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The impact of emotional stress on periodontal disease: The summery of evidence

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Abstract

Stress represents a set of non-specific changes, both emotionally and physically, triggered by some unwanted stimuli. Stress has been accepted as a 'risk factor' for periodontal disease recently. The hormonal and behavioral changes induced by the emotional stress explains the relationship between stress and periodontal disease. This review article enlightens the influence of stress on periodontal pathology.

Keywords: Stress, anxiety, periodontal disease

1. Introduction

Stress is almost an integral part of modern urban life style. The term arises from a Latin word 'stringere', meaning 'tight/ strained'. Stress represents a state of reactions, which tends to disturb the normal state of activities of an organism by unwanted stimuli, which could be internal or external, emotional or physical and which a person tries to avoid [1]. Selye (1976) defined stress as a state of response to physical or emotional forces beyond their adaptive capacity that lead to disease of adaption and eventually exhaustion and death [2]. Hence, stress is the problem of mal-adaptive coping strategy in response to a 'perceived threat' (Breivik, 1996) [3]. Selye furthermore explained it as the sum of all non-specific changes resulted by a challenge or damage, including the biological events necessary for re-establishment of normal resting state or condition [2]. Hence, Stress can be viewed as a process with both psychologic and physiologic components (Boyapati, 2007) [4].

The effects of stress reaction include emotional upsets, like impaired cognition, depression, anxiety etc. and systemic illness involving CNS, CVS and endocrinal changes. The stimuli, those elicit the stress response, are referred to as stressor. The psycho-social stressors were classified by LeResche and Dworkin (1976) as 'Major life events' and 'Minor daily hassels' [5]. Again, Holmes and Rahe (1967) developed a scale to measure stress in terms of life changes (Table 1) [6].

Periodontal disease is a chronic inflammatory disease of mixed microbial origin involving tooth-supporting tissues and structures, which results progressive periodontal loss and eventually tooth loss. Modern research already established that it isn't the bacteria, but mediators of inflammation, which brings about the tissue destruction largely. Hence even though plaque represent the prime etiologic factor for development of inflammatory process, host inflammatory response plays pivotal role in the progression of periodontal disease. Again, some biological or behavioral factors, including 'stress', influence the inflammation and subsequent tissue destruction [7]. These are referred to as 'periodontal risk factors', the existence of which favors the severity of disease.

As stress affects host immunity, and host's immuno-inflammatory response is most critical determinant of periodontal disease, stress is thought to influence the course and severity of periodontal disease also [8]. Historically, De Marco (1976) coined the term 'periodontal stress syndrome' for the soldiers involved in Vietnam War, who were suffering from severe gingivo-periodontal infection and also were under emotional stress related to warfare [9].

Table 1: Life events and their score for stress

Life events	Score
Demise of spouse	100
Marital separation	65
Death of close friend/ family member	60
Personal illness	53
Marriage	50
Frustration from job Loss of employment	47
Retirement	43

2. The link between stress and periodontal disease

Psychologic conditions, such as stress, were recommended as ‘a risk indicator for periodontal disease’ by Genco in 1996 [10]. As mentioned earlier, stress alters host response by affecting neuro-endocrinal control. In addition, it influences daily habits that furthermore predispose periodontal disease. The most documented relationship is that between stress and Acute Necrotic Ulcerative Gingivitis (ANUG) among students before examination or soldiers in war. Despite their well-known connection it has been elusive to confirm the relation between stress and different forms of periodontal disease, as the etio-pathogenesis of latter is a multi-factorial action and role of individual factor (e.g., stress) is still difficult to define [11]. Plus, it is notable to remember that although stress predispose a subject to a more advanced destruction from periodontal inflammation, it alone cannot evoke periodontal disease in absence of pathogen, microbial tooth deposit, i.e. plaque, remains the essential factor, and stress only aggravates the periodontal involvement already existing [12]. Individuals with a more positive life style (depending on relationship and employment status) and less negative life events are seen to report a less destructive disease process [13]; and the effect not merely depends on the

presence of stressful events, rather it depends on how one deals with those conditions.

2.1 Altered immunity

In a schematic model, Genco *et al.* (1998) explained how stress triggers a cascade of events in both autonomic Nervous system (ANS), and central nervous system (CNS) and hypothalamic-pituitary-adrenal (HPA) axis, resulting in impaired immune response, and aggravated periodontal tissue destruction; which all together worsen the periodontal disease status [14] (figure 1).

When ANS is activated, it results the secretion of catecholamines (epinephrine and nor-epinephrine) from adrenal medala, which promotes the production of post-anoids and proteases in tissue, and thus favoring the periodontal tissue destruction.

