

Novel Coronavirus and its Risk to Periodontists- How Do We Protect Ourselves?

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ABSTRACT

The Coronavirus Disease (COVID), commonly known as “COVID-19 Pandemic” has affected around 218 countries and territories across the globe. Coronavirus is a deadly virus which gains entry into the human body through various modes and causes symptoms such as dry cough, fatigue, coughing sputum, shortness of breath. The doctors are among the various frontline workers, who are at the greatest risk of contracting the COVID-19 infection. One of the major modes of transmission of coronavirus is the oral cavity. Hence, oral health care workers are at higher risk. Periodontitis is one of the most prevalent chronic inflammatory diseases of the oral cavity and is associated with much common co-morbidity making it a community health concern. Periodontal procedures are aerosol generating procedures and COVID-19 is a highly contagious disease, so it can be easily contracted during aerosol generating procedures. Periodontitis and COVID-19 have both been associated with much common co-morbidity so there is a possible association between them. The role of periodontists in preventing transmission of COVID-19 is critically important. Periodontists face direct exposure to oral fluids such as saliva and blood. So, precautionary measures are imperative for the periodontists so as to protect ourselves. Knowledge about the virus would be helpful in taking the necessary precautions. The aim of this review article was to understand the risk associated with the coronavirus and protection for periodontists in an unprecedented situation.

Keywords: Aerosols, Disease, Dental clinic, Dentists, Dental implants, Scaling and root planing, Transmission, Vaccines

INTRODUCTION

Coronavirus Disease-2019 (COVID-19) is an infectious disease primarily affecting the respiratory system and is caused by a virus called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) which belongs to the coronavirus family. The nomenclature “Coronavirus Disease (COVID-19)” was given by the World Health Organisation (WHO) which came to be known as “SARS-CoV-2” by the International Committee on Taxonomy of Viruses (ICTV) [1].

Coronaviruses are a group of Ribonucleic Acid (RNA) viruses which affect mammals and birds causing disease. The symptoms of contracted infection by this virus in humans are similar to the common cold, and four of Human Coronaviruses (HCoV) 229E, NL63, OC43, and HKU1 are responsible for 10-30% of infections [2]. There are six species of human coronaviruses that have been identified out of which one species is further subdivided into two different strains therefore a total of seven strains of human coronaviruses are present [3].

Four of them that produce mild symptoms are [4]:

1. Human Coronavirus OC43 (HCoV-OC43), β -CoV
2. Human Coronavirus HKU1 (HCoV-HKU1), β -CoV
3. Human Coronavirus 229E (HCoV-229E), α -CoV
4. Human Coronavirus NL63 (HCoV-NL63), α -CoV

Severe symptoms are caused by:

1. Middle East Respiratory Syndrome-Related Coronavirus (MERS-CoV), β -CoV
2. SARS-CoV, β -CoV
3. SARS-CoV-2, β -CoV

The clinical symptoms include fever (87.9%), dry cough (67.7%), fatigue (38.1%), shortness of breath (18.6%), pain in muscles/joints (14.8%), sore throat (13.9%), headache (13.6%), chills (11.4%), nausea/vomiting (5%), nasal congestion (4.8%), diarrhoea (3.7%), hemoptysis (0.9%) and conjunctival congestion (0.8%) [5]. The incubation period of the SARS-CoV-2 virus is from 2-14 days [6,7]. The prime mode of transmission is through respiratory droplets which can remain suspended in the air for a shorter period of time

(approximately three hours) but can remain viable on metal, glass or plastic surfaces thereby cause transmission [8].

COVID-19 infection severity has been associated with patients suffering co-morbidities like hypertension, diabetes, cardiovascular disease which are common with patients suffering from periodontitis [6]. Phase I therapy (Non surgical therapy) is an integral part of periodontal therapy which includes scaling and root planing to clean deposits on the teeth. Ultrasonic scaling involves aerosol generation in the air and on inanimate surfaces. The proximity between patients and periodontists in the clinic exposes them to the infection. Therefore, periodontal procedures should be considered as risky practice compared to other dental procedures regarding the aspect of bioaerosol generation [9].

