Review Article

Infection Control In Dental Office During Covid-19 Pandemic

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Abstract

The recent emergence of the coronavirus disease linked with SARS-CoV-2 and its severe acute respiratory syndrome (SARS-CoV-2) has alarmed the public health community on a global scale. Despite attempts made to control the disease globally. Because of the manner in which this sickness spreads within the community, the outbreak is continuously growing. Similar to other coronavirus infections, this zoonotic infection is thought to have started in bats and pangolins before spreading to people. While within the human body, the SARS-CoV-2 coronavirus is highly prevalent in the nasopharyngeal and salivary secretions of infected individuals, and its primary mode of transmission is believed to be respiratory droplet/contact. Endodontists and other dental practitioners may encounter patients who have SARS-CoV-2 infection that is either suspected or confirmed, and they will need to take prompt action to not only treat the patient but also stop the nosocomial transmission of infection. This article's goal is to offer a succinct review of the epidemiology, signs, and transmission routes of this unique virus. Also, particular suggestions for patient screening, infection control methods, and patient management protocol are made for dentistry practises.

Keywords : Covid infection, respiratory tract, infection control

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Introduction

Cross contamination must be eliminated in dentistry in order to ensure the general safety of both patients and staff. Despite the minimal overall risk, the effects could be disastrous. It's true that what we can't see can harm both us and our patients. In order to eradicate or limit all types of infections, it is our duty as health care professionals to make sure that our settings and activities adhere to established scientific norms. According to Merriam-Webster, an infection is a condition brought on by the presence of a pathogenic agent, such as a bacterium or virus, in or on an appropriate host. The ultimate decision-makers when it comes to our patients' and the dental team's safety is us.[1]

The first cases of COVID-19, a severe acute respiratory illness caused by SARS COV-2, were reported in Wuhan (China) in December 2019. It is a contagious illness that has spread quickly over the globe. The World Health Organization (WHO) classified the Covid-19 outbreak as a pandemic in March 2020. The pandemic has had a significant negative influence on global health systems, economic development, and social advancement. As of 4 December 2020, there had been 64,603,428 confirmed cases of Covid-19, including 1,500,614 deaths recorded to WHO, up from a few thousand confirmed cases in January.[2] The coronavirus that causes Covid-19 is now known as severe acute respiratory syndrome coronavirus 2. (SARS-COV-2). SARS-COV-2, a single-stranded RNA virus with an envelop membrane, protein spike, and nucleic capsid, is the cause of Covid-19.[3]

Because the virus enters host cells via the enzyme Angiotensin converting enzyme 2 (ACE2), which is most prevalent in type 2 alveolar cells of the lungs, the lungs are the organs most impacted by covid-19. The virus attaches to ACE2 and enters the host cell using a unique surface glycoprotein known as "spike".[4] Clinical signs of Covid-19 include fever, cough, myalgia or lethargy with an abdominal chest CT scan. Less frequent signs include sputum production, headache, hemoptysis, and diarrhoea.[5]

Covid-19 is typically spread through direct (cough, sneeze, and droplet inhalation) and contact (contact with oral, nasal, and eye mucous membrane) channels. The analysis of conjunctival samples from confirmed and suspected cases of 2019-n-cov or novel corona virus suggested that eye exposure might provide an effective way for the virus to enter the body, even though common clinical manifestations of novel coronavirus infection do not include eye symptoms. The touch or close contact of contaminated surfaces has also been a direct source of coronavirus indirect dissemination.[6]

A team of dental professionals is regarded as being high risk. Inhaling pathogenic microorganisms that can linger in the air for a long time, coming into direct contact with the conjunctival, nasal, or oral mucosa with droplets and microorganism-containing aerosols produced by an infected person and propelled by coughing and talking at a close range without a mask, using high pressure irrigation systems like hand pieces or ultrasonic scalers, and indirect contact with contaminated instruments and/or environmental surfaces.[7] The presence of virus in saliva (91.7% of patients) makes the dentiss too much vulnerable to contact the disease if appropriate protective infection control protocols are not undertaken.

Although routine dental examinations were discontinued because of concern for the spread of COVID-19, some critical dental issues, such as discomfort, swelling, and infections, still require adequate care and protection. Dentists lead dental teams that are well-versed in the use of standard personal protective equipment, such as complete gowns, N95 masks, protective eyewear, gloves, and face shields, as well as various cross-infection prevention techniques and risk analysis. While these issues have gained attention throughout the epidemic, there has been confusion about the best personal protective equipment (PPE) and working methods.[8] To stop the spread of the Covid-19 infection, all dental healthcare providers should adhere to the most recent infection control recommendations issued by the WHO, the American Dental Association (ADA), and

the Centers for Disease Control (CDC). These recommendations' primary suggestions concern personal protective equipment and transmission routes. To stop the spread of COVID-19 in dentistry, patient screening, dental office sanitation, and instrument sterilisation all play crucial roles. The danger of disease transmission can be reduced if the regulatory authorities' guidelines are carefully followed.[6]

Infection control in dentistry

All healthcare professionals have a moral obligation to follow infection control concepts and procedures. The same is true of dentistry. Because oral commensals and opportunistic pathogens may be present in patient saliva, infection prevention is crucial in dentistry. Moreover, it can harbour particular infections both during the carrier stage and the infection, including SARS-CoV-2. Exposure to blood and saliva aerosols is unavoidable because of the nature of dental treatments. Direct contact with environmental surfaces, tools, and equipment that have been polluted by fluids also has the potential to transmit pathogens. The danger of infection transmission in a dental office extends to the patients, the dentist, the dental assistant, the administrative and processing employees, and the personnel who handle the instruments. Hence, the CDC has historically advised step-by-step infection control methods, and nations around the world have developed unique country-specific guidelines. These infection control strategies were developed with an understanding of the cross-contamination and infection chain. Six categories can be used to group infection control strategies.[9]

