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An updated overview of periodontal health in chronic diseases

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Abstract

Periodontal diseases are chronic inflammatory diseases characterized by periodontal ligament loss and destruction of the alveolar bone, affecting the periodontium. Chronic diseases are complex diseases that vary regarding their causes and effects on society, some of which cause death, while others are long-term and unable to recover without treatment, which results with loss of function. There is much evidence showing the relationship between periodontal diseases and chronic diseases. Periodontitis is an independent risk factor for coronary artery disease. Poor oral hygiene, especially periodontal disease, increases the risk of CVD. The relationship between periodontal infection and DM has been reported in many studies. In particular, there are studies showing that periodontal disease increases insulin resistance, which plays a role in the pathogenesis of DM. It has been demonstrated that dramatically increasing obesity worldwide is a risk factor for periodontal disease. Oxidative stress can be an intersection point for obesity and periodontal disease. Rheumatoid arthritis is a chronic disease that causes many serious complications and requires many physical and psychological problems to be solved. Similar to periodontal diseases, the level of proinflammatory cytokines is increased in RA patients.

Similarly, studies have shown that there is a close and complex link between periodontal disease and chronic kidney disease. The patients with periodontitis have an increased risk of chronic renal failure, and there is evidence that periodontal treatment has positive results in these patients. Periodontal diseases have been associated with increased cancer risk and region-specific cancers, but the mechanism is not precise yet. In this review, the relationship between periodontal diseases and chronic diseases and the effects of oral health on chronic diseases will be evaluated.

Keywords: Periodontal diseases, chronic diseases, cardiovascular diseases, diabetes, cancer

Introduction

The extension of life expectancy at birth leads to increase the incidence of many chronic diseases. Periodontal disease is the 6th most common disease in the world. Periodontal diseases may be associated with most of chronic diseases including CVD, DM, Obesity, Cancer, HT, PCOS, ED, AD and hypothyroidism etc.

This review aims to evaluate the periodontal problems in chronic diseases.

Periodontal diseases are chronic inflammatory diseases characterized by periodontal ligament loss and destruction of the alveolar bone, affecting the periodontium. It is characterized by periodontal ligament loss and destruction of alveolar bone [1]. These diseases are diseases that are initiated by dental plaque microorganisms, progressing in a mixed host-microorganism relationship and are ultimately characterized by hard and soft tissue destruction [2].

Periodontal destruction can occur at any time during a person's life. Usually, the first symptoms manifest themselves in the adult period. It occurs clinically in the age of 30 and the 40s and 50s, the progression of the disease is observed if the patient is not treated or treated insufficiently. Therefore, it is essential to determine the diagnosis and treatment for the disease depending on the amount of periodontal destruction and the rate of progression [3].

Chronic diseases are long-term, non-self-healing, complex diseases that vary regarding their causes and effects on society, some of which cause death, while others cause loss of function. Chronic diseases constitute an important part of the deaths and are increasing in countries all over the world [4].

In the literature, periodontal diseases are frequently encountered in patients with chronic disease. Periodontal diseases are often neglected during chronic diseases. Periodontal diseases can be the first symptom of many systemic diseases and/or affect the factors involved in the etiopathogenesis of the disease and may lead to the development and/or progression of the disease [5].

The infectious and chronic characteristics of the periodontal diseases may lead to the local and systemic response. It has been suggested that this condition may affect the general health and the

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course of some systemic diseases.

Study evaluating the economic burden of periodontitis showed that cost to society found to be substantial and comparable with that of other chronic diseases. And this high economic burden may mainly be due to the high prevalence of the disease and resulting need for specialist periodontal care. In addition, patients with periodontitis also suffer from many chronic diseases mentioned above [6].

This study aims to evaluate the relationship between periodontal diseases and chronic diseases with in the light literature and to emphasize the importance of oral health in individuals with chronic diseases.

The Risk Factors in Periodontal Diseases

Various factors may increase the risk of periodontal disease. These factors are classified as modifiable (smoking, oral hygiene, nutrition, stress and drugs) and non-modifiable risk factors (age and genetics) [7].

