Impact of COVID-19 Outbreak on Oral Healthcare Services

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Abstract

Objectives: To assess the impact of COVID-19 outbreak on patient attendance at the dental clinic, University College Hospital, Ibadan and to make recommendations on how the oral healthcare services can adapt and evolve practices to appropriately care for increasing patients' load following the ease of lockdown.

Materials and Methods: The attendance records of patients in the second quarter of 2019 and 2020 was retrieved from the medical records department of the Dental clinic of the University College Hospital, Ibadan and reviewed. Data collected included age, gender and the specialty clinic attended. Descriptive statistics were used to analyse the data. Frequencies and mean age were calculated and comparison of attendance was done using the student t test.

Results: Three thousand, six hundred and seventy patients were seen in the second quarter of 2019 while 1276 were attended to during the same period in 2020. This showed a 66% decrease in clinic attendance in the period under review with reduction of 86.99% and 26.28% in April and June of these years respectively. The reduction in the attendance in the second quarter of 2019 compared to the second quarter of 2020 was statistically significant ($p = 0.002$).

Conclusion: The COVID-19 epidemic is still a major public health concern that may still persist for some time therefore preventative measures are necessary to curtail the spread of this viral disease. Dental practitioners have an important role in this global fight for preventing the transmission of infectious diseases such as COVID-19 and must be trained ready for this role. It is recommended that pragmatic approaches including standard infection prevention and control measures must be strictly adhered to in the oral health care settings to mitigate the spread of infection.

Keywords: Impact, COVID-19 Outbreak, Oral Health Services.

Introduction

In late 2019, a pneumonia outbreak of uncertain aetiology was reported in Wuhan, Hubei Province, China. There were reports relating the initial cases to a live-animal and seafood market in the Wuhan town, suggesting that the pathogen was transferred from animals to humans and subsequently evolved into transmission from human to human[1-3]. As a result of global travel, the virus was rapidly disseminated to all provinces of China and other Asian countries[4]. The pathogen was initially classi?ed as 2019 Novel Corona Virus (2019nCoV)[3]. The virus was later re-classified as SARS-CoV-2 by the International Committee on Taxonomy of Viruses[4] as it is closely related to the SARS-CoV virus[5,6] and on 11 February 2020 the World Health Organization (WHO) named

the disease as Coronavirus Disease 2019 (COVID-19)[3]. Since its advent, the world has grappled to understand the pathomechanism of the disease with a view to standardizing a consensus on mitigation and management. This article highlights the basic mechanism of transmission of COVID-19, its immediate and possible remote impact on the utilisation of dental services as well as provide various recommendations to prevent propagation in the dental clinic settings for the safety of both the Dental Health Care personnel (DHCP), their support staff, patients and their respective families.

Aetiology, transmission and clinical features of COVID-19

Coronaviruses are a large family of viruses that cause severe illnesses, such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). The name "corona" ("crown" in latin) is attributed to the spherical shape and surface projections. Coronaviruses belong to the Coronaviridae family, of the order Nidovirales[7], which include large, single, plus-stranded RNA as the genome contained within a lipid layer envelope[5]. They are divided into four major groups: alpha-coronavirus, betacoronavirus, gammacoronavirus, and deltacoronavirus[8]. (a) Alphacoronavirus contains the human coronavirus (HCoV)-229E and HCoV-NL63; (b) Betacoronavirus includes HCoV-OC43, Severe Acute Respiratory Syndrome human coronavirus (SARS-HCoV), HCoV-HKU1, and Middle Eastern respiratory syndrome coronavirus (MERS-CoV); (c) Gammacoronavirus includes viruses of whales and birds and; (d) Deltacoronavirus includes viruses isolated from pigs and birds[8]. SARS-CoV-2 is a part of the betacoronavirus group by the phylogenetic study based on the viral genome[9]. The natural host may be the bat Rhinolophus affinis from Yunnan Province China as SARS-CoV-2 showed 96.2% of whole-genome identity to BatCoV RaTG13[10]. Furthermore, a pangolins coronavirus comprised a genome with 99% similarity to that from SARS-CoV-2 indicating that the pangolin may be the intermediate host of SARS-CoV-2[11]. The SARS-CoV-2 can attach to the human angiotensin-converting enzyme 2 (ACE-2), which is the same entry port for SARS-CoV and can also attach to the ACE-2 receptor from bat, pig and civet cat cells; it does not attach to any cell in the absence of ACE-210. The strong association between ACE-2 and SARS-CoV-2 S-protein indicated that the population/tissue having more expression of ACE-2 could be more prone to SARS-CoV-2[12,13].

