

## Challenges in providing oral and dental health services in COVID-19 pandemic

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### Abstract

Coronavirus disease (COVID-19) pandemic has rendered the world completely unaware and off-balance. Most of the countries of the world are in a lockdown of varying severity to break the chain of transmission. Many non-essential healthcare practices have been shut down to impose social distancing against a population whose slogan has been freedom of movement.

Several healthcare providers have also been caught off guard. Many are not well-versed in the use of transmission-based safeguards, and the dental community, is no different.

In this article, we identify the challenges faced by the oral and dental care providers, whose procedures generate a significant amount of aerosol, which can be a significant source of disease transmission within the community. It further describes the dynamics of aerosol spread and various strategies to minimise aerosol generation. Guidelines for the delivery of emergency dental treatment are formulated based on different guidelines from various international dental associations and organisations.

**Keywords:** COVID-19, Dental guidelines, Aerosol, Pandemic.

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### Introduction

The coronavirus disease 2019 (COVID-19) continues unabated throughout the world, leaving economies, cultures, and societies devastated. It began in Wuhan, China on December 29, 2019; 4 cases of pneumonia of unknown aetiology were detected by local hospitals using a surveillance system developed in 2003 after the severe acute respiratory syndrome (SARS) outbreak. All four cases were linked to the Huanan seafood market.<sup>1</sup> The rest is history that is still unfolding, with 1.5 million infected and nearly 140,000 deaths, worldwide, at the

time of this writing.<sup>2</sup> Closer to home, there have been 6,505 cases with 124 deaths to date.<sup>3</sup>

The pathogen was described as a novel coronavirus (2019-nCov) in 2019. Later, as more information became available, the International Committee on Taxonomy of Viruses formally designated the pathogen as severe acute respiratory syndrome coronavirus-2 (SARS-Cov-2). The World Health Organization subsequently named the disease as coronavirus Disease 2019 (CoVID-19)<sup>4</sup> and announced the outbreak to be a pandemic on March 11, 2019.<sup>5</sup>

### COVID-19 and Its Transmission Dynamics Concerning Dental Environment

Transmission occurs through respiratory droplets produced by sneezing, coughing, and coming into direct contact with contaminated surfaces. Respiratory droplets are particles greater than 5 microns. They are caused by a patient who is coughing, sneezing, or talking. Droplets in the dental practice are also generated through splash and spatters. Disease transmission through droplets requires close contact (within 1 m), as large droplets, due to their size, do not move far and do not stay in the air.<sup>6</sup>

Aerosols are less than 5 microns in size. Coughing, sneezing, laughing, chatting, and breathing also creates aerosols. They have low settling speed, and stay suspended in the air for more extended periods and travel further.<sup>7</sup>

Transmission via aerosol has been identified as another possible route. A recent study by Santarpia and colleagues at the University of Nebraska Biocontainment Unit, examining surface and air samples at varying distances, showed the presence of viral RNA in 63% of the samples.<sup>8</sup> The study also found viral RNA in air samples taken from the corridors (66.7%), suggesting dissemination beyond the immediate containment area by aerosolisation of viral particles.

In light of such newer aerosol transmission studies, WHO has now added aerosol transmission as another mode of disease spread.<sup>6</sup> Dental procedures are however, conspicuous by their absence.

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The vast majority of dental procedures produce a significant amount of droplets, spatters, splashes, and bioaerosol. Collectively, such methods can be referred to as aerosol-generating procedures' or in short, AGP.

Few studies have been performed to research the distribution of aerosol dynamics in dental practice. Studies showed large bacterial loads, 2433 CFU/m<sup>3</sup>, in samples obtained up to 2 m from the patient when AGP was performed. Besides, samples collected after 20 min of AGP, also demonstrated a significant presence of bioload (1254 CFU/m<sup>3</sup> - 1433 CFU/m<sup>3</sup>). However, samples were found to be overwhelmingly negative, after work surfaces were disinfected. Samples collected from the underside of the face shield, worn by the user at the time of AGP, showed substantially low bioload (34 CFU/m<sup>3</sup>).<sup>9,10</sup>

Adding fuel to the fire, it is becoming clear that viral shedding occurs in the absence of symptoms.<sup>11</sup> This alone is not only an infection control nightmare, but it should make us, dentists, realise that we need to treat every patient as 'potentially infected' and use transmission-based precautions.

