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Review Article

Bioaerosols and Splatters Management in Dental Practice: An Update after COVID-19 Pandemic

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Abstract

Dental experts, dental hygienists, dental partners, and other medical care workers are at risk of contracting diseases due to bioaerosols and splatters from dental instruments including air needles, ultrasonic scalers, and rapid turbine handpieces. Increases in the spread of diseases including influenza A, hepatitis D, and severe acute respiratory syndrome (SARS) are blamed on the usage of sprayers (SARS). There are new worries about the spread of Coronavirus (COVID-19) at a dentistry clinic, where patients and employees are in close quarters and may be exposed to bodily fluids such as spit and blood. The information was translated by include documents that satisfied the inclusion criteria, such as those on spray the board, dental sprayers, dentistry and Coronavirus, dental unit waterlines, pre-procedural mouth flush, high volume draw evacuators (HVE), and CDC regulations. The importance of dental safety and its practical application are discussed, and a variety of methods for its regulation are examined in this article.

Keywords: *Aerosols; COVID-19; Dental Unit Waterlines; HVE; CDC*

Abbreviations

SARS-CoV: SARS Coronavirus; COVID-19: Novel Coronavirus Disease 2019; HVE: High Volume Suction Evacuators; CDC: Centers for Disease Control and Prevention; WHO: World Health Organization; PPE: Personal Protective Equipment; DUWL: Dental Unit Waterline

Introduction

It has been hypothesized that the human mouth is a Petri dish since it hosts more species of microorganisms and more microbial activity than any other part of the human body combined. According to recent studies, distinct types of mouth bacteria may be found in many different anatomical and physiological areas, suggesting that there may be as many as a thousand different bacterial species present in the mouth "(saliva, teeth, gingival sulcus, hard and soft palate, tongue, cheek, lip, and associated gingiva, to name a few). Several types of dental equipment, including air rotor handpieces, ultrasonic scalers, and air-water syringes, contribute to the generation of bioaerosols and spatter during procedures and treatments [1]. Aerosols may linger in the air for extended periods of time in a dental office, putting the health of both staff and patients at danger". Dental aerosols may include disease-causing bacteria, viruses, and other skin-infecting pathogens [2].

In Wuhan, China, the year 2019 ended with a pneumonia pandemic. The cause of the outbreak was never determined. Rapid animal-to-human and human-to-human transmission of coronavirus infections is supported by the available evidence. Novel coronavirus 2019 (2019-nCoV) and coronavirus illness 2019 (COVID-19) are the new designations for both the virus and the illness it causes [3]. The World Health Organization (WHO) issued a "Public Health Emergency" declaration on January 30, 2020, due to rapid spread of the corona-virus and on March 11, 2020 [4], a pandemic was proclaimed (COVID-19). This has led to the epidemic spreading at a frightening pace ever since. Increases in confirmed instances have negative effects on the global economy, population health, and social stability. Several respiratory ailments and even mumps may spread via the air, so it's important to take precautions while traveling.

Standard sterilization procedures and other measures for managing and regulating bio-aerosols and spatter must be strictly adhered to in order to protect the dentist and other dental office employees from the spread of infection, which is especially dangerous given the nature of dental treatment. Students at dental schools are also at a higher risk for developing a sickness or disease and should be taught preventative measures.

This article provides a literature review on the subject of the measures dental professionals may take to limit the spread of aerosols and splatters during dental procedures. Dental aerosols and spatter may transmit infections, therefore I also talk about important causes and illnesses of airborne contamination and several ways that should be seriously considered to manage the infections.

Methods of data collection

Aerosol management, dental aerosols, dentistry and COVID-19, dental unit waterlines, pre-procedure mouth rinse, high volume suction evacuators, and CDC guidelines were used as search terms in an electronic search. PubMed and MEDLINE were combed through for relevant articles.

Inclusion Criteria for articles included the following information:

1. Description of procedures that result in aerosol formation.
2. Microorganisms are found in aerosols.
3. Dental practice in times of COVID-19 and its challenges
4. Management procedures for controlling the spread of infection.