Patients who are COVID-19 positive are the main vector of infection[2,3]. The person-to-person transmission routes include direct transmission and contact transmission. Direct transmission occurs through coughing, sneezing and consequent droplet inhalation by victim, while contact transmission occurs via contamination of the oral, nasal, and eye mucous membranes especially through touch[10]. Apart from dispersion in droplets during coughing, sneezing or speaking, there is significant dispersal in the dental clinic where the use of rotary and ultrasonic instruments generates more aerosol. Workstation surfaces and instruments also can be contaminated and become a source of disease dissemination as the virus has varying lifetime on fomites. The aerosolised form of the virus can persist for up to 3 hours in the air and 48 to 72 hours on select surfaces[4,14,15].

The average incubation period for COVID-19 has been projected to be 5 to 6 days, although there is evidence that it can last as long as 14 days, which is now the widely accepted length for medical monitoring and quarantine of potentially exposed individuals[14,16]. The common clinical symptoms in patients suffering from COVID-19 are fever, cough, shortness of breath, myalgia (muscle pain), tiredness, and abnormal chest CT (bilateral ground-glass opacity (GGO) with patchy shadows as the most typical patterns)[2] and the less usual symptoms are headache, sputum production, coughing out blood, stomach pain, dizziness, nausea, diarrhoea, and vomiting[5]. Loss of the sense of taste (dysgeusia)[5] and smell (anosmia) are considered as some of the earliest symptoms of COVID-19[13]. Based on the latest report from the WHO, the proportion of serious cases among COVID-19 patients ranged from about 15% to 25%, as the disease may cause progressive respiratory failure and even death because of alveolar impairment and its consequences[13]. Older age, male gender, presence of underlying comorbidities such as hypertension, diabetes, cardiovascular and cerebrovascular disease are correlated with worse prognosis[13].

As of March 30, 2020, according to the World Health Organization (WHO), SARS-CoV-2 had involved 201 countries. By the end of June 2020, the disease had affected over 10 million people, resulting in more than half a million death. The first case in Nigeria was reported in Lagos State on 27th February 2020 in a visitor from Italy, and by the end of June 2020 the disease has affected about 25,000 people in 35 Nigerian states and the FCT with about 600 mortalities.

Impact of COVID-19 on oral healthcare services, education and training.

At the wake of the disease spread, most dental

practices were advised to lockdown globally. This had a major impact on provision of oral healthcare services and routine care was delayed. This had both short and long term economic impact on the patients and on the dental healthcare facility. Schools were also closed and trainees were asked to return to their homes thereby disrupting their academic calendar.

The dental healthcare personnel (DHCP) belong to a distinct category of healthcare workers as they must inevitably encounter the oral mucosa, upper airway and patient's secretions (such as saliva, mucus, blood) during the diagnosis and treatment course of oral diseases[5] because dental procedures necessitate close-proximity and face-to-face practices[16]. Saliva contains a high viral load in COVID-19 with up to $1{\cdot}2 \times 10^8$ infective copies/mL and this puts DHCP in a situation of high risk of contracting the infection and becoming, in turn, a source of contagion for other patients and their families (Fig. 1). The risk of infection during the diagnosis and treatment of oral diseases was identified globally, and most dental services suspended non-urgent outpatient dental treatments while maintaining only emergency dental healthcare services represented by trauma, malignant neoplasms, and infections, which require timely intervention.

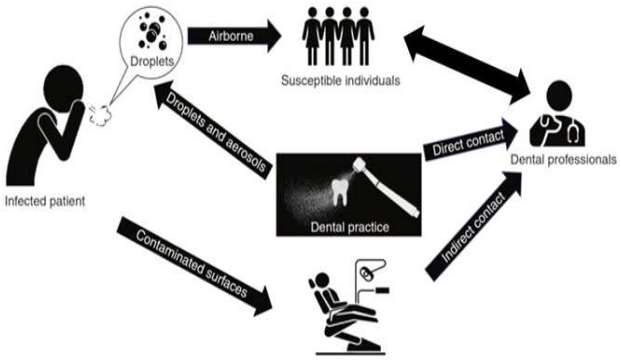

Fig. 1: Illustration of transmission routes of SARS-COV-2 in dental clinics and hospitals[10]

This also applies to the Dental centre of the University College Hospital, Ibadan where only non-deferrable dental, oncological and traumatic maxillofacial conditions were treated.

