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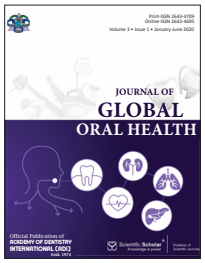

Review Article

Risk of coronavirus disease 2019 through aerosol generated dental procedures: A brief report

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ABSTRACT

A novel human coronavirus – now named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with 80% genetic makeup similarity with SARS-CoV-€1 – emerged from Wuhan, China, in late 2019. This new virus is highly infective especially through airborne transmission. Dentistry has been listed as the very-high-risk category in a new report called "Guidance on preparing workplaces for COVID-19" by occupational safety and health act. This literature review aimed at assembling relevant information regarding the risk of coronavirus disease 2019 through aerosol generated dental procedures.

Keywords: Coronavirus disease 2019, Severe acute respiratory syndrome coronavirus 2, Aerosol

INTRODUCTION

Since its outbreak by the end of 2019, coronavirus disease 2019 (COVID-19) affected more than 22 million people so far and has claimed nearly 8 lakh lives worldwide. This new virus, highly infective especially through airborne transmission, is responsible for an acute respiratory syndrome, distinguished by an often asymptomatic, but potentially lethal, interstitial bilateral pneumonia.[1] The US Centers for Disease Control and Prevention (CDC) has listed dental care-related aerosols or droplets as high risk on the basis of presumed equivalence of these aerosols to those that might occur during medical procedures.[2] As the oral cavity is the working area of dental professionals, they have a high risk of being infected. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been identified in the saliva of infected patients.[3] The dental aerosols can remain on the surface even after the patient has left the clinic and this can be a potential source of infection for the dental professionals. Although there is no evidence that aerosols generated from dental care lead to transmission of SARS-CoV-2, guidelines have been recommended given the urgency of the epidemic. Typically, the greater the imminent threat to public health, the lower the standards of evidence in early guidance.[4] Furthermore, universal precautions must be considered for all patients because asymptomatic patients can also transmit the virus.[5]

TRANSMISSION OF SARS-COV-2 IN DENTISTRY

According to size, particles can be classified as: coarse particles (2.5–10 μ), fine particles (<2.5 μ), and ultrafine particles (<0.1 μ). Air particles >10 μ can typically be filtered by human nose, but it usually fails to filter any particle <10 μ from entering into the respiratory system. Furthermore,

any fine particle (<2.5 μ) can easily enter the alveoli and any ultrafine particle (<0.1 μ) can enter the bloodstream and target organs such as heart and brain.[6] SARS-CoV-2 virus is an enveloped virus approximately 0.1 μ in diameter. Respiratory droplets are often divided into two size bins, large droplets (>5 μ), and small droplets (<5 μ). Large droplets fall to the ground at a faster pace due to gravitational forces, but small ones can stay suspended in the air for a much longer period of time and be inhaled by susceptible persons.[7] The characteristic diameter of large droplets produced by sneezing is approximately 100 μ,[8] while the diameter of droplet nuclei produced by coughing is on the order of ~1 mm.[9] Here are some examples of the longevity of SARS-CoV-2 in various places:[10]

- Plastic and stainless steel surfaces: 72 h
- Cardboard surfaces: 24 h
- Copper surfaces: 9 h
- Suspended aerosols: 3 h.

The exhalation distances of aerosol micro particles and large droplets are depicted in figure 1.

These bioaerosols that are produced by high speed dental handpiece, ultrasonic scaler, or air-water syringe are comparatively smaller particles (<10 μ) than respiratory droplets.[11] These bioaerosols are contaminated with various microorganisms and have the potential to suspend in the air for a considerable amount of time and be inhaled by the dentists or other patients.[12] Wang *et al.* (2004) examined the oral cavity of SARS patients and found large amount of SARS-CoV ribonucleic acid in their saliva ([7.08 × 103]–[6.38 × 108] copies/mL).[13] Veena *et al.* in 2015 demonstrated that contaminated aerosols can be found within 60 cm from the patient's head, mainly on the right arm of the dentist, on their mask, and around their nose and eyes. Moreover, the aerosol generated by an ultrasonic device can remain suspended in the air for 30 min after the procedure.[14] Incidence of particle transmission is highest during ultrasonic scaling followed by air polishing, air/water syringe, and high-speed hand piece aerosolization.[15] Ultrasonic instrumentation can transmit 100,000 microbes per cubic foot with aerosolization of up to 6′, and, if improper air current is present, microbes can last anywhere from 35 min to 17 h.[16] Dentistry has been listed as the very-high-risk category in a new report called "Guidance on preparing workplaces for COVID-19" by occupational safety and health act and the section "Implement workplace controls, engineering controls" recommends that dental practices should install negative pressure rooms or there should be an airborne infection isolation rooms for aerosol producing treatments.[17]

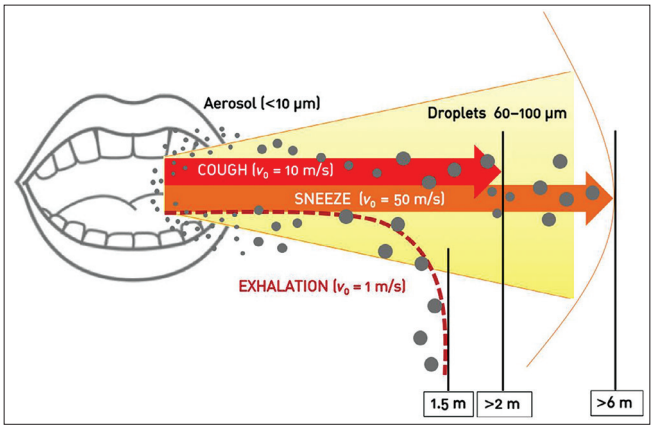

Figure 1: Exhalation distances of aerosol microparticles and large droplets. Original picture with data taken from Xie *et al.*[11]

HIDDEN FACTS

Although there is loads of literature suggesting the possible mode of transmission of COVID-19 through bio-aerosol producing dental procedures, few hidden facts are needed to be addressed. First, it has still not been established whether dental aerosols are similar to those produced during tracheal and nasopharyngeal procedures.[18] Aerosol is produced in dental procedures due to water or air spray, which would considerably dilute any potential viral presence. Second, there is question of presence of potential infectious virus within dental aerosols. Viral culture is necessary to substantiate the potential for infection, as demonstrated in investigations of other body sites.[10,19,20] Finally , there is lack of evidence of transmission of infectious respiratory disease through aerosol producing dental treatments. CDC guidance has suggested that SARS-CoV-2 spreads from person to person, and spread through contaminated surfaces is not the main way of virus transmission.[21] Moreover, risk assessment aerosols and contaminated surface must be based on isolation of viable virions, not only on polymerase chain reaction testing.

CONCLUSION

The aim of this review of literature was to assemble all relevant facts in the dental field since the emergence of the new coronavirus, SARS-CoV-2. The extent and severity of changes of infection control procedures in post-pandemic dental practice should be guided by evidences and researches.

Declaration of patient consent

Patient consent not required as there are no patients in this study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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