THE COVID-19 OUTBREAK

In December 2019, a case of pneumonia of unexplained origin was reported in Wuhan city, Hubei Province, China [10]. On 31 December 2019, the outbreak was outlined to a novel strain of “coronavirus”. The WHO declared the (nCOVID-19) outbreak, an International health emergency on 30th January [11]. Just when COVID-19 as a pandemic was announced by the WHO, The New York Times magazine declared health professionals to be at the highest risk of COVID-19 infection, amongst which dental professionals occupied the top ranking. The Dental Council of India (DCI) on 17th March 2020 notified precautionary and preventive measures to prevent spreading of Novel Coronavirus (COVID-19) among the dental health professionals such as washing hands thoroughly with soap and water, followed by alcohol-based hand sanitisers before and after every patient, surgical scrubbing of hands was recommended, preprocedural rinse with povidone iodine, wearing of N95 or atleast 3-ply masks and suitable head caps, protective eye wear and face shield is recommended and fumigation of clinics periodically was advised [12]. An announcement was made by the American Dental Association (ADA) instructing all the dentists in the US to limit dental treatment to emergency procedures only as the transmission started spreading across all the states. Appropriate Personal Protective Equipment (PPE) should be utilised to minimise

the risk of transmission during emergency dental treatments as well [13]. On 18th March 2020, The Chief Dental Officer (CDO), UK, recommended displaying educational posters on COVID-19 and adopting preventive measures such as establishing potential symptomatic patients ahead of dental visits and decreasing the number of routine checkups [14].

On 25th March 2020, the CDO of England suggested to put a halt on all dental treatments except emergency services. The patients were referred only for non manageable concerns [15]. These dental emergencies included uncontrolled radiating pain, doubt, recurrent infection, avulsed permanent tooth and severe trauma [16].

On 24th March 2020, the Government of India announced a nationwide lockdown for 21 days, limiting movement of the whole of 1.3 billion population of India as a security measure against the COVID-19 pandemic in India [17]. On 30th December 2020, Dental Council of India (DCI) declared that all dental procedures as prescribed in DCI Curriculum shall be carried out in the clinics by students, faculty members with appropriate protection. Dental treatments involving aerosol generation (Airtor/Ultrasonic Scalers) were avoided/minimised during the lockdown period and only emergency procedures were performed as notified by DCI [18].

RISK OF CORONAVIRUS TO PERIODONTISTS

Periodontal emergencies such as periodontal abscesses, pericoronitis, necrotising ulcerative gingivitis, herpetic gingivostomatitis, may occur necessitating immediate addressal [19]. Periodontal procedures like ultrasonic scaling, bone surgeries and implants are known to produce aerosols and droplets which are contaminated with bacteria and viruses [20]. Periodontists performing periodontal procedures should ensure proper protective measures so as to avoid or minimise the production of droplets or aerosols. As the coronavirus is one of the components of these aerosols, it is needless to say that the periodontists shall be exposed to this infection [21]. Periodontists can also acquire infection through, saliva, blood and Gingival Crevicular Fluid (GCF) as they come in contact with these body fluids while performing periodontal surgeries and placement of dental implants. Gupta S et al., (2020) conducted a study which stated GCF as a possible mode of transmission of SARS-CoV-2, which is the first report within the literature, and also provide the primary quantifiable evidence pointing towards a link between the COVID-19 infection and oral health [22]. Matuck BF et al., (2021) demonstrated the presence of SARS-CoV-2 in periodontal tissue in COVID-19 positive patients [23].

When examining, periodontists record the probing depths and to further diagnose, radiographic investigations of X-rays and Orthopantomogram (OPG) of patients are taken. Even when talking to the patients, infection can be contracted by airborne transmission via droplets from sneezing or coughing, which are often large (>5 μ m in diameter) or small (<5 μ m in diameter). Large droplets fall to the bottom at a faster pace because of gravitational forces, but small ones can stay suspended within the air for a far longer period and thus are often inhaled [24]. Another mode of transmission is indirect via a fomite (an object that has been in contact with an infected person) [25]. Kampf G et al., (2020) concluded human coronaviruses can remain infectious on inanimate surfaces for upto nine days [8]. So, it is imperative that periodontists should start taking precautions for their safety and also for the safety of the patients.

When an infected patient enters the clinic, he/she can transfer the droplets in air or on surfaces. Periodontists may come in direct or indirect contact and catch the SARS-CoV-2 virus [26]. How do we protect ourselves? – Forewarned is forearmed!

Treatment approaches for most of the periodontal conditions commences with a non surgical therapy (phase I) and if required, surgical therapy (phase II) is performed. It is challenging to perform periodontal treatment in the current scenario owing to the COVID-

19 pandemic, as periodontal treatments generate aerosols so they have implications for both the periodontists and patients [27]. Use of PPE such as face masks has found to prevent infections by 85% in dental clinic [28].

The initial guidance on Infection Prevention and Control (IPC) strategies for healthcare workers when infection with a novel Coronavirus (2019-nCoV) is suspected, has been adapted from WHO's IPC during healthcare for probable or confirmed cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection [29].

