

Infection Control Practices in Dental Clinics and Dental Care Settings during COVID - 19's Spread: A Comprehensive Review

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ABSTRACT

Coronavirus disease 2019 (COVID-19) is caused by a novel coronavirus, known as severe acute respiratory syndrome. Dental care units and settings face various problems relating to the transmission of disease during treatment and dental operations. The degree to which the healthcare system is ready affects how well coronavirus illness is managed. Blood, saliva, and mixed water droplets possessing the virus cause contamination of equipment used for dental treatment. Both patients and workers may become transmitters and infectors of COVID-19 through direct contact during dental operations. It is possible for dental professionals and patients to contract COVID-19 and spread it to others. The dental care routine is very effective as we discussed below the prevention steps are very effective. All healthcare workers at the dentistry clinics should collaborate to prevent the spread of the COVID-19 virus among patients. The primary aim is to make dental health care providers aware of the pathophysiology of COVID-19 and to increase their preparedness and understanding of this challenge, which will aid in controlling transmission. The information and data that collected will be useful for the dental community in providing effective patient management through evidence-based recommendations for infection control and disinfection protocols.

KEYWORDS: COVID-19, dental infection control, occupational health and safety, dental care In Covid-19 pandemic.

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INTRODUCTION

Children's upper respiratory tract infections are primarily caused by human corona viruses, which were initially identified in the 1960s. The name was first used in 1968 by an informal group of virologists to designate the new family of viruses [1]. Since 2003, at least five new human corona viruses have been identified, including the severe acute respiratory syndrome corona virus, which caused significant morbidity and mortality. The most of these have involved serious respiratory system infections is SARS-CoV-2 in 2019 [2]. In the past few years, coronavirus outbreaks have been a source of emerging public health problems that mainly attack the respiratory system of humans [3]. This kind of outbreak was discovered in Wuhan, China, in December 2019, and on January 30, 2020, it was deemed a Public Health Emergency of International Concern as a pandemic by the WHO [4]. Because they are on the front lines of patient care, health care personnel have been identified as potential carriers of the disease due to its widespread dissemination [5, 6]. Due to their intimate patient relationships and increased risk of

contracting COVID-19 and other respiratory illnesses, dentists are on the front lines of this epidemic.

Because of the nature of dental treatments and the large number of droplets, standard precautions in routine dental clinical settings are insufficient to stop the spread of COVID-19 and the aerosols that can be produced [7, 8]. Considering the generation of high amounts of droplets and aerosols during routine dental procedures, the conventional protective measures that are routinely followed by dental clinicians are no longer efficient for prevention of COVID-19 transmission [9]. Several studies are available, which provide accurate reports of the situation for each country regarding infections by health care professionals, as stated by WHO, particularly among dental professionals [10, 11]. Preliminary reports have also suggested that health care workers are prone to infection at the workplace and in the community due to wide interaction [12, 13]. Because they are on the front lines of patient care, health care personnel have been identified as potential carriers of the disease due to its widespread dissemination [14]. It's critical for staff and patient safety to

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implement certain infection control measures. The purpose of this discussion is to find out the relationship between dental care settings and their impact on the transmission of COVID-19.

METHODS

This review was undertaken for global literature in Embase, PubMed and Google Scholar. Papers were enrolled to address inquiries regarding conditions that must be met, patients who are prioritized for dental care services, and operations that can be carried out during the COVID-19 outbreak. and necessities for patient intromission, waiting room and operatory room, and personal protective equipment (PPE) that is necessary for dental clinicians and the office staff. Also, several agencies and professional organizations have a direct influence on dentistry, infection control, and other health care safety issues. These agencies and organizations, [Centers for Disease Control and Prevention (CDC), Australasian Society for Infectious Diseases (ASID) and World Health Organization (WHO)] can serve as an excellent resource for information on occupational dental healthcare issues under Covid-19 pandemic spread. A literature search was performed to retrieve relevant articles with the following combination of key words: (COVID-19, dental infection control, occupational health and safety, dental care in Covid-19 pandemic). In addition to issuing the recommendations and regulations some have regulatory roles and others are advisory.

RESULTS

Selected papers and studies were further investigated to carry out a systematic or formal inquiry to discover and examine the facts for adherence to the following points: dental care procedures for patient treatment during Covid-19's spread, dental health facilities to combat and prevent further global spread of the pandemic, and precautions for the transmission of infection. The final measures of the selected papers through this research survey were focused on the following main topics:

1- Pathogenesis of Covid-19.

The process via which an infection results in disease is known as pathogenesis.

