

Effects of Stress on Periodontium: A Review Article

Sowmiya R¹, Rajapandian.K², Ravishankar. P. L³, Kalaivani.V⁴

¹BDS, Srm Kattangulathur Dental College
^{2,3,4}MDS, Srm Kattangulathur Dental College

ABSTRACT

Periodontal diseases are common chronic inflammatory diseases caused by pathogenic microorganisms colonizing the subgingival area and inducing local and systemic elevations of pro-inflammatory cytokines resulting in tissue destruction. One of them, psychological stress, has been proposed to have a negative impact on the results of periodontal therapy. Patients with periodontal illnesses have higher levels of stress markers in their blood and saliva. These stress markers can affect the course of the disease by altering the inflammatory response and changing the makeup of the dental biofilm, among other processes. This review seeks to shed light on the connection between periodontal diseases and psychological stress.

KEYWORDS: Stress, periodontium, saliva, factors, periodontal disease, inflammation.

INTRODUCTION

STRESS

Stress can be defined as a condition of physiological or psychological strain brought on by unfavorable internal or external physical, mental, or emotional stimuli that have the potential to interfere with an organism's normal functioning and that the organism instinctively seeks to avoid. The Latin word "stringere," which meaning "tight strained," is where the word "stress" first appeared. At the moment, stress is categorized as a "risk indicator" for gum disease. ^[1,2]

Stress reaction may bring about systemic sickness including the CNS, CVS, and endocrine abnormalities in addition to mental disturbances such sadness, anxiety, and decreased cognition. Stressors are the triggers, or the things that make you feel stressed. ^[3]

The tissues and structures that support teeth are affected by periodontal disease, a chronic inflammatory condition of mixed microbial origin that leads to progressive periodontal loss and ultimately tooth loss. Stress has an immunosuppressive effect on the host defense system, which makes the body more susceptible to illness. ^[8,5,6]

STRESSOR

Stressors are any stimulation, event, or circumstance that has the potential to cause a stress reaction. Stressors are defined as factors that had the ability to challenge the organism's capacity for adaptation. ^[7]

RISK FACTORS FOR THE ONSET OF PERIODONTAL DISEASE AND / OR ITS PROGRESSION

Risk factors have a significant impact on how a person reacts to a periodontal infection. Plaque accumulation is the primary causative factor for the development of periodontal disease. They also comprise illnesses and ailments like osteoporosis, metabolic syndrome, diabetes mellitus, obesity, low dietary calcium, and low vitamin D. Since many periodontal patients may change these risk factors, managing them is a key part of their modern therapy. Periodontal disease is also influenced by genetic factors, which make it possible to identify and prevent certain people early on. ^[8]

EVIDENCE ASSOCIATING STRESS TO THE PROGRESSION OF PERIODONTAL DISEASE

In 1945, Dean and Dean and Schluger were among the first to propose that psychological stress could be an etiological factor of periodontal disease (1949). The most common and well-established periodontal diseases linked to psychological stress are necrotizing ulcerative gingivitis and periodontitis (NUG and NUP). ^[9]

In order to determine whether stress, distress, and poor coping strategies are risk factors for periodontitis, Genco (1995) examined data from 1400 individuals ranging in age from 25 to 75. It was found that those who experienced financial strain had more advanced periodontal disease. Another study by Shannon et al. (1969) ^[24] looked into a potential connection between stress and ANUG in 478 males undergoing screening for military duty, as determined by the urinary steroid excretion rate. The findings demonstrated elevated corticosteroid activity in the urine of ANUG patients. The idea that adrenocortical activity plays a role in stress as an etiologic factor in ANUG is reinforced. ^[9]

THE STRESS PATHWAY

Depending on how long it lasts, there are two categories of stress: acute and chronic. Acute stress frequently results from an infection, for example, and primes the immune system for an instant reaction. However, long-term stress can affect inflammatory processes, which can result in the emergence of local or systemic illnesses like diabetes, rheumatoid arthritis, cardiovascular disorders, and periodontal diseases. Genco et al. (1998) provided a schematic model to illustrate how stress sets off a series of events in the autonomic nervous system (ANS), central nervous system (CNS), and hypothalamic-pituitary-adrenal (HPA) axis. These events lead to compromised immune response and worsened periodontal tissue destruction, all of which worsen the state of periodontal disease. ^[9]