In a real-life scenario, this means that there is still a chance for airborne exposure at the end of an AGP, when the dentist removes face protection. The bioaerosol can move further to general patient waiting areas, where none of the patients have barrier protection. Airflow modelling studies conducted in Hong Kong at the time of SARS-CoV-1 outbreak found that residents on upper floors were at risk of infection from infected residents on lower levels, as bioaerosol was travelled up in warm polluted air.<sup>12</sup> Within the dental environment, the condition gets further complicated if the next patient is seated within 30 minutes of the previous one's departure, as studies have shown that air remains polluted within the limits of dental surgery.<sup>10</sup>

COVID-19 is the third major infectious communicable disease outbreak since the beginning of the century; SARS occurred in 2003 and Middle East respiratory syndrome (MERS) in 2012. In the case of the COVID-19 pandemic, the dental environment can be a possible nidus to promote the spread of disease.

The dentist in particular, and the dental community in general, need to understand the potentially devastating role that a poorly managed dental environment can play in the spread of COVID-19. Only by understanding the propagation mechanisms within the dental practice environment, should we expect to play our part in helping to minimize the spread of this outbreak.

## Strategies To Reduce Spread Of Aerosol In Dental Practice

It seems clear that the key source of infection spread in dental practices is bioaerosol. Other causes of contamination, such as work surfaces and infected instruments, are typically well-managed, as most dental practices follow standard protocols prescribed for surface disinfection and instrument sterilization. Bioaerosol transmission tends to be the weakest link in the transmission chain. Various strategies can be employed in dental practices to reduce the generation of bioaerosol.

### Pre-procedural mouthwash:

A 20-30 second mouth rinse has been shown to reduce bioload within the dentally generated aerosol.<sup>13</sup> However it is not yet clear whether this will affect viruses and bacteria harboured in the nasopharynx. Surprisingly, Xu and colleagues have reported the existence of SARS-CoV-2 cell receptor, called angiotensin-converting enzyme II (ACE2) in oral mucosa and tongue.<sup>14</sup> A mouth rinse with either 0.2% chlorhexidine (CHX) or 0.2% povidone-iodine or 1% hydrogen peroxide is nevertheless suggested.<sup>15</sup>

### Use of rubber dam:

The use of rubber dam effectively removes bioaerosol by building a physical barrier between the oral cavity and the environment. The aerosol that will be produced will contain airborne tooth dust, organisms contained within the tooth itself, and any bacterial within water coolant coming from the dental unit water lines.<sup>13</sup> Rubber dam, however, cannot be used for most oral surgical procedures and procedures that have a subgingival component.

### Use of high volume evacuator:

High volume evacuator (HVE) is successful in removing aerosol just as it is becoming airborne. It is 90% effective.<sup>13</sup> The saliva ejector is not considered as HVE. Both of these devices are usually installed in modern dental units. During an AGP, the dental assistant usually tucks the saliva ejector in the posterior part of the oral cavity, and then holds the HVE in such a way that its vacuum evacuates the aerosol that is being formed. It means that 4-handed dentistry has to be part of the procedure instead of working without an assistant.

### HEPA filters:

High-efficiency particulate air (HEPA) filter separates polluted air from the dental operatory. While they effectively reduce airborne contamination, their use in our local setting is unheard of due to their high costs.

## Suggested Guidelines For Managing Dental Care In COVID-19 Pandemic

In the context of Pakistan, there are no formal national dental guidelines. Therefore, we looked at the American recommendations, the Australian Dental Association, and the National Health Service UK guidelines, and sought to formulate strategies that could be used in our context, so that our dental community continues to care for our patients.<sup>15-17</sup>

Leading dental associations around the world have advised deferral of any non-urgent dental care. Please note that the recommendations are interim and are constantly evolving. The reader is directed to review the current information by accessing the respective web resources listed in the reference section of this article.