The virus can implant itself at the portal of entry, replicate locally, disseminate to target organs (disease sites), and spread to other locations as part of its pathogenic mechanisms [15]. Pathogenesis starts when SARS-CoV-2 attaches to respiratory tract epithelial cells and starts to replicate, which enables the virus to go farther into the lungs and infect alveolar epithelial cells [16]. However, mostly they cause a milder form of respiratory illness. On phylogenetic analysis of the genome, it was demonstrated that SARS-COV-2 belongs to the beta (β)-CoV variant, due to which it is capable of infecting adults and children and has a tendency to spread faster in contrast to other types previously seen [17]. This virus reduces the number of lymphocytes, which modifies immunity. Immunity helps in fighting against invasive pathogens. A positive aspect of this virus is that most people tend to exhibit mild symptoms and recover quickly. Only a few develop severe conditions impacting multiple organs making this virus fatal [18]. The virus can pass through the mucosal membrane, particularly in nasal areas and areas around the larynx, and enter the lungs via the respiratory tract. Fever and coughing are the infection's main symptoms. Later on, it spreads to peripheral blood from the lungs, where it becomes highly pathogenic by binding with targeted organs that have receptors on the surface for instance kidneys, lungs, heart, and the gastrointestinal region [19]. As it enters the lungs, it causes symptoms of respiratory distress and pneumonia on approximately the eighth day. Following infection, the second wave occurs in patients on the 7th to 14th day, when the clinical condition worsens. Initially, leucocyte counts are normal. However, B lymphocytes decline during the early phase of the infection and alter the antibody production ability of patients [20]. Those who are unable to defend against the virus experience aggravated symptoms within 7 to 14 days, accompanied by neutrophilia, as well as elevated blood urea and creatinine levels [21]. Dentists are the medical professionals most exposed to the COVID-19 pandemic because of their workplace and the oral cavity, which are both significant potential sources for the virus's rapid transmission [22]. According to the characteristics of dentistry, significant amounts of contaminated aerosols are generated in most treatment procedures, which create a high risk of infection to dental patients and professionals [23]. (Fig. 1)

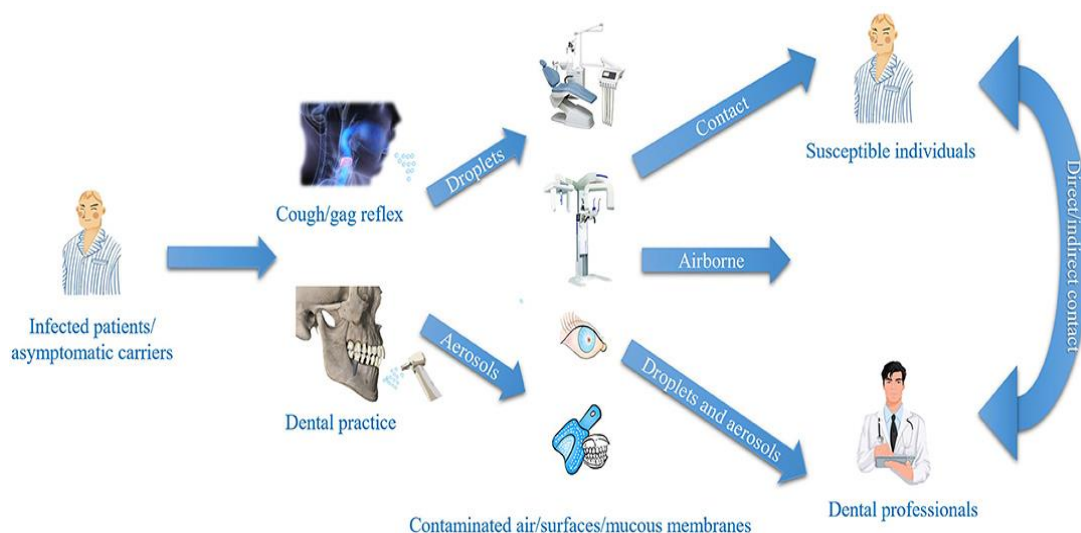


Fig. 1: The pathogenesis of Covid-19 in dentistry.

2- General routes of transmission of Covid-19.

The general COVID-19 transmission mode is happened by contact between humans. However, the transmission routes of this virus include direct transmission through inhaled droplets, from patient’s cough or sneeze, contact with an infected patient’s saliva, blood and other body fluids through the oral mucosa, nasal and ocular membranes [24]. Some studies have reported COVID-19 patients with mild flu-like symptoms or those who may be even asymptomatic. [25]. Three categories could be used to transmission, depending on the origin and carrier of the infection. Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei, which are generally considered to be particles < 5µm in diameter, and which result from the evaporation of larger droplets or exist within dust particles. They may remain in the air for long

periods of time and be transmitted to others over distances greater than 1 m. [26]. In the case of COVID-19, certain conditions and environments where aerosol-producing operations are carried out (such as dentistry settings) may allow for airborne transmission.

