow the preventive protocol recommended for COVID-19 recommended by various dental organisations.

**Keywords:** COVID 19; Infection control; Dental clinics; Dentists; Air filters; Personal protective equipment

## Introduction

The novel corona virus is the main cause for the current pandemic worldwide. Infection with this virus leads to severe acute respiratory illness [1]. It is an enveloped single stranded RNA virus, spherical in shape, has a crown like appearance, measures about 60-140nm diameter and belongs to family Coronaviridae [1,2]. Because of its similarity in the morphology, characteristic spread, clinical manifestation and mortality rate with SARS COV and MERS COV corona viruses it was named as SARS COV2 and its associated disease as COVID 19. On January 30th,2020, WHO announced the COVID situation as a Public Health Emergency [1].

Once the infection occurs, the clinical manifestations may include fever, non-productive cough, myalgia, fatigue, diarrhoea, anosmia [2]. Depending upon the age, presence of co-morbidity, the severity of infection may vary from mild fever, cough till organ dysfunction and even death [2]. The path of infection can be of three types: Air borne (Droplets), Direct contact, Aerosol [2,3]. We, the dental professionals share an infectious environment due to aerosol

production and duration of our dental procedures [4]. The mean surgical period of dental procedure is calculated as 2 hours and the survival of viral particles in aerosols is at least 3hours to 9 days which paves the way for this viral disease to become a nosocomial infection from a dental set up [5].

This COVID 19 disease had changed everyone for a challenging lifestyle and the dentists have their specific role in preventing the cross infection by upgrading the dental clinic. This literature overview provides some valuable information about the requirements for the upgradation of dental set-up in this COVID 19 era.

## Disinfection of Dental Set-up and Equipments

Cleaning and Disinfection of dental operatories prior to and after daily work, and in case of major splash in between the dental procedure is mandatory. Cleaning alone will not be a sufficient job to destroy microbes. Presence of organic matter in the surface will

interfere with action of disinfectant. Cleaning enables the removal of organic matter. Disinfection should be done to get rid of microbes. So, it is a two-step process. Cleaning can be done with a detergent. Disinfection can be done by the following methods.

1. Natural ventilation
2. Air filtration
3. Chemical defogging
4. Irradiation

### Ventilation

Natural ventilation with minimum 6 air changes (ACH) of 60 min (recommended by CDC) [4]. Positive air flow across the room should be created with adequate inlet and outlet. Additionally, exhaust fans can be used for mechanical ventilation [6]. If aerosol generating procedures is needed for a suspected COVID 19 patient, it should be done in a negatively pressured room or air borne infection isolation room (AIIR) [6,7].

### Air filtration

Purification of air helps in reducing the viral load [3,5]. Devices specifically made for purification of air aids in filtration of dust, microbes and other air borne particles of extremely small size through its various channels such as carbon activated filter, UV light layer, photocatalyst, ionisers. It also removes volatile gases efficiently. Depending on particle size filtering capacity of an air filter, it may be of two types, HEPA (high efficiency particulate air) filter and ULPA (ultralow particulate air) filter. These air filters are made up of borosilicate glass fibers. Compared to HEPA, the ULPA filter have hard medium. The filtration capacity of HEPA is 99.97% up to a size of 0.3microns and ULPA is 99.999% up to a size of 0.12microns. to mention a few of them are Dr. Aeroguard (EUREKA FORBES), Atmosphere mini (AMWAY), Air concept, BGM PRION-CID (WIESPL).