### Prioritize urgent care:

This disease is highly infectious, and there is more evidence that not only symptomatic patients, but presymptomatic ones are capable of shedding the virus.<sup>11</sup> As a result, only urgent and emergency care should be given, concentrating on relief of acute pain and infection, using limited AGP. For examples of what constitutes a dental emergency, see Box-1.

Medication for pain relief and infection can be given through a video call by the dentist where possible. One of the authors routinely asks patients to first send a picture or make a video of the area of concern and, in most cases, the prescription of pain relief and/or antibiotic solves the problem without physically calling the patient in.

**Box-1:** Some common examples of dental emergency.<sup>15,16</sup>

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- ◆ Acute dental pain
  - ◆ Uncontrolled bleeding
  - ◆ Dental abscess, where potential for airway compromise is deemed to be present
  - ◆ Dental trauma and facial trauma
  - ◆ Replacing lost temporary filling on endodontic access cavity
  - ◆ Snipping or adjusting orthodontic wires causing ulceration of oral mucosa
  - ◆ Medically compromised patients with dental problems, which may compromise their systemic disease
  - ◆ Managing dental concerns of patients referred by medical colleagues for medically necessary dental care, e.g., patients about to undergo cardiac valve replacement or head and neck radiotherapy

#### NOTE:

1. We recommend to use only minimally invasive procedures, with minimal aerosol generation that focuses on alleviating pain and infection
  2. This is not a complete list, and the dentist is advised to use discretion to decide what is or is not a dental emergency
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## Screening for COVID-19 status:

If the patient considers it necessary to visit the dental clinic, every effort should be made to assess the risk of COVID-19 by telephone or video call. See Box-2 for questions on screening.

**Box-2:** Examples of questions to ask to ascertain risk of COVID-19.<sup>15,22</sup>

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- ◆ Overseas travel in the past 14 days
  - ◆ Symptoms of fever, cough, sore throat or shortness of breath
  - ◆ Any contact with a confirmed or suspected case of CoVID-19 in the past 14 days
  - ◆ Engaged in public dealing, e.g., bank teller, general physician
  - ◆ Participated in a large public gathering in the past 14 days
  - ◆ Daily or frequent use of public transport
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## Waiting room and arrival protocols:

- ◆ Remove all unnecessary items in the waiting room like reading materials and toys
- ◆ Adjust the distance between seats to at least 1.5 - 2 meters
- ◆ Regularly wipe down all surfaces with more than 60% alcohol wipe or 0.1% sodium hypochlorite
- ◆ On arrival, the patient should use alcohol-based hand rub (AHBR)
- ◆ The patient should be given a surgical mask while seated in the waiting room. There is proof that the virus is aerosolized by talking and coughing, and the use of facemask decreases the measurable amount of virus in respiratory droplets and aerosols.<sup>8,18</sup> This will protect all those sitting in the waiting room.

## How to provide emergency dental treatment, when an aerosol-generating procedure is anticipated?

All dental treatment is given with 'transmission based, contact and droplet precautions' in addition to the standard or commonly known universal precautions. Use appropriate personal protective equipment (PPE); this includes fluid-impervious disposable long-sleeved surgical gown, gloves, and eye protection.

Regarding airborne precaution, all personnel involved in the procedures should use N95 or FFP2/P2, which has been previously fit-tested and seal-checked at the time of use. It is recommended that a surgical mask and a face visor/shield be used over the respirator. This will reduce contamination and increase its durability, particularly when these respirators are acutely deficient. Using these additional measures, the use of the respirator may be

prolonged for the remainder of a session.<sup>19,20</sup>

When the patient enters the operatory, ask the patient to wash their hands before sitting in the dental chair. This is going to preserve ABHR. Most of the dental offices have a washbasin inside their operatories.