Again, activation of HPA axis and CNS results secretion of cortico-trophin releasing hormone (CRH) from hypothalamus, that stimulate release of adreno-cortico-trophic hormone (ACTH) from anterior pituitary, which up-regulate the production of glucocorticoid hormones, chiefly cortisol, from adrenal cortex into circulation. Immune-inflammatory response is suppressed by the higher level of cortisol, as it interferes with both cellular immunity (by inhibiting PMNL activity and IgA/G production respectively). Furthermore, cortisol is seen to reduce collagen synthesis in-vitro, and sulfated GAG synthesis in-vivo. In addition, cortisol increases the glucose level in tissue, rendering it susceptible for microbial infection (figure 1).

Hence, stress influences the neuro-endocrinal control for immune response, which suppresses anti-microbial resistance of host and also affects the structural integrity of tissue, and all these aggravate the severity of periodontal disease, if already existing.

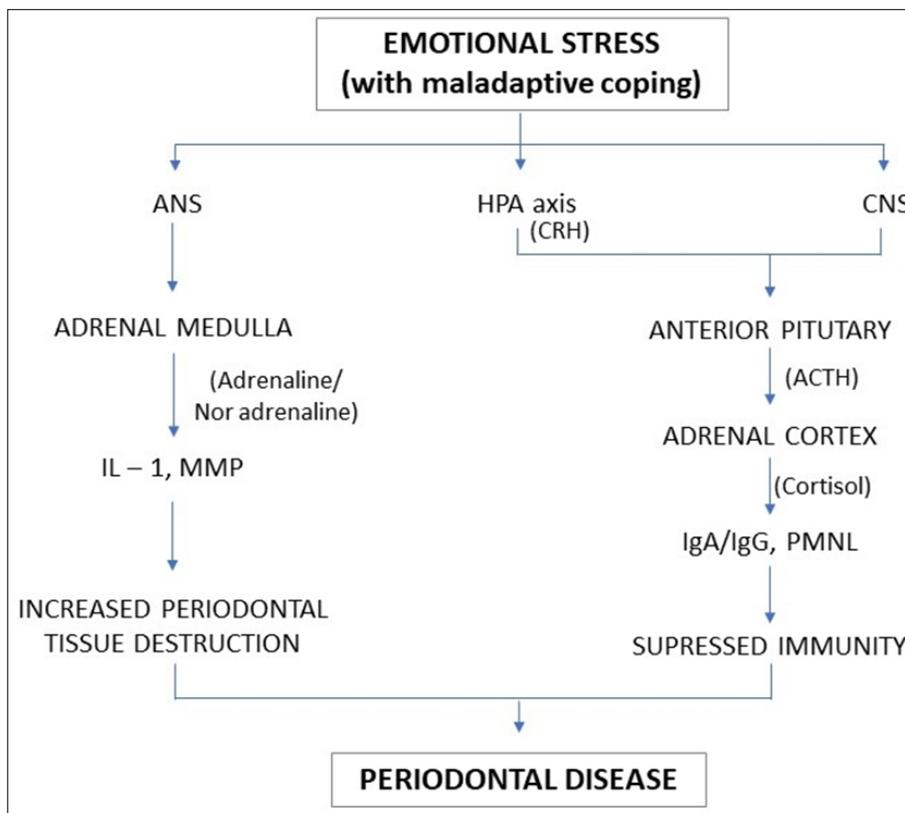


Fig 1: Stress induced altered immune-inflammatory response and periodontal disease.

2.2 Altered behavior

Emotional stress negatively impact daily habits, like oral

hygiene practice, diet and others, which all together affect periodontal health (figure 2).