The release of catecholamines (nor- and adrenalinephrine) from the adrenal medulla occurs when the ANS is activated. This process encourages the synthesis of post-anoids and proteases in tissue, which in turn favors the destruction of periodontal tissue. ^[4]

The HPA axis and central nervous system are again activated, leading to the release of corticotrophin releasing hormone (CRH) from the hypothalamus. This, in turn, triggers the anterior pituitary to release adreno-corticotrophic hormone (ACTH), which in turn increases the amount of glucocorticoids, primarily cortisol, from the adrenal cortex into the bloodstream. 1. *Ind Psychiatry J.* 2013 Jan-Jun; 22(1): 4–11. doi: 10.4103/0972-6748.123585 Because elevated cortisol interferes with cellular immunity (inhibiting PMNL activity and IgA/G production, respectively), it suppresses the immune-inflammatory response. ^[4]

Provided a schematic model that illustrates the possible role that psychosocial stressors may have in starting a chain reaction in the autonomic nervous system, the central nervous system, and the corticotrophin releasing hormone/HPA axis. These physiological reactions have the effect of lowering immunity and raising the risk of infection, particularly periodontal disease. Current research has verified that individuals exhibiting signs of depression have higher levels of cortisol in GCF and cytokines (IL-6, IL-1 β , etc.).^[10]

The two additional HPA axis hormones, CRF and adrenocorticotrophic hormone ACTH, each individually affect immune system function by controlling the synthesis of cytokines—signaling substances from immune cells—by monocytes, such as IL-1, and by preventing macrophage activation. They also encourage the growth of B cells, but they prevent the production of antibodies.^[10]

THE RELATIONSHIP BETWEEN STRESS AND PERIODONTIUM

Chronic diseases are multifactorial in nature and arise from long-term interactions between an environment and a host. Numerous mechanisms have been suggested to mediate the suggested association between inflammatory periodontal diseases and psychosocial conditions.^[10]

1. EMOTIONAL STRESS

Emotional stress has a detrimental effect on daily routines, including diet, oral hygiene, and other practices that collectively affect periodontal health.^[8]

2. NEGLECT OF ORAL HYGIENE

It is clear that the patient's mental health status affects maintaining good oral hygiene to some extent. Psychological disorders have been shown to cause patients to neglect their oral hygiene, which can lead to plaque buildup that is harmful to the periodontal tissue.^[10]

3. MODIFICATION OF THE FOOD INTAKE

An imbalanced diet, particularly one high in fat, can cause increased cortisol production and subsequent immunosuppression. Behavioral changes such as overeating, skipping meals, or eating an unbalanced diet are a direct result of emotional disturbances. Researchers have found that gingival inflammation is a risk factor for academic stress, which is associated with lower oral hygiene standards and elevated levels of crevicular interleukin-b.^[10]

4. SMOKING:

Smoking is the oral behavior that damages the periodontium the most out of all those that might be acquired as a result of stress because:

Smokers have a higher prevalence of periodontal disease (7-8 times higher than nonsmokers) and a higher severity of periodontal disease (depth of periodontal pockets, periodontium, and bone attachment losses) than nonsmokers.

- Whether nonsurgical, surgical, or medicinal in nature, smokers react less well to periodontal therapies. Additionally, when there is nicotine in the blood, the following happens:
- vasoconstriction brought on by noradrenaline and adrenaline release. This constriction of blood vessels prevents nutrients from entering periodontal tissues; it also suppresses the antibody response in vitro and inhibits the oral neutrophil.^[8]

5. BRUXISM AND ORAL HABITS

Stress and anxiety lead to bruxism, which causes repetitive occlusal trauma that is harmful to periodontal health. However, it is challenging to provide evidence to support this claim. Oral expression of neurotic

needs is found. The tongue can be used to convey dependency or animosity, to get what one wants, to cause or accept suffering. As in thumb sucking, tongue thrusting, baby swallowing, and biting of the tongue, lip, cheek, or fingernail, sucking, biting, sensing, and feeling can become habits. These behaviors also play a role in smoking, clenching, bruxing, and tooth-doodling. Occlusal traumatism, occlusal wear, and tooth movement can result from such practices. ^[7]