Dental aerosols and splatter

In their aerobiology research, Micik and colleagues initially introduced the phrases "aerosol" and "splatter" to describe the dental environment. To be considered aerosols, a particle's size must be smaller than 50 micrometers [6]. Their construction involves solid or liquid particles that float in the air. Particles may range in size from less than 1 millimeter to more than 100 millimeters [6]. When an aerosol's liquid component evaporates, it leaves behind a "droplet nucleus" that may be contaminated with saliva, dried serum, or microorganisms [7]. Two hours after dental treatment, aerosols have been shown to revert to pre-treatment levels [1-9]. In addition, research shows that droplets may contaminate surfaces from a distance of 1m (3.3 ft) and remain in the air for a considerable amount of time [8-10].

There is some evidence from a small number of studies that aerosolized severe acute respiratory syndrome-coronavirus (SARS-CoV) might travel farther than 6 feet [11]. It is not well adapted to dry environments, several studies have shown that it can live on a surface for a few days and spread, especially when suspended in human secretions [11-13].

Micik and coworkers defined spatter as aerosolized particles with a diameter of 50m or more [5]. Visible to the human eye, splatter consists of a combination of water, saliva, and blood [7]. Patients and dental staff alike are put at risk by the presence of aerosols released during and after procedures due to the large volume of patients treated every day.

Sources of airborne contamination

Various bacteria from the nasal cavity, pharynx, and lungs may be stored in the human mouth. A telltale sign is the constant production of microbe-rich spit. When a person coughs, wheezes, grins, or speaks, they create drops or sprayers, some of which are very large (> 5 meters in width) and others which are quite little (< 5 meters in diameter). While larger droplets fall swiftly inferable from gravity, the beads required for transmission need close, personal contact between a contaminated person and a vulnerable person. Small beads or momentary molecule survivors from evaporated droplets, on the other hand, may float in the air for longer and cover greater distances before entering the respiratory lot or smudging surfaces because to their sluggish settling speed.

Dental instruments, patient spit, exhaled air, and the affected area all pose risks of spreading infection via the air during dental medicine administration. The presence of microorganisms on dental equipment is the primary cause of contamination. Sterilization of dental equipment eliminates all possible germs and bacteria, and routine cleaning of waterlines in dental units eliminates biofilm accumulation in the tubes [5].

Studies have shown that the typical concentration of bioaerosols varies with different methods. Cavity preparation creates the most aerosols (24 - 105 CFU/m^3), ultrasonic scaling provides the most aerosols (42 - 71 CFU/m^3), and extraction and oral inspection produce the least aerosols (9 - 66 CFU/m^3) [1]. The air quality in dental offices has drastically declined as the usage of ultrasonic scalers and turbine handpieces has increased [2]. Larger droplets, being heavier, fall to the ground more rapidly than smaller ones. However, owing to their slow settling velocity, tiny droplets or minute particle remnants of evaporated droplets may float in the air for longer and cover more ground before entering the respiratory tract or contaminating surfaces (Figure 1) [5].

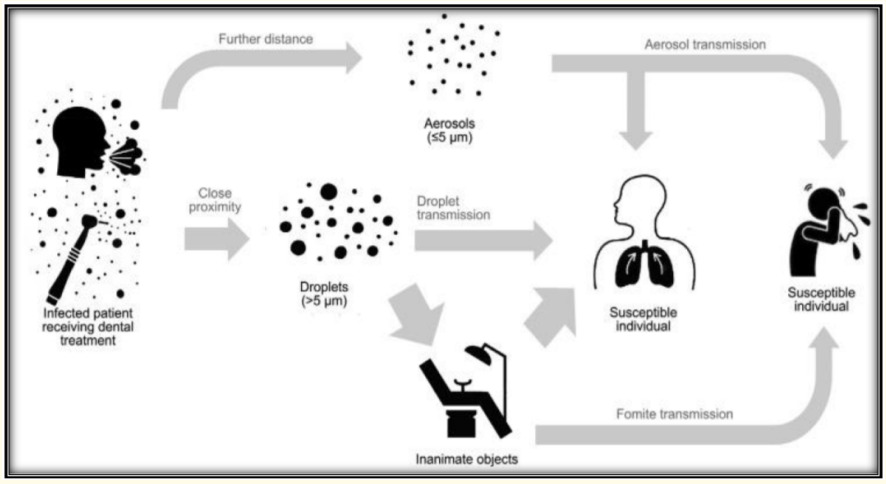

Figure 1: *Different routes of transmission in the dental setting: aerosol, droplet, and fomite.*

