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## **Challenges in Dentistry during Covid- 19 Pandemic: The new normal**

M Arif Khawaja<sup>1\*</sup>, Puneet Ahuja<sup>2</sup>, Nishant Singh<sup>3</sup>

1. MDS Student, Deptt. of Oral Pathology and Microbiology

DJ College of Dental Science and Research Modinagar Ghaziabad UP.

2. Prof and Head, Deptt. of Oral Pathology and Microbiology

DJ College of Dental Science and Research Modinagar Ghaziabad UP,

(Formerly Zonal Head Clove Dental, New Delhi)

3. Professor, Deptt. of Oral Pathology and Microbiology

DJ College of Dental Science and Research Modinagar Ghaziabad UP

Corresponding author: M Arif Khawaja\*

### **Abstract**

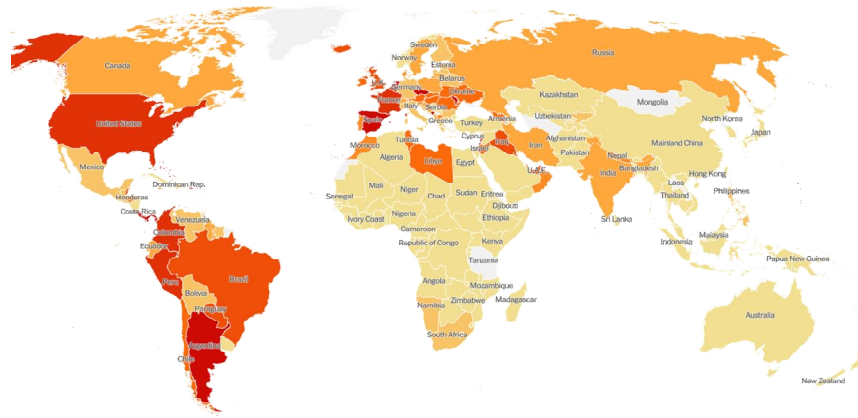
We are in the midst of Covid 19 pandemic. The world is passing through testing times. Economies world over are crashing and corporate sector has faced huge financial losses. There are millions of job losses . Hundreds of companies have filed for bankruptcy. The global death toll has already crossed 1.34 million with 55.6 million confirmed cases and 35.8 million recoveries as on 18-11-2020. Cases in India have surged to 8.91 million with death toll over 131, 000 as on 18 November, 2020 (with 8.34 recoveries).. Every sector is affected. Healthcare is no exception. Dentistry in particularly is facing huge challenges. Dentists throughout world are facing immense hardships and financial losses with loss of working hours and patients that has adversely affected profits and financial stability. Covid 19 infection was first reported from a Wuhan lab in China in December 2019. On 21 February 2020 WHO declared Covid 19 as a Public Health Emergency. This article reviews the various challenges being faced by dentists throughout world, the various guidelines/recommendations from various organizations/authorities for the dentists and the various solutions/suggestions that may have implications on dental practice.

**Key words** : Dentistry, Covid 19, Challenges, Limitations, Precautions, Recommendations, Teledentistry.

### **Introduction**

The name “Corona”(“crown” in Latin) is attributed to the spherical shape and surface projections. Four subfamilies of Corona virus have been identified: alpha-, beta-, gamma-, and delta-corona viruses. Beta-corona viruses seem to originate from mammals, namely bats; it was found that the genome sequence of SARS-CoV-2, the virus responsible for COVID-19, is >90% identical to a bat corona virus RaTG131 Its widely suspected that the Covid-19 pandemic originated from a seafood market in Wuhan.

Covid-19 has been declared as global pandemic by WHO on March 11 2020. So far, 4 different types of corona viruses namely- SARS (SARS-CoV), MERS (MERS Cov), Corona virus infecting birds and mammals causing gastroenteritis, and most recently SARS- Cov-2, are known worldwide.<sup>2</sup> By 18 November 2020, 214 countries and territories in the world have been affected by Covid 19.