### Disinfectants

Chemicals such as chlorine, sodium hypochlorite and alcohol-based compounds that are recommended against SARS COV-2 can be used for surface disinfection. Dry environment should be ensured to limit the viral spread as the corona virus may live up to a week in a humid environment. After every patient visit or 2hourly surface disinfection can be done with 0.1% Sodium Hypochlorite, 0.5% Hydrogen Peroxide or 70% Ethanol by mopping [4,5]. The contact time should be at least 10 minutes [4]. Disinfection of operatories can also be done by spraying or fogging of disinfectant. Alcohol based compounds can be used for small surfaces and in well ventilated areas as it is flammable, and its use may cause discoloration swelling and hardening of plastics. Hydrogen peroxide and Benzalkonium chloride can be used for waterlines [4]. Sodium hypochlorite should be used with caution as it may cause corrosion and rusting. Chlorine dioxide is an oxidising

agent acts by protein denaturation. It can be effectively used as disinfectant, germicide and sporicide at a concentration of 0.5 to 10 ppm. Cholritab (tablet), Bio-tab, Rapi-G are some commercial sterilization products.

### Irradiation

Among the Ultraviolet spectral range, short wavelength UVC (100-280nm) has germicidal effect [5,6,8]. The far UVC (222nm) is found to be effective against SARS COV2 Viruses by a process called photodimeration, especially when comes into direct contact in air it damages DNA or RNA that lead to its inactivation. This is very helpful in dental aerosol generating procedure [9]. UVC is totally absorbed by atmospheric ozone, has minimal penetration to the surface of the earth and thus has little effect on human health such as mild irritation. preset timer should be used to avoid exposure [8,9]. There are numerous studies which show that UV C can be very effectively used to sterilise PPE including coverall, N 95 masks. The effectiveness of UVC depends on dosage, duration and distance. it reduced to one fourth, as the distance doubles. UVC not more than 252 nm with 40 W bulb for 100 sq. ft for at least 10 minutes can be used in combination with 6 ACH ventilation [4]. Ventilation increases the effect of radiation. Commercially available products are Steriline+(CONFIDENT), Pyrotech, Self-check KIOSK, SAMSON.

### Precautions Before Starting A Dental Procedure

Patient who needs treatment should be screened through the phone call and history should be noted by asking objective questions like travel history from affected countries or from containment areas, for presence of fever or cough, pain along with dental complaint through telescreening and triaging [4-6] with the aid of this history dentists can decide whether patient needs to visit dental clinic. then appointment should be scheduled. Patient should be asked to bring one attender if needed and advised to wear a face mask. On appointment we should provide sanitizers for hand hygiene and social distancing should be followed in the waiting room [4]. Precautionary steps to be followed with

1. Sanitizers
2. Infrared forehead thermometer

### Sanitizers

Hand hygiene measures are recommended as a main protective tool for SARS-CoV-2. Sanitizers can be used for preventive reasons when patients are entering the dental clinic and for dentist in between the procedures [4]. Hand sanitizers are commonly quarternary ammonium compound based or alcohol-based products. WHO suggests alcohol-based sanitizer to be used for infection control against COVID-19. Two formulations for sanitizer recommended by WHO are 80% ethanol and 75% isopropanol as active components. H2O2 (Sporicide) and Glycerol (Humectant) added to both formulations. Foot operated hand wash and sanitizer dispenser are more preferred [1].

## Thermal screener

Once the patient enters the dental clinic body temperature of the patient should be checked with a non-contact infrared thermometer (ZEBRONICS, INDIA ; IKB VASTRA; UNI-T:UT30R; KK DENTAL EQUIPMENTS AND TRUST DENTAL, CHENNAI). Temperature measurement can be one part of the assessment to determine if a person has an elevated temperature potentially caused by a COVID-19 infection to limit the spread of infections [4]. Further diagnostic testing must be needed to confirm the disease.

## Pre-procedural mouth wash

The way to reduce the viral load is the mouth rinses [4]. Therapeutic mouth washes can be used to inactivate viruses in oral cavity but there is no evidence against the viral replication especially SARS COV-2. So, prior to dental procedures using mouth washes such as chlorhexidine (0.12%), cetylpyridium chloride (0.05%) reduces the spread of active viruses in aerosols. The effect of mouth wash seems to be valid till 2 hours only [10].