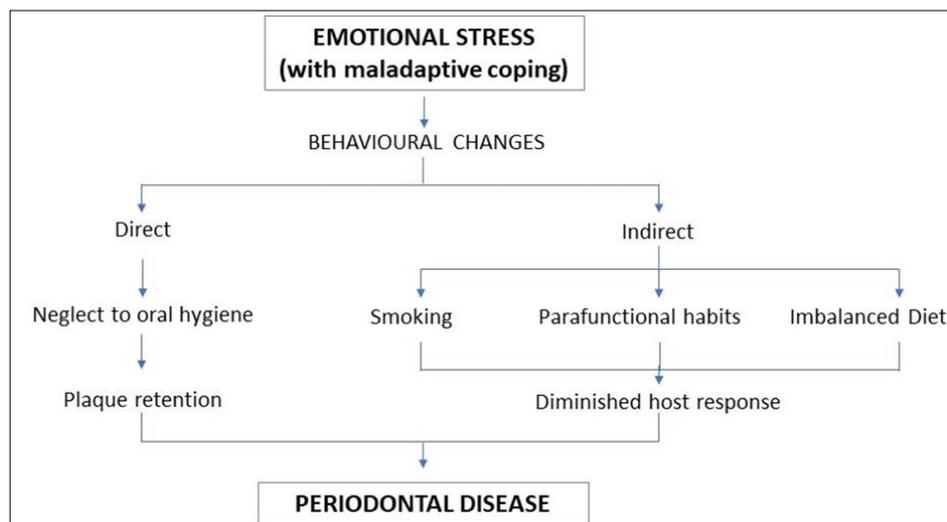


Fig 2: Stress induced behavioral changes and periodontal disease.

2.2.1 Oral hygiene negligence

Mental status of a subject is an obvious factor for orientation of maintenance of oral hygiene. Patients with psychological disturbance exhibit increased plaque score due to their negligence toward hygiene maintenance [15].

2.2.2 Change in dietary intake

Emotional disturbances direct to behavioral changes like over-eating, or skipping the meals, or non-balanced diet; especially high lipid containing diet, which can induce increased cortisol production, and hence immunosuppression. Affinity to diet with soft consistency and greater amount of refined carbohydrate increases plaque deposition from less vigorous mastication [16].

2.2.3 Smoking and other oral habits

Smoking and all harmful oral habits get increased by emotional disturbance and all those worsen periodontal health significantly [17]. Circulating nicotine results in (1) vasoconstriction, which causes lack of nutrients for periodontal tissue; and (2) immune-suppression.

2.2.4 Bruxism and para-functional habits

Stress and anxiety trigger bruxism which is detrimental to periodontal health by resulting repetitive occlusal trauma, though it is difficult to establish the claim by evidences [18].

2.3 Change in salivary flow

Stress and anxiety reduces salivary flow by sympathetic pathway resulting in a thick saliva, which favors plaque deposition. Besides, it induces change in its pH and composition, like IgA secretion, which favors microbial growth. Hence, anxiety and stress contribute to periodontal disease by enhancing microbial plaque formation via altering salivary secretion with ANS control (Gupta *et al.*, 1966) [19].

2.4 Change in gingival circulation

As sympathetic stimuli constricts the periodontal vessels, and stress activates sympathetic control; Manhold *et al.* (1971) suggested that in continued and long-term stress, blood supply to tissue is diminished; which affects periodontal homeostasis [20].

2.5 Stress and periodontal microbiota

In an in-vitro study, Roberts *et al.* (2002) demonstrated that adrenalin and nor-adrenalin, which are released as a response

to stress, signal to alter the growth of 43 microbial species seen within sub-gingival plaque [21]. Shortly after this, it was also found that chronic emotional stress has an impact on host response against *Porphyromonas gingivalis* [22]. Again, in a case-control study among person with active periodontal disease, Moss *et al.* (1996) showed that IgG for *Tannerella forsythia* count was higher among individuals more suffering from family, financial and job related stress [23]. These indicate that stress induces a shift in sub-gingival plaque biofilm, and microbial infections develop as a response to stress.

3. Review of literature

3.1 Stress and necrotizing ulcerative gingivitis/periodontitis (ANUG/ NUP)

NUG/ NUP is the most frequently studied periodontal disease in relation to predisposing psycho-social factors, as those are thought to possess definite immunological bearing; and stress is known to alter immune reaction. Pindborg (1951) reported higher incidence of necrotizing ulcerative gingiva-periodontal lesion during military service [24], and soon after Giddon (1964) showed the same among college students during examination [25]. Later other studies as that of Cohen-Cole (1983) [26] and Monterio *et al.* (1995) [27] also indicated role of emotional stress on ANUG. Shannon *et al.* (1969) [28] and Maupin *et al.* (1975) [29] found higher concentration of 17-hydroxy corticosteroid in urine of ANUG patients indicating the possible role of stress in its pathogenesis.

3.2 Stress and chronic periodontitis

The definitive correlation between emotional stress and chronic periodontitis is hard to establish, and still demanding more research work. Genco and co-researches (1999) evaluated the relation between financial strain and periodontal attachment loss [30]. They observed that persons with a 'problem focused (practical)' and better coping for managing strains from daily life performed better than patients those expressed a more 'emotionally focused (avoidance)' and poor coping to strain, and concluded that positive coping behavior can improve the periodontal health. After that, Croucher *et al.* observed a positive correlation between periodontal disease and major life events [13].

