



## COVID-19 AND PERIODONTAL DISEASE - AN OVERVIEW

### Dental Science

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### ABSTRACT

Covid 19 a pandemic disease caused by SARS CoV-2 mainly affects lungs and causes respiratory distress. The severity of the disease increase with underlying systemic conditions such as diabetes and hypertension. Periodontal disease comprises a group of disease involving inflammatory reaction of the host and dysbiosis that eventually affects the periodontium and could have systemic involvement. Since inflammatory and dysbiosis affects systemic health it is possible that the periodontal status indicates the risk and severity of the infection. In Covid 19 there has been increased levels of circulating proinflammatory cytokines has been reported. The abnormal secretion of adipokines, cytokines and interferons may induce an impaired immune response. So, there is presence of a common inflammatory response leads to a possible relation between periodontal disease and Covid-19.

### KEYWORDS

Periodontal disease, Covid-19, Cytokines, Diabetes Mellitus.

### INTRODUCTION

Covid-19 is a viral disease that is caused by SARS-CoV-2 which mainly affects the lungs and causes respiratory distress. Patients have shown to exhibit mild to moderate symptoms that range from fever to respiratory failure, pneumonia, acute respiratory distress syndrome and in severe cases multiple organ distress syndrome. While some patients might not show any symptoms at all. WHO on March 11 announced Covid-19 as a pandemic at the time which had affected around 30 lakhs people around the world. The severity of this disease increase with predisposing systemic conditions such as diabetes, hypertension and cardio vascular diseases. The virus enters the host cell via the angiotensin converting enzyme which is mostly present in type 2 alveolar cells of the lungs. The viruses later utilizes the special glycoprotein called spike to get attached to the ACE2 and invade the host cells. The amount of ACE2 present in each tissue correlates with the severity of the disease. It has shown that decreasing the amount of ACE2 present might establish a protective stance against covid19.

Periodontitis is a biofilm induced chronic inflammatory disease of complex etiopathogenesis that eventually leads to destruction of periodontium and tooth loss. The stages of severity are dependent upon the dysregulated host immune response against a dysbiosis microbiota. host related risk factors also play a major role in the severity and outcome of the disease. The periodontal diseases have also been widely interlinked with other inflammatory systemic disorders. The link between viruses and periodontal disease is an ongoing discussion that should be further studied and investigated. Most of the data suggest that the link between oral microorganisms and viruses play a major role in the severity of periodontal disease.

During these unprecedented times when organizations are trying to understand the SARS-CoV-2 investigation have pointed towards a possibility of correlation between periodontal disease and the viral infection. The lifestyle of stress, increased anxiety and inability to access supportive periodontal treatment induced due to isolation may lead to development of poor oral hygiene and also intensifying and aggravating the existing periodontal conditions. SARS-CoV-2 interacts with the oral commensals and causes dysbiosis that influences the overgrowth of pathobionts that leads to destruction of periodontium.

### Common Risk Factors Involved In Periodontal Disease And Covid-19

Due to the shared risk factors between the severity of Covid-19 and

periodontal diseases suggests a relationship between them. [1] Most of the severe risk factors reported in Covid-19 patients have also shown to aggravate the pathogenesis of periodontal diseases. Aging is an important risk factor in covid-19 attributed to the the absence of a strong immune response, presence of chronic diseases which also causes an alternation of the microbiota in the oral cavity and allows the development of periodontal disease.

Diabetes mellitus and the development of periodontal disease are interlinked, having diabetes increases the possibility of developing periodontal disease. Diabetic patients are often treated with angiotensin converting enzyme inhibitors and angiotensin II type I receptor blockers. Covid-19 binds to target cells through angiotensin converting enzyme found in lungs, blood vessels and in intestine. Due to the treatment with angiotensin converting enzyme inhibitors and angiotensin II type I receptor blockers there is increased expression of ACE II which could facilitate the infection and also increase the severity of the disease. As diabetes is an important risk factor in periodontal disease and covid-19, periodontal disease can be used to identify the risk groups of Covid-19. In obesity the adipose tissue secrete low level of proinflammatory cytokines like leptin, these cytokines contribute to the periodontal disease by altering the bacterial load. The abnormal secretion of adipokines, cytokines and interferons may induce an impaired immune response. Additionally inflammatory reported in obesity could alter the response of the patient, who may develop covid-19 infection.

There is another mechanism which links covid-19 and periodontal disease. This connection could be attributed to increased immune response and increased viral attachment cause by galectin 3. Galectin 3 is a member of beta galactoside binding protein family that plays a major role in cell adhesion cell matrix interaction macrophage activation apoptosis and angiogenesis and is involved in inflammation. [10]

### Periodontitis And Covid-19 The Cytokine Connection

Chemokines are a group of cytokines that are chemotactic in nature and cause the cells of inflammation to recruit. They play a major role in inflammatory response by recruiting leucocytes to the site of infection. Cytokines are present in patients with periodontitis which cause destructive changes. The bacteria present trigger inflammation that causes the release of interleukin-6. Increased amount of IL-6 levels can destroy tissues. Patients with periodontal disease are more susceptible to produce proinflammatory cytokines. [4] There has also been evidence of increased IL-17 in patients who are suffering from

periodontal disease .It has also been demonstrated that non surgical periodontal treatment have led to decreased level of IL-17 in serum of patients with periodontal disease.[2]

### Covid-19- The Cytokine Storm

In covid-19 there has been increased levels of circulating pro-inflammatory cytokines ( interferon , interleukin 12) and also chemokines which have been linked with pulmonary inflammation and lung involvement in patients. As reported by huang et al. The increase levels of cytokines suggested toward the possibility of activation of T-helper cells function [9]. The presence of this cytokine storm emerged as a major factor that lead to a more severe clinical course .This cytokine storm is followed by the immune system attacking the body causing Acute Respiratory Distress Syndrome (ARDS) and in severe cases death .The release of large amounts of proinflammatory cytokines (IFN gamma , interleukin-6 , interleukin-12) and chemokines precipitate and sustain the systemic inflammation . Interferons, tumor necrosing factor – alpha ,interleukins are the main components of the cytokine storm. Interleukin -6 is involved in acute inflammation due to its role in regulating acute phase response .Its production is increased by IL-1 beta and tumor necrosis factor . Interleukin is also responsible for activation of T-helper cells. IL-6 also plays a major role in the pathogenesis of cytokine storm due to its pleiotropic property. The serum levels of IL-6 in covid-19 patients are positively related to the severity of the disease. [7] Combination of various immune active molecules result in the cytokine storm and ultimately ARDS. Many of the components of the cytokine storms have been assimilated with the cytokine expression pathway of periodontal disease.

There has been evidence of increased IL-17 in patients that are suffering from periodontal disease .It has also been demonstrated that non surgical periodontal treatment have led to decreased level of IL-17 in serum of patients with periodontal disease. [8]

### CONCLUSIONS

The presence of a common inflammatory response leads to a possibility of a relationship between periodontal disease and Covid-19 . Researchers have concluded that covid-19 patients with higher level of serum IL-6 are more likely to suffer from acute respiratory distress syndrome that those who do not. The connection between Covid-19 and periodontal disease through their cytokine similarities may lead to recommending maintenance of oral hygiene in the Covid-19 patients and help to identify patients with periodontitis as having an increased risk of exhibiting COVID related adverse outcomes.

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