

The COVID-19 Outbreak and Dentistry

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ABSTRACT

The goal of infection prevention in dentistry practise is to safeguard patients, the dental team, and ultimately, public health. Worldwide public concern has been raised by the recent coronavirus disease 2019 (COVID-19) pandemic, which was brought on by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Globally, patient care has have to undergo significant modifications as a result of this extremely contagious disease. This article's objectives are to evaluate the most recent research, introduce key information concerning COVID-19, suggest management procedures, and suggest suitable protection for dental workers during the epidemic.

From April to June 2020, a literature search was done. 85 studies in all were included after full-text screening. Some properties of SARS-CoV-2 are still unknown because of its novelty. Due to the nature of dental operations and the fact that the virus is aerosol-transmissible, dental staff and patients are at a significant risk of contracting the disease. To prevent the transmission of COVID-19 in dental settings during the outbreak, it is crucial to implement adequate management protocols and targeted preventative measures. It is yet unknown how COVID-19 will ultimately affect global health care. Because of the potential for the material

to become stale as the epidemic spreads, this poses a serious drawback to this evaluation. The cautious practitioner will take this review as a starting point and keep themselves actively updated as the outbreak spreads. Further research is necessary to determine the possible effects of SARS-CoV-2 infections in dentistry settings.

Keywords: Dentistry, Coronavirus, COVID-19, severe acute respiratory coronavirus 2 (SARS-CoV-2) Infection.

INTRODUCTION

Dentistry is a branch of medicine that involves close contact between dental professionals and patients' oral cavities, which are biological niches that can harbour microorganisms that are opportunistic and pathogenic and can increase the risk of cross-contamination, infection, and systemic infections. [1] Additionally, the open and invasive nature of dental care increases the risk of exposure during dental operations. Despite this, until recently, the transmission of infectious pathogens between patients and dental professionals was reported as being uncommon and was frequently brought on by failures in straightforward procedures to prevent infection, such as breakdowns in the sterilisation cycle of dental hand pieces or instruments between patients, inadequate autoclave monitoring (i.e., conduct spore testing), and unsafe injection practises. [2] The primary goal of infection control in dental practises should be to avoid the spread of bacteria, viruses, and fungi that cause disease from patients to other patients, patients to the dental team, and vice versa [3].

The traditional classification of diseases into bloodborne, airborne, and disseminated by fomites (items that may be contaminated with infectious organisms and serve in their transmission) is based on the modes of transmission. Dentists have a duty to know about these illnesses as health care providers and to follow stringent protocols and safety precautions when providing dental care in order to prevent the diseases from spreading inside the clinical setting. [3] Blood and saliva from patients can operate as important cross-transmission vectors in dentistry settings. Bloodborne contamination may result from the interaction of infectious materials through sores on the skin and mucosa. Another airborne route of transmission that has the potential to damage both patients and dental personnel is the emission of pathogens brought on by the spray of dental hand parts. The danger of any

such transmission often depends on a variety of variables, including the pathogen dose transferred, its virulence, the likelihood that an individual will be exposed to the infectious material, and the host immune system's health. [1]

Patients who are receiving medical attention can get nosocomial infections. This may include illnesses contracted while in the hospital or dentist office but developing after discharge, as well as occupational infections spread among staff members of the facility. Hepatitis B and C viruses, enteroviruses, respiratory syncytial virus (RSV), rotavirus, cytomegalovirus, Ebola virus, HIV, herpes simplex virus, influenza viruses, and varicella-zoster virus are among the viruses that can spread as nosocomial infections. [4] Health care workers should adhere to tight guidelines and processes since they have a critical obligation to prevent nosocomial infections.

A coronavirus outbreak that resulted in an increase in viral pneumonia in December 2019 started in Wuhan, China. The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that caused this illness has now spread across the globe, posing a significant threat to public health. [5,6] The World Health Organization (WHO) designated the outbreak as a public health emergency of worldwide concern on January 30 due to its growth, and on February 11 it was given the official name coronavirus illness 2019. (COVID-19). [7] There is a sizable risk of cross infection with this virus in dental settings due to the peculiarities of dental therapy. [8] Dental workers and patients may be significantly at risk of contracting this extremely contagious illness, as SARS-CoV2 has been found in the saliva of infected patients and disease transmission patterns suggest [9]. Dental professionals must therefore be knowledgeable about the condition, strict with their infection control measures and regulations, and attentive in safeguarding the populace from the widespread spread of this public health threat. [10] This article's objective is to provide a summary of recent research, explain key information concerning COVID-19, and offer suggested management procedures, including sufficient protection for dental workers during this viral outbreak.