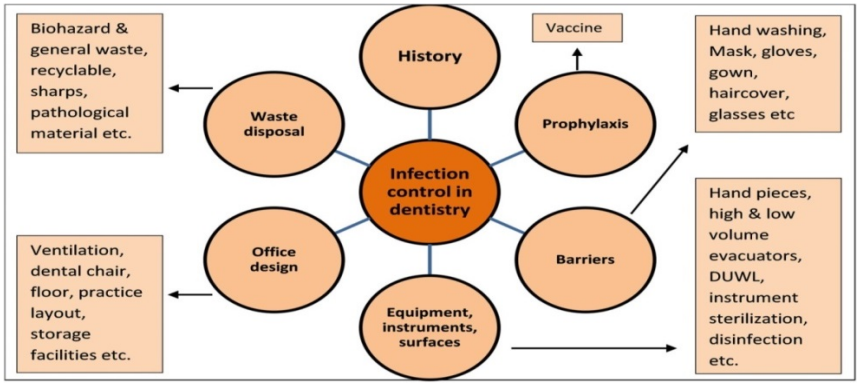


Figure 1: Infection Control Strategies

Route of Transmission

There are two main channels through which this new virus spreads. Both of those paths are, in fact, thought to be common transmission routes. The second route, known as the contact route of transmission, is thought to be different from the first routes because it involves contact with the oral, nasal, and eye mucous membranes. The first route, known as the direct route of transmission, includes the direct way of transmission through coughing, sneezing, or even droplet inhalation transmission. Although the eye is not among the typical clinical symptoms of new coronavirus infection, the study produced a different conclusion. The COVID-19 conjunctival

samples taken from infected and suspected patients revealed that this virus may also view eye exposure as a useful route for entering the human body in addition to the respiratory tract as a mode of transmission.[10]

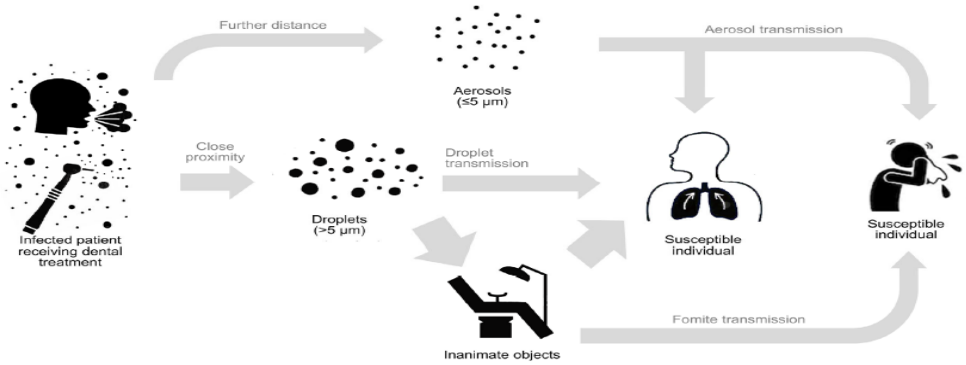


Figure 2: Different routes of transmission in dental setting: aerosol, droplet, and fomite

Transmission in dental office

When performing dental procedures with a high speed hand piece, friction between the tooth and the rapidly rotating bur would create excessive heat. Without a coolant, the heat could cause damage to hard dental tissue and lead to pathological changes to the dental pulp. Therefore, to prevent heat gain, it is a universal consensus to use a water coolant when performing dental procedures, including tooth preparation, oral prophylaxis, and oral surgery. The water coolant, however, could generate aerosols. Bio aerosols are produced when body fluids in the oral cavity, such as blood and saliva, are mixed together. These bioaerosols have the potential to float in the air for a long time and be inhaled by the dentists or other patients. They are frequently infected with bacteria, fungus, and viruses. Possible transmission windows are as follows:

- Direct contact with bodily or oral fluids, as it was noted that the virus may remain in the air for an extended amount of time.
- Coming into close contact with blood.
- If dentists come into contact with patient materials, this could pose a risk.
- The potential for oral or nasal mucosal exposure.
- Indirect contact with contaminated (non-sterile) equipment.
- If infected patients cough or sneeze in the clinic's waiting area.

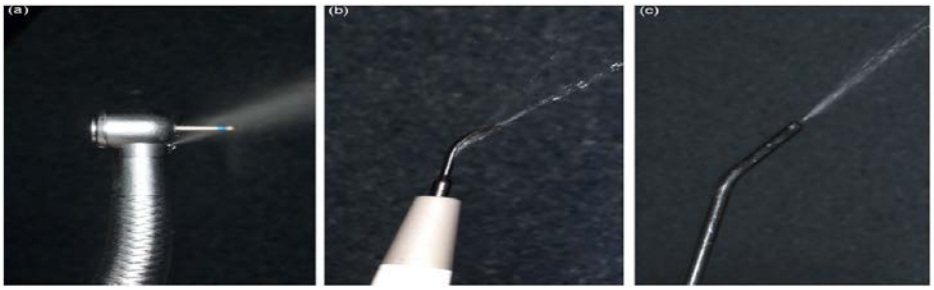


Figure 3: Aerosols generated by dental high-speed handpiece (a), ultrasonic scaler (b), air-water syringe (c)

Transmission	Representative example	Suggested precautions
Droplets	Coughing, sneezing, or talking at short distance	Distancing measures (e.g., in waiting room), surgical masks for at-risk patients, PPE for staff
Airborne	Inhaling aerosols from rotary dental instruments and suspended in the air	Reduce aerosol-producing procedures, N95 respirator masks or FFP3 respirator, saliva ejectors, room ventilation
Direct contact	Unprotected touching, contact with oral fluids, secretions, or contact with body lesions	Wear standard PPE, including eyewear or face shields
Contaminated surfaces	Contaminated hands, contaminated needle or other sharp objects, instruments and surfaces not properly cleaned or disinfected	Frequent hand hygiene, thorough disinfection of all surfaces, sterilization of non-disposable instruments

Figure 4: SARS-CoV-2 transmission routes and suggested precautions in the dental setting

Oral Manifestations of COVID-19

The severe acute infection, its consequences, and therapeutic approaches may all have an impact on oral health in the case of COVID-19. Xerostomia is a crucial factor in COVID-19's detrimental effects on tooth health. The direct impact of SARS-CoV-2 on the salivary glands could be one cause. Mouth breathing brought on by nasal congestion, anxiety, dehydration, and medicine are possible additional contributing factors. Complications with the lower respiratory system and dental health are the results. If xerostomia persists, it may have more serious effects on oral health, such as dental caries, cheilitis, swelling and fissuring of the lips and oral mucosa, ulcerations and/or inflammation on the buccal mucosa and tongue, oral candidiasis, enlargement of the parotid gland, sialadenitis, and halitosis. Oral ulcers, petechiae, and reddish macules, notably on the palate, have been described in a number of case reports. The tongue, lips, and buccal mucosa are additional locations. In children who have SARSCoV-2 antibodies, fissured lips and strawberry tongue are symptoms of the multisystem inflammatory syndrome.[11]