3.3 Stress and aggressive periodontitis

Page *et al.* (1983) first suggested a link between aggressive periodontitis and psycho-social factors including loss of

appetites^[31]. Monatario *et al.* (1996) reported depression and loneliness as significant factor for aggressive periodontal disease^[32]. In a case-control study by Kamma and co-workers (2003), evaluation of clinic-microbiological periodontal status among patients with early onset periodontitis, who had received supportive periodontal care every 3-6 months for 5 years following active periodontal therapy showed that stress was one of the co-factors for progression of disease at few sites in few patients^[33].

3.4 Stress and periodontal therapy

Prognosis of periodontal therapy largely depends on one's emotional stress level and ability to cope up with that stress. Axtellius (1998) observed that patients with psycho-social strain and passive dependent trait did not respond well to periodontal therapy^[34]. Elter (2002) analyzing dental records of 1299 subjects, who previously underwent periodontal therapy, noticed that 85 subjects, who had suffered from depression also, had less favorable post-treatment outcomes compared to those without depression^[35]. Kamma *et al.* (2003) reported that, in aggressive periodontitis, supportive periodontal therapy was more effective in subjects with lesser stress^[33]. Wimmer *et al.* (2005) showed that patients with mal-adaptive coping strategy have a more advanced disease and poor response to non-surgical periodontal therapy, and concluded that this mal-adaptive behavior, especially with co-existing risk factors (like smoking) is a concern for prognosis and treatment for periodontal disease^[36]. Gamboa *et al.* (2005) explained the influence of 'emotional intelligence' (used as a measure for coping) on early response to periodontal therapy in chronic periodontitis, and showed significant improvement of periodontal status in patients with active coping^[37]. Positive cognitive behavioral therapy has been attempted to patients suffering from stress and anxiety and also having periodontal disease, as an adjunct to routine periodontal care, with promising results recently.

4. Conclusion

Stress represents a set of changes in response to perceived threat. Based on the literature review, now it can be concluded that emotional stress has a bearing on periodontal disease process. One with more stressful life events and maladaptive coping strategy suffers more destructive periodontal lesion. Stress itself cannot evoke the early inflammatory response, but it worsen severity of the disease, if already existing. Different stressful life events and individual active 'coping' skill to handle those stress are determinant for impact of stress on periodontal health; and with cognitive behavioral management, outcomes of periodontal therapy have been improved.

Hence, before making the treatment plan, it is necessary to evaluate a person's emotional stress level for assessing the risk for periodontal destruction as well as success for the planned therapy. Finally, thinking beyond the oral cavity, a dentist must introspect the psycho-social issues, considering behavioral management with routine periodontal therapy.

5. References

1. Dorland. Dorland's Illustrated Medical Dictionary. Oxford, UK: WB Saunders, 2000.
2. Selye H. Stress in health and disease. Boston: Butterworths, 1976.
3. Breivik T, Thrane PS, Murison R, Gjermo P. Emotional stress effects on immunity, gingivitis and periodontitis. *Eur J Oral Sci.* 1996;104:327-334.
4. Boyapati L, Wang HL. The role of stress in periodontal

