

Exhaled Bioaerosols from Asymptomatic COVID-19 carriers- A Potential Risk in Orthodontics?

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ABSTRACT

The current manuscript sheds light on the possible role of bioaerosols (from mouth breathing) that may serve as vectors for transmitting COVID-19 in asymptomatic carriers reporting to dental hospitals and, hence, may pose a great challenge for even a simple orthodontic diagnosis. Further, we would like to add a few preventive considerations for containment of this novel disease spread via bioaerosols emitted, particularly during mouth breathing.

Key words: Bioaerosols, Coronavirus, Disease spread, Mouth breathing, Orthodontics, Pandemic

INTRODUCTION

Coronavirus disease (COVID-19) has posed great challenges presently and, in that, the role of health-care professionals in preventing the spread of transmission is extremely significant. The novel disease has spread rapidly to several countries, affecting 223,022,538 people worldwide, causing 4,602,882 deaths on September 10, 2021, according to the reports of the WHO (World Health Organization, 2020)¹. In view of this global pandemic that is quite alarming, WHO has stressed the importance of basic protective measures, mainly being hand hygiene and social distancing².

PRE-SYMPTOMATIC TRANSMISSION OF COVID 19

Recently, researchers reported that the novel coronavirus disease 2019 (COVID-19) spreads from asymptomatic carriers. The latest evidence suggests that pre-symptomatic transmission by viral shedding is quite possible, occurring just 2-3 days before the symptoms' onset^{3,4}. Interestingly, the infectious profile of SARS-CoV-2 resembles more likely that of influenza rather than SARS⁴. At this stage, the exact mechanism by which the asymptomatic individuals acquire and spread the virus at the pre-symptomatic period is under exploratory research. We would like to emphasize our notable observations.

PRE-SYMPTOMATIC TRANSMISSION OF COVID 19

Literature evidence suggests that any infectious material in a true aerosol form (*i.e.*, < 50 μ m diameter) becomes re-airborne as droplet nuclei that linger in the

atmosphere for up to 30 minutes, thereby expanding the spatial extent of emitted particles^{5,6}. Apart from speaking/coughing, aerosols are also generated during normal breathing, commonly referred to as "exhaled bioaerosols" consisting of airway-lining fluid in small droplets⁷. Mouth breathing is another significant overlooked factor, producing the largest number of airborne droplets (< 1 μ m) much more than breathing, speaking, and coughing, definitely posing a threat⁸. These emitted particles act as vectors for the spread of various infectious diseases, including influenza in the past and hence, we have to consider the impact of these bioaerosols on the current pandemic too. This could be one of the probable reasons that COVID-19 is highly transmissible between the subjects in the pre-symptomatic and/or asymptomatic stage^{3,4}.

EXHALED BIOAEROSOLS- A RISK FACTOR IN ORTHODONTIC PATIENTS?

More recently, it has been reported that bioaerosols from mouth breathing serve as an under-recognized transmissible mode in SARS-CoV-2 infection⁹. This builds up internal pressure since we are at high exposure risk as health care professionals. The probability of risk transmission is quite high, especially in the case of mouth-breathing individuals who report with one or more significant orthodontic findings seeking treatment. Hence, the disease control measures for COVID-19 should be adjusted to account for probable substantial pre-symptomatic transmission, as stated earlier⁴. However, we would like to add considerations for containment of the spread

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via bioaerosols emitted, particularly during mouth breathing or normal breathing. More recently, Anfinrud *et al.* (2020) visualized speech-generated salivary droplets with and without masks by laser light scattering and qualitatively reported the significance of a damp cloth cover over the oral cavity to curb droplets emission¹⁰.

SUGGESTED PREVENTIVE MEASURES

It was also reported in an earlier study by Edward *et al.*⁷ that nebulized suspension containing isotonic saline and surfactants like 1,2-Dipalmitoyl-*sn*-glycero-3-phosphocholine (DPPC) and 1-94 palmitoyl-2-oleoyl-*sn*-glycero-3-phosphoglycerol (POPG) significantly reduced the exhaled aerosols by altering the physical properties of the lung-lining fluid, notably, surface tension and viscosity in “super spreaders” (*i.e.*, high bioaerosol producers). Hence, this prophylactic inhalation measure can also be considered to combat COVID-19 transmission effectively via asymptomatic carriers, added to other defensive actions including isolation, enhanced personal hygiene, and use of face masks/shields as proposed. Further, filtering facepiece masks (FFP), especially FFP3 that possess a high filtration rate (99%), can be highly recommended amongst dentists to contain the airborne spread of the virus^{11,12}.

CONCLUSION

Therefore, it is understood that the generation of bioaerosols is an inevitable and never-ending process. Bioaerosols are omnipresent, and the exhaled bioparticles from asymptomatic COVID-19 carriers are a potential threat. The risk of transmission increases multifold, particularly in individuals with compromised immune systems due to debilitating diseases. Since there are no definite therapies available for the treatment of COVID-19 presently, it is indispensable to adopt the aforesaid prophylactic preventive actions carefully.

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AUTHOR'S CONTRIBUTIONS

Conceptualization: B. Saravanakarthykeyan and Divya VC

Writing- Original Draft Preparation: Divya VC

Writing- Review & Editing: B. Saravanakarthykeyan

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The authors declare that they have no competing interests.

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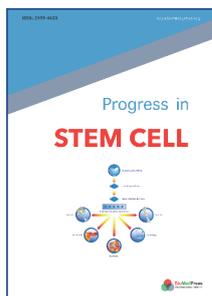
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