Patient screening and telephone triage

Routine dental procedures should not be carried out during the SARS-COV outbreak due to the increased risk of spreading the infection. Only dental emergencies or urgent dental care should be provided. Uncontrolled bleeding, cellulitis with swelling that could compromise the airways, and facial injuries with possible airway involvement are all considered potentially life-threatening dental crises. During a pandemic, hospital emergency rooms are overburdened, therefore individuals who would normally need hospital services should have access to urgent dental care. It is urgent to get treatment for severe dental pain and disorders including surgical post-extraction osteoitis and third molar pericoronitis. Dentists employ rotating devices like handpieces or ultrasonic scalers with water cooling systems and air-water syringes in their daily work. These devices produce a spray that can be seen and is made up of huge droplets of water, saliva, blood, and germs. It is highly challenging to contain this aerosol production, which has the potential to be harmful. For these reasons, thorough patient screening is required before clients attend the dentist office or clinic. The most effective strategy to stop the disease from spreading inside the dental studio may be to identify affected COVID-19 individuals with poor symptoms

via a telephone survey before they arrive at the dental office.[12]

Primary screening

When making an appointment over the phone or online, primary screening should be done. At this stage, a straightforward questionnaire can be used to assess the patient's status with reference to COVID-19. The key inquiry should be the patient's primary complaint to ascertain whether he or she is a candidate for emergency/urgent dental care, aside from the customary demographic data and medical history. Before the procedure begins, the patients should complete a questionnaire that includes specific COVID-19 screening questions. These inquiries might cover the following topics:

	Questions	Yes	No
1	Do you have fever or experienced fever within the past 14 days?		
2	Have you experienced a recent onset of respiratory problems, such as a cough or difficulty in breathing within the past 14 days?		
3	Have you, within the past 14 days, traveled intercity with a public vehicle (airplane, train, bus)?		
4	Have you come into contact with a patient with confirmed 2019-nCoV infection within the past 14 days?		
5	Are there at least two people with documented experience of fever or respiratory problems within the last 14 days having close contact with you?		
6	Do you have confirmed COVID-19 disease?		

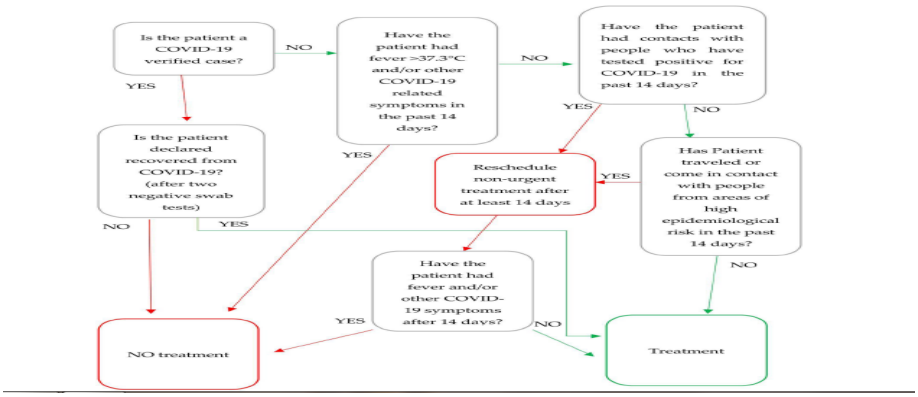


Figure 5: Patients flowchart screening for non-emergency dental care

Secondary screening

Patients should undergo secondary screening when they arrive for a clinical in-office appointment. Before the patient reaches the operating room, a preliminary checkup must be done. Additionally, before entering the clinic, patients should be instructed to put on a surgical mask and adhere to the respiratory system's hygiene rules (using tissues when coughing or sneezing and tossing them in a closed-lid trash can immediately after use) and hand hygiene rules (washing hands with

water and soap or using hand rubs with 70–90% alcohol). Fever is the most prevalent clinical symptom of COVID-19 and is present in 88.7% of patients. Thus, for in-office patient screening, assessing body temperature with a noncontact forehead thermometer or infrared cameras with thermal sensors can be quite helpful. At this point, patients' interviews should be used to confirm the information provided on the questionnaires during the primary screening. Once the emergency or urgent situation is confirmed, only then should dental treatment be given. Using information from the screening questionnaires, three groups of individuals — supposedly healthy, suspected cases, and verified cases — can be ascribed to those who need emergency or urgent dental treatment. For each patient type, separate waiting areas and operating rooms should be taken into consideration. These separate rooms are necessary for the treatment of all patients in typical central dental care clinics. Private practises might not have the necessary resources to treat patients in all three patient groups in an emergency, nevertheless. As a result, their offerings ought to be constrained by the number of separate waiting and operating rooms that are available. It should be emphasised that a normal body temperature does not necessarily exclude the presence of a disease; additional signs and symptoms as well as the answers provided on the questionnaires should be carefully examined. It is thought that patients are more likely to contract COVID-19 if they have underlying systemic disorders.

Figure 6: Checkpoint during temperature measurement with an ear thermometer

Emergency dental care is needed to halt bleeding, lessen pain, and stop infection in situations where the patient's life is in danger. Those representing the urgent dental cases are:

Very painful dental fractures or soft-tissue injuries brought on by trauma; Pericoronitis, discomfort in the third molar region; Postoperative osteitis; Dry alveolitis; Luxations; dental avulsions.