A pre-procedural oral rinse with 0.2% chlorhexidine (0.2% povidone-iodine or 1% hydrogen peroxide could also given) should then be administered to the patient for 2 minutes. Although its effectiveness against SARS-CoV-2 has yet to be determined.<sup>16</sup>

The following should be utilised during procedure:

- ◆ High volume evacuation to maximize the capture of aerosol during the procedure
- ◆ Rubber dam wherever its use is possible
- ◆ 4-handed dentistry

Using handpieces fitted with anti-retraction or anti-reflux valves are very strongly recommended. This prevents the aspiration of bioaerosol into the dental unit's air and water lines. Hence for the next patient, the potential of disease transmission from procedurally generated aerosol is greatly reduced.<sup>21</sup> The installation of these anti-retraction valves in dental handpieces and waterlines is not a common practice in our country. It is therefore recommended that this device be incorporated into our everyday practice.

Minimize the use of 3-in-1 syringe as it causes the forceful ejection of aerosol. Intraoral radiographs should be avoided as placement of intraoral X-ray films or sensors can cause some patients to cough.

At the end of the procedure, use two complete cycles of surface cleaning using high-level disinfectant solutions or wipes. Place all clinical waste into a separate double-layered yellow bag that is sealed with gooseneck ligation. This can then be put in the appropriate clinical waste bin for further disposal according to local medical waste management protocols.<sup>21</sup>

Consider allowing at least 20 minutes before seating the next patient. Open any windows to the outside, if present. This will allow complete air change within the operatory.

### The Dental Team:

Ensure education of the entire dental team in transmission-based precautions. Staff with comorbidities and who are pregnant may be asked to stay away from dental practices. Workers experiencing flu-like symptoms should not report to work and should self-quarantine for

at least two weeks.

### Conclusion

This is a time of uncertainty and a great deal of anxiety. Lack of guidance at local, regional, and national levels can create a dangerous situation in which dentists can spread the transmission of COVID-19 to the population. Through keeping up with current international recommendations, we can respond to the urgent oral and dental needs of our patients, keeping ourselves, our families, and our communities healthy and safe. This unfortunate event can act as a wake-up call for our dental profession. It should galvanize us into a single professional body, a body that advocates for both the dental professional and the patient. Too many opportunities have been lost in the past - let us not waste this one too!

### References

1. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med* 2020;382:1199-1207. doi: 10.1056/NEJMoa2001316.
2. Coronavirus Resource Center. COVID-19 Case Tracker. [Internet] Johns Hopkins Coronavirus Resource Center [updated 2020 Apr 18; cited 2020 Apr 20]. Available from URL: <https://coronavirus.jhu.edu/>
3. COVID-19 Health Advisory Platform by Ministry of National Health Services Regulations and Coordination [Internet] Government of Pakistan [updated 2020 Apr 13; cited 2020 Apr 20]. Available from: <http://covid.gov.pk/>
4. Coronaviridae Study Group of the International Committee on Taxonomy of V. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol* 2020;5:536-544. doi: 10.1038/s41564-020-0695-z.
5. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet] World Health Organization; 2020 Mar 11 [cited 2020 Apr 20]. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
6. WHO. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations [Internet] World Health Organization; 2020 Mar 29 [cited 2020 Apr 20]. Available from URL: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>
7. Ge Z-y, Yang L-m, Xia J-j, Fu X-h, Zhang Y-z. Possible aerosol transmission of COVID-19 and special precautions in dentistry. *J Zhejiang Univ Sci B* 2020;1-8. doi: 10.1631/jzus.B2010010
8. Santarpia JL, Rivera DN, Herrera V, Morwitzer MJ, Creager H, Santarpia GW, et al. Transmission potential of SARS-CoV-2 in viral shedding observed at the University of Nebraska Medical Center. *medRxiv* 2020:2020.03.23.20039446. doi: 10.1101/2020.03.23.20039446
9. Rautemaa R, Nordberg A, Wuolijoki-Saaristo K, Meurman JH. Bacterial aerosols in dental practice - a potential hospital infection problem? *J Hosp Infect* 2006;64:76-81. doi: 10.1016/j.jhin.2006.04.011.
10. Chuang C-Y, Cheng H-C, Yang S, Fang W, Hung P-C, Chuang S-Y. Investigation of the spreading characteristics of bacterial aerosol contamination during dental scaling treatment. *J Dent Sci*