An infectious agent is transmitted directly from a reservoir to a host that is vulnerable through direct touch or droplet dispersal. Direct contact occurs through skin-to-skin contact and kissing. Also, direct contact refers to contact with soil or vegetation harboring infectious organisms [27]. During the incubation period of the virus, infected individuals can also serve as carriers for COVID-19. Especially, asymptomatic patients can transmit the disease to others, a large number of studies have confirmed the possibility of asymptomatic transmission [28]. (Fig. 2)

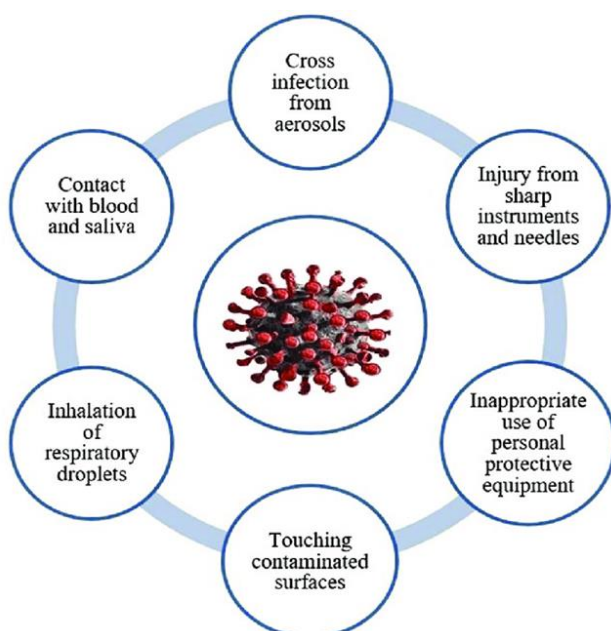


Fig. 2: The general routes for transmission of Covid-19.

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3- The transmission routes of Covid-19 in dental settings.

Contact is the most frequent mode of COVID-19 transmission in dental health settings. However, dental clinics are at high risk because dental treatments involve procedures that generate aerosols, such as through the use of high-speed hand pieces or ultrasonic instruments. Viral infections may be transmitted in dental practice by blood or saliva through direct contact, droplets, or aerosols [29]. The different available routes of viral transmission during dental treatment are: via direct contact / via blood-blood contact / via contaminated tools / via dental unit water and aerosols [30]. However, the most information put the risks of infections related to the dental settings are most likely when infection control measures are not followed perfectly. COVID-19 can be transmitted from person to person via direct contact. Person-to-person transmission is very common among the family members and also dental healthcare workers who are in direct contact with COVID-19 patients and carriers [31]. The transmission of viruses or other pathogens by cross-infection (also called cross-contamination), which is defined as the spread of contaminants (viruses, bacteria, fungi, and

parasites) from one source to another because of unsanitary handling procedures. The persistence of the novel corona virus can only be restricted in dental settings by regularly disinfecting procedures and cleaning the surfaces in the dental settings after each patient treatment [32]. Transmission of infection within the unit of dentistry may occur through one of the following routes with different percentages: (Fig. 3)

1. From the patient to the dental team 60% (because of dental team do not wear masks).
2. From the dental team to the patient 20% (because of failure to apply the necessary precautions while dealing with patients).
3. From patient to patient 10% (because of non-use of single-use items or insufficient sterilization and disinfection practices).
4. From patient to patient 10% (because the patient get the infection from the infected dental health workers or contaminated dental equipment or places).

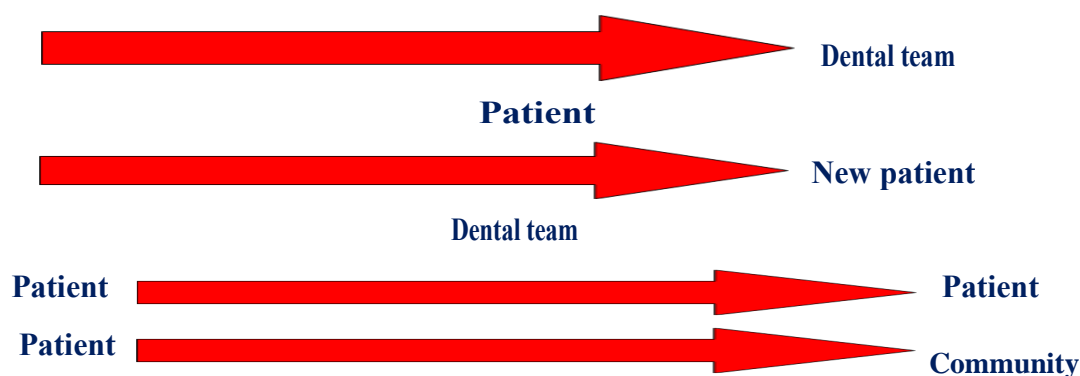


Fig. 3: Percentage of transmission of infectious agents in dental settings

4- Emergency of dental care during the COVID 19 pandemic.

