Review Article
ISSN:2249-1236
CODEN: IJRRBI
***Deepak Chauhan et al., Int*. J. Res. Rev. Pharm. Appl. Sci.,*(2020) 10(1) 032-040**
International Journal of Research and Reviews in Pharmacy and Applied sciences

Novel Coronavirus (COVID-19) and Dentistry: Prevention in Dental Practice. A Literature Review

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Abstract:
The novel corona virus (COVID-19) pandemic has become a real challenge for healthcare providers around the world and has significantly affected the medical professionals in practices especially in the field of medicine and dentistry.

This virus is found abundantly in nasopharyngeal and salivary secretions of the affected patient. It is also transmitted through respiratory particles and contact with the infected surface; that's why dental jobs and dental professionals are more at risk.
Therefore, the aim of present article is to review the available literature on the relevant aspects of dentistry in relation to COVID-19 and to discuss potential impacts of COVID-19 outbreak on clinical dental and research work the present study was an attempt to propose epidemiologcal symptoms and routes of COVID-19 transmission for dental care and patient screening.
Though, this new corona virus was detected in Wuhan, China at the end of 2019 and has since caused a worldwide pandemic. This virus is responsible for an acute respiratory syndrome (COVID- 19), distinguished by a potentially lethal interstitial bilateral pneumonia. Because Sars, CoVid is highly infective through airborne contamination, the high risk of infection in the dental environment is a serious problem for both professional practitioners as well as to patients.
This literature overview provides a detailed description of the clinical aspects of COVID-19 and its transmission, while supplying valuable information regarding protective and preventive measures.
In conclusion, COVID-19 has many immediate and further long-term impacts on clinical practice, education and research in the field of dentistry.
Keywords: Coronavirus; COVID-19; SARS Covid; Dentistry; Dental practice

Introduction:

COVID-19 has now been spread worldwide and has become a significant concern. Despite universal attempts for repressing this disease, it increasingly spreads due to its prevalence pattern of the infection.

A new corona-virus (Sars- CoV- 2) was detected in China at the end of 2019 and has since caused a worldwide pandemic. This virus is responsible for an acute respiratory syndrome (COVID-19),[1,2] distinguished by a potentially lethal interstitial bilateral pneumonia. Because Sars & Covid is highly infective through airborne contamination, the high infection risk in the dental environment is a serious problem for both professional practitioners and patients. This literature overview provides a description of the clinical aspects of COVID- 19 and its transmission, while supplying valuable information regarding protection and preventive measures

This novel viral pneumonia was named "Corona Virus Disease (COVID-19)" by the World Health Organization (WHO). "SARS CoV-2" was also the given name for this novel coronavirus by the International Committee on Taxonomy of Viruses (ICTV) [3].

Soon, it turned into one of the toughest public health challenges in the modern world having spread in over 200 countries across the globe. On 30 January 2020, the WHO declared the COVID-19 outbreak as a public health emergency of an international scale [4,5].

COVID-19-related clinical symptoms can vary from case to case but the most common symptoms are mild fever, continuous dry cough, myalgia or fatigue and in more severe cases, abnormal chest computed tomography (CT) scan findings such as bilateral and peripheral ground-glass and consolidative pulmonary opacities have been reported[6]. Some evidence highlighted the production of sputum, headache, diarrhea and hemoptysis amongst the less common clinical symptoms[7,8,9]. These symptoms are slightly different from those of severe acute respiratory syndrome (SARS) caused by SARS corona-virus which was widely spread in early 2000s.

The differences between SARS and COVID-19 are hidden in their transmissibility and severity pyramids. The transmissibility rate of COVID-19 is reported to be higher than that of SARS[10]. Additionally, in comparison with SARS, a larger population of COVID-19 positive patients demonstrate mild or no symptoms which makes it challenging to diagnose the patients clinically during the incubation period, and therefore, spread of infection can occur at an accelerated rate [11].

It has been indicated that infectious pathogens of COVID-19 had been transmitted via human contact and led to the widespread viral outbreak [2,12]. Although loss of sense of smell and taste were not initially evidenced as symptoms of COVID-19, recent reports suggest that olfactory and

gustatory disorders were prevalent symptoms in COVID-19 patients in Europe[13]. Additionally, some new evidence on the impact of COVID-19 on the central nervous system suggests that SARS-CoV-2, like other corona viruses such as SARS-CoV and MERS-CoV, could target the central nervous system, possibly infecting neurons in the nasal passage and disrupting the senses of smell and taste [14].