Principles of Infection Prevention and Control (IPC) strategies associated with healthcare:

1. Timely recognition and control of the cause like isolating patients having suspected SARS-CoV-2 infection.
2. Regular safeguards for all patients.
3. Implementing pragmatic supplementary safeguards for suspected cases of SARS-CoV-2 infection.
4. Employing organisational controls.
5. By means of environmentally friendly norms.

There are various potential transmission sources in the spread of the COVID-19 among which dentists have received maximum attention [30].

PRACTICES TO BE ADAPTED IN A PERIODONTAL CLINIC

The first screening measure would be taking the body temperature of each patient using a contact-free forehead thermometer [31]. Patients should fill in a questionnaire answering questions to determine if they have had symptoms such as fever, persistent cough and difficulty in breathing within the past two weeks. Individuals having any contact with COVID positive persons for COVID-19 should be recorded. Patients should also report if they have had contact with atleast two people who demonstrated fever or respiratory symptoms within the last two weeks [32]. The social history and any participation in public gatherings need to be noted as well.

All the staff members should be well trained and educated so that they will be able to manage all the patients (Possibly COVID-19 positive). The front desk, waiting room and dental clinic, all the surfaces should be routinely sanitised [33]. These should be cleaned with 0.1% sodium hypochlorite, 0.5% hydrogen peroxide or 62-71% ethanol. It is the duty of the front desk to ask the patients about their medical signs and symptoms, history of travel especially to endemic areas and the possibility of coming in contact with patients diagnosed with COVID-19. The escorts of the patients should be instructed to wait outside only to avoid crowding. The waiting area and clinic should be properly ventilated with air exchange for six times an hour during operatory hours and should be cleaned preferably with hypochlorous acid [34]. The dental clinic should be an isolated room with negative pressure relative to the nearby area. All dental chairs and its surfaces including that of surfaces in the clinic should be disinfected at regular intervals between patients using ethanol 70% [35].

In the waiting area, to keep the recommended distance between patients, chairs should be taped and labelled with social distancing signs (2 feet apart). Also, it should also have posters of signs and symptoms of COVID-19 indicating them to seek immediate medical help. Patients should be instructed about using a hand sanitiser from a non touch dispenser stand and to vigorously rub their hands for 20 seconds before entering the clinic [33,36].

For periodontal treatment, priority should be given to hand scaling and polishing instead of ultrasonic scaling. During implant placement, as an alternative of using conventional high speeds with physiodispenser in regular drilling of implant sites, speed as low

as 50 rpm with irrigation could be preferred or use of active self-drilling types of implants over passive implants would be beneficial [37]. In case of soft tissue procedures like gingival depigmentation, frenectomy, gingivectomy, operculectomy, epulis excision, scalpel over electrocautery should be preferred because surgical smoke has been shown to harbor intact viral and bacterial particles [38]. Periodontal surgeries involving bone such as resective osseous surgeries and crown lengthening procedures, the use of Er:YAG laser should be preferred as they produce no smoke during the ablation process. Other advantages include non contact intervention, no mechanical vibration, free and elaborate cut geometries and aseptic effects. However, disadvantage with lasers is the prolonged time of the procedure and its cost [39].

If any periodontal emergency like a periodontal abscess eventually develops which is painful, tablet azithromycin 500 mg one per day for three days and a mouthwash three times a day and applying chlorhexidine gel twice a day over the painful area could be given [40].

Personal Protective Measures and Equipments

Personal protective measures and equipment intended to the highest levels of sterilisation protocol are:

Hand hygiene: Hand washing is one of the most regularly emphasized measures by WHO and healthcare authorities for restricting the spread of coronavirus. Hand washing should be practiced by both patients and periodontists [41]. Use of alcohol-based hand rubs with at least 60% ethanol/isopropanol or soap has been known to be effective to inactivate enveloped viruses, including coronaviruses. Hands must be washed prior to clinical examination, prior to periodontal procedure, any inadvertent contact with oral mucosa, wounds or damaged skin, blood, body fluid, saliva and surrounding surfaces without disinfection. Hand washing technique pictorial representation can be displayed near the sinks. It is advisable to avoid touching their own eyes, nose and mouth until it safe to do so [42].

Personal protective measures [43]: Long-sleeved virus-sealed waterproof surgical gowns or disposable PPEs should be worn. They should be sterilised properly after each patient.

