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Covid-19 and Periodontitis: A Bi-Directional Relationship

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ABSTRACT
Periodontitis is a chronic inflammatory disease that causes the loss of structures around tooth. The prevalence of the periodontits has increased globally over the past several years. There have been various studies now to identify people who are most susceptible to get affected by periodontal disease. Major Risk factors identified in these groups of individuals are diabetes mellitus, aging, smoking, cardiovascular disease, obesity. As we know that today whole world is fighting against a pandemic i.e., SARS- Cov-2. It was a need of the hour to identify people who are at more risk for succumbing to Covid-19. Risk groups of covid-19 are very similar to that of periodontal infection. This fact makes us ponder on the possible linkage between periodontal disease and covid-19.

I. INTRODUCTION:

Today mankind is battling against coronavirus (Covid19) outbreak, which has come out to be the most devastating health problem all over the world. Though, most of the cases turn out to be mild cases with symptoms quite similar to that of common viral infections with hyposalivation and altered taste sensation. Out of all the cases, only some cases are severe cases who suffer from severe pneumonia and thus leading to multi-organ failure and hence leading to the death of an individual.[1] It has been seen that patient with co-morbidities like cardiovascular disease, hypertension, diabetes mellitus, obesity, and chronic renal disease are at high risk of suffering from a severe form of covid19. This fact has attracted researchers from all over the world to seek the relationship of covid 19 diseases and also common dental problems i.e., periodontitis.

Periodontitis is a common chronic inflammatory disease that involves alveolar bone loss and other supporting soft tissue structure and hard structure as well. There have been several studies to seek the relationship between periodontitis and other medical conditions like diabetes, hypertension, asthma, and liver diseases. Apart from these factors, other risk factors which promote periodontitis are poor oral hygiene, tobacco smoking, certain medication, age, hereditary, and obesity.[2]

Covid19 spreads mainly through aerosol which is produced by an infected person. So, there is a possible role of the oral cavity in disease transmission. Covid19 diagnosis involves nasopharyngeal and also oropharyngeal swab. So, there arises a question of whether there's a possible bidirectional relationship between the most common oral problem i.e., periodontitis and Sars-Cov-2 or Covid19.

Periodontal disease can be associated with the severity of covid19 infection. Co-morbidities that are responsible for aggravating covid19 infection were also found to increase the prevalence of a severe form of periodontal disease.

Rationale:

Periodontitis is a common most prevalent There is a very limited amount of data available to form an association between periodontal disease and COVID-19. Risk factors responsible for aggravating both the disease i.e., Periodontal disease and Sars-Cov-2 have been formulated which demonstrates a possible linkage between both the disease; the reason being shared risk factors. This fact makes it all the more important to discuss the linkage between both the diseases to identify such individuals and isolate and treat them accordingly.

Epidemiology:

Periodontal disease is globally prevalent disease affecting nearly 20-50% of global population. It is prevalent both in developing and developed countries.

On the other hand, covid 19 or the SARS-Cov2; is a infectious respiratory illness. The pace at which it has spread since the time it was first reported in Wuhan, China is unprecedented. According to WHO, as of 11 February 2022, total

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number of cases reported worldwide are 404,910,528 including 5,783,776 deaths.

Periodontitis:

Periodontitis is a chronic inflammatory disease linked with multiple factors and also associated with dysbiotic plaque biofilms and characterized by the destruction of supporting structures of the tooth.The periodontal disease of severe type leads to the destruction of connective tissue and dental bones which is preceded by an inflammatory host response.[3]

All forms of periodontal disease are caused by mixed microbial infections within which specific groups of pathogenic bacteria coexist.
There are various predisposing risk factors which are responsible for aggravating periodontal disease condition.

