

## Mini Review: The importance of oral and dental health as an indicator of general systemic health in the fight against viruses that can cause a pandemic.

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### Abstract

**When the mechanisms of formation of Periodontitis and apical periodontitis are examined, it is seen that oral and dental health is not independent of the immune system. Scientific evidence shows that the oral cavity has a significant role in the pathogenicity of many respiratory viral diseases, such as SARS-CoV-2. Therefore, since it is associated with a strong immune system, a healthy mouth, and a dental condition, detecting parameters that can indicate this relationship can be decisive in directing the fight against viruses.**

**Keywords:** SARS-CoV-2, Micro biome, Oral and dental condition, Immune system.

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### Literature

There is a common misconception in society that white shiny teeth are considered appropriate for oral and dental health. Advertisements and social media presentations are the most important marketing tools that shape buying behavior. In fact, the truth is different. Healthy dental structure does not just mean beautiful teeth. It also means having healthy mineralization, healthy gingiva, plate structure with proper-thickness, and healthy oral microbiome diversity. Thus, healthy oral and dental health, which is a whole, means that a complex structure is completely healthy. This structure cannot be thought to be independent from the immune system. Because, the mouth is the main door to all other systems of the body. Therefore, as the existence of a healthy immune system cannot be independent of the mouth and dental structure, a healthy oral and dental structure cannot be independent of the immune system [1–4]. Actually, there is a strong relationship between the two, and both structures work as separate elements that support each other. This means that oral and dental health is extremely important for maintaining overall body health. T and B lymphocytes and phagocytes have active roles in oral immunity. Clinical studies showed that conditions that affect the immune system, such as diabetes, alcoholism, and acquired immunodeficiency syndrome, affect oral defense mechanisms [5]. Therefore, the condition of natural immune system can be estimated from oral health and oral symptoms. When the mechanism of formation of inflammatory diseases such as periodontitis and apical periodontitis, which are accompanied by loss of periodontal tissue and alveolar bone, are examined, it is clear that oral and dental health cannot be achieved independently of the immune system. The fact is that a group of diseases that

result in the gradual destruction of structures that support the teeth in the jaws having periodontal ligament, cementum, and alveolar bone are defined as periodontitis. The infection of the periapical

tissue, which becomes prone to the colonization of the pathogen microorganisms due to dental pulp's iatrogenic and traumatic incidents, is defined as apical periodontitis. As can be seen, oral and dental health is not impaired unless immunity system is defeated. Thus, bacteria are involved in monocytes, macrophages, and CD4 helper/CD8 cytotoxic cells, as well as in inflammatory and inflammatory processes (including various cytokines such as IL-1, IL-6) [4,6–8]. In all these pathological processes, it is understood that the natural immune system plays a major role in events. As it is known, the natural immune system is also the body's first barrier to resist viruses and bacteria. Defeating this barrier means the beginning of pathological processes. Most of the tissue destruction including acute or chronic periodontitis and apical periodontitis following the infection or inflammation of the tissues regarding the mouth, gingiva, palate, and teeth is characterized by defeating the immunity reaction directed against these organisms to the host tissue. With the genetic and environmental factors, the most important factor determining the severity of the disease that develops with the disbiotic microbial colonization that can trigger alveolar bone resorption is the systemic health that also involves the immune system [4,7,9].

A healthy immune system is essential for the survival of the organism. In this case, it is expected that the factors that ensure you have a healthy immune system are each also strong. It is at this point that the importance of oral and dental health is better understood, showing a complex modular structure. So how does a glitch or disease in this structure affect our resistance to viruses? In a recent

study, we found a relationship between DDStg (Dental Damage Stage) and the prognosis of COVID-19 disease, which is an indicator of oral and dental health based on APGS (apical periodontitis grading scale), RBL (Radiographic Bone Loss), and NDC (number of Dental Caries), which confirms all the above claims [10]. A strong immune system, proper nutrition, and exercise, strong genetic, physiological, and psychological structure are important factors in the fight against viral diseases that have the potential to cause pandemics. Many of these factors are closely related to oral and dental health. Because the continuance of a strong natural immune system and the maintenance of biochemical and physiological processes occur with a correct and balanced diet that is only possible through the mouth. Therefore, the natural immune system, which is closely and indirectly related to oral and dental health, is determinant in the body's fight against various viruses, including Coronavirus, which is called SARS-CoV2 that caused the Covid-19 pandemic [10–13]. Thus, parameters or scales which can identify the oral and dental health condition most properly can provide us with important information in the fight against these diseases. As can be seen from here, the state of oral and dental health, which is one of the most important indicators of human health, can be a director in the fight against many pathogens.

