

Michelle Desjardins, Sarah Desrochers, Emma Heyland & Joann Moulton, RDH, MS | Dental Hygiene Department, Westbrook College of Health Professions

## Research Question

Are patients with periodontal disease at an increased risk for severe COVID-19 illness?

## Abstract

COVID-19 has become a novel pandemic increasing rapidly all over the world.<sup>1</sup> Periodontal disease and COVID-19 share many of the same risk factors such as age, gender, and systemic diseases like diabetes and hypertension.<sup>1</sup> Although not many studies exist on periodontal disease (PD) and COVID-19 due to it being a new and emerging topic, many studies suggest key links between the two. Maintaining superior oral health is especially important during the COVID-19 pandemic to prevent PD.<sup>3</sup> Further research is needed to have concrete evidence between PD and COVID-19 due to COVID-19 being a new and emerging illness, while PD is more frequently studied and understood.<sup>1</sup>

## Introduction

- COVID-19 was first reported in Wuhan, China in December 2019<sup>2</sup>
- WHO declared it a pandemic on March 11, 2020<sup>1</sup>
- Main route of transmission is through infected respiratory droplets<sup>2</sup>
- COVID-19 infection presents as fever, dry cough, and dyspnea<sup>2</sup>
- In severe cases, infection causes severe alveolar damage causing respiratory distress, leading to hospitalization and sometimes death<sup>2</sup>
- Periodontal diseases are a group of diseases (periodontitis and gingivitis) involving inflammatory aspects of the host and dysbiotic events that affect periodontal tissues and could have systemic complications<sup>1</sup>
- According to WHO, PD affects 10% of global population<sup>1</sup>
- Cytokines largely associated with PD: interleukins (ILs) and TNF-alpha<sup>3</sup>
- Angiotensin converting enzyme-2 (ACE-2) has been considered the main receptor for COVID-19 entry into target cells<sup>4</sup>

## Review of Literature

- Dysregulated inflammatory response that is associated with PD has been observed in severe COVID-19 illness contributing to its progression<sup>1</sup>
- Oral mucosa in pathological states such as chronic periodontitis/oral cancer has shown to exhibit higher levels of proteases furin and cathepsin L that help enable SARS-corona virus-2 to infect the host cells<sup>2</sup>
- Patients exhibiting an exaggerated form of COVID-19 symptoms necessitating ICU admission show even greater levels of IL-2, IL-7, IL-10, IP-10, G-CSF, MIP1A, MCP1 and TNF alpha<sup>3</sup>
- COVID-19 has been seen more prominently in patients with PD due to this increased “cytokine storm”<sup>3</sup>
- Cells from the oral cavity have been found to highly express ACE-2 in a comparable manner to lung cells<sup>4</sup>
- Periodontal pockets (PP) act as reservoirs for viruses<sup>4</sup>
- Viral detection in PP has been established in numerous publications: median prevalence figures in PP of different forms of periodontitis are 26–78%, 46–58% and 42–58% for Herpes Simplex virus (HSV), Epstein-Barr virus (EBV) and Human Cytomegalovirus (HCMV) respectively<sup>4</sup>
- PD acts within the same chronic inflammatory model seen in other diseases such as cardiovascular disease, diabetes, obesity, aging, and hypertension, with these diseases being risk factors for more severe COVID-19 illness<sup>5</sup>

## Discussion

- Enough evidence to propose that PD acts as a potential risk factor for COVID-19<sup>1</sup>
- Important during the time of COVID to maintain proper oral hygiene<sup>3</sup>
- Limitations of the research:
  - COVID-19 is new and evolving
  - PD health status has not been assessed in patients with COVID-19 illness<sup>1</sup>
- Suggestions for future research:
  - It would be useful to characterize the microbiome in PD patients with COVID-19<sup>1</sup>
  - Future studies should explain the various patterns of SARS-CoV-2 infection-replication-migration, in relation to each specific target cell families and to the plausibility of reactivation of the virus in already healed patients<sup>4</sup>

## Conclusion

Evidence has been shown to make a connection between periodontal disease and COVID-19 regarding similar modes of viral entry and risk factors. However, there is still further research to be done to declare the two have a significant correlation or if one exacerbates the other. The research that has been concluded thus far has shown increased levels of specific cytokines in periodontal disease that are alike those in the COVID-19 infection. Studies still need to be executed on patients with periodontal disease and COVID to determine the exact relationship between the two.

## References

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## The PD and COVID-19 Connection<sup>6</sup>

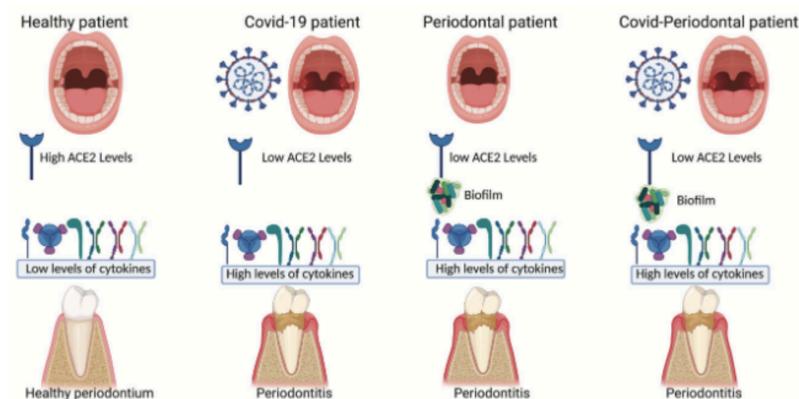


Figure 2. ACE2 levels and biofilm as enhancers in periodontal disease in periodontal and COVID-19 patients.