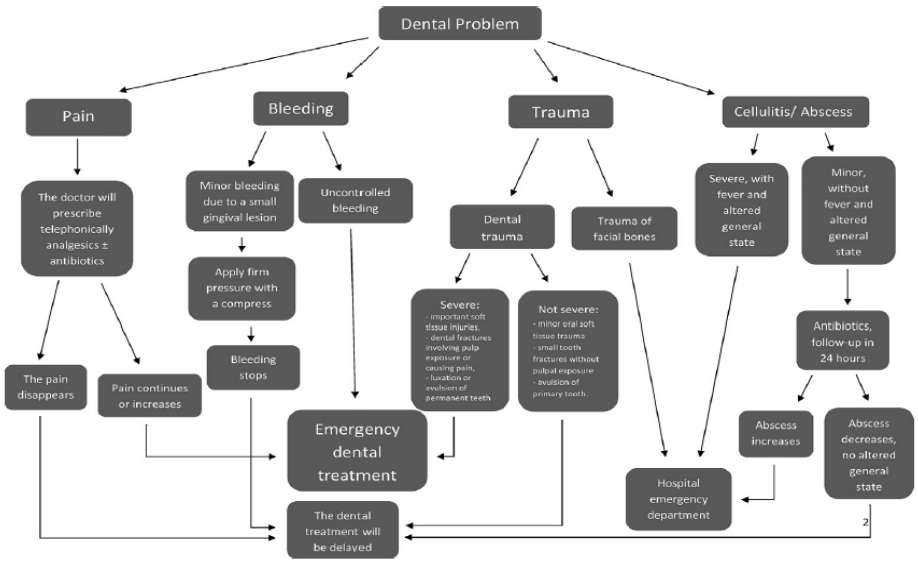


Figure 7: Proposed Dental Treatment

Patient admission and waiting room

Although COVID-19 is primarily spread by personal touch, there are still some worries about its ability to spread through the air. So, it is best to plan patient appointments such that there is just one patient sitting in the waiting area. Nonetheless, three distinct waiting areas for individuals who are confirmed, suspected, and appearing healthy should be taken into account. Negative pressure should be present in any waiting area for COVID-19 cases that are either suspected or proven. As an alternative, such patients should be given access to isolation rooms for airborne infections. The recommended amount of ventilation for dental patients who are asymptomatic and appear healthy is 60 L/s/patient in spaces with typical ventilation. If there are more people than seats in the waiting area, there should be a safe gap between them (at least six feet), or the patient may be required to wait in their car or outside until their appointment time. All surfaces in the waiting area should be regarded as high-risk due to the potential for patient coughing, sneezing, or hand touch to produce droplets that could be contaminated. Thus, it is important to regularly sanitise all surfaces.

As the patient leaves the waiting room and enters the operating room, it makes sense that the chair and the area around it (up to six feet) should be cleaned and disinfected.[13]

- Surgical masks are required for all patients because they shield others from the wearer's saliva and breathing droplets.
- Measure the patient's blood's oxygen saturation with a pulse oximeter.
- Place seats in the reception area at least one metre apart to maintain social distance. Tell the patient to use a mask while they wait in the lobby and to keep their airways clean by covering their mouth and nose when they cough or sneeze.
- Commercial split, centralised, and window air conditioners should not be used unless they have high-efficiency particulate air (HEPA) filters. It is advised to use both mechanical and natural ventilation, including fans and exhaust.

• Front office staff members should converse with patients while keeping at least a metre between them, ideally through a protective screen.
• A quick test (IgG/IgM anti-SARS-CoV-2 detection, rapid PCR kit SARS-CoV) should be conducted in the triage area. If the test yields a positive result, the appointment will be rescheduled for at least 14 days, and competent institutions should be notified. The patient may enter the surgery room if the test is negative.

Figure 8:Social physical distancing dental waiting room

Figure 9:Finger tip Pulse Oximeter

After that, the patient will be instructed to place any bags, backpacks, or coats in designated storage bins or areas. He will be instructed to dispose of the surgical mask in a designated, closed container and to wash his or her hands with a hydroalcoholic solution to sterilise them. The patient is now outfitted with disposable shoe covers, a gown, a surgical mask, and goggles. He or she is then required to wait in the waiting room until their name is called to enter the clinical area. Up to the conclusion of the clinical process, patients must remain in the PPE given.

Environmental cleaning and disinfection

Dentists or dental managers are responsible for making sure the dental clinic is always a secure place for both patients and staff. Door handles, light switches, and other possibly contaminated surfaces can be the site of indirect contact between patients and dental workers and should be cleaned often because SARS-CoV-2 can live on surfaces for up to three days. The WHO and regional organisations all around the world have released and are continuously updating guidelines. EPA-registered disinfectants, such as hydrogen peroxide, quaternary ammonium, sodium hypochlorite, and ethanol at various formulation types and contact times, have been published and qualified under the EPA's emerging viral pathogens programme for use against SARSCoV-2.[14]

Transmission	Representative example	Suggested precautions
Droplets	Coughing, sneezing, or talking at short distance	Distancing measures (e.g., in waiting room), surgical masks for at-risk patients, PPE for staff
Airborne	Inhaling aerosols from rotary dental instruments and suspended in the air	Reduce aerosol-producing procedures, N95 respirator masks or FFP3 respirator, saliva ejectors, room ventilation
Direct contact	Unprotected touching, contact with oral fluids, secretions, or contact with body lesions	Wear standard PPE, including eyewear or face shields
Contaminated surfaces	Contaminated hands, contaminated needle or other sharp objects, instruments and surfaces not properly cleaned or disinfected	Frequent hand hygiene, thorough disinfection of all surfaces, sterilization of non-disposable instruments

Figure 10: SARS-CoV-2 transmission routes and suggested precautions in the dental setting

Table 1: Broad spectrum chemicals for environment disinfection

Disinfectant	Required Exposure Time
70% ethyl alcohol	5 min
Potassium peroxymonosulphate solution (1/100 dilution)	5 min
2.5% sodium hypochlorite	5 min
55% hydroalcoholic solution with quaternary ammonium propionate	5 min

Design considerations to ensure safety in dental practice

Making dental treatment environments safe for patients and the dental team has been a constantly evolving reaction since the COVID-19 outbreak. Masks, aerosol extraction equipment, air filters and ventilation systems, and dental operatory design were among the advancements that addressed redesigning or upgrading of everything pertinent to the safe dental practise. Yet, for the time being, we must rely on preventative measures, as well as reducing and managing the aerosols with what we now have.[15]

Figure 11: Example of infection isolation room

Ventilation and air disinfection of the Dental office

The CDC does not offer guidance on the decontamination of these systems since there has been no proof that live SARS-CoV-2 contaminates heating, ventilation, and air-conditioning (HVAC) systems in buildings potentially exposed to this disease. Yet, they presuppose that ventilation systems should move air in a direction from clean to less clean in their suggestions for proper ventilation system maintenance. The utmost level of filtration efficiency should be achieved, particularly through the HVAC system, and demand-controlled ventilation should only be used sparingly during times when people are present. The ventilation in dental offices should be sufficient to remove contaminated air from the space and replace it with clean air. It is strongly advised to utilise air purifiers with HEPA filters or higher, with a filtration efficiency of 99.995% for particles smaller than 0.01 mm, especially during and right after an aerosol-generating procedure for the patient. The two most frequently utilised equipment are the inexpensive high volume evacuator (HVE) and the pricey high efficiency particulate arrestor (HEPA) filters to remove or filter contaminated air in treatment zones.