Situational analysis of UCH Dental Centre, Ibadan

The attendance record of patients in the second quarter of 2019 and 2020 was retrieved from the Medical Records department of the Dental Clinic. Age, gender and specialty clinic visited were recorded. Frequencies and mean age were calculated and comparison of attendance was done using the student t test.

The Dental clinic of the University College Hospital Ibadan only attended strictly to emergencies from the last week of March, 2020 to middle of April, 2020 at the initial phase of community transmission of COVID-19. The clinic has subsequently reopened to urgent and selected routine procedures since 15th April 2020. The total number of patients seen in the second quarter of 2019 was 3670 compared to 1246 seen during the same period in 2020. This indicates a 66% decrease in clinic attendance in the period under review with reduction in of 86.99% and 26.28% in April and June respectively. The reduction in the attendance of the 2nd quarter of 2019 compared to second quarter of 2020 was statistically significant ($p = 0.002$). (Table 1).

Table 1: Monthly attendance and percentage reduction between the 2nd quarter of 2019 and 2020

Month	2019	2020	% Reduction in clinic attendance
April 2019	1311	94	86.99
May 2019	1244	330	73.47
June 2019	1115	822	26.28
Total	3670	1246	66.05

The Oral surgery, Oral Diagnosis and Orthodontics clinics had the highest patient attendance during the period when only emergency procedures were seen. The high patient volume at the Oral Surgery and Oral Diagnosis clinic was because the Oral Diagnosis clinic is the first point of call for all cases including emergencies and the Oral Surgery clinic is responsible for the treatment of most of the emergency conditions. A high patient attendance at the Orthodontics clinic may however be due to emergencies involving fixed appliances and patient that required important follow up visits. The high patient volume usually associated with the Conservative dentistry clinic and the Periodontology clinics reduced because most of the procedures in these clinics involve the use of fast rotary and ultrasonic instruments. (Fig. 2).