Aerosols generated during routine activities

Although the generation of aerosols has been the subject of much attention during the current COVID 19 outbreak, it is important to remember that aerosols may also be produced by everyday human activity (e.g. respiration). About 90% of the particles created by human expiration are < 1m, according to research by Papineni and Rosenthal. The results of Duguid's experiment are shown in table 1 he found that 95% of the particles were smaller than 100 m, with the majority falling between 4 and 8m. Most of the tiny drops come out of the front of the mouth, with some coming out of the nose and the throat as well.

Activity	Number of droplets generated (range)	Region of origin
Respiratory function (for 5 min)	0-few	Nose
Single normal nasal expiration	Few-few hundred	
Laughing (for 1 min)	0-few	Facial region
Counting feebly (1-100)	Few-few dozen	
Counting aloud	Few dozen-few hundred	Oral
A single cough with open mouth	0-few hundred	Oral
A single cough with closed mouth	Few hundred-many thousand	Oral
Single sneeze	Few hundred thousand-few million Few-few thousand	Oral Nasal and facial region

Table 1: *The number of droplets produced throughout human expiration and the region of their origin.*

Aerosol-generating procedures (AGPs) in dentistry

Aerosol-generating procedures (AGPs) are "any medical or patient-care process that results in the creation of airborne particles (aerosols) in the environment" (Table 2). About half (56%) of all AGPs were induced by the use of three-in-one syringes equipped with high-speed handpieces, (43%) by powered (sonic/ultrasonic) scalers, (29%) by the utilization of medium-speed handpieces, and (22%) by the utilization of surgical handpieces. The dental operatory is an exception to the rule that aerosols have a negligible role in the dissemination of SARS-CoV-2 during normal occupational activities. This is because a lot of dental instruments are too hot to use without a constant stream of water splashing over the tip as they work.

Dental procedure	Cause of aerosol production	Methods to minimize aerosol
Ultrasonic and sonic scalers	The cavitation effect of an ultrasonic scaler, utilized in combination with controlled water spray during scaling produces countless airborne particles derived from blood, saliva, tooth debris, dental plaque, and calculus. The incorporation of blood products within the aerosol is more during root planning	High-volume suction Antiseptic mouthwashes
Air polishing	After the scaling procedure, air polishing is done to smoothen up the tooth surface. It is done by a device that releases pressurized air to remove all the debris and plaque, which generates aerosols in high numbers near the operatory site	High-volume suction Antiseptic mouthwashes
Air/water syringe	The water released from this device comes through a waterline that is connected to the dental chair which is a hub for many microorganisms which can easily enter oral cavity. Also, the compressed air with water can generate aerosols	Regularly sterilize this syringe since it gets placed in multiple oral cavities, decontamination of DUWLs

Air turbine handpiece/ air rotor	After combining with body fluids such as saliva and blood in the mouth, water coolant could generate bioaerosols	Use mouthwash, rubber dam, high-speed evacuation, decontaminate DUWLs
Orthodontic procedures	Aerosols are generated by the use of water spray during enamel etching and also during the removal of composite following completion of fixed orthodontic appliance treatment	Minimize use of water-spray syringe, use antiseptic mouthwash, non-etching mediated bonding, biomimetic bonding agents (eliminate use of rotary instruments), carbide tungsten bur

Table 2: *Aerosol generating dental procedures and methods to minimize contamination.*

Other aerosol-generating dental procedures: Preparation of intra-coronal cavities, Crown preparations, Reducing high points new restorations, Removal of old restorations, Any procedure that requires acid etching followed by rinsing and drying, Endodontic therapy. DUWLs: Dental Unit Waterlines.