Among oral manifestations[15] and cutaneous lesions [16] associated with COVID-19 have been reported in adults and more recently children [17]. There is some clinical evidence that COVID-19-positive patients with a history of cardiac risk factors[18] and established cardiovascular disease (CVD) showed more vulnerability to developing severe symptoms and poor clinical out-comes[9,19]. The significance of CVD in prognosis of such patients was established in a cohort of 191 patients, where 30% had hypertension and constituted 48% of non-survivors, whereas CVD was present in 8% who constituted 13% of non-survivors [20].

A meta-analysis of 1527 patients with COVID-19 reported an overall case fatality rate of 2.3% in the entire cohort. However, this rate was significantly higher in patients with hypertension, diabetes, and CVD with 6, 7.3, and 10.5 percent, respectively [21,22].

In 1968, a Nature publication by Almeida et al. first described a newly discovered single-stranded RNA virus with a diameter of 120 nanometers[23]. They decided to name this new group of viruses "corona virus" due to their appearance under the electron microscope. The distinguishing fringe of projections on the outer surface of the virus reminded the scientist of solar corona. Coronaviruses are prone to mutation and recombination, and therefore, around 40 different variations of coronaviruses have been recognized mostly infecting human and non-human mammals and birds [24].

Some evidence suggests that the pathogen of COVID-19 originated in some species of bats first, and it was then spread to intermediate hosts such as wild dogs, snakes and pangolins. The spread to human is thought to have happened via contaminated meat products from traditional wildlife market in Wuhan [25,26] .

The aim of this article was to review the available literature on the relevant aspects of dentistry in relation to COVID-19 and to discuss potential impacts of the novel corona virus pandemic on clinical dentistry, dental education and research.

Protection mechanisms to avoid infection with COVID-19 in the dental environment
Although it remains unclear which devices are most effective for protection against Sars-CoV-2 infection, all dental patients should be considered as potentially infected [27]. Therefore, the use of

Personal Protective Equipment (PPE), such as disposable waterproof scrubs and bonnets, gloves, eyewear protection, face shields, disposable shoe-covers and masks, is highly recommended [28], [29].

Environmental disinfection:

Every potentially contaminated surface should be cleaned and then disinfected with hydro-alcoholic disinfectants containing an alcohol concentration of >60%[28]. A recent review of 22 selected studies evaluated the persistence of human corona virus on various surfaces and the effects of multiple disinfectant agents on virus inactivation. This review revealed that coronaviruses can persist on plastic, glass and metal surfaces and remain infective for a maximum of 9 days, with a mean infective period of 4–5 days. These authors found that coronavirus could be effectively eliminated in 1 minute when the surfaces were disinfected with 62%–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite[30].

More recently, the Sars& Covid-19 survival rate was studied in aerosols, as well as on copper, cardboard, stainless steel and plastic. Sars&Covid-19 was viable in aerosols, with a progressive reduction of its infectious titre within the first 3 hours and a median half life of approximately 1.1 hours [31]. Moreover, Sars & Covid-19 appeared to be more stable on plastic and stainless steel than on cardboard or copper; the following differences were found regarding the duration before Sars & Covid-19 became inactive: 72 hours for plastic, 48 hours for stainless steel, 24 hours for cardboard and 4 hours for copper[32]. Thus, for environmental disinfection, it may be useful to place a dispenser containing an alcoholic gel (with an alcohol concentration of 60%–85%) in the waiting room, for hand cleansing.

Antimicrobial agents:

A valid method to reduce the microbial load in the oral cavity is rinsing before dental procedures. There remains controversy regarding the effectiveness of chlorhexidine against corona virus [27], [30]. Because Sars & Covid-19 is sensitive to oxidation, mouthrinses containing 1% hydrogen peroxide or 0.2% povidone iodine solution have been proposed.

Hand hygiene:

Hand hygiene is considered the most important preventive measure to reduce the risk of transmission of microorganisms between dentists and patients[27]. Soap and cleansers must be rubbed extensively on both hands, until the appearance of abundant foam. This foam has been shown to dissolve the lipid sheath around the viruses, causing dispersion and decomposition of viral molecules.