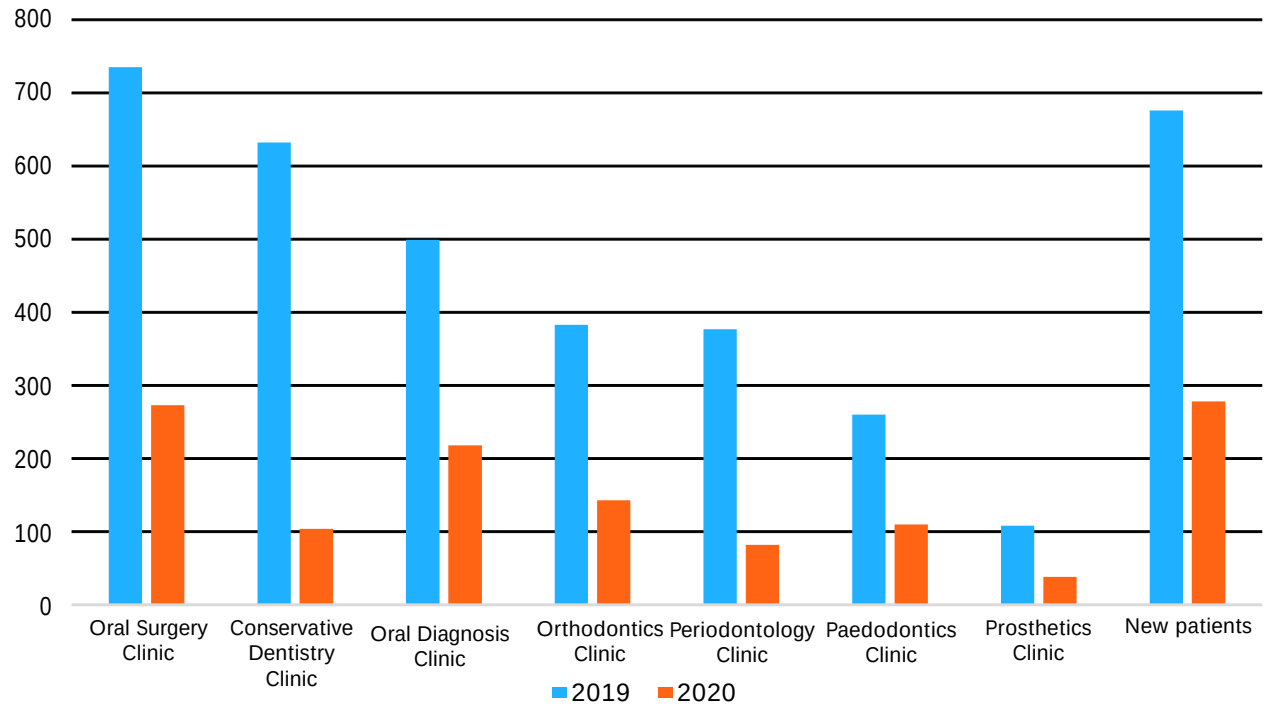

Fig.2: 2019 and 2020 Second quarter patient attendance at the specialty clinics.

Preventative measures

Several general preventive measures to curb the spread of COVID-19 disease include cough hygiene where people are encouraged to sneeze or cough into their elbow or into a tissue paper which must be discarded immediately. Hand hygiene which prescribes washing of hands with soap and water for 20 seconds, alcohol hand rub, avoidance of handshake and not touching the face, eye, mouth and nose with unclean hands. Disinfection of surfaces with alcohol or chlorine-based disinfectants, staying safely at home, wearing of face mask, and keeping physical distance of at least 2 metres from other people are the other measures.

Patients that present to the dental clinics during this period of community transmission of the disease could be classified as subjects with potential risk of infection, subjects with unknown risk of infection, subjects with known SARS-COV-2 infection and subjects who have recovered from COVID-19[14]. With the current understanding of the disease spread and the risk of spread by asymptomatic carriers, it is important to assume every patient is a carrier, hence standardized measures must be in place to minimize the risk of spread of the disease in the dental clinic[3].

Despite the evidence of community transmission of the disease, dental clinics are re-opening to attend to patients with emergent and urgent procedures, and patient attendance is increasing. The need to institute measures to ensure the safe practice of dentistry and mitigate the spread of the disease within the clinic setting is therefore imperative. At the Dental clinic of the University College Hospital, Ibadan, the infection control protocol is based on information provided by the Center for Disease Control and Prevention (CDC), American Dental Association (ADA), the National Health Service (NHS), Federal Ministry of Health of Nigeria, Nigerian Centre for Disease Control as well as other health regulatory bodies[17,18]. These include various administrative, patient management, facility related measures and personnel measures.

Administrative measures

Administrative measures which include standard operative protocol for all patient interaction must be put in place. Such protocols must be kept simple to facilitate easy implementation by all members of staff. An infection prevention and control (IPC) focal person who acts on issues relating to adherence to established protocols must be appointed for the clinic. The entire dental team must be well educated, trained, and must practise appropriate use of PPE. Other administrative policies include limiting the number of the team members present at the clinic in at a time to reduce exposure of the entire workforce. Health care personnel with underlying health conditions must have work restriction to reduce their chances of contracting the disease. Any DHCP who feels unwell must be asked to stay away from work until he/she feels better and flexible/non-punitive sick

leave policy needs to be instituted. DHCP should be asked to regularly monitor themselves for fever and other symptoms consistent with COVID-19 and should be screened at the beginning of their shift for symptoms consistent with COVID-19. In an inadvertent case of a potential work exposure to COVID-19 or if a DHCP suspects that he/she has COVID-19, NCDC exposure guidelines must be followed.

Patient management measures

Teledentistry has rapidly evolved during the pandemic with patients receiving phone calls for appointment scheduling, consultation and follow up[19]. During the scheduling call, the patient must be asked for symptoms of COVID-19 disease and the risk of exposure to the SARS-COV-2 should be assessed. Furthermore, it is important that all patients receive definitive instructions on the clinic visit. This instruction must include advising the patient to use the face mask on his way to the clinic, keep to time and come to the clinic unaccompanied. If there is a need for a companion, only one companion should be allowed into the clinic area; and all visitors should be screened for fever and acute symptoms of COVID-19 before access to the dental facility.