In the study by Sampson et al., where whether the bacteria have a role in bacterial super infections and complications such as pneumonia, acute respiratory distress, and sepsis was studied based on the relationship between [14] the bacteria load and SARS-CoV-2, it was suggested that there could be a connection between the COVID-19 complications and oral health and periodontal disease. The same researchers stated that comorbidities having a high risk of COVID-19 complications may increase the periodontal disease risk by causing unbalance in the oral microbiome. They also thought that based on the link between a high bacterial load in the mouth and post-viral disease complications, it might be possible to improve oral health and reduce the risk of complications resulting from COVID-19. Similar to these claims, Botros et al. [13] stated that many patients suffering from serious complications caused by COVID-19 had underlying conditions such as obesity, diabetes, and hypertension; and in parallel to that, there could be a connection between periodontitis and systemic diseases. They also suggested that because the oral cavity is a reservoir for respiratory pathogens, patients with periodontal disease had a higher risk of developing hospital-acquired pneumonia compared to healthy individuals. Therefore, they thought that improving oral health can reduce the severity of COVID-19 disease and related morbidity. Herrera et al. moved it further and put forward that antiseptic mouthwash (containing cetylpyridinium chloride or povidone-iodine) could reduce the severity of COVID-19 by reducing the infection risk by limiting the viral load in droplets and aerosols and reducing the oral viral load in infected individuals [15]. The common ground of all these researchers is that there could be a close relationship between the severity of the COVID-19 diseases and their spread and oral and dental health. In recent studies, there is evidence that oral infections (such as periodontitis) can trigger or

aggravate systemic diseases such as cardiovascular disease, bacterial pneumonia, and diabetes. The possible mechanism for the occurrence of this condition was linked to the fact that the infection can spread meta statically through the oral cavity, that oral microbial toxins can pass into the circulation, causing metastatic damage, and that immunological damage caused by oral microorganisms shows insufficient protective function. The improvements after the classification of the oral microorganisms unfolded the importance of oral focal infection. According to the focal infection theory, which came up again in this context, focuses that cause sepsis are blamed for the onset and progression of various inflammatory diseases such as arthritis, peptic ulcer, and appendicitis [16–18]. Endodontic and periodontal infections can promote the systemic spread of bacterial products and immunocomplexes by causing bacteriemia because of the anatomic susceptibility to the bloodstream. Immunologic damages that develop due to bad oral and dental conditions may leave the body undefended against bacterial and viral attacks [18–20]. Therefore, more severe infections will be inevitable as the mucosal system and natural immune system, which are among the first barriers of the body against the viral or bacterial pathogens from outside, will be ineffective.

Coates EA et al. [21] conducted a study in which they aimed to assess the state of oral health of people who are infected with hepatitis C. DMFT (decayed, missing, the filled tooth) and CPITN (the community periodontal index of treatment needs) indices of individuals with and without C infection were recorded. It was found that the DMFT index differs significantly to be against hepatitis C patients. It was found that the number of decayed and missing teeth (the number of decayed and missing teeth) was higher in those infected with hepatitis C compared to other patients. Additionally, although there was no significant difference between the groups in terms of CPITN indices, it was found that individuals with hepatitis C tend to have a worse periodontal condition.

## Conclusion

Consequently, scientific evidence suggests that the oral cavity and its elements have an important role in SARS-CoV-2 pathogenicity and morbidity. As a strong immune system is related to a healthy mouth and dental condition, identifying the parameters or scales, which can show this relationship, could be determinant, especially in the direction of the fight against the respiratory passage viruses.