Disinfection by fogging with hydrogen peroxide

A common method of disinfection called fogging involves distributing small particles of the disinfectant into the airstream. Thereafter, a mist of different biocides is released into the space, depending on the formulation. Incubators, medication carts, laboratory cabinets, rooms, pharmaceutical sections, operating rooms, isolation rooms, intensive care units, and general medical wards are just a few confined spaces where hydrogen peroxide is commonly advised for everyday use. Reactive oxygen species (ROS), which attack vital biological components including DNA, lipids, and proteins, are produced by the hydrogen peroxide solution, which is based on pure water and is activated by plasma. It coats the surfaces in the room and functions as an oxidising and disinfectant. The substance has antibacterial, antifungal, antiviral, and antisporicidal properties. In comparison to its liquid form, hydrogen peroxide is a more potent antibacterial agent in its gaseous state. An experienced individual should operate the fumigator. This process takes a lot of time and costs money.[16]

Figure 12: Hydrogen peroxide fogging

In hospitals, labs, and dental offices, ultraviolet (UV) radiation has been used for almost 50 years to eradicate airborne bacteria. The majority of bacteria and viruses that have been investigated so far respond to UV decontamination. While research on other coronaviruses, like SARS-CoV and MERS-CoV, have demonstrated their susceptibility to this sort of radiation, SARS-susceptibility CoV-2's to UV has not yet been thoroughly examined. By interfering with DNA base pairing and preventing virus reproduction, UV-C light can destroy viruses. UV-C rays are produced by germicidal lamps. They are intended to lessen the possibility of airborne infections while enhancing the efficiency of manual chemical cleaning, which may leave persistent contaminants on the surface. In the dentist office, the evidence-based perioperative infection control plan should call for complete cleaning in between patients as well as UV-C exposure for 20–30 minutes. Moreover, attempts to reprocess PPE using UV radiation have been made, but no clear technique has yet been established. UV-C lamps are a crucial part of the infection control protocol during the COVID-19 pandemic.[16]

Figure 13: UV Light disinfection

Uv Sterliser : Combination Of Air,Sterliser/Sanitizer and Purifier

With a sophisticated filtration system and a sterilisation reactor chamber, it combines the functions of an air steriliser and purifier. The major goal of this system is to deliver an environment that is entirely safe and clean, disinfected air. With removal rates of SO2:99% and NO2:98%, respectively, it will aid in the elimination of VOCs, offensive odours, hazardous gases, ultra-fine particles, and most critically, airborne lethal bacteria and viruses. It eliminates viruses such as polio, corona, and influenza. It sterilizeazăs difficult-to-disinfect fungi as well as respiratory viruses. It operates via the photo catalytic oxidation method, which is the most extensively used (PCO).

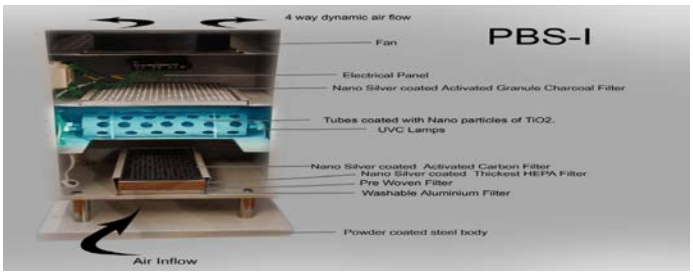


Figure 14: UV Sterilizer and air purifier

Table 2: Prevention and Safety measures in Dental office before and after SARS COV-2 outbreak

	Before SARS-COV-2	During SARS-COV-2
Before appointment	-	Phone-Triage
First appointment	Medical history: systemic diseases, allergies, drugs, smoke, alcohol	Screening: temperature < 37.5°C Medical history: systemic diseases, allergies, drugs, smoke, alcohol Fast blood test IgM/IgG COVID-19/swabs
For dental staff and patients in administration office/waiting room	Social hygiene	Social hygiene Frequent hand washing Hand disinfection with alcoholic gel before entering the operative area Respect the social distancing Communicate through protective partition Wear surgical mask
For dental professionals and dental staff in operative area	Hand washing Work uniform and washable work shoes, surgical mask, surgical cap, eye protection, gloves	Hand washing twice before and 3 times after intervention Hand disinfection with alcoholic gel FFP2 or FFP3 mask, surgical mask, surgical cap, overshoes or washable work clogs, disposable waterproof gown, protective goggles or full-face shield, double gloves
Hygiene oral cavity (for patients)	Brush your teeth Mouthrinse with chlorhexidine before starting the visit with the specialist for one minute	Brush your teeth Mouthrinse with 1% hydrogen peroxide or 0.2% povidone for one minute Mouthrinse with chlorhexidine before starting the visit with the specialist for one minute

Dental procedures	-	Extraoral x-rays Early isolation with rubber dam Reduce aerosol making procedures Use disposable instruments as much as possible High volume aspirating system CAD/CAM dental records or traditional dental records made of disinfectable synthetic material
Hygiene dental Office	Air exchange after dental operation Normal cleansing and disinfection of the dental unit	Air exchange after dental operation Air exchange equipment with air purification and air sanitization Extraordinary cleansing and disinfection with ethanol/sodium hypoclorite of all surfaces of the operating areas for every patient

Table No. 3: Specialily Wise Do's And Don'ts For Safer Dental Practice Procedures

Speciality	**Allowed**	**Not Allowed**
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.nScaling and root planing. Planned periodontal surgery and implant surgery.
Oral Pathology	Hemogram for emergency dental extractions.	Hemogram for elective surgical procedures.
Prosthodontics	Minor adjustment/occlusal equilibration in the existing complete/partial denture. Removal of crown/fractured segment of prosthesis. Recementation of dislodged crown / bridge. Removable complete/partial denture insertion.	Biomechanical tooth preparation for receiving crown/bridge. Placement/removal of dental implant. Impression making for removable/ fixed prosthesis. Removal of faulty prosthesis/ complicated crown/bridge.
Oral medicine	Medicinal treatment of oral precancerous lesions	Intraoral periapical radiographs. Extraoral radiographs and cone-

and radiology		beam computed tomography except in case of emergency
Conservative dentistry and endodontics	Caries hand excavation and dressing Glass ionomer restoration in cervical abrasion Emergency root canal opening if swelling/abscess/pain in tooth Recementation of inlay	Airotor/Aerosol use for any procedure except emergency RCO Surgical endodontics Ultrasonic use in endodontics
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
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
Oral and maxillofacial surgery	Suturing of bleeding wounds Incision and drainage of severe space infections 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