On arrival, strategically positioned visual alerts must be placed in the receiving area to instruct patient on hand hygiene measures. Hand hygiene measures should ordinarily be a wash-hand basin with running water, Veronica bucket could be used as a temporary measure. Non touch wash-hand basin systems and alcohol rub should be made available. All patients must fill the COVID-19 screening form before access to the reception area and a routine check for fever should be carried out, individuals with temperature above 38^{0}C should be denied entry to the facility. An open screening tent is advised for achieving this.

Much attention is now paid to preoperative and postoperative oral hygiene measures to reduce oral viral/bacteria load. A 30 second gaggle with mouthwash containing 1% hydrogen peroxide or 0.2% povidone has been shown to be effective because SARS-COV-2 is vulnerable to oxidation. Hydrogen peroxide has demonstrated to be particularly effective in reducing the viral load and studies have reported that povidone iodine effectively reduces the number of droplets and aerosols produced during oral operations[20,21]. Other oral hygiene measures include 0.05% to 0.1% Cetylpyridinium chloride and Chlorhexidine gluconate[22].

On completion of the procedure, the patient should be asked to re-don their face covering when they leave the treatment area. Patient should be requested to inform the dental clinic if they develop symptoms or are diagnosed with COVID-19 within 14 days following the dental appointment.

Facility consideration

Chairs in the waiting area should be positioned such that the patients sit at least six feet apart. All shared items like toys, magazines and other frequently touched objects should be removed to reduce the risk of surface contamination. The number of patients in the waiting room should be minimised and patients may opt to wait in a personal vehicle and called in when the clinic is ready for them. The single room dental clinic model is advocated. The room should be well ventilated, with air flow directed away from the operator towards the patient and out of the operatory. When open floor model is adopted, at least 6 feet spacing should be between dental chairs; easy-to-clean floor-to-ceiling barriers between patient chairs are also advised. Most importantly, good ventilation and airflow control within the operatory is important. Air exhaust is advocated to enhance air circulation within the operatory.

In centres where only emergency services are provided, such dental services should be provided in the regular dental clinics setting, and patients should not be directed to the emergency rooms unless a life-threatening emergency is encountered[5].

Dental Healthcare Personnel measures

As earlier stated, DHCP must receive training on and demonstrate an understanding of, when to use PPE, what PPE is necessary; how to properly don, use, and doff PPE in a manner to prevent self-contamination, Also, they should be educated on the cleaning, disinfection. maintenance, limitations, decontamination and proper disposal of reusable PPE. There should be policies and procedures describing a recommended sequence for safely donning and doffing PPE. This should be printed and placed on the doors and clinic entrances.

Outdoor outfits should not be worn in the clinic; these include all accessories like wrist bands, rings, chains and neck ties. Minimal personal belongings should be brought to the clinic[23]. Elbow length scrubs with caps are appropriate wears in clinic, these allow for proper hand hygiene measures in between patients. Dental healthcare facilities should ensure that hand hygiene supplies are readily available in every care location to allow for frequent and reliable hand hygiene measures among DHCP. Multiple options for achieving this should be available and everyone should obey the hand washing instruction. Cloth facemasks should be worn by all DHCP with

non-invasive patient contact while surgical face mask should be donned within the clinic. Manufacturers suggest that fluid resistant surgical facemasks filter 62% - 75% of airborne particles compared with 94% for FFP2 masks and 99% for FFP3 masks[4], therefore use of N95, KN95 and FFP3 mask should be mandatory for aerosol generating procedures.

During routine patient interaction, like clerking and routine examination, DHCP should ensure standard universal preventive measures like wearing a surgical mask. When routine procedures are done like routine extractions, impression taking or manual scaling and polishing, DHCP should wear gloves, surgical mask, eye protection (face shield or goggles) and a nonabsorbent gown. Procedures should be carried out by the most experienced hand to minimise duration of exposure to the patient. Strict four handed dentistry must be adhered to and the operator should not touch other items like light handle, control buttons and other reusable items in the dental workplace after contacting the saliva of the patient. The use of rubber dam has been shown to reduce exposure to aerodigestive tract secretions. It has been suggested that rubber dam should be extended to shield over the patient nostrils to reduce exposure of the DHCP to exhaled air. Salivary suctioning should be carefully carried out to prevent gag re?ex, high volume or double suction has been advocated. Mucosa anaesthesia should be considered to reduce irritation of the airway and subsequent coughing. Impression trays should be carefully chosen and modified to have the proper size for impression taking to prevent cough and gag reflexes. All dental impressions must be completely disinfected according to routine protocol.