This study shows the need for adjustments to dental practice because to the high droplet-to-droplet transmissibility of COVID-19 and the prior knowledge of dental operations that create a considerable number of aerosols [14].

Modes of transmission of aerosol

Direct and indirect contact

Pathogens (Table 3) may be spread directly from one patient to another in dental offices by unwashed hands, contaminated tools, and accidental needle sticks. Inhalation of germs that float in the air and eventually settle on surfaces is a major transmission mode. This occurs because aerosols continue to float in the dental clinic's air after a procedure has ended, with larger and heavier particles falling at a faster rate.

Transference through direct contact		**Transference through blood-blood contact**		**Transference through dental unit water and aerosols**	
Viruses	**Bacteria**	**Viruses**	**Bacteria**	**Viruses**	**Bacteria**
Herpes simplex virus types 1/2	*Staphylococcus aureus*	Hepatitis viruses (HBV, HCV, HDV)	*Neisseria gonorrhoeae*	Cytomegalovirus	*Streptococcus pyogenes*
Norovirus	*Escherichia coli*	HIV	*Treponema pallidum*	Measles virus	*Mycobacterium tuberculosis*
Coxsackievirus				Mumps virus	*Legionella pneumophila*
				Respiratory viruses (influenza, rhinovirus, adenovirus)	*Pseudomonas aeruginosa*
				Rubella virus	

Table 3: *Pathogenic microorganisms in a dental clinic sorted by their prime transference route.*

Blood contact

Direct transmission of germs from blood "(e.g. of the patient) to blood occurs most often in the clinic (e.g. of the dental health care personal)". Accidents like this happen in every branch of medicine, but dental surgeons have an especially high likelihood of injury. Consequently, oral health care workers face a potential occupational health hazard due to the risk of transmitting blood borne diseases since, they often handle sharp equipment and needles and often operate in poorly lighted environments, increasing the likelihood of accidental finger injuries.

Dental unit waterlines

For a successful dental surgery, it is necessary to use water from the dental unit waterlines (DUWLs) to cool the operating unit during the process. Also, this cooling medium has the potential to serve as a vector for the spread of infectious microbes. Both the incoming water and the water brought in from the patients' side might introduce harmful bacteria into the DUWLs. Infected water from DUWLs poses a direct or indirect threat to oral health professionals and their patients (through aerosols, generated via dental hand-piece).

Disease transmission through an airborne route

"Multidrug-resistant *Staphylococcus aureus*, Influenza, Cytomegalovirus, Hepatitis B and C, Herpes Simplex Infection Types 1 and 2, and HIV are just some of the bacteria and viruses that might be floating about in the air [15]". The confirmed cases of Coronavirus among healthcare workers have increased since the outbreak began.

Unsanitary environments were found to include a variety of bacteria, including staphylococci (42%), streptococcus (41%), and gram-negative germs. Not only was Diphtheriae isolated from the dental clinic's environment, but so were *Corynebacterium, Staphylococcus aureus, Pseudomonas* species, and growths [6]. Infectious diseases as diverse as the common cold, sinusitis, pharyngitis, mumps, SARS, TB, and influenza have all been linked to the use of sprayers. Wang., *et al*. (2004) looked in SARS patients' mouths to determine how much SARS-related COVID to include in their models. Their saliva was shown to have significant levels of SARS-CoV RNA (Figure 2) [16], suggesting that the virus may be transmitted by saliva droplets.

Methods of reducing airborne contamination

The Center for Illness Control and Prevention's List of Contamination Avoidance Practices in Dental Settings [17] suggests "Standard Precautions" to be used during normal dental activities to decrease the risk of disease. Patients are given the same level of treatment whether or not they have a history of contact with blood or are at risk for contracting a blood-borne illness like HIV, hepatitis B, or hepatitis C. Extra precautions should be taken in dental care settings, according to the Centers for Disease Control and Prevention (CDC), because of concerns regarding Coronavirus (Break Disease Anticipation and Control Direction for Dental Settings During the Coronavirus Reaction; 2018) (Table 4) [18,19].