MATERIALS AND METHODS

The following keywords were used to search the content published up through June 30, 2020 in the PubMed, Elsevier, ScienceDirect, and WHO databases: "infections in dentistry" [MeSH] OR "infection prevention" [MeSH] AND "dental" [MeSH]; "SARS to MERS"

[MeSH] OR "coronavirus in Wuhan" [MeSH] AND "epidemiology" [MeSH] OR "pandemic" [MeSH]; "coronavirus disease 2019" [MeSH] OR "corona viruses" [MeSH] OR The three authors independently assessed titles and abstracts, selecting the most pertinent and recent content in accordance with their areas of expertise. Information from the investigations was provided regarding new coronaviruses and dental infection control. Studies that were not in English or irrelevant to people were excluded. A total of 85 studies were included after the screening.

RESULTS

What is COVID-19?

The infection brought on by the most recent coronavirus, formerly known as 2019-nCoV and currently known as SARS-CoV-2, is known as COVID-19. [5] Before the outbreak started in Wuhan, China, in December 2019, the new virus and the disease it causes were completely unknown. [5] The order Nidovirales' Coronaviridae family of single-stranded RNA pathogens, which includes coronaviruses, is very large. [11] A vast, positive-sense single-stranded RNA embedded in a lipid bilayer envelope makes up the virus. [12,13] Mild respiratory symptoms are typically produced in people by coronavirus infections. Having said that, serious deadly respiratory disorders and global outbreaks were brought on by the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 and the severe acute respiratory syndrome coronavirus (SARSCoV) in 2002. [14-18] This virus family is zoonotic, which means it can spread from animals to people. Because the host immune system is not equipped to respond to the infection, interspecies transmission can be far more harmful, and this is a major factor in the recent pandemic. Some of the properties of COVID-19 are yet unclear because of the virus's novelty.

Clinical manifestations

At the beginning of the illness, COVID-19 patients frequently experience fever, exhaustion, a dry cough, myalgia, and dyspnea. Usually mild, these symptoms appear gradually. Headache, vertigo, nausea, vomiting, abdominal discomfort, and diarrhoea are all possible side effects for certain patients. 19 According to the most recent statistics available given by the WHO, roughly 1 out of every 6 SARS-CoV-2 infected individuals becomes critically unwell and

experiences breathing problems. 4 In addition, it was noted that between one-fourth and one-third of hospitalised patients in Wuhan experienced serious complications like acute respiratory distress syndrome, arrhythmia, and shock and required admission to intensive care units. [20–22] According to the research, almost 80% of COVID-19 patients only had minimal symptoms, which were frequently comparable to those that would be expected with the seasonal flu or seasonal allergies. This characteristic of the illness has led to an increase in cases going undetected and has been crucial to the spread of the pandemic. [23]

Diagnosis

The virus was originally isolated by the Chinese Center for Disease Control and Prevention on January 9, 2020, and the data on the viral genome sequence was released in international database banks, including GenBank and the Global Initiative on Sharing All Influenza Data (GISAID). [20,28] As soon as this crucial information was made accessible, laboratories and researchers all over the world could start creating distinctive tests to identify COVID-19. [21,29] As of the time of writing, COVID-19 was mostly diagnosed by swabs of upper respiratory tract samples, often taken from the nose and throat. The literature also implies that platforms for salivary diagnostics may be useful in making a diagnosis. [32,33] For several days following infection, the virus can be found in the saliva. 10 Additionally, collecting saliva is a convenient, affordable, noninvasive method that needs little equipment and can reduce the danger of nosocomial COVID-19 transmission to medical personnel. [34]