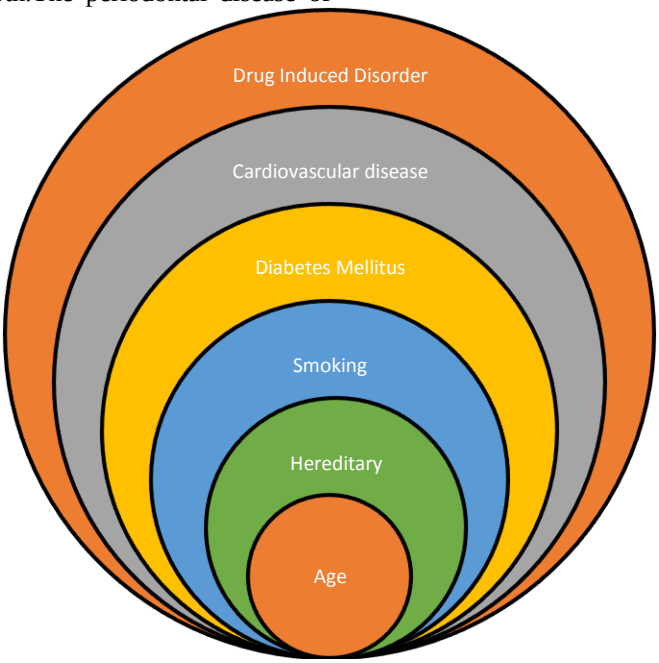

Figure 1 Major Risk Factors Associated with Periodontal Disease

1) Tobacco Smoking:

One-third of the world's adult population are smokers. It has been observed that patients who have habit of smoking are at high risk of developing periodontitis. Tobacco smoking has shown an increasingly destructive effect on periodontal tissues. Studies have shown that tobacco smoking modifies host response. Nicotine present in tobacco induces vasoconstriction, reduced blood flow, edema because of which there are fewer signs of clinical inflammation and gingival bleeding when compared to non-smokers. Smoking changes human microflora, immune response, therefore making it an established risk factor for periodontitis.[4]

2) Diabetes Mellitus:

Diabetes mellitus presents with one of the most common signs i.e., gingivitis and periodontitis. Generally, patients with uncontrolled diabetes and patients unaware of their condition are at more risk of suffering from periodontitis. There have been numerous researches to study the association between diabetes and oral diseases. Diabetes has been confirmed as a major risk for periodontitis. Risk of developing periodontitis increases by three-fold in a diabetic patient when compared with a non-diabetic patient.[5]

3) Cardiovascular diseases:

Over the past several years there have many studies conducted to establish an association between periodontitis and cardiovascular diseases. Cardiovascular diseases (CVD) have now become a major health problem, especially in developing countries. 30% of annual death in the United States are caused by cardiovascular diseases. Studies have shown that Periodontal Diseases are significantly associated with cardiovascular diseases. A study conducted by Genco and his colleagues demonstrated a positive correlation between periodontal diseases and cardiovascular diseases. [6]

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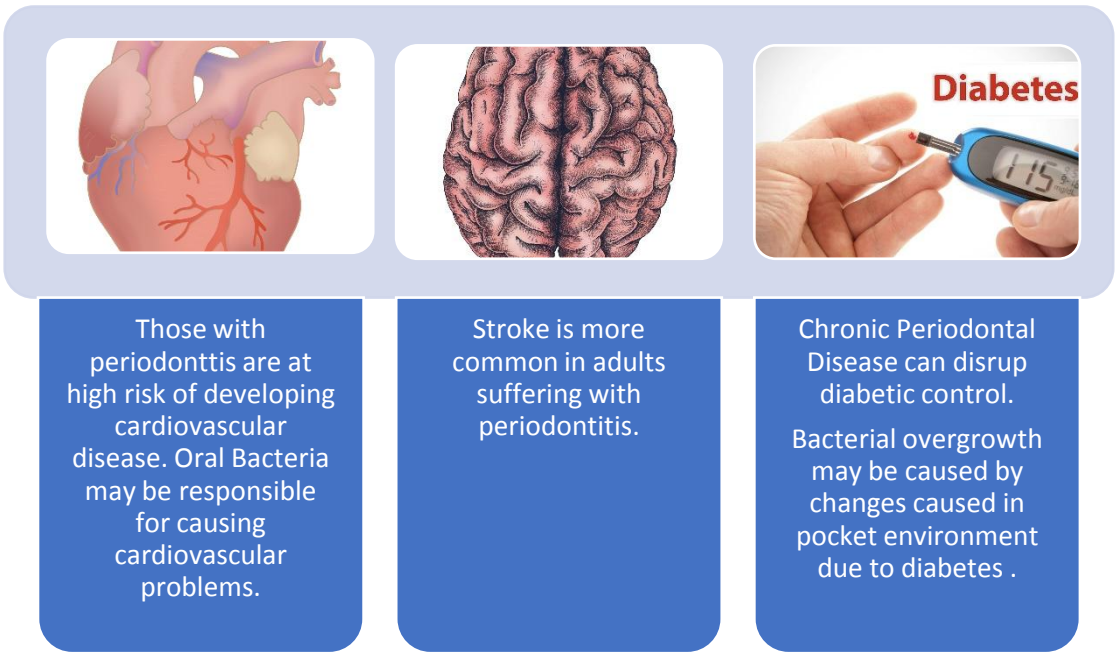