Sources: Local governments; The Center for Systems Science and Engineering at Johns Hopkins University; National Health Commission of the People's Republic of China; World Health Organization

Figure 1. Covid 19 Hotspots ( on the basis of Average daily cases per 100,000 people in the past week)

### Structure

The SARS-CoV-2 measures around 120 nm (0.12  $\mu\text{m}$ ) and aerosol particle sizes range from 3-100 nm. The use of a FFP3 respirator offers a filtration rate of 99% of all particles measuring up to 0.6  $\mu\text{m}$ .<sup>3</sup>

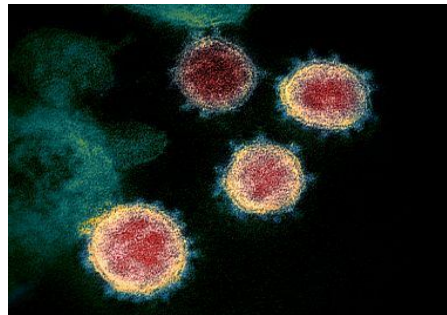


Figure No 2 : Transmission electron microscope image shows SARS-CoV-2, the virus that causes COVID-19, isolated from a patient in the U.S. Virus particles are emerging from the surface of cells cultured in the lab. The spikes on the outer edge of the virus particles give corona viruses their name, crown-like. NIAID-RML4

### Symptoms

Initial symptoms of Covid 19 infection include fever, cough, nasal congestion, fatigue and other signs of upper respiratory tract infections. In approximately two thirds of the cases, the infection can worsen with with dyspnea and severe lung congestion. Multi-organ failure may eventually result in the form of respiratory failure, acute respiratory distress syndrome, shock, acute liver injury, arrhythmia, acute myocardial injury, and sepsis.<sup>5</sup> There's no definitive treatment or vaccine for Covid 19 as of now and the whole world is waiting for a successful vaccine or miracle drug to treat Covid 19.

The mortality rate of Covid 19, though variable in various countries/regions, so far is approximately 6-10 times more than a seasonal influenza, with 10-27% in patients aged more than 85 years to less than 1% in adults aged 20-54 years.<sup>6</sup> With the passage of time the figures may change as new evidence comes in. Age and co morbidities have been recognized as critical factors in the prognosis of Covid 19 infection.

### Transmission

The SARS-CoV-2 virus can be detected in aerosols up to 3 h postoperatively, and can persist on surfaces for extended periods. The nature of the surface alters the persistence of the virus. On copper surfaces, the virus can persist for up to 4 hours, on

cardboard up to 24 hours, and on plastic and stainless steel up to 2–3 days.<sup>7</sup> Face masks, frequent hand washing /sanitizers and social distancing have been stressed to minimize the spread of infection in communities.

The droplet and aerosol transmission of SARS-CoV-2 is of immense concern in dental clinics and hospitals<sup>8</sup> as it is difficult to avoid the generation of large amounts of aerosol and droplet mixed with patient's saliva and even blood during dental procedures.<sup>9</sup> Many studies have described the presence of Covid-19 in deep throat saliva.<sup>10,11</sup> Many studies indicating COVID-19 may be airborne through aerosols formed during medical procedures or indirectly through saliva have been published so far.<sup>12,13</sup>

### **Dental/medical Implications**

Most dental procedures generate aerosol. They include preparing cavities for fillings, use of rotary instruments for root canal treatment, scaling and polishing of teeth, dental implantation, and surgical removal of teeth. Sometimes asymptomatic COVID-19 patients may present for emergency dental treatment. These patients are a confirmed source of infection and are expected to have contaminated saliva. Moreover, the conjunctiva mucosa and upper respiratory tract are connected by the nasolacrimal duct, and they share ACE2 on the cell membrane. This exposes dental healthcare personnel to the risk of infection via direct exposure of conjunctiva (eyes) to droplets from patients during dental treatment.<sup>14</sup>

Health-care workers themselves fall in the high-risk group for infection. Exposure to them and to the health-care settings must be avoided or postponed to control community spread. On analysis of an earlier report of hospitalized patients with SARS-CoV-2, in the early stage of the epidemic, it was observed that 41% were presumed to have been infected in hospital, including 29% of health-care workers and 12% of patients.<sup>15</sup>

A study published in *Lancet Public Health* on 31 July 2020 indicated that front-line health-care workers had at least a threefold increased risk of reporting a positive COVID-19 test and predicted COVID-19 infection, compared with the general community, even after accounting for other risk factors.