This action is mediated by the surfactant agents in soaps and cleansers, which can enter the virus lipid membrane through hydrophobic interactions, eventually causing it to lyse [22]. At concentrations greater than 60%–65%, alcohol can dissolve fatty molecules of the external lipid layer of the virus, which leads to disruption of the virus particle; therefore, friction with an alcoholic hand sanitizer is suggested after hand washing.

Minimally invasive procedures:
When possible, it is recommended to avoid dental procedures that could cause cough and regurgitation. Orthopantomography (OPG) or cone beam computed tomography (CBCT) are preferred; periapical X-rays should be avoided because they could provoke hyper salivation, coughing or vomiting.

Rubber dam:
When hand pieces or ultrasonic devices must be used, the use of a rubber dam is indicated as this significantly reduces the amount of aerosol containing saliva and/or blood, providing a 70% reduction of droplets around the surgical field [32]. When isolation using a rubber dam is not possible, manual instrumentation is preferred over high-speed handpieces[28].

High speed saliva ejectors:
Considerable reduction of droplet spread during dental procedures can be achieved using either high speed saliva ejectors or surgical ejectors, and the use of such devices is therefore highly recommended. Simultaneous assembly of two ejectors (e.g., a high speed ejector and a high volume evacuator) may also be useful.

Anti retraction high speed hand pieces:
Hand pieces generally used in dentistry can draw and then expel biological fluids and contaminants that can become deposited on the patient or the dentist, leading to cross infection. Because it has been shown that anti-retraction hand pieces effectively reduce the return of bacteria and viruses into the tubing system, the use of hand pieces without an anti-retraction system should be avoided during the COVID-19 pandemic[16, 28].

Dental environment sanitation:
Although there is a lack of information concerning environmental sanitation related to corona viruses, some options are always useful for reducing bacterial and viral loads in dental clinics. Common sense based guidelines suggest an adequate air change after each dental procedure by opening the windows in surgical rooms and in the waiting room. Safe distances must be maintained between patients in the waiting room.

In the early 1990s, the air quality in a dental clinic was shown to become extremely polluted by aerial microbiota after the most common dental procedures16. When no aerosol is created, most Sars & Covid-19 droplets precipitate and deposit on surfaces. When hand pieces or ultrasonic devices are used, the aerosol generated can transmit the viruses into the air where it can persist, viable, for more than 15 hours.

Currently, there is no evidence regarding sanitation devices that are specifically effective against Sars & Covid-19. The following air sanitation systems were developed in the past and are commonly used in medical settings.

Air depuration systems have been developed to filter and re-circulate the air of surgical rooms and medical and health clinics. Air is drawn through different filters: the first stops bacteria and larger droplets; the second reduces gas components; and the third reduces the numbers of the smallest droplet particles and the smallest microorganisms. These systems can filter droplet particles smaller than 0.01–0.3 µm, with a filtration efficiency of 85%–99% [33], [34] .

Ozone is a natural gas, and it is one of the most effective systems for environmental sanitation. It provides highly reactive free radicals that can oxidise bacteria, viruses and organic and inorganic compounds, thereby affecting bactericidal action towards air contaminants. Because ozone is heavier than oxygen, so it precipitates on tissues and disinfects both air and surfaces [35].

Germicidal ultraviolet (UV) radiation also represents a valid sterilization option: UV light can damage microbial DNA and RNA, thus preventing reproduction of microbes and reducing the harmful effects of infectious organisms. These UV lights can be installed with a filtration apparatus and used in water- and air-circulation systems to eliminate powders, bacteria and viruses [36].

Conclusions and Future Trends:

This literature overview was intended to collect relevant data in the dental field since the identification of the new corona virus, Sars & Covid-19. Its aim is to supply practical information to dental professionals. However, researchers and scientists may have found and presented new strategies, products and technologies that are more effective against COVID-19.

COVID-19 has had many immediate complications for dentistry of which some may have further long-term impacts on clinical practice, dental education and dental research. So, It is important to consider the following points in the long-term:

Preparedness and contingency planning for modifying clinical practice in dentistry.

- Optimization of cross-infection control protocols.
- Further focus on prevention and oral health promotion for the public.
- Patient empowerment and education.
- Incorporation of modern IT-based and online forms of teaching and assessment
- Into dental education, which can also help the environment and reduce pollution.
- Increased role of e-consultancy and tele-medicine.
- Further investment in relevant dental research fields.

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