- 2014;9:294-6. doi: 10.1016/j.jds.2014.06.002
11. Wei W, Li Z, Chiew C, SE Y, Toh M, Lee V. Presymptomatic transmission of SARS-CoV-2-Singapore, January 23-March 16, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:411-50 doi: 10.15585/mmwr.mm6914e1
  12. Yu IT, Li Y, Wong TW, Tam W, Chan AT, Lee JH, et al. Evidence of airborne transmission of the severe acute respiratory syndrome virus. *N Engl J Med* 2004;350:1731-9. doi: 10.1056/NEJMoa032867.
  13. Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. *J Am Dent Assoc* 2004;135:429-37. doi: 10.14219/jada.archive.2004.0207.
  14. Xu H, Zhong L, Deng J, Peng J, Dan H, Zeng X, et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. *J Oral Sci* 2020;12:1-5. doi :10.1038/s41368-020-0074-x
  15. ADA. Managing COVID-19 Guidelines. [Internet] Australian Dental Association [updated 2020 Mar 25; cited 2020 Apr 20]. Available from: <https://www.ada.org.au/Campaign/COVID-19/Guide-to-Managing-COVID-19/ADA-Managing-COVID-19-Guide-v-2.aspx>.
  16. ADA. ADA Interim Guidance for Minimizing Risk of COVID-19 Transmission. [Internet] Australian Dental Association [updated 2020 Apr 01; cited 2020 Apr 20]. Available from: [https://www.ada.org/~media/CPS/Files/COVID/ADA\\_COVID\\_Int\\_Guidance\\_Treat\\_Pts.pdf?utm\\_source=adaorg&utm\\_medium=covid-statement-200401&utm\\_content=cv-pm-ebd-interim-response&utm\\_campaign=covid-19](https://www.ada.org/~media/CPS/Files/COVID/ADA_COVID_Int_Guidance_Treat_Pts.pdf?utm_source=adaorg&utm_medium=covid-statement-200401&utm_content=cv-pm-ebd-interim-response&utm_campaign=covid-19).
  17. Magennis P, Coulthard P. Guidance PPE for patients with emergency oral and dental problems of unknown COVID Status. [Internet] British Association of Oral Surgeons; 2020 [updated 2020 Mar 25; cited 2020 Apr 20]. Available from: [https://www.baoms.org.uk/\\_userfiles/pages/files/professionals/covid\\_19/baoms\\_baos\\_covid\\_advice\\_update\\_25\\_march\\_2020\\_final.pdf](https://www.baoms.org.uk/_userfiles/pages/files/professionals/covid_19/baoms_baos_covid_advice_update_25_march_2020_final.pdf).
  18. Leung NH, Chu DK, Shiu EY, Chan K-H, McDevitt JJ, Hau BJ, et al. Respiratory virus shedding in exhaled breath and efficacy of face masks. *Nat Med* 2020. doi: 10.1038/s41591-020-0843-2
  19. CDC. Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings - NIOSH Workplace Safety and Health Topic [Internet] The National Institute for Occupational Safety and Health (NIOSH) 2020 [updated 2020 Mar 27; cited 2020 Apr 20]. Available from: <https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html>
  20. Gov.UK. COVID-19 personal protective equipment. [Internet] Public Health England [updated 2020 Apr 17; cited 2020 Apr 20]. Available from: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe>.
  21. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020;12:9. doi: 10.1038/s41368-020-0075-9.
  22. Government of Pakistan. Guidelines - Clinical Management Guidelines for COVID-19 Infections. [Internet] Ministry of National Health Services, Regulations & Coordination; 2020 [updated 2020 Apr 02; cited 2020 Apr 20]. Available from URL: [http://covid.gov.pk/guidelines/pdf/20200402%20Clinical%20Management%20Guidelines%20for%20COVID-19%20infections\\_1201.pdf](http://covid.gov.pk/guidelines/pdf/20200402%20Clinical%20Management%20Guidelines%20for%20COVID-19%20infections_1201.pdf).
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