Dental discipline	Special precaution
Endodontics	A rubber dam must be applied during endodontic treatment.
	Root canal treatment usually requires a number of endodontic instruments and devices, therefore minimizing unnecessary hand contact with surfaces and equipment in the dental office to reduce the possibility of fomite transmission.
Restorative dentistry and pediatric dentistry	Avoid using rotary instruments during cavity preparation. In selective cases, consider using chemo-chemical caries removal or a traumatic restorative techniques.
	If rotary instrumentation must be performed, rubber dam isolation should be applied

Periodontics	Hand and ultrasonic instrumentation are equally effective in removing plaque and calculus deposits; if required, manual scaling and polishing are recommended.
Prosthodontics	Salivary suction must be performed with care to avoid gagging.
	Select and adjust trays to the right size for impression taking to avoid cough reflex. For highly sensitive patients, consider applying oral mucosa anesthesia to the throat before impression taking.
	During fixed partial denture or single-crown preparation, treatment alternation may be considered to incorporate rubber dam application. For example, design a supra-gingival margin for the posterior bridge or use a split-dam technique.

Table 4: *Strategies to reduce droplet generation in different dental disciplines.*

Special considerations during COVID-19

When the pandemic of COVID-19 hit, there was a 38% drop in the need for emergency dental care [14]. This was despite the widespread spread of the virus across communities. This reaction demonstrates the continued need of emergency dental treatment for the general people, even during pandemics. Tele dentistry may be used if the situations do not need immediate attention. Only after a thorough examination may dental care is administered. Dentists and other medical professionals should weigh the risks of treating a patient who has delayed treatment against the risks of spreading a disease.

Waiting area

In order to open, the waiting room must have a certain number of patients. When a patient coughs or sneezes, I would recommend telling them to cover their mouth and nose with a tissue or their elbow. Patients should be compelled to wear masks and there should be at least 6 feet between each chair in the waiting room [20]. Sufficient air circulation must be provided in the area where patients wait. Atkinson., *et al*. (2009) indicate that in naturally ventilated rooms, 60 liters per second per patient is sufficient. The minimum recommended distance between patients is one meter [3]. The World Health Organization (WHO) advises disinfecting frequently used medical devices with ethyl alcohol at 70% after each use.

Patient evaluation

Each visit is an opportunity to add new information to the patient's medical record. The dentist should discuss it with the patient and get their signature before beginning any dental work. In order to make adjustments to therapy, a thorough medical history is essential. In order to get therapy for COVID-19, patients must first respond to certain screening questions. Your own medical, travel, and outbreak histories should all be part of this inquiry. Be sure to take note of the patient's temperature and any signs of trouble with their lower respiratory system. Fever and exhaustion are two symptoms that need to be tracked carefully. In the presence of these signs, it is important to determine their cause. Clinically stable patients with suspected or confirmed cases of COVID-19 should undergo laboratory testing. The patient has to be rescheduled for the sake of patient and healthcare provider safety [14]. There is currently a lack of a standardized methodology or set of guidelines for providing dental treatment to those with confirmed or suspected cases of COVID-19. Indeed, there are no internationally accepted standards for the delivery of dental treatment in the event of a pandemic, national calamity, or global emergency [14]. However, the optimum control of infection through aerosols is achieved by combining the following strategies suggested by the CDC and WHO.

Hand hygiene: In order to prevent the spread of disease, it is crucial to practice proper hand hygiene. Regular dental checkups and non-surgical treatments may be performed with only water and regular soap or antimicrobial soap [17]. The CDC [17] suggests utilizing an

alcohol-based hand massage with a concentration of at least 60% Ethanol or 70% Isopropanol on a regular basis. Before doing surgery, doctors should wear sterile gloves and carefully wash their hands.