Treatment

There were no licenced vaccinations or particular antiviral drugs that have been scientifically demonstrated to prevent or treat SARSCov-2 infection in people at the time this article was written. [28] The current strategy for treating COVID-19 patients is to eliminate the virus's source and take precautions to prevent and control infection, which lowers the chance of transmission. Early diagnosis, isolation, and supportive care have all been demonstrated to be crucial in slowing the spread of the pandemic and should be given first priority by those who are afflicted. [21] Supportive care helps the majority of patients recover, but some with

serious illnesses need to be hospitalised. [28] To find a cure for this worldwide pandemic, numerous research teams are working around the world. [35] The effects of the genetically altered tuberculosis vaccine VPM1002 on COVID-19 are being studied in randomised control experiments by a group of multinational researchers from the Universities of Melbourne, Athens, Radboud, and Exeter. This is a result of studies by Netea et al [36] that were published in 2016, where the authors discussed the idea of "trained immunity" and investigated the possibility that the vaccination may broaden the human immune system's ability to combat SARS-CoV-2 and possibly prevent illness entirely. As a potential COVID-19 immunisation strategy, Kim et al.[37] proposed a microneedle array (MNA) delivery device of recombinant coronavirus vaccines in April 2020.

Transmission routes of COVID-19

The COVID-19 transmission paths are still entirely unknown at this time. [29, 39] According to reports, this virus takes between two and fourteen days to incubate in an individual. People are most contagious within the first week after contracting SARS-CoV-2, when they exhibit little to no symptoms. [20, 30, 40, 41] This epidemiologic aspect of COVID-19 has made control extremely difficult. [42] Additionally, it is unknown if the virus can pass from women to their unborn children while they are still pregnant (vertical transmission), during labour and delivery, or after delivery. [43–45] Additionally, it is yet unknown whether individuals who are in the recovery stage could also be potential infection sources. [42]

Even asymptomatic COVID-19 patients can cause the virus to become airborne by releasing droplets when speaking, coughing, or sneezing, potentially infecting those in close proximity (within 6 feet [1.80 m]), posing a significant danger to daily interpersonal contact. [52,53] The main source of COVID-19 contamination is thought to be this trait, which forms the foundation for the advice to avoid social contact. [52] Droplets might originate from the nasopharynx or the oropharynx, which are typically connected to the salivary glands. Due to the prolonged aerial suspension times of airborne viruses, smaller droplets are to blame for the long-distance contamination. [54,55] Larger droplets tend to fall to the ground or other surfaces because they are too heavy to stay suspended in the air and could potentially contaminate equipment or environmental surfaces. [56] According to the literature, human coronaviruses can survive for several days on surfaces made of metal, glass, or plastic.

[54,57] This trait also makes it possible for patients and healthcare professionals to contract a virus through contact with fomites. Neckties and stethoscopes are frequent objects linked to nosocomial infections. 58 In addition, the SARSCoV-2 virus particles survive at room temperature better at greater (50%) than lower (30%) humidity levels and stay contagious for 2–9 days without a host. [58]

Recommended management protocols and adequate protection to the dental team

There is a tonne of guidance available for dentists on how to handle patients during the current pandemic. Determining the appropriate strategy to manage patients, especially those who are in pain, can be challenging as a result. Since January 2020, routine dental procedures have been postponed in the majority of Chinese cities until further notice. Only emergency treatments are now carried out, although they must adhere to stringent infection prevention and control protocols. [8] The American Dental Association (ADA) [53] advised practitioners to stop doing elective operations for the ensuing three weeks in order to concentrate solely on treating dental emergencies. This recommendation was made on March 16, 2020. The British General Dental Council (GDC) [58] emphasised in a statement released in March 2020 that, "in many situations, the proper strategy will be to suspend offering treatment completely" for the length of the outbreak. Dental authorities around the world have lately acknowledged that dentists may need to progressively start providing nonemergency dental care while rigorously adhering to guidelines intended to minimise the risks to patients and to dental professionals as the epidemic continues to unfold.

Approaches to minimising the risk of COVID-19 in a dental setting

It is crucial to determine the potential risk of SARS-CoV-2 infection and how to properly handle the patient's treatment needs accordingly if the triage or assessment procedure determines that the patient needs to be seen. Ideally, patients with COVID-19 should not be treated in a regular dental office environment and should instead be directed to an urgent dental care (UDC) hub or other emergency dental service that is specifically designed for this. It is advised that dental offices undertake pre-check triage on a regular basis to take and record each staff member and patient's temperature. [4] Patients who are high risk or shielding should be seen as soon as feasible during the clinical session. To reduce the

likelihood of cross infection, appointment times should be set so that adequate time is allowed for infection control procedures between patients.