The Relationship Between Periodontal Diseases and Chronic Diseases

Cardiovascular Diseases (CVD)

Nowadays cardiovascular diseases are one of the most important causes of mortality and morbidity. Periodontitis is an independent risk factor for coronary artery disease [7]. It has been suggested that oral hygiene, especially the presence of periodontal diseases increases the risk of CVD. Studies in different populations suggest that atherosclerosis and acute thromboembolic diseases are associated with chronic oral infections and especially periodontal disease. In these studies, gram-negative periodontal pathogens were detected in atheroma plaques [8]. It has been shown that periodontitis is associated with an increased risk of CVD. Cardio vascular risk factors like smoking, stress, older age, and socioeconomic status are also risk factor for periodontitis The chronic inflammation of periodontitis and the immune response to the inflammation is supposed underlying mechanism for this association [9,10].

Hypertension

It has been shown that hypertension and periodontitis share common risk factors. Oxidative stress and endothelial dysfunction have been shown to be playing a role in the pathogenesis of both diseases. Furthermore, observational studies support an association between periodontal disease and hypertension [11].

Diabetes Mellitus (DM)

Although bacterial plaque is the main factor in periodontal diseases, it is known that some systemic and metabolic factors affect disease severity and prognosis. DM is a widespread disease in society. The relationship between periodontal infection and DM has been reported in numerous studies. There may be many reasons for the increased likelihood of periodontal disease in people with diabetes. The changes in immune response, the change in polymorphonuclear leukocyte functions, and the increase of oxidation may cause periodontal disease development in DM [12]. In these two diseases, the level of proinflammatory cytokine is high and may affect the pathological effects of each other negatively

[13]. According to a meta-analysis report in the literature, periodontal treatment has been observed to provide glycemic control in patients with type 2 DM for at least three months [14]. Also, the literature supports the relationship between periodontitis and insulin resistance. Periodontal disease has been suggested to exacerbate insulin resistance that plays a role in the pathogenesis of DM. It was also reported that periodontal intervention might reduce insulin resistance in diabetic patients [15].

Obesity

Obesity is a significant public health problem affecting both developed and developing countries. Studies have shown that overweight and obesity are associated with many chronic diseases, including periodontal diseases. Inflammatory and hyper-oxidative changes in obesity may cause hypersensitivity to bacterial infections and may facilitate the initiation or progression of periodontal infection. Oxidative stress may constitute an intersection point for obesity and periodontal disease [16]. Persistent systemic inflammation in obese individuals may support the microcirculation of periodontal tissue and the increase of pathogenic species in periodontal diseases [17]. The relationship between obesity and periodontitis is a topic to be evaluated in terms of public health [18].

Rheumatoid Arthritis (RA)

Rheumatoid arthritis is a chronic disease that causes many serious complications and has many physical and psychological problems. In epidemiological studies, the prevalence of RA ranged from 0.5% to 1%, with an annual incidence of 12-1200 per 100,000 populations. The risk of gastrointestinal, respiratory, cardiovascular, infectious and hematological diseases increases in patients with RA [19]. However, the level of proinflammatory cytokines was high in the samples taken from the joints of patients with RA, and this was shown to be similar to periodontal diseases [20].

Chronic renal failure

Chronic kidney disease affects 8% to 16% of the global population and causes increased morbidity and mortality [21]. In the literature, there are studies showing that periodontal diseases are a potential risk factor for non-communicable diseases (such as diabetes mellitus, cardiovascular diseases, pulmonary diseases, and chronic kidney diseases) [22]. Periodontal pathogen gram-negative bacteria and their products, such as lipopolysaccharides, significantly activate host immunity, and this effect is not limited to periodontal tissues. In the literature, several studies, which provided evidence of the increase in the prevalence of periodontal disease in patients with kidney disease, especially in patients who underwent dialysis and kidney transplantation, have been published [23]. In a systematic review, the risk of chronic renal failure increased in patients with periodontitis; and there is evidence that periodontal treatment has positive results in these patients [24]. Numerous studies have shown a close and complex relationship between periodontal disease and chronic kidney disease [25].

Cancer

Cancer is an important health problem increasing around the world, alongside it is also a disease that can cause both financial and moral losses for individuals [26].

Oral cancers include lip, oral cavity, and cancers in the pharyngeal

region; it is a major threat for adults and elderly in both high- and low-income countries and is known as the eighth most common type of cancer worldwide [27].