## References

1. Abou Neel E, Aljabo A, Strange A, et al. Demineralization-Remineralization Dynamics in Teeth and Bone. *Int J Nanomedicine*. 2016; 11: 4743–4763.
2. Meighani G, Aghamohammadi A, Javanbakht H, et al. Oral and Dental Health Status in Patients with Primary Antibody Deficiencies. *Iran J Allergy Asthma Immunol*. 2011; 10: 289–293.
3. Szczawinska-Poplonyk A, Gerreth K, Breborowicz A, et al. Oral Manifestations of Primary Immune Deficiencies in Children. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009; 108: 3: e9–e20.

4. Sollecito TP, Sullivan KE, Pinto A, et al. Systemic Conditions Associated with Periodontitis in Childhood and Adolescence. A Review of Diagnostic Possibilities. *Med Oral Patol Oral Cir Bucal*. 2005; 10: 2: 142–150.
5. Atkinson JC, O'Connell A, Aframian D. Oral Manifestations of Primary Immunological Diseases. *J Am Dent Assoc*. 2000; 131: 3: 345–356.
6. Caplan DJ. Epidemiologic Issues in Studies of Association between Apical Periodontitis and Systemic Health. *J Endod*. 2004; 8: 1: 15–35.
7. Cardoso EM, Arosa FA. CD8+ T Cells in Chronic Periodontitis: Roles and Rules. *Front Immunol*. 2017; 8: 145.
8. Irwin C, Myrillas T. The Role of IL-6 in the Pathogenesis of Periodontal Disease. *Oral Dis*. 2008; 4: 1: 43–47.
9. Hajishengallis G. Periodontitis: From Microbial Immune Subversion to Systemic Inflammation. *Nat Rev Immunol*. 2015; 15: 1: 30–44.
10. Sirin DA, Ozcelik F. The Relationship between COVID-19 and the Dental Damage Stage Determined by Radiological Examination. *Oral Radiol*. 2021; 3: 1–10.
11. Ren YF, Rasubala L, Malmstrom H, et al. Dental Care and Oral Health under the Clouds of COVID-19. *JDR Clin Trans Res*. 2020; 5: 3: 202–210.
12. Liu YC, Kuo RL, Shih SR. COVID-19: The First Documented Coronavirus Pandemic in History. *Biomed J*. 2020; 43: 4: 328–333.
13. Botros N, Iyer P, Ojcius DM. Is There an Association between Oral Health and Severity of COVID-19 Complications? *Biomed J*. 2020; 43:4: 325–327.
14. Sampson V, Kamona N, Sampson, A. Could There Be a Link between Oral Hygiene and the Severity of SARS-CoV-2 Infections? *Br Dent J*. 2020; 228: 12: 971–975.
15. Herrera D, Serrano J, Roldán S, et al. Is the Oral Cavity Relevant in SARS-CoV-2 Pandemic? *Clin Oral Investig*. 2020; 24: 8: 2925–2930.
16. Li X, Kolltveit KM, Tronstad L, et al. Systemic Diseases Caused by Oral Infection. *Clin Microbiol Rev*. 2000; 13: 4: 547–558.
17. Scannapieco FA. Position Paper of The American Academy of Periodontology: Periodontal Disease as a Potential Risk Factor for Systemic Diseases. *J Periodontol*. 1998; 69: 7: 841–850.
18. Loesche WJ, Lopatin DE. Interactions between Periodontal Disease, Medical Diseases and Immunity in the Older Individual. *Periodontol 2000*. 1998; 16: 1: 80–105.
19. Kilian M. Dental Microbiology (Book, 1982). In *Dental microbiology*; R, M. J., M, M. S., H, C. G., Eds.; Philadelphia, Pa: Harpers & Row, 1982; 832–838.
20. Weinberg A, Krisanaprakornkit S, Dale BA. Epithelial Antimicrobial Peptides: Review and Significance for Oral Applications. *Crit Rev Oral Biol Med*. 1998; 9: 4: 399–414.
21. Coates EA, Brennan D, Logan R, et al. Hepatitis C 23. Infection and Associated Oral Health Problems. *Aust Dent J*. 2000; 45: 2: 108–114.

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