Table No. 4: Dental Practice Modification During Covid-19 Infection

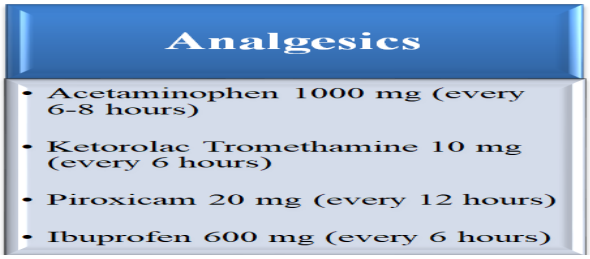
Speciality	Practice Modifications
Oral medicine and Radiology	Perform OPD procedures only Radiology section to cater only extra oral radiography. Intraoral radiographs-double barrier technique

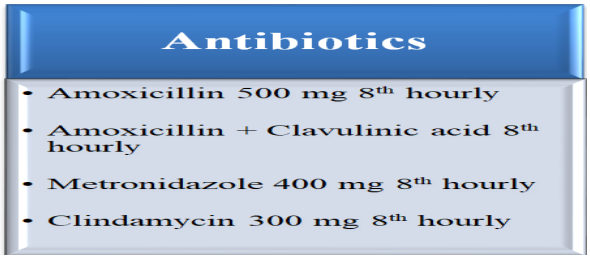
Prosthodontics	Preprocedural mouth rinse with 0.2% povidone iodine, or 1% hydrogen peroxide before crown preparation. Use high vacuum suction tips during tooth preparation. Use disposable airotor or anti retraction handpiece. Disinfection of dental impression using appropriate disinfectants (glutaraldehyde, sodium hypochlorite, or CHX for 10 min). Disinfection of cast by disinfectant spray, immersion in proper disinfectant solution, or incorporation of disinfectant in stone at the time of mixing.
Conservative dentistry and Endodontics	Preprocedural mouth rinse with 0.2% povidone iodine, or 1% hydrogen peroxide. Use of rubber dam. Use hand instruments for caries excavation. Use high vacuum suction tip. Use disposable airotor or anti retraction handpiece
Orthodontics	Bonding the metal brackets using dual cure GIC. Microetching or Sandblasting technique can be employed to modify enamel surface for bonding without etching. Self-etching primers eliminate rinsing and drying steps. Crystal bonding techniques and laser etching may cause aerosols.
Pedodontics	Use hand instruments for caries excavation. Use high vacuum suction tip. Use disposable airotor or anti retraction handpiece.
Oral and maxillofacial 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. Use high vacuum suction tip. Use hand instruments for scaling.

Pharmaceutical therapy

Those suspected of having COVID-19 who are found throughout the screening process are advised to receive pharmaceutical therapy, which includes antibiotics and analgesics, to somewhat relieve their symptoms. Therapeutic interventions ought to be put off until recovery, ideally.

It should be emphasised that in order to use safer pharmaceuticals, pharmaceutical therapy should be based on the most recent, updated information. Ibuprofen is allegedly contraindicated for COVID-19 patients because it interferes with immune system function, according to certain claims.





Personal Protective Equipment (PPE) For the Dental Professionals

The airborne droplet is the main method of transmission in hospitals and dental offices. Thus, all protective barrier equipment is strongly advised for all dental teams in the clinic or hospital during the COVID-19 epidemic period. Protective glasses, medical hand gloves, a medical cap, a medical face shield, a medical face mask, and specific medical protective suits are all included in the kit. It was noted that the face shield's proper use depends on its use indications. The most practical eye protection from splashes comes from properly sized, indirectly vented goggles, although face shields are preferred over goggles for preventing infectious agents from getting into the eyes. In order to prevent airborne transmission, a study suggested utilising N95 respirator masks or FFP3 respirators in addition to room ventilation. The following precautionary measures are advised in three tiers (according to the level of risk) based on the likelihood that COVID-19 disease may spread.[10]

The patient's and the staff's protection from COVID-19 is greatly influenced by the indications and proper application of Personal Protection Equipment (PPE). All dental health workers working in the operatory should be required to wear masks, shields, goggles, disposable caps, gloves, and protective apparel because aerosols and droplets are frequently used to spread airborne infections and are abundantly produced by dental and ultrasonic handpieces. Surgical masks are advised for individuals who do not interact with patients directly (such as office staff), while chair side employees are required to wear N95 masks.

Protective Eyewear and face shields

As infectious droplets could easily contaminate the human conjunctival epithelium, it is clinically obvious that COVID-19 may also be spread via contact with the mucous membrane of the eyes. 23 Protective eyewear, goggles, or a disposable or reusable face shield that covers the front and sides of the face should be used during treatment to shield the eyes from aerosols and debris formed during dental procedures. For the purpose of preventing the aerosol created during dental treatment, the face cover should extend up to the chin. Before each usage and in between patients, reusable eye protection must be washed and sanitised in accordance with the manufacturer's recommendations. After use, disposable eyewear should be thrown away.[11]

Appropriate mask

The common surgical mask, often referred to as the fluid-resistant surgical mask, forms a barrier that shields the nose, mouth, and respiratory system from splashes, big droplets, and other fluids. It is not resistant to tiny airborne particles and is loose-fitting. In aerosol-generating processes, the respirators, also known as N95 masks in the United States and filtering face pieces (FFP)

in the United Kingdom, shield the wearer from tiny airborne particles. FFP-3 respirators are advised for use during aerosel generating procedures, according to National Health Service guidelines. For level 2 PPE during non-aerosol producing procedures, FFP-2 respirators are advised. The N95/FFP3 mask features pores that are roughly 0.3 microns in size compared to the typical surgical masks' 2-10 micron pores. The coronavirus has a diameter of around 0.12 microns, while the droplets have a diameter of about 3 to 50 microns, therefore using a N95/FFP3 respirator can filter out 95 to 99.9% of all particles up to 0.6 microns. At least once a year, every dental personnel should go through fit testing and training for the selected type and size of the respirator mask. Every time a physical condition changes, such as a large weight gain or reduction, a new set of dentures, facial surgery, or scars, a respirator must be retested to ensure that it will still seal well to the face.

