Review Article

Periodontitis and Systemic Diseases: A Review

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ABSTRACT

Periodontitis is one of the inflammatory-infectious diseases of the oral cavity, which results in an alteration in the production of host inflammatory mediators. Oral cavity has plentiful diverse bacteria that can spread different sites of the body particularly in immune compromised individuals and results in various systemic diseases. As the oral cavity is the mirror image of our systemic health, hence maintenance of oral health is equally important. This paper reviews the etiology of periodontitis and systemic relation.

Keywords:- *Periodontal infection, systemic disease, health outcomes*

Periodontitis is an inflammatory disease of tooth-supporting tissues, caused by specific microorganisms that result in progressive destruction of periodontal ligament (PDL) and alveolar bone [1,2]. Oral cavity has plentiful diverse bacteria that can spread different sites of the body, particularly in immune-compromised individuals. Periodontal infection act as a risk factor for various systemic diseases including cardiovascular diseases, diabetes mellitus, respiratory diseases, cerebrovascular disease, adverse pregnancy outcomes and Alzheimer Disease [3-5]. Thus, the aim of this paper has to review the etiology of periodontitis and systemic relation.

EPIDEMIOLOGY AND ETIOPATHOLOGY OF PERIODONTITIS

Periodontitis is a noteworthy health problem that affects 10 to 15% of the population worldwide [6] with 66.2% prevalence rate among 15 years and 89.2% prevalence among 35-44 years [7]. Plaque biofilm releases a variety of gram-positive and gram-negative bacteria, which colonize around tooth structure, gingival margin, and inter-proximal areas. These products include endotoxins, cytokines and protein toxins that have the ability to penetrate the gingival epithelium and initiate a host response that results in inflammation of gingival. Evidence of inflammation visible with clinical changes in tissue color from pink to red, swelling, and bleeding upon probing [8,9]. These changes attributable by certain pathogens include aggregatibacter actinomycetecomitans, porphyromonas gingivalis, bacteroides forsythus, prevotella intermedia, Campylobacter rectus, treponema denticola, fusobacterium nucleatum etc.

Crevicular fluid often contains inflammatory mediators and the oral pathogens associated with periodontitis. The mechanism underlying this destructive process involves both direct tissue damage from plaque bacterial products and indirect damage through bacterial induction of the host inflammatory and immune responses [10]. Similarly, with Focal infection theory oral microorganisms are responsible for a wide range of systemic conditions. He claimed that gingivitis, periodontitis and carious teeth with periapical infections act as a 'foci of infection' by which disease spread [11].

Table I: Physiologic Rationale for Cardinal Signs of Inflammation [12]

Cardinal Signs of Inflammation	Physiologic Rationale
Rubor (redness)	Increased vascularity
Tumor (swelling)	Exudation of fluid
Calor (heat)	A combination of increased blood flow and the the release of inflammatory mediators
Dolor (pain)	The stretching of pain receptors and nerves by the inflammatory exudates, and by the release of chemical mediators
Functiolaesa (loss of function)	A combination of the above effects

RISK FACTORS

Risk factors of periodontitis include stress, aging, alcohol consumption, depression, environmental exposure (e.g., cigarette smoking) and a number of systemic conditions such as diabetes mellitus [13,14].

PERIODONTITIS AND SYSTEMIC DISEASES

Periodontitis is a caustic inflammation of tooth-supporting structures that involves specific microorganisms that result in the formation of periodontal pocket formation, gingival recession and bone destruction [1,2]. The host response in periodontal disease involves an array of events in innate and adaptive immunity. Periodontitis proposed an etiologic factor in cardiovascular disease, diabetes mellitus, respiratory disease, cerebrovascular disease, adverse pregnancy outcome and Alzheimer's disease [15].

Cardiovascular disease

Cardiovascular disease (CVD) characterized the accumulation of inflammatory plaques that result in thromboses and myocardial infarction [16]. According to Noack [17] C - reactive protein, levels are high in patients with periodontitis, which is an independent risk factor for CVD. However, mechanisms by which CRP participate in the pathogenesis of atheroma formation is not clear [18].

Diabetes mellitus

Diabetes Mellitus (DM) is a metabolic disorder with chronic hyperglycemias accompanied by alterations of carbohydrate, protein, and lipid metabolisms [19]. DM predisposes to periodontal destruction but in several studies have identified that periodontal disease is responsible for poor glycemic control, thus there is a two-way relationship exist between periodontal disease and diabetes mellitus [20].

As DM is metabolic disorder and periodontitis is an infectious disease their relationship exists due to inducing an inflammatory response that leads with the production of inflammatory mediators [21]. A study conducted by Pathak AK et al to found an association between diabetes mellitus and periodontitis showed that out of 300 diabetic individuals only 6.7% exhibited a healthy periodontium whereas 68.0% exhibited gingivitis and 25.3% exhibited periodontitis [22].

Pulmonary infections

It recently recognized by various researchers that oral infection, especially periodontitis affects the course and pathogenesis for a number of systemic diseases including pulmonary infections. According to Thoden Van Velzen *et al* [23] one cubic millimeter of dental plaque contain about 100 million bacteria that serve as a persistent reservoir for potential pathogens. Oral and respiratory bacteria in the dental plaque shed into the saliva and aspirated into the lower respiratory tract to cause pulmonary infection [24].

According to Munro *et al*, the oral bacterial load increases during intubation and higher dental plaque scores predict the risk of pneumonia [25]. A study by Prasanna SJ found that the scores of the gingival index (GI), Papilla bleeding index (PBI), Russell's Periodontal Index (PI) and Periodontal Index for Risk of Infectiousness (PIRI) was higher among patients with chronic obstructive pulmonary disease (COPD0 [26].

Cerebrovascular Disease

The cerebrovascular disease affects a large number of the population worldwide and contributes a high degree of morbidity and mortality. The associated risk factors of cerebrovascular diseases include hypertension, diabetes mellitus, hyperlipidemia and cigarette smoking [27]. A number of studies reported that some infectious and inflammatory diseases are an etiologic factor behind the cerebrovascular disease. In periodontal infection, going to the inflammatory process is responsible for a high risk of cerebrovascular disease [28].

Adverse Pregnancy outcomes

Periodontal disease in pregnancy is an exceedingly prevalent condition that has various adverse outcomes including preterm delivery, preeclampsia, and low birth weight. Various researchers hypothesize that hematogenous transport of pro-inflammatory mediators from periodontal infection into the placenta, fetal membranes, and amniotic cavity induces pathology that leads to these adverse outcomes [29].

Alzheimer Disease

Alzheimer's disease (AD) is a fatal neurodegenerative disorder associated with inflammation including Aβ-amyloid 1-42 peptide (Aβ42), hyperphosphorylated tau protein (P-Tau) [30]. In periodontitis, inflammatory mediators and pathogens cause systemic infection due to that Blood Brain Barrier (BBB) of cerebral transport become compromised by microbial activation, Tau protein phosphorylation and platelet aggregation that results in Alzheimer's disease [31].

CONCLUSION

This review concluded that periodontitis serves a connecting link between various systemic problems due to its inflammatory nature. Periodontal infections associated with an array of microorganism that can spread different sites of the body. Periodontal disease predisposes to inflammatory mediators in systemic circulation hence prevention of periodontal disease progression is advisable to avoid its systemic outcomes.

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