- disease and wound healing. *Periodontol.* 2000. 2007;44(1):195-210.
5. LeResche L, Dworkin SF. The role of stress in inflammatory disease, including periodontal disease: review of concepts and current findings. *Periodontol* 2000. 2002;30:91-103.
6. Holmes TH, Rahe RH. The social readjustment rating scale. *J Psychosom Res.* 1967;11(2):213-218.
7. Novak KF, Novak MJ. Risk assessment. In: Newman MG, Takei HH and Klokkevold PR. Caranza's clinical periodontology, 10th edtn. California: Saunders, p602.
8. Novak KF, Novak MJ. Risk assessment. In: Newman MG, Takei HH and Klokkevold PR. Caranza's clinical periodontology, 10th edtn. California: Saunders, p606.
9. De Marco T. Periodontal emotional stress syndrome. *J Periodontol.* 1976;47(2):67-68.
10. Genco R. Current view of risk factors for periodontal diseases. *J Periodontol.* 1996;67:1041-1049.
11. Klokkevold PR, Mealey BL. Influence of systemic disorders and stress on periodontium. In: Newman MG, Takei HH and Klokkevold PR. Caranza's clinical periodontology, 10th edtn. California: Saunders, p.300.
12. Klokkevold PR, Mealey BL. Influence of systemic disorders and stress on periodontium. In: Newman MG, Takei HH and Klokkevold PR. Caranza's clinical periodontology, 10th edtn. California: Saunders, p.301.
13. Croucher R, Mercenes WS, Torres MC, *et al.* The relationship between life events and periodontitis: a case-control study. *J clin Periodontol.* 1997;24(1):39.
14. Genco RJ, Ho AW, Kopman J, Grossi SG, Dunford RG, Tedesco LA. Models to evaluate the role of stress in periodontal disease. *Ann Periodontol.* 1998;3:288-302.
15. Hildebrand HC, Epstein J, Larjava H. The influence of psychological stress on periodontal disease. *J West Soc Periodontol.* 2000;48(3):69-77.
16. Suchday S, Kapur S, Ewart CK, Friedberg JP. Urban stress and health in developing countries: Development and validation of a neighborhood stress index for India. *Behav Med.* 2006;32:77-86.
17. Haber J. Smoking is a major risk factor for periodontitis: current opinion in periodontology, 1994, 12-18.
18. Olkinuora M. A psychosomatic study of bruxism with emphasis on mental strain and familiar predisposition factors. *Proc Finn Dent Soc.* 1972;68:110-23.
19. Gupta OP. Psychosomatic factors in periodontal disease. *Dent Clin North Am.* 1966, 11-9.
20. Manhold JH, Doyle JL, Weisinger EH. Effects of social stress on oral and other bodily tissues. II. Results offering substance to a hypothesis for the mechanism of formation of periodontal pathology. *J Periodontol.* 1971 Feb;42:109-11.
21. Roberts A, Matthews JB, Socransky SS, *et al.* Stress and periodontal diseases: effects of catecholamines on the growth of periodontal bacteria in vitro. *Oral Microbiol Immunol.* 2002;17(5):296-303.
22. Hourri-Haddad Y, Itzhaki O, Ben-Nathan D, *et al.* The effect of chronic emotional stress on the humoral immune response to *Porphyromonas gingivalis* in mice. *J Periodontol Res.* 2003;38(2):204-9.
23. Carveth JA, Gesse T, Moss N. Survival strategy for nurse-midwifery students, *J nurse-midwifery.* 1996;41:50-54.
24. Pindborg JJ. Gingivitis in military personnel with special reference to ulceromembranous gingivitis. *Odontol Tidskr.* 1951;59:407-493.

25. Giddon DB, Goldhaber P, Dunning JM. Prevalence of reported cases of acute necrotizing ulcerative gingivitis in a university population. *J Periodontol.* 1963;34:66-70.
26. Cohen-Cole SA, Cogen RB, Stevens AW Jr. Psychiatric psychosocial and endocrine correlates of acute necrotizing ulcerative gingivitis. *Psych Med.* 1983;1:215-225.
27. Silva AM, Newman HN, Oakley DA. *J Clin Periodontol.* 1995;22(7):516-526.
28. Shannon IL, Kilgore WG, Leary TJ. *J Periodontol.* 1969;40(4):240-242.
29. Maupin CC, Bell WB. *Journal of Periodontology.* 1975;46(12):721-722.
30. Genco RJ, Ho AW, Grossi SG, *et al.* Relationship of stress, distress and inadequate coping behavior to periodontal disease. *J Periodontol.* 1999;70:711.
31. Page RC, Altman LC, Ebersole JL *et al.* Rapidly progressive periodontitis. A distinct clinical condition. *J Periodontol.* 1983;54:197-209.
32. Monteiro da silva A, Oakley D, Newmann H, Nohl F, Lloyd H. Psychosocial factors and adult onset rapidly progressive periodontitis. *J Clin Periodontol.* 1996;23:789-794.
33. Kamma JJ, Baehni PC. Five-year maintenance follow-up of early onset periodontitis patients. *J Clin Periodontol.* 2003;30:562-572.
34. Axtelius B, So'drefeldt B, Nilson A, Edwardson S, Attstro'm R. Therapy-resistant periodontitis psychosocial characteristics. *J Clin Periodontol.* 1998;25:482-491.
35. Elter JR, White BA, Gaynes BN, *et al.* Relationship of clinical depression to periodontal outcome. *J Periodontol.* 2002;73(4):441.
36. Wimmer G, Ko'hldorfer G, Mischak I, Lorenzoni M, Kallus KW. Coping with stress: its influence on periodontal therapy. *J Periodontol.* 2005;76:90-98.
37. Gamboa ABO, Hughes FJ, Marcenes W. The relationship between emotional intelligence and initial response to a standardized periodontal treatment: a pilot study. *J Clin Periodontol.* 2000 July ;32(7):702-7.