Table No. 5: Aerosol filtration percentage and internal leak rate of FFP masks

Type of masks	Specifies
FFP-1	Aerosol filtration percentage : 80% minimum Internal leak rate : Maximum 22%
	Aerosol filtration percentage : Not less than 94% Internal leak rate : Maximum 8%
FFP-3	Aerosol filtration percentage : Not less than 99% Internal leak rate : Maximum 2%

Hospital gown

A hospital gown is a crucial piece of personal protective equipment (PPE) that is needed when caring for patients, especially if they are suspected of having a contagious disease. For blood-borne diseases, such as surgical gowns, surgical isolation gowns, and nonsurgical gowns, hospital gowns can be split into two primary categories (coverall gowns and nuclear protective gowns). The best option for protection against the COVID-19 so appears to be coverall gowns that guard against airborne infections. When a patient enters the care area, members of the dental team should be wearing a clean, sterile, long-sleeved gown and gloves. Also, if there is a chance that the fluid will seep through the gown during specific procedures involving significant fluid volumes, a waterproof apron will be needed. If the gown gets dirty, replace it. Upon leaving the patient room or care area, remove the gown and dispose of it in a designated waste or linen container. After use, disposable gowns should be thrown away. Gowns made of fabric should be washed after each usage.[13]

Hand gloves

When gloves are advised to protect hands from contact with potentially hazardous substances, such as blood and body fluids, non-sterile disposable gloves should be used first (e.g., wound care, aerosol generating procedures). While entering the room of patients with endemic multidrug resistant organisms (MDROs), facilities may think about suspending the use of gloves (e.g., MRSA, VRE, ESBL-producing organisms). Nonetheless, HCPs must wear gloves when it is reasonable to expect that they will come into touch with mucous membranes, non-

irradiated skin, blood, or other potentially infectious materials. Employers are required to make sure that hand hygiene guidelines are strictly followed when HCP are exposed to such MDROs. At intervals where gloves would typically be changed (e.g., when switching from a "dirty" to a "clean" task, between patients), or hand hygiene would ordinarily be carried out, gloved hands must be cleansed using the cleaning techniques outlined in detail below. When there is a significant likelihood of contamination, using two pairs of gloves is recommended as an extra precaution.When any of the following happens with disposable medical gloves: • Visible soiling or contamination with blood, respiratory secretions, or other bodily fluids occurs • Any signs of damage (such as holes, rips, or ripping) or deterioration are noticed • Four hours maximum of continuous use • Doffing previously removed gloves should not be repeated due to the increased risk of contamination and ripping. Consequently, it is not recommended to "reuse" disposable gloves.

Headgear for surgery

To avoid hair contamination during the treatment process, wear surgical headgear or a disposable head cap. Before putting on a head cap, women should carefully tie their hair. After each patient, the disposable headgear should be discarded.

Shuffle Cover

Disposable To avoid bringing contaminated shoes into the dental office, wear shoe covers. After the treatment, it should be thrown away.

Figure 15: PPE Kit

Pre procedural mouth rinse

Preoperative use of antibacterial mouthwash helps reduce oral cavity microbial load. Pre-procedural mouth rinses are recommended by certain guidelines as a precaution to reduce the risk of contamination among dental staff. The American Dental Association (ADA) distinguishes between cosmetic and medicinal mouthwashes. The only chemical or biological use of cosmetic mouthwash is to temporarily control foul breath. Active chemicals in therapeutic mouthwash, which is more commonly used and studied in dentistry, are meant to assist control or lessen diseases like bad breath, plaque, gingivitis, and tooth cavities. Following the use of 15 mL of 0.12% CHX mouthwash, the viral load in saliva reduced momentarily for two hours, according to a clinical trial that examined the effects of

CHX mouthwash on SARS-CoV-2 viral load. It is often advised to use antimicrobial rinses and mouthwashes because they may lessen the viral load of some viruses in oropharyngeal tissues and fluids. Yet it's unclear that mouthwashes will be able to entirely get rid of the viruses.

To separate the surgical site from the rest of the mouth, a thin, square rubber dam made of latex or a synthetic material is utilised.

The value of rubber dams: Isolation, Retraction of tissues, improved access and visibility, enhanced dental material qualities, operator and patient safety, increased operational effectiveness, and decreased operator time. The dental dam is regarded as a model piece of equipment for isolation in the dentistry industry, particularly during root canal therapy. It improves the ability of the dental staff and the patients to effectively control cross-infection. Due to the fact that the dentist and his or her staff will be protected from the risk of those diseases that may be transmitted by the patient's saliva, it also plays a significant part in infection control measures as it helps in the prevention of the spread of the infection that appears in cases of contagious diseases like AIDS and viral hepatitis.

Rubber dams offer primary source protection during dental treatments that produce aerosols and virtually remove all infections that emerge from respiratory secretions. If the rubber dam is properly positioned, the tooth that is receiving treatment would be the only source of contamination. When rubber dam was used during cavity preparation, the spread of germs was significantly reduced by 90%. In all aerosol-generating processes, rubber dam is used. The rubber dam has the drawback that it is impractical for treatments like subgingival restoration and subgingival crown margin preparation that need for subgingival instrumentation.[17]

Dental radiography

Due to the stimulation of saliva release and coughing, intraoral radiography shouldn't be sought. Extraoral radiography, including cone-beam CT or panoramic radiography, can take the place of intraoral radiography.

Minimizing the aerosols

It is advised that dental doctors avoid or use them sparingly while doing treatments that produce droplets or aerosols, such as using three-way syringes, a high-speed handpiece, or ultrasonic scalers. There is evidence that all types of ultrasonic scalers produce significantly more aerosols than hand curettes. The production of droplets and aerosols can be reduced by using rubber dams and saliva ejectors with low or high volumes. The creation of saliva- or blood-contaminated aerosols can be considerably reduced by using rubber dams during aerosol-generating processes (such as the use of high-speed handpieces and ultrasonic scalers). However, it should be noted that a high-volume saliva ejector should be used in addition to a standard saliva ejector in the event of putting a rubber dam. According to the evidence, using a rubber dam to seal up a cavity can reduce the spread of bacteria by 90%.