Extra oral radiography should be prescribed as appropriate as this reduces the risk of exposure to oral secretions. However, if intraoral radiograph is indicated, this should be taken ensuring that standard preventive protocol is observed. Intra oral digital sensor should be doubly protected.

All procedures that result in significant aerosol generation (Aerosol-Generating Procedures (AGPs) e.g. (the use high speed handpieces, ultrasonic devices) should be minimised as much as possible, this means that excavation of caries rather than drilling and conventional root canal treatment rather than rotary instruments should be the mainstay of treatment. When AGPs are performed, full PPE which consists of gloves; N95/ FFP3 mask, face shield, eye protection goggles, nonabsorbent gown, shoe cover and head wear is recommended for DHCP. Rubber-dam should be properly applied as much as possible. Also, the use of high volume/double suction reduces bioaerosols by between 81% to 90%. AGP should be carried out in a well ventilated, air flow-controlled room preferably with air filtration or exhaust installation. Use of indoor air purifiers may be an effective supplementary measure to improve the dilution of indoor air contaminated with virus-laden aerosols. A previous study has proved air purifiers can significantly reduce DHCP exposure to aerosols and droplets[24]. The peak concentration of SARS-CoV-2 aerosols appears in two distinct size ranges, one in the submicron region with aerodynamic diameter dominant between 0.25 and 1.0 µm, and the other peak in supermicron region with diameter larger than 2.5 µm. Most air purifiers employ high-efficiency particulate air filters (HEPA) for particle filtration, the filtration efficiencies HEPA are more than 95% for aerosols of diameter between 0.25 and 1.0 µm and nearly 100% for those with diameter larger than 2.5 µm[24].

Also germane for DCHP personal protection and the support/ancillary staff is the need for proper environmental management. It is advised that a 15 minute time interval be observed after completion of AGP before cleaning of the operatory commences. Cleaners should wear disposable gloves, double fluid resistant surgical masks, and disposable waterproof aprons. DHCP should ensure that environmental cleaning and disinfection protocol is always followed consistently and correctly, and all surfaces should be kept dry. Regularly touched surfaces or objects e.g. door handles, chairs, and desks should be disinfected using (62-71) % ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite and the floor should be cleaned with 0.1% sodium hypochlorite solution[25-27]. Medical wastes are hazardous and should be properly disposed. Instruments should be managed according to standard sterilization protocol and the dental waterlines should be regularly disinfected[17].

Recommendation for Dental professional education and training

Training of DHCP has been severely hampered by the pandemic. It is important that similar IPC administrative protocol for crowd control, hand hygiene and distancing already established in the clinic be adhered to. E-learning solutions like online lectures, case studies, and problem-based learning tutorials should be adopted to avoid unnecessary aggregation of people[26]. Increased role of simulation is important to improve core competences before exposure to patients in the clinic[28]. This is the right time for dental schools to expand the learning outcomes of their courses to include additional roles for dentistry that take natural disasters and pandemics into consideration, as we continue striving to keep this disease under control, the oral

healthcare industry needs to consider the following activities for future preparedness.

1. Oral health services need to prioritize infection control training and improve preparedness for emerging and re-emerging infectious diseases. Proper usage, donning and doffing of PPE should be included in the curriculum.
2. Researches into saliva based rapid point of care (POC) test research.
3. Aerosol research to evaluate aerosol generation and control in dental offices and engineering control to improve airflow in dental office. Future research should also look at the extent virus aerosols are able to spread in dental procedures and how long this lingers in the air after completion of procedures[30].
4. Research into oral health implication of infectious diseases in terms of signs, symptoms, oral manifestation and orofacial sequalae.

Conclusion

The COVID-19 epidemic situation is still a major public health concern that may still be around for some time. Preventative measures are necessary to curtail the spread of diseases. Dental practitioners have an important role in this global fight for preventing the transmission of infectious diseases like COVID-19 and therefore must be trained ready for this role. It is recommended that pragmatic approaches including standard IPC measures must be strictly adhered to in the oral health care settings to mitigate the spread of infection.

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