Figure 2: The link between Periodontitis and Cardiovascular diseases

4) Aging:

It is a well-known fact that several changes take place with aging. One of the very common changes that are visible and can be considered as a sign of aging is the alteration in oral tissues. There is a various physiological and clinical alteration that can be seen as the person ages. Changes in oral tissues become more dynamic when the person gets old. Aging causes various degenerative changes at a cellular level and leads to various diseases such as autoimmune, infectious, or inflammatory including periodontal diseases. WHO has confirmed that periodontal diseases are more common in older adults; the reason being additional associated factors like systemic diseases.[7]

5) Gender

It has been observed in various studies that men are prone to develop periodontitis when compared to women. Usually, there is a difference in immune reaction in males and females; also, the behavioral and environmental factors can be one of the reasons to explain the fact that men are at more risk to develop a severe form of periodontitis.[8]

6) Obesity:

Obesity is a lifestyle disease; the prevalence of which is increasing day by day. After smoking, obesity is a major cause of periodontitis. Obesity causes changes in microbial flora and also increases the number of pathogens; thus, causing a systemic inflammatory state. Adipose tissue secretes proinflammatory cytokines i.e., Il-6, Il-8, TNF- α, adipokines, like leptin and adiponectin. These various cytokines aids in the development of periodontal disease by altering bacterial response in gingival tissue. [9]

7) Chronic Obstructive Pulmonary Disease (COPD)

COPD is a lung disease that is caused by exposure to noxious gases, smoking being a major factor behind it. There have been various studies to link COPD to periodontitis. Recently in a study, it has been concluded that the severity of periodontitis increases the risk of COPD mortality especially in older patients. [10]

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Risk Factors shared by Covid-19:

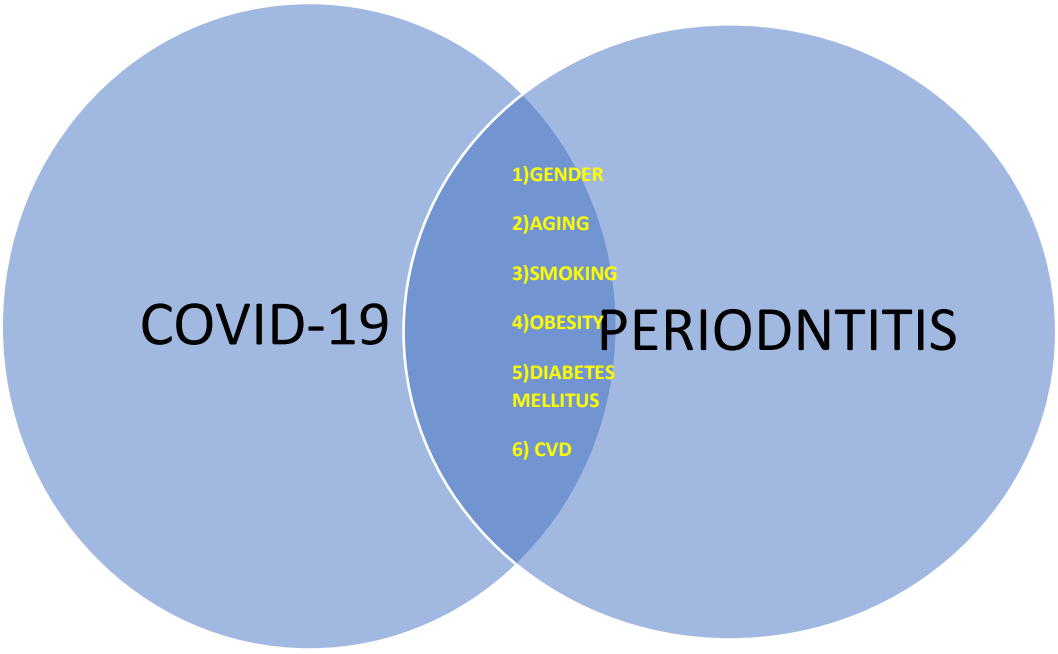

Figure 3: Major Shared Factors associated with Covid-19 and Periodontitis

As discussed, above there are various risk factors associated with the severity of the periodontal disease. Interestingly, most of the risk factors associated with periodontitis are also known to be associated with severe cases of covid-19. This suggests a relationship between periodontal disease (PD) and severe cases of covid-19. Also, it has been seen that covid-19 patients are at higher risk of developing periodontal disease cause being the low level of immunity and thus attracting various opportunistic pathogenic organisms.

It has been confirmed now that people of age above 65 are at higher risk of developing a severe form of covid-19 and are prone to succumb to this disease. This same group of people is at higher risk of developing periodontitis too. This fact makes it clearer that aging is a factor shared by both the disease i.e., covid 19 and periodontal infection.

Similarly, there is enough evidence to show a risk of developing a severe form of covid-19 infection amongst diabetic people. It has been seen that covid-19 affects angiotensin-converting enzyme-2 (ACE-2) in the lungs. This receptor is greater in diabetic patients as compared to non-diabetic individuals.

Diabetes is a very important factor that can help determine the severity of both covid-19 and periodontal diseases.

Hypertension is also a major factor causing covid related death. There is various evidence that showed increased expression of ACE-2 in this disease. Therefore, expression of ACE-2 in hypertension and periodontitis represents a major risk factor of severe covid-19.

Smoking is a known factor that aggravates the covid-19 disease. It has been well established that people who smoke are at 1.4 more-time higher risks of developing a severe form of covid 19 symptoms. Also, COPD which is linked to smoking could increase the expression of ACE-2.

II. CYTOKINE STORM, IL-6 & DISEASE SEVERITY

Some of the major inflammatory mediators include IL-6, IL1β& TNF-α. It has been observed that in presence of viral infections there is increase of IL-6 expression. Some of the viruses can evade immune response and therefore cause an increase of IL-6 levels. Also, genetic IL-6 polymorphisms can cause rise in IL-6 levels. Increase in the levels of IL-6 can cause affect alveolar capillary blood gas exchange in the lungs & oxygen diffusion which in turn contributes to severe lung problems and lung failure. Rise in IL-6 levels can certainly predict respiratory failure as patients with elevated levels of IL-6 are more prone for respiratory failure.

VII. CONCLUSION:

Since it is a well-known fact that tobacco chewers and smokers are at higher risk of developing a severe form of periodontitis and also recently has been linked to a severe form of covid-19. This makes it clearer that somehow both the factors are interlinked.[11]

There is enough evidence that suggests that covid-19 and periodontitis share many risk factors. The fact that there has been a limited amount of study on SARS-Cov-2 or Covid-19 and still this viral infection is new to the human population.

Also, the periodontal infection cannot be assessed fully in covid-19 patients, it becomes all the more difficult to link both the disease. But the fact that both the diseases have many common risk factors giving us a clear idea that both the diseases are possibly linked to each other.[12]

Future studies if done to see the periodontal status of a covid-19 patient can surely give a clearer picture on the association of both the diseases thereby allowing identification of people who are at higher risk of developing the disease.

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