## Recommended precautions to be followed during the dental procedure

Most of the operatory procedure performed in dental office generates aerosol which contains smaller infectious particles. So, one should be careful and personally protective by using Personal Protective Equipment (PPE) that includes a gown, goggles, facemask, face shield, shoe cover. The cross-contamination by aerosols produced during procedures can be reduced by rubber dam, suction devices and anti-retraction hand-piece (CONFIDENT DENTAL).

## Personal protective equipment (PPE)

PPE acts as a physical barrier for health care professionals and reduces the risk of COVID-19 infection

**Eyewear (goggles) and face shield:** Eyes, nose and mouth are the organ that mainly plays a role in the route of transmission. Eye wear is used to prevent the transmission through conjunctiva [5,6]. Eye wear and Face shields should be regularly disinfected in between appointments [7]. Recently combined goggles and face shield is available that protects the eye against splashes, designed with specific cylindrical lens and indirect ventilation. Eg: Kleenguard

**Face mask:** A surgical mask is sufficient to filter and prevent infection for the wearer, but it is loosely fit which may lead to small particle entry [7]. National Institute for Occupational Safety and Health-certified N95, European Standard Filtering Face Piece 2 (EU FFP2), or equivalent can be used to safeguard not only the wearer but also patients and dental auxiliary staff [11]. These N95 type of masks fits around the nose and chin and very useful during aerosol generating procedures. EU FFP3 respirators are available which advanced and higher level of protection and can be used at times handling the suspected and confirmed cases of COVID-19.

Infectious Disease Society of America (IDSA) recommends use of either surgical or N95 respirators and at time of crisis N95 respirators can be used after reprocess. It is also advised to cover with a surgical mask over reprocessed N95 respirator. Now battery powered mobile air purifier mask with four layered filtering elements is commercially available [11,12]. Eg: Air concept.

## Patient related

### Rubber dam

Rubber dam isolation aids in covering the throat and nose. Using rubber dam reduces the aerosol production and prevents the particles from entering lungs [6]. Along with the use of mouth rinse and extra oral evacuation system, rubber dam isolation provides 98% effectiveness against cross contamination [5,13].

### Suction devices

Salivary low volume suction device can be used but salivary ejector alone is not very effective in evacuation of dental aerosol against COVID-19 [14]. High volume evacuators can be used as it will remove the air at a rate of 100 cubic feet/minute (approx).m it should be held at a distance of 6-15 mm from the tip of hand piece [5,6,14].

### Rotary instruments

Water lines should be irrigated with hydrogen peroxide for at least 1 minute after each patient and procedure [4]. High speed air turbine dental hand pieces generates aerosols and when foot control is released back flow of contaminated water will occur that leads to cross contamination [15]. In such cases anti retraction hand pieces can be used to avoid back flow of air and water [5,6]. In general, micromotors and electric friction-grip hand pieces generates less aerosols than air turbine systems [2,15].

## Discussion

The rapid spread of the SARS COV-2 made its part in every field and changed the life trend. Dentistry also has to face its own challenges. As a dental professional we have to overcome the situation by making certain modifications in the clinical practice. The knowledge about COVID-19 its spread, route of transmission, mode of action and its potential effects should be known. The latest updates regarding the viral infection from World Health Organization (WHO) [16], recommendations given by various organizations such as Infectious Disease Society of America [17], Center for disease Control (CDC) [18], various federal resources [19,20], against the spread of infection should be implemented in our clinical practice.

We should be well-versed about mode of action and structural morphology of the corona virus and infection control measures and products used for infection control and their mode of action. If needed informed consent should be obtained from the patient during treatment. Use of protective equipment's and measures such

as wearing face mask, hand hygiene, role of mouth wash should be explained to the patient. Thus, upgradation of our dental clinic with appropriate equipments and following the WHO protocol post COVID-19 will let us survive in our dental practice.

## Conclusion

The need of the hour is to ensure zero infection for the practicing dentist, the dental auxiliary staffs, and the visiting patients. Asymptomatic and noninfectious patient selection for treatment should be based on proper screening procedures discussed above and the associated medical, dental, and travel history of patients.

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## Conflict of Interest

The authors declare no conflict of interest.

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