The exact toll of COVID-19 on health-care workers can only be approximated. On 3 September 2020, Steve Cockburn, Head of Economics and Social Justice, Amnesty International announced that 7000 health workers in 80 countries have died of Covid 19 pandemic. The report says 1320 health workers in Mexico, 1077 in USA, 649 in UK, 634 in Brazil, 631 in Russia, and 573 in India have died of the pandemic.<sup>16</sup> According to International Council of Nurses, the number of infected healthcare workers across globe had crossed 90,000 in 30 countries as on 7 May 2020. This included death of more than 260 nurses worldwide. On 16 September 2020, the Indian Medical Association announced that 382 doctors have died in India due to COVID-19 and 2238 were infected.

An article published in *The New York Times* points out that dentistry had the most risk of any profession in relation to COVID-19.<sup>17</sup>

A study by T Rafael R. Moraes et al sheds light on the evidence of three major aspects being at stake in dentistry in the new pandemic epicenter. First, differences in coverage between public and private clinics suggest an intensification of regional and socioeconomic inequalities. Second, although dentists have a similar fear of contracting COVID-19 as other healthcare providers, they report feeling less prepared to assist patients (Zhang et al. 2020). Third, dentists have adopted new routines and incurred increased costs, which eventually will be transferred to patients or paid by the government in public clinics<sup>18</sup>

Dentists all over Europe are doing their part to limit the spread of COVID-19 while staying up to date with national and local regulations. However, as an increasing number of member states have restricted the provision of dental care to medical emergencies only, some dentists are finding it difficult to fulfill their professional obligations and are struggling to comply with the existing and new infection control protocols. Since dentists are postponing elective procedures and reducing office hours, the number of dental patients being treated is low and as a result dentists have starting to feel the tremendous long-term impact of the pandemic on their businesses.<sup>19</sup> This may have long term complications for dental profession.

### **Impact on Dental Education/Research**

Throughout world, colleges and universities are facing the brunt of devastating COVID-19 pandemic outbreak. The access to pre-clinics and clinics has been restricted due to lockdowns, there is limited or no access to clinical learning opportunities for students. There is almost no available treatment for patients in faculties' clinics. These are just some of the challenges faced in dental education. There are millions of losses in revenue sources, collapse of research programs and grants, suspension of academic conferences, graduation ceremonies, and ceremonies of convocation, dramatic shifts in pre-planned projects and activities and economic instability. Moreover, COVID-19 influences recruiting new academics and scientists, causing psychological impacts on students and faculty.<sup>20</sup>

### **Recommendations/Guidelines**

Different countries and organizations are issuing different advisories/protocols for dentists as per the local situations and governance. Some global organizations have also issued guidelines and recommendations.

FDI Council recommended some key principles for dental practice and oral health promotion during the current pandemic as follows:

1. Oral health is a fundamental component of overall health and well-being, and oral healthcare is an essential public service that must be made as broadly accessible as possible. Authorities should ensure regulations do not unnecessarily impede access to oral healthcare and put measures in place to improve access where feasible, including tele-dentistry services, emergency clinics and oral health promotion initiatives.
2. Oral health professionals and oral healthcare should be included in all discussions and decisions related to the regulation and guidance of healthcare delivery and health professionals during the pandemic.
3. Where possible and relevant, authorities should provide appropriate financial and administrative support to dentists as business owners and liberal professionals, and implement appropriate fiscal measures, to reduce the financial burden on dental practices and ensure the continuation of adequate care during and after the pandemic.
4. All regulations and guidance for oral health professionals and oral healthcare should take into account the current public health situation and needs of the country, and not only the individual infection risk of practitioners and patients.
5. Oral health professionals must strictly follow all national guidelines and regulations in place, including those relating to personal protective equipment (PPE), treatment procedures and patient intake procedures.
6. Authorities should ensure easy access to PPE at reasonable costs.
7. Oral health professionals have a responsibility to assure emergency care whenever possible and as permitted by national regulations.
8. Oral health professionals should take every opportunity to communicate and reinforce oral disease prevention messages to help reduce treatment need, avoidable dental visits and healthcare costs.
9. Dentists/practice owners have a responsibility to protect the health and well-being of their staff and patients.
10. Further research into SARS-CoV-2 and its transmission, including specific considerations for dental practice, is essential to allow appropriate guidance to be made.<sup>21</sup>