Personal protective equipment: Personal protective equipment (PPE) is created to shield healthcare workers vulnerable mucosal and skin surfaces from infection. The hands, eyes, and mouth are particularly vulnerable areas of skin that are often left uncovered. "The most prevalent forms of PPE in oral healthcare settings are gloves, surgical masks, protective glasses, face shields, and protective clothing (including gowns and jackets) [18]".

Protective eyewear: Most dental operations release aerosols, thus it's important to always wear protective eyewear. Cleaning reusable protective equipment with soap and water is essential [18]. It has to be thoroughly sterilized in between each patient.

Masks: When getting dental work done, the mask is often the part that ends up the most polluted with spray and spatter. The mask must be of sufficient strength to prevent injury and must completely enclose the nose and mouth. Masks also protect against the spread of infectious diseases like hepatitis B and others that may be carried in the large droplets of spatter. Some studies have shown that surgical masks can filter out more than 95% of airborne germs. The N95 masks have a filter efficiency of > 95% (i.e. filter leakage 5%) at 50 L/min [18], thus the name. making them suitable for filtering 1m particles in the unloaded condition.

During operations, masks should never be handled by a person who has germs on their hands. When dealing with COVID-19 or TB, it is recommended that particulate-filter respirators with the N95, N99, or N100 ratings from the National Institute for Occupational Safety and Health be worn [18].

Gloves: As a precaution, medical professionals should always wear gloves while handling bodily fluids such as blood and saliva. Gloves should be replaced immediately if they get ripped or punctured. For safety, it's best to use gloves designed for the job and sized appropriately. Isolation gowns must include gloves that completely enclose the wrists. Standards for sterility assurance in surgical gloves are regulated by the Food and Drug Administration (FDA) [19].

Face shields: Dentists, hygienists, and dental assistants are strongly advised to wear face protection during any systems or patient consideration exercises that may result in the spray or splatter of bodily fluids, blood, or spit due to the current Covid plague [20]. Facial masks should be disinfected after each patient. Similarly, a face cover that reaches down to the neck is advised for the same reason [18].

Protective clothing: Everything from the skin to the hair to the shoes is protected. As personal protective equipment (PPE), a gown must have sleeves that extend beyond the wearer's forearms to meet OSHA's blood borne pathogens standard [18]. Before leaving the workplace, it is important to change out of any protective clothes you may have been wearing, such as a lab coat or surgical gown [18].

Make sure you have enough supplies and protective gear to handle the number of patients you expect. Prioritizing dental treatment for the most in need and most vulnerable patients is essential if personal protective equipment and supplies are limited [20].

Dental unit waterline (DUWL) sterilization: Dental unit waterlines are 3 - 4m flexible, narrow tubes made of plastic material connected to the Dental Chair Unit (DCU) which supplies water to ultrasonic scalers, dental hand pieces, and three-way air or water syringes. The inside surface of the tube enhances the formation of biofilm due to the narrow diameter that causes water stagnation [21]. When the handpieces or scalers are used, the biofilm-coated untreated dental unit waterlines allow the microorganisms to disperse through the water network and allow the pathogens into the environment through aerosolization of dental water from the dental equipment [22]. More than forty species were identified from the dental unit waterline biofilms and the main pathogenic organisms were Gram-negative bacteria which produce endotoxins and can cause fever, mild inflammation to septic shock [23,24].

The author reported two patients contaminated with *Pseudomonas aeruginosa* when treated in a dental clinic, where DUWLs were the source of infection. The microorganisms that were isolated from the oral abscess developed in these patients were the same strain isolated from the DUWLs [7].

The CDC recommends that dental unit water used in nonsurgical procedures measure less than or equal to 500 colony-forming units of heterotrophic bacteria per milliliter (≤ 500 CFU/mL) of water, the standard set for drinking water by the Environmental Protection Agency (EPA) [18].