Waste management

Disposable personal protection items should also be treated as hazardous trash along with all waste produced during the care procedure. The medical waste, which includes needles, gauzes with a lot of blood on them, and pulled teeth, may provide a risk of infection. The non-sharp regulated medical wastes should be contained in a special biohazard bag with a leak-resistant feature. Although sharp objects like unused sterile sharps, scalpel blades, and syringes ought to be kept in puncture-resistant containers marked with a biohazard symbol, such sharp containers. Regulations set forth by the state and local EPA govern the storage and disposal of medical waste. Infectious medical wastes are those produced by the care of patients who have COVID-19 infections that are either suspected or proven. 'Gooseneck' ligation and a double-layered yellow coloured package/bag specifically made for medical wastes should be used to dispose of this group of trash. The surface of the package or bag should be labelled, and it should be disposed of in accordance with the SOP and guidelines for managing medical waste.

Figure No. 16: Waste disposal in different colour coded bags

Conclusion

SARS-CoV-2 is an extremely contagious virus that causes COVID-19, a condition with a wide spectrum of symptoms, from absence of symptoms to ARDS and ultimately death. Both the risk of nosocomial transmission and the risk of dental employees contracting COVID-19 infection are regarded as high. The close closeness to the patient, the presence of saliva, blood, splatter, and aerosol exposure are the causes. Every patient should be regarded as potentially contaminated, and

strict adherence to infection control procedures should be required at all times. The likelihood of SARS-CoV-2 transmission during dental practise can be considerably decreased by effective sanitising measures combined with proper PPE use. Also, this virus is a sly, undetectable foe that can spread in a number of ways. We think that UV-C flow germicidal lamps and equipment with HEPA filters offer further practical means of air disinfection, in line with the CDC's recommendations. The clinical dentistry setting can also make use of equipment that uses hydrogen peroxide fogging and plasma disinfection. Also, additional clinical studies should be conducted to examine the efficacy of current regulations and determine how to strengthen them to create a safe environment for dental practise. All dental professionals and axillaries are advised to stay informed when new scientific information on COVID-19 emerges.

References

1. Amber Ather, Biraj Patel, Nikita B. Ruparel, Anibal Diogenes, Kenneth M. Hargreaves. Coronavirus Disease 19 (COVID-19): Implications for Clinical Dental Care. J Endod 2020 : 1–12.
2. Roberto Careddu, Manuela Ciaschetti, Greg Creavin, Flavio Molina, Gianluca Plotin. COVID-19 and dental practice: overview and protocols during pandemic. Giornale Italiano di Endodonzia 2020 : 34 (00-00).
3. Suraj Arora , Shahabe Abullais Saquib , Nilofar Attar , Sandeep Pimpale , Khwaja Saifullah Zafar , Priyanka Saluja , Anshad M Abdulla , Shaheen Shamsuddin Evaluation of Knowledge and Preparedness Among Indian Dentists During the Current COVID-19 Pandemic: A Cross-Sectional Study.J Multidiscip Healthc 2020 Aug 24;13:841-54.
4. Nitish Mathur, Sanjeev Tyagi, Vartul Dwivedi, Anu Narang, Parimala Tyagi, Kartik S Nath. Dental considerations amidst covid-19 scare. International Journal of Medical and Biomedical Studies; March 2020 : 4(3): 141-5.
5. Matteo Peditto , Simone Scapellato , Antonia Marcianò , Paola Costa , Giacomo Oteri . Dentistry during the COVID-19 Epidemic: An Italian Workflow for the Management of Dental Practice. Int J Environ Res Public Health 2020 May 11;17(9):3325.
6. Khalid Almas , Abdul Samad Khan , Afsheen Tabassum , Muhammad Ashraf Nazir , Ashar Afaq , Abdul Majeed . Knowledge, Attitudes, and Clinical Practices of Dental Professionals during COVID-19 Pandemic in Pakistan. Eur J Dent. 2020 Dec;14(S 01):S63-9.
7. Suliman Y. Shahin, Amr S. Bugshan, Khalid S. Almulhim, Mishali S. AlSharief, Yousif A. Al-Dulaijan, Intisar Siddiqui & Faisal D. al-Qarni . Knowledge of dentists, dental auxiliaries, and students regarding the COVID-19 pandemic in Saudi Arabia: a cross-sectional survey. BMC Oral Health 2020 : 363.
8. MortezaBanker, KamranBagheriLankarani, DanaJafarpour, SedighehMoayedi , Mohammad Hasan Banakar & Ashkan MohammadSadeghi. COVID-19 transmission risk and protective protocols in dentistry: a systematic review. BMC Oral Health 2020 : 275.

9. Mrudula Patel. Infection control in dentistry during COVID - 19 pandemic: what has changed? Heliyon 2020 Oct 30;6(10):e05402.

10. Ahmed Basheer Ayyed. Dental Practice Infection Control Measurements: Coronavirus Disease (COVID-19) Outbreaks. Int J Clin Pediatr Dent. 2020 May-Jun; 13(3): 279–83.

11. Fathima Fazrina Farook,mMohamed Nizam Mohamed Nuzaim, Khansa Taha Ababneh, Abdulsalam Alshammari, Lubna Alkadi. COVID-19 Pandemic: Oral Health Challenges and Recommendations. Eur J Dent 2020 Dec;14(S 01):S165-70.

12. AlessandraAmato , MarioCaggiano , MassimoAmato , GiuseppinaMoccia , MarioCapunzo , Francesco De Caro. Infection Control in Dental Practice During the COVID-19 Pandemic. Int J Environ Res Public Health 2020 Jul 2;17(13):4769.

13. Mehran Falahchai, Yasamin Babaee Hemmati, and Mahya Hasanzade. Dental care management during the COVID-19 outbreak. Spec Care Dentist. Sep 2020 : 19 (10).

14. Spicciarelli, V., Marruganti, C., Viviano, M., Baldini, N., Franciosi, G., Tortoriello, M., & Grandini, S. Prevention and safety in the dental office after Novel Human Coronavirus outbreak: unresolved questions and future directions. J. Osseointegration 2020 :12(2), 145-53.

15. Ghani F. COVID-19 Outbreak and Dentistry: Guidelines and Recommendations for the Provision of Dental Healthcare Services. J Coll Physicians Surg Pak 2020; 30(Supp1):S101-5.

16. Monika Tysiąc-Miśta , Agnieszka Dubiel , Karolina Brzoza , Martyna Burek , Karolina Pałkiewicz . Air disinfection procedures in the dental office during the COVID-19 pandemic. Med Pr 2021 Feb 3;72(1):39-48.

17. Zi-Yu Ge , Lu-Ming Yang , Jia-Jia Xia , Xiao-Hui Fu , Yan-Zhen Zhang. Possible aerosol transmission of COVID-19 and special precautions in dentistry. J Zhejiang Univ Sci B 2020 May :21(5):361-8.