COVID-19 has had many immediate complications for dentistry and there may be long-term impact on clinical practice, dental education and dental research.

Poyan Barabari et al in a review of literature suggests the following points for dental practice in the long run:

1. Preparedness and contingency planning for modifying clinical practice in dentistry.
2. Optimization of cross-infection control protocols.
3. Further focus on prevention and oral health promotion for the public.
4. Patient empowerment and education.

5. Incorporation of modern IT-based and online forms of teaching and assessment into dental education, which can also help the environment and reduce pollution.
6. Increased role of e-consultancy and tele-medicine.
7. Further investment in relevant dental research fields.<sup>22</sup>

The WHO recommends that the general public should not wear medical masks as this may cause unnecessary cost, procurement burden and create a false sense of security that can lead to neglecting other essential measures such as hand hygiene practices.<sup>23</sup> There have been some controversies on the necessity of medical masks for general public use. There is no conclusive recommendation on the usefulness and effect of locally made masks for Covid 19 prevention in different situations and in different regions or countries.

WHO however, recommend that individuals with respiratory symptoms should wear a medical mask and seek medical care if experiencing fever, cough and difficulty breathing, as soon as possible as these may be symptoms of Covid 19. Research has shown that a mask used on the source achieves far greater levels of protection than when used by the receiver.<sup>24</sup> Individuals with co morbidities and who are aged may require better protection and preventive measures.

The demand for personal protective equipment (PPE) has increased manifold after Covid 19 pandemic, and it consists of garments/protective gear to protect healthcare workers or any other persons to get infected. The standard PPE consist of gloves, mask, and gown. However, in case of airborne infections like COVID-19, additional equipment should be utilized including mask, gloves, face protection, goggles, face shield, , gown or coverall, head cover, and rubber boots<sup>25</sup> PPE have been advised for healthcare workers posted in isolation wards for Covid positive patients as also during burial/cremation of bodies of Covid patients.

On May 20, the Centers for Disease Control and Prevention issued updated guidelines for dentists preparing to resume non emergency dental care. It included recommendations for treating those with Covid-19 as well as those without the virus. Such strategies are important because no test is 100 percent accurate. There have been reports of many false-negatives for Covid-19 virus. Both in the dental clinics and elsewhere, there is still another important safety issue that concerns everyone, especially people who already had Covid-19 and recovered and those who are tested and shown to have antibodies to this corona virus. Neither a prior infection nor the presence of antibodies guarantees protection against a new Covid infection. It is not yet known how many antibodies are needed to prevent it, how potent the antibodies have to be or how long their protection may last. These are the same as-yet unanswered concerns surrounding the effectiveness of any future vaccine.<sup>26</sup>

USA and India remain the worst affected countries due to the Covid 19 pandemic.

In India several guidelines were issued by Dental Council Of India and Indian Dental Association. The government later issued unified guidelines in May. These are dynamic guidelines and will be updated from time to time, as required (<https://www.mha.gov.in/>)

The Guidelines for Dental Professionals in Covid-19 pandemic situation Issued on 19/05/2020 by Ministry of Health and Family Welfare, Government of India pertain to various zones. The zone in India have been divided at a macro level (state or district level) into Red, Orange and Green as per the presence, severity or absence of infection. Green zones are infection free and Red zones signify active infection zones. Containment zones are an isolation strategy at the micro level (town, municipal or panchayat level ) both in urban and rural areas to break the chain of infection. A list of dental procedures was included with these guidelines with detailed Do's and Don'ts.