Patient management

It might be advantageous for patients to wait in their own cars or outside the dental office so that they can use their phones to signal their arrival and be notified when it is their turn for treatment. If possible, patients should be situated in a separate, well-ventilated room, at a safe social distance, and away from other people if they must wait in the building. [53] Magazines, coffee mugs, flower pots, toys, and other items that may harbour the virus should be removed from the vicinity. Pens and Clinipads should only be used sparingly for collecting medical data, and they should be thoroughly cleaned with a surface disinfectant on a regular basis. Patients should go to their appointments alone, only bringing companions when absolutely required.

Hand hygiene

Health care practitioners are educated on the value of hand cleanliness and how it contributes significantly to infection control in clinical settings during training. The most important step in minimising the risk of pathogen transmission in dental settings and lowering nosocomial infections is maintaining good hand hygiene. This routine requirement is essential to preventing the spread of the disease in dental settings due to the potential SARS-CoV-2 transmission vectors. [58] All dental workers and patients are strongly encouraged to use hand sanitizers or antiseptics before and after dental operations, preferably given through a sensor-detected, nontouch method. [52] Particularly prior to utilising personal protection equipment, it is advised to wash hands with soap and water for at least 20 seconds or use alcohol-based hand rubs with 60%-95% alcohol (PPE).

Surface disinfection

This highly contagious disease can linger on surfaces for several days or even for several hours. [58] This supports the requirement for proper hand hygiene and the significance of thoroughly disinfecting all important surfaces within the dentist office using hospital-grade disinfectants (i.e., ethanol 70%) after each patient is seen. Surface decontamination using 0.1% sodium hypochlorite can be done after cleaning with a neutral detergent if there is a

lack of hospital-grade disinfectants, albeit its efficacy against SARS-CoV-2 is not entirely assured. [64] Regular cleaning and disinfection of communal spaces and public spaces is required, including complete disinfection of all door handles, chairs, desks, touchscreens, and monitors.

PPE

Dental practitioners should always wear a cloth face covering or face mask when they are in the dental environment as part of source control procedures. The fact that SARS-CoV-2 is "aerosol-transmissible" has a big impact on how the dental team should handle potentially infected patients and what kind of PPE they must wear. Face masks or visors are frequently used by dental clinical workers; nevertheless, it is unknown if the protection offered by this type of PPE serves as an effective protective barrier for aerosols. [50] Additionally, in actual practise, this equipment frequently does not fit perfectly or is positioned and removed improperly. [50] To protect skin and mucosa from potentially infectious blood or saliva and to avoid cross contamination, it is advised to use disposable PPE and tools such mouth mirrors, syringes, masks, gloves, long-sleeved gowns, and goggles or face shields/visors. [8,53]

Air management

Ideal treatment settings include airborne infection isolation rooms or negative-pressure treatment rooms for patients with suspected or proven SARSCoV-2 infection (AIIRs). As soon as they are released, possible infectious droplets and aerosols must be removed at the source using high-volume suction in order to reduce or stop their dispersion in the air. To maintain the efficacy of the suction device' filters and stop potentially polluted air from being recirculated, the exhaust air should be vented outdoors.

Medical waste

It is best to categorise the disposal of household and medical waste created as a result of treating SARS-CoV-2 positive patients as infectious clinical waste category B. [58] Therefore, handling should be done by workers wearing the proper PPE. Double-layer yellow colour medical waste package bags with "gooseneck" ligation are recommended. The surface

of the package bags should be properly marked, and they should be disposed of in line with the rules and regulations of the healthcare facility.

Dental treatment during the COVID-19 outbreak

Preprocedural mouth rinses (PPMR): Regarding the clinical efficacy of PPMR to lower SARS-CoV-2 viral load in saliva or to stop the spread of COVID-19, there is no published evidence.⁶⁰ According to some research, employing PPMR may lessen the quantity of germs that are intraorally present before a dental checkup, which may be useful.

Oral examination: Some dental operations have a higher chance of making patients cough, which results in the production of potentially contagious droplets. Therefore, doctors should exercise caution and endeavour to prevent, execute, or discover workable alternatives to such treatments. Periapical or bitewing intraoral X-rays are frequently employed in dental examinations, however due to the positioning of the radiographic devices, they frequently increase saliva production and have the potential to make patients cough. Therefore, during the COVID-19 outbreak, alternatives to intraoral dental imaging such as cone beam computed tomography (CBCT), oblique lateral views, and panoramic pictures are appropriate.