The PPE should include

- (i) Headcaps- Either disposable or surgical caps should be used. Disposable headcaps should be discarded after each patient and surgical cap should be sterilised.
- (ii) Eyewear- Safety goggles with side shields as ocular tissues have been shown to be susceptible to transmission of aerosols. They should be cleaned and disinfected for re-use.
- (iii) Masks- Surgical masks or N95 respirators should be used. Filtering Face Piece3 (FFP3) respirators for confirmed COVID-19 cases/FFP2 respirators for suspected COVID-19 cases should be used.
- (iv) Face shield- Face shields that provides a clear plastic barrier and covers the face should be used. The shield should extend below the chin, laterally to the ears and there must be no gap between the forehead and the shield's headpiece.
- (v) Gloves- Two pairs of gloves during dental surgical procedures are highly recommended as there can be small tears, in rupture of the glove during use.
- (vi) Shoe covers- Disposable shoe covers come in various sizes and types. They should be worn and disposed after every procedure.

Performing Periodontal Procedures

Before starting any periodontal treatment, patients should be instructed to rinse their mouth with chlorhexidine or 1% hydrogen peroxide or 0.2% povidone iodine as COVID-19 pathogen is more

vulnerable to oxidation [44]. It has been found that povidone-iodine has a 99.99% activity against viruses such as influenza, Ebola, MERS and SARS coronavirus owing to its strong bactericidal and viricidal properties [45]. The dental chair should follow routine cleaning and disinfection. Syringes soiled with blood should be discarded and disposed of according to the sterilisation protocols. All reusable instruments should be cleaned, disinfected and reprocessed before being used in the next patients. It is also recommended that adequate ventilation should be ensured in clinic environments for effective removal of air borne pathogens and to reduce transmission [46].

Waste Management

Clinical waste from a periodontal clinic mainly includes blood-stained cotton rolls, gauze pieces, syringes and excised tissues. They should be stored separately. This waste should be considered an infectious residue and should be packed in two-layered packages and sealed properly. The surface of the package bags should be marked and disposed according to the regulations [47]. A waste stabilisation pond (that is, an oxidation pond or lagoon) is generally considered to be a practical and simple wastewater treatment technology that is particularly well suited to destroying pathogens, as relatively long retention times (that is, 20 days or longer) combined with sunlight, elevated pH levels, biological activity and other factors serve to accelerate pathogen destruction [48].

CURRENT SCENARIO

There is ample research going on in development of vaccines very swiftly. Many companies across the world including UK, China and India are conducting clinical trials for battling this pandemic, till date no vaccine has been declared the most effective. Vaccines developed till date are Pfizer-BioNTech COVID-19 vaccine (BioNtech and Pfizer Inc. United States), Moderna COVID-19 vaccine (National Institute of Allergy and Infectious Diseases (NIAID), the Biomedical Advanced Research and Development Authority (BARDA), and Moderna, United States), BBIBP-CorV (Sinopharm, China), CoronaVac (Sinovac, China), Gam-COVID-Vac (Gamaleya Research Institute of Epidemiology and Microbiology, Russia), Oxford-AstraZeneca vaccine (Oxford University and AstraZeneca, England) and COVISHIELD™ (manufactured by Serum Institute of India Pvt. Ltd.) [49]. It consists of non replicating viral vector. The COVISHIELD™ vaccination course consists of two separate doses of 0.5 ml each. The second dose should be administered between 4 to 6 weeks after the first dose [50].

COVAXIN™- India's first indigenous COVID-19 vaccine by Bharat Biotech is developed together with the Indian Council of Medical Research (ICMR)- National Institute of Virology (NIV). It is an inactivated vaccine. The vaccine received DCGI approval for Phase I Human Clinical Trials and Phase II clinical trials also the trials commenced across India from July, 2020. After efficacious completion of Phase I & II clinical trials of COVAXIN™, Bharat Biotech will start Phase III clinical trials in 26,000 participants in 25 centers across India [51].

So far, about 80 million of people are vaccinated worldwide with five million fully vaccinated in India [52]. Since the COVID-19 pandemic outbreak in India, there has been a surge in new cases with an average of one lakh new COVID positive patients per day. COVID-19 pandemic has brought a new unparalleled encounter to the world of dentistry. It is important to change the way dental treatment is conducted from now on because then only we can minimise our exposure to the SARS-CoV-2 virus and protect ourselves.

Future Trends

Periodontists ought to be abreast of newer approaches such as teledentistry which can be of great help to periodontists to avoid the risk of cross infection. It not only eliminates any chance of exposure to the coronavirus but also decreases the treatment cost and most significantly social distancing can be maintained [53]. Teledentistry

offers an innovative approach to resume periodontal practice amidst of the pandemic. However, it won't substitute but can augment the relatively hampered periodontal practice [54].

CONCLUSION(S)

The novel coronavirus has caused profound damage worldwide which is worsening day-by-day. It has driven significant changes to occur in the routine practice of periodontists. So, guidelines and the stringent protocols for the disinfection of the operators and environments is crucial. The guidelines are suggested so as to limit the spread of infection. We should update our knowledge continuously through the dental and medical associations to fight this pandemic together.

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