#### Zones and Dental Clinics

1. The dental clinics will remain closed in the CONTAINMENT ZONE; however, they can continue to provide tele triage. Patients in this zone can seek ambulance services to travel to the nearby COVID Dental Facility.
2. In the RED ZONE, Emergency dental procedures can be performed.

3. The dental clinics in ORANGE AND GREEN ZONE will function to provide dental consults. Dental operations should be restricted to Emergency and Urgent treatment procedures only.
4. All routine and elective dental procedures should be deferred for a later review until new policy/guidelines are issued.
5. Due to the high risk associated with the examination of the oral cavity, oral cancer screening under National Cancer Screening program should be deferred until new policy/guidelines are issued.

Italy was also one of the worst affected countries by Covid 19 infection. As on 18-11 2020, total number of Covid 19 cases in Italy reached approximately 1.24 million with about 46,464 deaths reported. 458000 cases had recovered. Italy also issued prevention protocol for dentists.

C. Prati et al while discussing the impact of Covid 19 on dental schools in Italy and the associated clinical problems in endodontic practice have emphasized the following prevention protocol being adopted in Italy :

1. Triaging patients to detect by the history any with respiratory infection, flu, acute respiratory illness, conjunctivitis and cardiovascular abnormalities;
2. Separation of patients with respiratory symptoms to limit their contact with dental staff, students and patients;
3. Avoiding dental treatment if at all possible;
4. Regular, meticulous and effective hand washing with no touching of face, eyes etc; use of face masks;
5. Decontamination of all surfaces within clinics with 0.1% sodium hypochlorite or 70% ethanol or 0.5% hydrogen peroxide, which are disinfectants already available in dental clinics (Kampf et al. 2020);
6. Respiratory hygiene/cough etiquette – use of tissues (Catch, Bin, Kill); <https://www.england.nhs.uk/south/wp-content/uploads/sites/6/2017/09/catch-bin-kill.pdf>;
7. Special precautions by dentists and assistants to prevent contamination from air droplets:
  - a. Wear a disposable surgical mask and isolate the patient in a dedicated single-patient room (with closed door) separated from other staff/patients;
  - b. When possible, use a rubber dam that must cover the nose of patient during the entire endodontic procedure;
  - c. Application of powerful air/water surgical suction pump (aspirator) close to the tooth and a second suction close to the nose to prevent aerosol and saliva droplet diffusion;
  - d. If possible, use high-speed handpiece with no exhaust;
  - e. Decontamination of equipment, surgeries/operatories after reach patient<sup>27</sup>

Ali Alharbi et al of King Saud University have proposed certain guidelines for dental patient's management during and after the Covid 19 pandemic. Treatment considerations and recommendations from their research paper are reproduced below:

1. Intraoral imaging should be restricted and extra oral radiographs should be utilized to reduce the excessive salivation and gag reflex associated with intraoral radiographs.
2. Using 0.23% povidone-iodine mouthwash for at least 15 s before the procedure can reduce the viral load in the patient's saliva (Eggers et al., 2018).
3. Disposable and single-use instruments and devices should be used whenever possible to reduce the cross-infection risks.
4. Rubber dam should be used whenever possible as this will significantly reduce the spread of microorganisms (Cochran et al., 1989).
5. The dental treatment should be as minimally invasive as possible.
6. Aerosol-generating procedures should be avoided whenever possible.
7. Whenever pharmacologic management of pain is required, Ibuprofen should be avoided in suspected and confirmed COVID-19 cases (Day, 2020).<sup>28</sup>

### **Solutions/Suggestions**

Teledentistry is a promising alternative in the current pandemic situation. Newer technologies have enhanced the quality of management of dental patients. They have made possible the partial or complete management of healthcare centers or dental clinics from long distances. The entire process of distant consultations, networking, sharing digital information, , workup, and analysis is dealt through telemedicine concerned with dentistry known as “Teledentistry<sup>29,30</sup> Teledentistry can offer a novel solution to resume dental practice during the current pandemic. Teledentistry should be included into routine dental practice. It can complement the existing compromised dental system during the current pandemic.<sup>31</sup>