Aerosol-generating procedures (AGPs): AGPs should be avoided wherever possible, and atraumatic or minimally invasive restorative procedures should be used instead. If AGPs are required, it is recommended to use four-handed dentistry, sufficient PPE, high-volume suction, and dental dams to reduce droplet spatter and the creation of aerosols. Dental care should ideally be given in private patient rooms whenever possible, and if AGPs are done, the room should be empty for a while before cleaning is done.

Rubber dams: Rubber dams are a commonly used isolation technology that significantly improves the management of moisture during dental procedures. [55] When employing high-speed dental hand pieces or ultrasonic instruments, rubber dams can lessen the creation of potentially contaminated saliva and aerosols, hence reducing the danger of cross-contamination by SARS-CoV-2. According to the British Endodontist Society (BES) [44], it

could be advantageous, if practical, to position the rubber dam so that it covers the patient's nose to reduce the danger of inhaling infections.

Ant retraction: In routine dental treatments, high-speed dental hand parts are frequently utilised, and their sterilisation is required. These rotating tools have the ability to aspirate and discharge fluids and debris during therapy, which raises the risk of cross infection by allowing germs to flow back into the dental unit and hand piece. This danger of cross infection can be considerably reduced by using hand parts with ant retraction valves or other ant reflux devices. Therefore, during the COVID-19 epidemic, these should be the first choice for dental care. [58]

Endodontic emergencies: In accordance with the most recent BES COVID-19 guidelines, patients who present with symptomatic irreversible pulpitis, symptomatic apical periodontitis, or acute apical abscess may need emergency endodontic treatment if adequate analgesia proved ineffective. If the tooth can be restored predictably, it can be done so utilising high-volume suction after local anaesthesia, followed by rubber-dam isolation and chemomechanical caries removal. The dental pulp should then be removed in order to relieve pain. [8]

Trauma: Treatment options for tooth fractures, luxations, and avulsions should be determined on an individual basis. Before starting therapy, it is important to carefully assess the patient's age, the extent of the dental injury, the stage of apical development, and the length of the tooth avulsion. Dentoalveolar damage or a developing fascial space infection, for example, will unquestionably require emergency care. [53]

Surgical emergencies: Absorbable sutures are preferred when a tooth needs to be extracted and the soft tissue closure necessitates suturing for a sufficient haemostasis and better postoperative healing. Similar to this, debridement followed by suturing with absorbable sutures (if practical) should be carried out on patients with facial soft tissue contusions. Use high-volume suction to gently clean the wound while preventing spraying. When oral and maxillofacial complex injuries are detected, a hospital should be referred for rapid treatment in potentially life-threatening situations. [8]

DISCUSSION

Despite the fact that a thorough search of the available literature was done, this is not a systematic review. The information provided is based on the best available evidence at the time this was published, which should also be understood. Regarding the exact scope and influence of COVID19 globally at the time of publishing, there was still a great deal of doubt. This makes it difficult and even overly ambitious to objectively arrive at any definitive conclusions regarding the effects of this viral pandemic on dentistry both now and in the future. Any information in such a rapidly changing environment has the risk of becoming out of date, which severely restricts the review. The goal of this article is to clarify the present understanding of COVID-19, the difficulties faced by dental professionals, and provide potential management and protective procedures. It is not the intention of this paper to offer definitive advice for an operational practise. According to the literature, additional safety measures are required in dental practise, including careful patient prescreening, appropriate referral for specialised services when necessary, and additional and stringent infection control measures if treatment of patients with confirmed or suspected COVID-19 is required. A general agreement advises dentists to forgo elective dental care during the epidemic and concentrate solely on emergency care. Dental practitioners should be aware that COVID-19 case presentations can be dynamic and there is a good potential that dental practises may have to treat asymptomatic patients because the incubation time can range from 2 to 14 days and the majority of patients only have moderate symptoms. [30,42] Every patient should be thought of as possibly contaminated as a result, and all dental care facilities need to reconsider their infection control procedures as well as their systems for triaging, scheduling, and treating patients. [57]

It has been encouraging to observe how dental practitioners from around the world have pooled their resources while adhering to the tight guidelines recommended by governments and the WHO: Many dental professionals have facilitated continuing professional education remotely, and many have volunteered to be on the front lines treating patients with COVID-19. Dental practises have made any stock of PPE available to the frontline health care services. Three-dimensional printing has also been creatively used to produce masks, visors, and even ventilator components for dental workflows. As a final thought, the authors would

want to offer these motivational stories as a ray of optimism for the future of dentistry following the COVID-19 pandemic.

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