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News and Perspectives

Is there an association between oral health and severity of COVID-19 complications?

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ABSTRACT

Most patients with severe complications from COVID-19 have underlying conditions such as obesity, diabetes, and hypertension. In parallel, there is growing evidence for a link between periodontitis and non-oral systemic diseases. The oral cavity is also a reservoir for respiratory pathogens, and patients with periodontal disease are more likely to develop hospital-acquired pneumonia than healthy individuals. We therefore hypothesize that improving oral health could decrease the severity of COVID-19 symptoms and reduce the associated morbidity.

The new coronavirus SARS-CoV-2 was first detected in late 2019 and has quickly developed into a global pandemic [1]. Age is one of the highest risk factors for developing severe symptoms of COVID-19, the disease caused by infection with SARS-CoV-2 [2]. Thus, individuals over the age of 65 and those living in long-term care facilities are especially vulnerable to morbidity and mortality due to infection with SARS-CoV-2. However, persons with chronic lung disease, moderate to

severe asthma, severe obesity, diabetes, chronic kidney disease, and liver disease are also at high risk for severe COVID-19 symptoms. A recent study lists hypertension, obesity, and diabetes as the three major underlying conditions with the most unfavorable outcomes in COVID-19 patients requiring hospitalization [3].

While COVID-19 can affect multiple organs in the body, including the kidneys and liver [4,5], the main cause of

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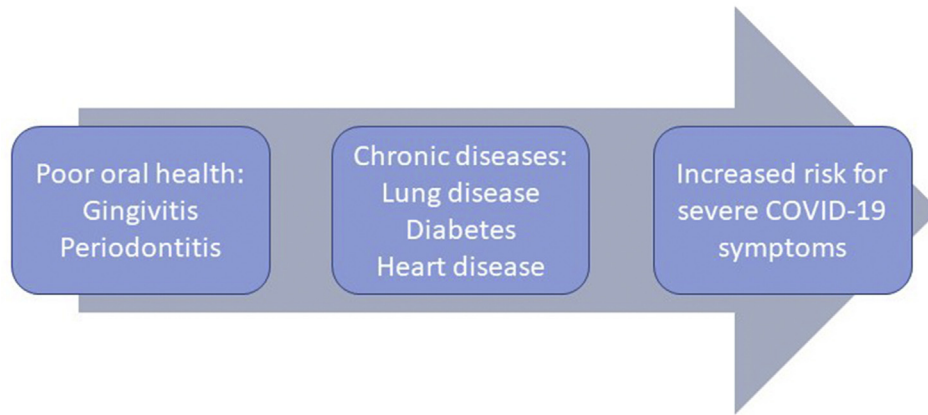


Fig. 1 Mechanisms that could cause poor oral health to exacerbate symptoms of COVID-19.

mortality is due to the ability of SARS-CoV-2 to infect the respiratory tract, leading to severe pneumonia. Patients with COVID-19 display symptoms of fever, cough, dyspnea, and other complications associated with acute respiratory distress syndrome [6–8].

A salient feature of COVID-19 is its ability to trigger an excessive immune reaction in the host, termed a ‘cytokine storm’, which causes extensive tissue damage, particularly in the connective tissue of the lungs [9]. The lung pathology of patients who die from COVID-19 pneumonia includes edema, focal reactive hyperplasia of pneumocytes with patchy inflammatory cellular infiltration, and multinucleated giant cells [10].

Oral health and non-oral systemic diseases

Over the past few years, it has been clear that oral health has a large impact on general health. Several studies suggest that cytokines or microbial products released systemically in response to oral infection causes inflammation in distant organs, which enhances development of systemic diseases such as Alzheimer’s disease, diabetes, atherosclerotic heart disease and cerebrovascular disease [11–14]. Research has also shown that poor oral health can increase complications of systemic diseases like diabetes, chronic kidney disease and liver disease [11,15,16]. Conversely, obesity predisposes individuals to oral diseases, especially gingivitis and periodontitis [17].

Furthermore, the oral cavity is a significant reservoir for respiratory pathogens, including *Chlamydia pneumoniae*; and patients with periodontal disease are more likely to develop hospital-acquired pneumonia as a complication [18–20]. Several mechanisms may explain the ability of oral pathogens to exacerbate lung infection, including aspiration of oral pathogens into the lower respiratory tract, especially in high-risk individuals; modification of mucosal surfaces along the respiratory tract by salivary enzymes, which thereby facilitate colonization by pathogens; and secretion of pro-inflammatory cytokines during periodontitis, which can promote adhesion to lung epithelium and lung colonization by respiratory pathogens [21,22]. Improving oral hygiene may thus reduce oropharyngeal colonization and the risk of respiratory complications.

It has also been shown that improved oral hygiene and frequent professional oral health care reduces the progression or occurrence of respiratory diseases, particularly in the elderly population and those in intensive care units [23]. This population is also most at risk for developing serious complications related to COVID-19 [24,25].

Concluding statement

Older adults and people of any age who have serious medical conditions such as chronic lung disease, diabetes, heart conditions or chronic kidney disease are at high risk for developing severe illness due to SARS-CoV-2 infection. At the same time, poor oral health increases the risk of developing the same medical conditions. Therefore, improving oral health in people of any age, by reducing their risk of developing non-oral systemic diseases, may reduce the morbidity of COVID-19 [Fig. 1]. Although the association between oral health and severity of COVID-19 symptoms appears logical, more research is needed to demonstrate the association empirically.

Conflicts of interest

One of the authors (DMO) is an editor with Biomedical Journal. The other authors do not declare any competing interests.

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