6. CHANGES IN SALIVARY FLOW

Stress and anxiety cause the sympathetic nervous system to lessen saliva production, which leads to thicker saliva that promotes plaque buildup. In addition, it causes changes in its composition and pH, such as IgA secretion, which promotes the growth of microorganisms. ^[10]

7. CHANGES IN GINGIVAL CIRCULATION

Through the autonomic nervous system, emotions can change the tone of blood vessel smooth muscle. Furthermore, persistent blood vessel constriction during prolonged or intense emotions may change the tissues' access to oxygen and nutrients. ^[11]

8. DECREASED HOST RESISTANCE:

Corticotropic mechanisms. The hypothalamus releases vasopressin and corticotropin-releasing hormone, which act on the pituitary gland, as a physiological reaction to stress by activating the hypothalamic-pituitary-adrenal axis.

In response, the adrenal cortex is stimulated by the pituitary gland's secretion of pituitary corticotropic hormones, which raise cortisol and glucocorticoid hormone production and release. These hormones are essential for a sustained stress response. Glucocorticoids cause lymphocytes, macrophages, and monocytes to behave differently, which lowers immunocompetence. Long-term changes of this kind raise the risk of developing diabetes mellitus, rheumatoid arthritis, cardiovascular disease, and other illnesses. ^[8]

The following factors contribute to this decline in immunocompetence: alterations in the inflammatory response; suppression of IgA, IgG, and neutrophil function, which increases bacterial colonization of the biofilm and reduces the body's capacity to prevent connective tissue invasion; substitution of the original cytokine profile for interleukin-1 and TNF α ; - increased blood sugar levels; - alterations in specific growth factor rates. ^[8]

9. STRESS AND ANUG:

When it comes to psycho-social risk factors, Acute Necrotizing Ulcerative Gingivitis (ANUG) is the most researched periodontal disease. For ANUG, a psychogenic origin has been proposed. Psychogenic factors most likely encourage bacterial overgrowth and/or reduce host resistance, which predisposes the disease. Mechanisms involving the autonomic nervous system and endocrine glands that raise corticosteroid and catecholamine levels have the potential to alter host tissue resistance. In addition to improving Prevotella intermedia nutrition and decreasing gingival microcirculation and salivary flow, this may also suppress neutrophil and lymphocyte functions, which aid in bacterial invasion and damage.

It has been reported that when ANUG patients were compared to controls, they showed:

- Depressed phagocytosis and polymorphonuclear leukocyte chemotaxis; and
- Reduced lymphocyte proliferation upon nonspecific mitogen stimulation. ^[7]

10. STRESS AND AGGRESSIVE PERIODONTITIS:

In their description of aggressive periodontitis, Page et al. (1983) established the link between aggressive periodontitis, psycho-social factors, and appetite loss.

According to Monteiro da Silva et al. (1996), compared to those with chronic periodontitis, those with aggressive periodontitis exhibited higher levels of depression and social isolation. These studies demonstrate the link between psychosocial stress and aggressive periodontitis.^[1]

CONCLUSION

One risk factor for periodontal disease is psychological stress. Additionally, stress can worsen periodontal disease and make treatments less successful. Patient care may have been restricted to informing patients about the negative effects of certain behaviors when the only known indirect effect of stress on the periodontium was the appearance of risk behaviors for periodontal-induced stress, such as smoking, eating poorly, and maintaining poor oral hygiene. A sophisticated network of bidirectional signals connecting the immunological, endocrine, and neurological systems facilitates communication between the immune system and the central nervous system. Stress throws this network's homeostasis off, which modifies immunological response. These findings imply that patients should be managed by a multidisciplinary team consisting of a physician, dentist, and psychologist in order to identify those who experience chronic stress and to implement preventative measures to lessen the damaging effects of stress on the periodontium. ^[8,10]

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