

The Role of Oral Health in the Acquisition and Progression of SARS-CoV-2

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Research Question: How is oral health status (measured by number of missing teeth and alveolar crest height) related to the acquisition and severity of COVID-19?

BACKGROUND

The oral cavity is a major entry point for COVID-19 making it a possible player in the onset of the disease. SARS-CoV-2 enters cells via the human angiotensin-converting enzyme 2 (ACE2) receptor which is found abundantly in the oral cavity and respiratory tract.¹ Greater ACE2 expression has been suggested to be linked to SARS-CoV-2 infection susceptibility as well as periodontal disease, suggesting that poor oral health may be linked to COVID-19 infection.^{2,3} Overlapping risk factors between severe COVID-19 and periodontal disease such as age over 65 years, male sex, hypertension, diabetes, and cardiovascular disease also point towards their possible relationship.^{4,5} Periodontal disease can also cause increased levels of local and systemic cytokines, which may potentiate the cytokine storm seen in COVID-19 patients.

OBJECTIVES

This study aimed to investigate the whether certain indicators of periodontal health such as alveolar crest height and number of missing teeth are related to the likelihood of acquiring COVID-19 and hospitalization due to COVID-19. In the future, improving oral health may be helpful to reduce the severity of COVID-19.

TABLES

Table 1 - Multivariate logistic regression models for COVID-19 status

	COVID-19 status
	n=147 case-control pairs
Characteristic	Adjusted Odds Ratios
History of smoking (ever)	0.222 (0.079 - 0.621)
Alveolar crestal height (mm)	4.302 (2.510 – 7.376)
Missing teeth (number)	0.897 (0.835 – 0.967)
* with alveolar crestal height and missing teeth as forced variables	
Variables included in univariate analysis: race, ethnicity, HTN, diabetes, smoking (ever vs never)	

Table 2 – Multivariate logistic regression models for hospitalization among COVID-19 patients

	Hospitalization status
	n=231 COVID-19 cases- n=25 hospitalized and n=216 non-hospitalized
Characteristic	Adjusted Odds Ratios
Alveolar crestal height (mm)	1.313 (0.812– 2.124) p=0.27
Missing teeth (number)	1.113 (1.034– 1.197) p=0.005
* with ACH and missing teeth as forced variables	
Variables included in univariate analysis: Age, Sex, race, ethnicity, HTN, diabetes, smoking (ever vs never)	

METHODS

A retrospective analysis using electronic health record data was performed on charts dated 12/01/2019 to 08/24/2020 from the Columbia University Irving Medical Center (CUIMC). 387 COVID-19 positive cases were matched to COVID-19 negative controls based on age, sex, and race. Demographic data, number of missing teeth, and alveolar crest height (ACH) were determined from medical and dental charts and radiographs, and a conditional logistic regression model was used to assess their association with COVID-19 status and hospitalization status.

- COVID-19 cases were found to have increased alveolar bone loss, fewer missing teeth, and lack of smoking history compared to controls
- COVID-19 cases with increased number of missing teeth were associated with hospitalization

DISCUSSION

COVID-19 and alveolar bone loss may have a bi-directional relationship where patients with alveolar bone loss may be more susceptible to COVID-19 infection and may also experience increased alveolar bone loss after infection. Increased alveolar bone loss and more missing teeth are associated with hospitalization in COVID-19 and missing teeth is associated with increased risk of hospitalization. Surprisingly, COVID-19 cases were found to have fewer missing teeth compared to controls. We will further investigate these findings by employing an artificial intelligence program that will automatically measure ACH and missing teeth allowing us to expand our control group.

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