Flushing the handpiece is a common practice, done to reduce the microbial count in the dental unit waterlines [25]. The FDA recommends flushing all water lines for at least 20 - 30 seconds after each patient. It reduces the microbial content in the dental water but the biofilm still exists adhering to the inner wall of the dental unit waterlines, which continues contaminating the incoming water [26,27]. Another approach to improve the quality of DUWL output water is by using sterile, distilled, or deionized water in DCU reservoir bottles. Draining DUWLs after use and drying them with pressurized air has also been attempted, but following reconnection of DUWL to the water supply, microorganisms still remain viable in the biofilm. Fitting microbial filters to DUWLs near the dental instrument attachment sites can improve the quality of water but the disadvantage is that they get clogged frequently and do nothing to the already existing biofilm [28].

A study was conducted by Shajahan and colleagues in 2016, in which 200 ml of hypochlorous based disinfectant was made to run through the dental chair unit system and was allowed to remain in the water lines. Based on the result obtained from SEM, it was concluded that the usage of disinfectant was found to be effective in the removal of biofilm. Various other disinfectant solutions that are used include hydrogen peroxide, chlorhexidine gluconate, Listerine mouthwash, povidone-iodine, and electrochemically activated water [29].

High volume suction evacuators: Because of the potential for aerosol generation, dental handpieces, ultrasonic scalers, and air-water syringes should be used with care during the COVID-19 period. Restoring damage should preferably be done with as little pain as possible (with just hand tools) [20]. High-volume suction evacuators and four-handed dentistry should be utilized to their maximum ability in emergency circumstances to reduce the spread of potentially harmful aerosols.

The polluted air should be filtered out as much as possible before it leaves the treatment facility for practical reasons. The use of a high-volume evacuator (HVE) has been shown in studies [30] to have the potential to remove more than 90% of contaminants from the surgical site. High-velocity extractors (HVEs) are suction mechanisms capable of rapidly removing enormous amounts of air. The majority of dental HVEs have openings of eight millimeters or more and are connected to evacuation systems that may evacuate hundreds of cubic feet of air per minute [5]. Since the hole of a saliva ejector is so tiny, it cannot be classified as a high-velocity ejection device (HVE) [5].

Recent research by Desarda., *et al*. demonstrates that a high-volume evacuator, when utilized alone, has negligible effects on aerosol counts and environmental pollution. With or without an HVE, the amount of CFUs generated did not change significantly [30]. "Ultrasonic scalers with and without an aerosol reduction mechanism produced the same number of mean colony forming units (CFUs) 6 inches from the subject's oral cavity, however this investigation disproves that conclusion (i.e. combination of HVE and ultrasonic scaler)". King., *et al*. perhaps accounted for their contradictory results by using slightly altered equipment that stopped spatter before it reached the agar plates [31].

In contrast, Muzzin., *et al*. [32] used a high-volume evacuator and air polisher combined into a single device for an *in vivo* study and found an 86% reduction in CFU. Additionally, Yamada., *et al*. investigation's on high-volume evacuators for clearing the air of blood mist aerosols was conducted. Researchers found that multiple extra-oral high-volume evacuator systems were more effective than single systems in decreasing aerosol blood mist [33]. These tests shown that the aerosol-cloud may be greatly reduced by using a modified HVE system.

Pre-procedural mouth rinsing: To reduce the amount of bacteria in one's mouth, rinsing is a common practice. Using mouth rinses prior to a dental procedure can help reduce the likelihood that the aerosol used in the procedure will be tainted.

Pre-procedure mouth rinsing has been shown to decrease dental aerosol colony-forming units by 68.4% according to a meta-analysis [34]. Povidone iodine [35], chlorhexidine (CHX) [36], cetylpyridinium chloride (CPC) [37] and essential oils (EO) [38] are just some of the pre-procedure mouth rinses that can be used. Domingo and coworkers found that patients who rinsing their mouths with Povidone Iodine diluted to 1% (or 20 mL) reported less bacterial infections. The drop in gingival surface flora lasted for up to four hours, demonstrating a bactericidal impact on the micro-organism concentration [35]. Microorganisms in the gingiva were decreased prior to oral prophylaxis using ultrasonic scalers with 0.12% chlorhexidine (CHX) gluconate, as shown by Veksler., *et al*. [39,40]. However, the effectiveness of a mouthwash used prior to a coronavirus-related procedure is unclear at this time [24].