During the COVID-19 pandemic, only patients with emergencies and unpostponable treatments should be managed. A list of emergency treatments should include cases like hemorrhage, trauma, severe pain, acute infections, oral and maxillofacial infections, and oral lesions are to be addressed [33]. For routine follow-up appointments and unneeded dental treatments, people typically avoid going to the doctor. Although with this decline in the number of patients, it is still difficult for dental institutions to perform effective infection control [34]. Due to fear of the current situation, people usually delay their treatments until their pain levels are unbearable [35]. Only absolutely necessary people can accompany the patient's dental appointment for support, and both must use a fabric face covering or facemask until treatment begins. Patients suspected of having COVID-19 should wait until the isolation period is over (virus incubation

period). Patients with COVID-19 symptoms should avoid non-emergency dental treatments [36]. It is advised that both adults and children maintain proper oral hygiene and a healthy diet to prevent dental issues. For this reason, maintaining a home care routine that includes using mouthwash, dental floss, and thorough brushing is essential to preventing the growth of plaque. oral diseases.

5. Effectiveness of the precautions in dental settings against COVID-19 transmission.

Once the dentist is sure that a patient has a symptoms or additional risk factors, dental treatment can be performed using a standardized protocol. Therefore, hand hygiene must also be practiced, washing hands before and after patient treatment to avoid cross-infection. Advanced personal protective equipment (PPE) in dentistry, such as disposable clothes, surgical caps, face shields, and eyewear, should be used with extra care [37]. Before resuming routine oral health

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treatment, each team/ institution must make judgments based on their understanding of the local prevalence of COVID-19 cases, patients' needs, and operational improvement. CDC previously advised dentists to prioritize urgent appointments and postpone elective procedures during the pandemic [38]. It is imperative to disinfect the frequently touched surfaces such as the door knobs, tables, and light switches. Several disinfecting agents are used for this purpose including alcohols, hydrogen peroxide or sodium hypochlorite. Evidence shows that disinfecting agents containing 62-71% ethanol or 0.1% sodium hypochlorite can eliminate the coronavirus from the surfaces if used for one minute [39]. The instruments and equipment should be disinfected according to the instructions or the WHO instructions for reuse of medical and dental equipment. Since COVID-19 is not able to survive more than 30 minutes at temperatures above 56 °C, the common sterilization protocols are still effective for the prevention of cross-infection [40].

6. New prevention strategies for dental health care workers and patients.

According to the American Dental Association, dental procedures can be divided into two groups of emergency / urgent and routine / elective during the COVID-19 pandemic. The American Dental Association added urgent dental care as part of the emergency guidance [41]. A new advancements have been made in digital dentistry in the recent years particularly in restorative dentistry that has many strength points with regard to infection control as well. For instance, digital intraoral impressions eliminate the need for use of an impression tray or dental impression materials [42]. Although, some concerns still exist regarding the efficacy of digital technology to offer specialized treatments based on the patient's cases. However, it appears as good promising strategy for later use in certain circumstances such as infectious diseases or global pandemics [43].

CONCLUSIONS AND RECOMMENDATIONS

Understanding the propagation and occurrence of the coronavirus is essential to the treatment and management of dental issues. Many updating requires for this purpose. Dental practices remain a difficult environment for controlling the spread of the COVID-19 infection. As a result, dental settings need to develop level-appropriate techniques. The incidence of infection has shown that a higher number of health care providers and dental practice teams are at increased risk of virus exposure due to face-to-face interactions with the patients and exposure to blood from infected peoples, contaminated saliva, other body secretions, and infected sharp tools. The dental health care teams should be vigilant and keep patients and themselves in a safe environment according to the related guidelines. However, because recommendations are changing so frequently, it is the professional duty of every member of the dental team to be

up to speed. As a result, dental settings need to develop level-appropriate techniques. These include patient pre-evaluation, the use of proper PPE, hand hygiene, the use of a rubber dam, and possibly the anti-retraction hand pieces. The dental health workers in clinics have to work as infection control officers and put great effort to minimize the route of transmission of infection of COVID-19 by ensuring strict application of the sterilization policy of equipment in the clinics after each use and between a patient and another, ensuring proper sealing of equipment, cleaning and disinfection of the dental chair after being used by a patient, and reminding and ensuring proper use of personal protective equipment and universal precautions by the dentistry to break the chain of COVID-19 transmission and any other infection.

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