Periodontal diseases have been associated with increased cancer risk and region-specific cancers, but the mechanism is not precise yet. Periodontal pathogens can be transferred to the esophageal and colon tissues via saliva; to the lung tissue via aspiration. There are many studies in the literature showing periodontal pathogens isolated from lymph nodes, arteries, lungs, precancerous stomach, and colon lesions and esophageal, colorectal cancers. Periodontal pathogens may promote cancer formation when they find the appropriate environment [28].

Stress

Chronic stress has been shown to be negative effect on the occurrence, development, and response to the treatment of periodontal disease by means of indirect actions on the periodontium [29]. Stress may be considered as an important risk factor for periodontal disease. Human studies evaluating role of psychological stress showed hyperactivation of the hypothalamus-pituitary-adrenal axis in patients with chronic periodontitis [30]. Psychological factors have an adverse effect over the plaque levels and gingival status among the students [31].

Chronic obstructive Pulmonary Disease (COPD)

Many studies suggest that COPD and periodontitis could be causally linked each other. Thus, treatment of one could decrease the severity and progression of the other. There are similarities in the pathogenesis like dysfunctional neutrophil, chronic neutrophilic inflammation, and connective tissue loss that support epidemiological evidence of relations in both diseases [32].

Alzheimer's Disease (AD) and Dementia

Poor oral health and periodontal diseases could possibly contribute to the risk of AD onset or progression. Additional cohort studies are needed to evaluate whether any cause-and-effect association exist or not [33]. Likewise recent studies suggest that older patients with dementia have high levels of plaque and poor oral health disorder related to oral soft tissues, such as gingival bleeding, periodontal pockets, stomatitis, mucosal lesions, and decreased salivary flow [34].

Multiple sclerosis

Multiple sclerosis is a inflammatory neurodegenerative disease and its prevalence around the 69.1 per 100,000 subjects. Since both diseases have an inflammatory origin, link between multiple sclerosis and periodontitis is not surprising. Thus, multiple sclerosis patients needs special support by dentist and treatment could be provided to these patients to improve their dental health [35].

Erectile Dysfunctions (ED)

A few of studies have investigated possible relation between ED and dental health. Oral and dental examination of 300 adult men demonstrated that statistically significant relationship between score of periodontal disease and presence of ED. And the prevalence of PD in adult men with ED was shown to be 26.9% aged less than 30 years. PD is play a crucial role in the etiology of ED by increasing reactive oxygen species in the tissues which reduces the bioavailability of nitric oxide, which increase endothelial

dysfunction and impairs the muscular contractions [36].

Polycystic ovary syndrome (PCOS)

Many studies investigated possible the association between periodontal diseases and PCOS. In these studies, proinflammatory cytokines were evaluated from gingival and saliva specimen. Likewise, salivary microbes were investigated. All studies indicated that a strong association exists between periodontal disease and PCOS. Patients with PCOS should also be referred to the dentist for oral examination and treatment those need it [37].

Vitamin D deficiency

Vitamin D plays important functional roles in many organ systems; but prevalence of deficiency is very high and constitutes 30-50% of the population. Its effects on bone density/osteoporosis are very well known, but it has been shown that Vitamin D deficiency may be associated with the periodontal diseases. Recent studies showed that there are significant relations between dental health and periodontal diseases and intake of vitamin D and calcium, more importantly vitamin D therapy can improve periodontal status, decrease severity of periodontal disease, and increase bone mineral decrease alveolar bone resorption. It must be kept in mind that vitamin D beside the role in bone and calcium homeostasis, acts as an anti-inflammatory molecule since it decreases immune cell cytokine expression. This finding indicate that vitamin D may play beneficial role in the treatment of periodontitis improve dental health [38].

Hypothyroidism

Decreased serum levels of thyroid hormones may increase periodontitis- related bone loss, as a function of an increased number of resorbing cells, but the tooth- supporting alveolar bone seems to be less sensitive to changes in hormone levels [39].

Conclusion and Suggestions

Community-based screening is needed to detect periodontal diseases at an early stage. Since periodontitis can be the first symptom of many systemic diseases.

It is necessary to raise awareness about the problems that may be caused by inadequate oral hygiene (dental caries, gingivitis, periodontitis, etc.). All the society should be informed for the possible chronic diseases and their interaction with the inadequate oral hygiene. As a consequence, both the permanent damage of the disease and the cost to society will be reduced.

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