High-efficiency particulate air filters: Used in air purifiers are effective in reducing airborne particles and germs [41]. Filters like this, which are flat and pleated, are used to remove dust and other particles from the air via a mechanical process. These filters use a paper-like substance with a thin glass fiber woven into it. Standardized at a minimum efficiency rating of 99.97%, it can filter out particles as small as 0.3m (1/83,000 of an inch) in size [42].

Filters' ability to trap and kill microorganisms was investigated by Maus., *et al*. (2001). Allegedly, bacteria may survive in filters for a long time and re-enter the filtered air. This is because the filter creates conditions that are more conducive to microbial growth [43]. Another problem is the high cost of energy needed to run the large fans that are necessary to move enough air through the filter to make it effective in removing airborne particles [42].

A negative pressure chamber with at least 12 air changes per hour, or at least 160 L/s per patient, has been suggested by the World Health Organization (2020a) to promote natural ventilation. Before moving on to the next patient, it's important to start mechanical ventilation. Using these devices will lessen the amount of dust and moisture in the air [20].

Rubber dam isolation: In order to prevent saliva from entering the treatment area, a rubber dam is placed over the tooth or teeth to be treated. It is generally accepted practice for dentists to employ a rubber dam whenever a patient requires restorative or endodontic procedures. Use of this product has been linked to improved dental treatment outcomes [44]. In addition, the usage of rubber dams has been shown to significantly reduce bacterial air pollution in two different experiments by Cochran., *et al*. [45] and Samaranayake., *et al* [46]. However, there are situations when it is not feasible to use a rubber dam, such as at the very end of a procedure in which a tooth is being prepared or when bone is being cut during However, wherever practical, it should be used.

Sterilization and disinfection of rooms and dental equipment: Cleanup and disinfection are required after every patient procedure. Wiping, spraying, and wiping should be used to clean anything from x-ray machines to dental chairs to laptops to eyeglasses to dental equipment. Cleaning and disinfecting healthcare facilities according to industry standards (with an EPA-registered, hospital-grade disinfectant, for example) may help stop the spread of SARS-CoV-2 [20].

According to the potential for infection they pose to patients, dental instruments and supplies may be further categorized as critical, semi-critical, or noncritical [18].

Items that penetrate soft tissue are considered critical. To eliminate the greatest potential for spreading or harboring disease, heat sterilization is required for certain items [18]. Use biological markers to check the effectiveness of the sterilizers, particularly before reopening after an extended period of inactivity [20].

Semi-critical patient care products are in contact with healthy mucous membranes and undamaged skin. The danger of infection is minimal while using them. In order to properly clean a semi-critical object that is sensitive to heat, a high-level disinfectant should be used [18].

Non-essential things are less likely to spread illness since they come into contact with healthy skin. An EPA-approved hospital disinfectant with a tuberculocidal claim should be used if there is visible blood or saliva on the item [47,48].

Conclusion

Workers in the dentistry industry have a higher risk of contracting airborne illnesses. Since, more people are aware of COVID-19 and its potential for spread via aerosols, the dental team should always follow the standard precautions in addition to any new ones that have been introduced. By accepting and implicitly implying the most current CDC guidelines and recommendations on COVID-19, oral health professionals may better protect their patients and themselves. Combining many measures, such as sterilization of dental instruments and the use of PPE kit are the most effective method for the management of dental aerosols. Maximum Vacuum Suction The use of Povidone-Iodine or Chlorhexidine mouth rinses before to a procedure may assist reduce the quantity of germs in the patient's saliva, and evacuators are helpful for reducing the spread of aerosols in the surroundings.

Water pipes that supply dental units must be regularly disinfected and serviced with a strong disinfectant like hypo-chlorous acid or hydrogen peroxide. Following each patient, the dental operatory must be efficiently and completely cleaned, with special attention paid to any areas that may have been overlooked. Dental clinics should use the same infection control measures as hospitals to stop the spread of illness.

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Conflicts of Interest

No.

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