Although telehealth cannot substitute for procedural intervention for most dental disease, the growth of teledentistry may benefit patients who face access to routine dental care, including patients in rural areas, nursing homes or other residential facilities, and those with mobility or transportation limitations. Smartphone camera quality has improved tremendously and clinicians can use televisits to garner additional diagnostic information from patients. <sup>32</sup>

Due to changing trends, patients may become accustomed to the convenience and accessibility of telehealth. It will most likely be accepted as a new alternative in Dentistry. Current teledentistry codes enable evaluation and triage of acute dental problems without an in-person visit.<sup>33</sup> Giving treatment advice to patients on phone, getting details of x rays, photo graphs on WhattsApp, and seeing the lesions/signs during video calls are slowly gaining acceptance during lockdown periods in India and possibly other regions. Follow up advice from doctors is often obtained on phone and it minimizes the hospital/clinic visits.

There are speculations that COVID-19 outbreak may encourage the use of digital intraoral scanners instead of conventional impressions and may boost the demand for computer aided design and manufacturing (CAD/CAM) and 3D-printing technology. There could be an increasing demand for more productive and cost-effective digital dentistry equipment in future.<sup>22</sup>

Medical and Dental education has been adversely affected especially in India. Many clinical facilities have been converted into dedicated Covid hospitals and continuous lockdowns have made it difficult to continue the academic curriculums in teaching institutions. Examinations have been delayed and research has been affected. Classes, seminars and webinars have ginned acceptance on apps like Zoom. There has been increased activity and academic exchange of ideas via email. Online interaction has gained acceptance and popularity.

### **Discussion**

There is no definitive treatment for Covid 19. No drug has been successful to cure Covid 19 infection. There are apprehensions that it will not arrive soon. There is hope for a successful vaccine but it will take some time. Russia became the first country to officially register a Corona virus vaccine on 11 August 2020. The Russian vaccine is called "Sputnik V" after the Soviet-era satellite that was the first launched into space in 1957.

It was developed by the Gamaleya research institute for epidemiology and microbiology in Moscow in coordination with the Russian defence ministry. However, the controversies surrounding the vaccine still refuse to die as the World Health Organization has maintained that the Russian vaccine is NOT in the advanced stages of human trials (Phase III). Currently, the Russian vaccine is not among the WHO's list of six vaccines that have reached phase three clinical trials, which involve more widespread testing in humans. Meanwhile Pfizer and its German partner BioNTech have announced that their trial Vaccine is 90 % effective against Covid 19 as per phase 3 trials. Another drug manufacturing company Moderna has claimed that their vaccine is more than 94% effective against Corona virus. Covid 19 pandemic has affected every sphere of our life. Dentistry is no exception. Dentists all over the world are in dilemma. They have to take calculated risks to sustain their practices and earn their livelihoods. This may tantamount to increased costs due to mandatory protective gears, disinfection expenses and preventive measures in clinical setting. A part of increased expenditure on protocols/ facilities has to be passed on to the

patients. It will also result in lesser working hours, loss of profits, lesser supporting staff, stress, job insecurity and debts. There is possibility of career switch over in countries like India where thousands of dentists are getting trained every year without much career prospects. Some Dental associations in India have already appealed to government to support the dentists in these difficult days of pandemic. Dentists all over the world have to follow the local government directives on lockdowns and other circulars on functioning of healthcare facilities.. And they have to live with and accept the shortfalls of dwindling economies in a new world order where they may have to make bigger compromises in careers and sacrifice career goals.

### Conclusion

Dental professionals have to learn to live with SARS-CoV-2. The dental treatments, dental education, research and the treatment protocols will see a paradigm shift in coming days. Dentists have to reset their goals with proper planning. They have to compromise on profits and growth. They have to focus on self protection and patient's concerns. Dentist world over have to learn to accept new methods and approaches to face the Covid challenges. The world is no longer a safe place for a haphazard practice and random treatments. We have to prioritize our health concerns more than our career aspects. As they say health is wealth. There will be survival of the fittest in the new normal.

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