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Review

Influence of Depression and Anxiety on Periodontal Disease: Literature Review

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Abstract

Periodontal disease affects the gums and the tissues surrounding the teeth and has a multifactorial etiology. In some cases, periodontal disease, depending on its form, whether mild or more moderate, can cause tooth loss. In this context, depression and anxiety have been gaining notoriety as risk indicators for the manifestation and progression of periodontal disease. In this way, the present work aims to carry out a literature review to identify the association between anxiety and depression (psychological states) in periodontal disease. The methodology used was the literature review. Data collection was carried out in the period of August and September 2022, and covered publications from the years 2015 to 2022. Twenty-five publications were selected to compose the present work, and the year 2020 was the one that presented the most publications on the theme depression and anxiety in periodontal disease, with n=7, followed by the year 2019, with n=5. In the end, it was concluded that depression and anxiety are factors that may favor the emergence of periodontal diseases, since these psychological changes make the individual's immune response more susceptible to immunoinflammatory changes.

Keywords: Dental Elements, Gum, Immunoinflammatory, Psychological Changes

INTRODUCTION

Periodontal disease is characterized by inflammation caused by the accumulation of bacterial plaque, and is mainly caused by gram-negative anaerobic bacteria that affect the protective and supporting tissues of the teeth, which include cementum, alveolar bone, periodontal ligament and gums. The transition from a health condition to periodontal disease occurs through several disorders that undergo several cellular events, coordinated by the host's immune system, with the aim of protecting it from microbial attack. In this way, several defense mechanisms act against the presence of microorganisms, such as the presence of substances in saliva and gingival crevicular fluid (Alencar et al., 2020).

About periodontal disease or periodontitis Petit et al. (2021) add that it is a chronic inflammatory disease induced by oral dysbiosis and characterized by clinical symptoms, including gingival edema, gingival bleeding, lossof clinical insertion and tooth mobility. This highly prevalent disease impacts oral health-related quality of life and its long-term management is costly. The development of periodontitis involves disruption of the balance between host response and polymicrobial communities promoted by key pathogens such as Porphyromonas gingivalis. Periodontal pathogens invade the gingival tissues and provoke an exacerbated inflammatory response mediated by cytokines and chemokines.Such an inflammatory process will modulate bone homeostasis by promoting osteoclastogenesis, contributing to the destruction of alveolar.

The presence of bacteria alone, in most cases, cannot trigger the disease process, since periodontal disease is involved in a multifactorial etiology, which associates genetic predisposition, systemic condition and environmental factors.

There are some risk factors that alter the host's immune response, such as diabetes and smoking. These factors end up interfering with the course of the disease, its severity and response to treatment. There are also other factors, such as psychological stress, anxiety and depression, which have been constantly associated as

potential variables that may end up influencing the disease.The biological reasonableness to admit this association is established in studies that have shown that psychosocial conditions end up affecting the host's immune response, making it more susceptible to periodontal disease (Dantas et al., 2016).

Decker et al. (2020) highlight that in fact several inflammatory mediators (IL-1b, IL-6 and IL-8) implicated in the development of periodontal diseases correlated with the level of stress, emphasizing a link between periodontal status and the psychological state. Accordingly, Araújo et al., (2016) highlighted that a relationship between psychological stress and periodontal disease has been reported. Anxiety and depression are associated with altered immune responses and may increase susceptibility to periodontal disease.

In modern society, the assessment and management of psychological stress can be important for the prevention of periodontal disease.Measuring cytokines in saliva has proven useful as an objective method of assessing psychological stress. The stress response is also associated with increased neural activity in the hypothalamic-pituitary-adrenal axis or the sympathetic-adrenal axis, resulting in the release of cortisol from the adrenal cortex (Maruyama et al., 2022).

Therefore, the aim of this study is to carry out a literature review to identify the association between anxiety and depression (psychological states) in periodontal disease.

METHODOLOGY

This study is a literature review, which sought to verify the association between anxiety and depression (psychological states) in periodontal disease. Data collection was carried out between August and September 2022, and covered publications from the years 2015 to 2021 extracted from Google Scholar and the Virtual Health Library (BVS) and indexed in the virtual libraries Scientific Electronic Library Online (Scielo), Literature Latin America and the Caribbean in Health Sciences (LILACS).

The search took place through the use of health science descriptors “Anxiety”, “Depression” and “Periodontal Disease”. Exclusion criteria for this study were works without relevance to the topic, without proven scientific relevance, repeated (duplicate) publications, abstracts, works that were not published in full, publications dated less than 2015. The time period between 2015 to 2021 for selection of publications. 2,070 publications were found in Google Scholar and 80 publications in the Virtual Health Library (BVS), which totaled 2,150 publications. Of the 80 publications found in the Virtual Health Library, 71 were excluded, remaining 09. Of the 2,070 publications found in Google Scholar, 2,055 publications were excluded, remaining 16 publications. Therefore, the present work consisted of a total of 25 publications.

Theoretical Reference

Stress

Stress is perceived through emotional agitation that produces an adaptation process by disorganizing homeostasis, which is characterized by the increase in adrenaline secretion that produces various systemic manifestations, such as psychological and physiological disorders. There are reports that argue that stress is the product of a state of imbalance both in the person-work environment relationship and in the demand-resources relationship. In the clinical view, stress is a psycho-physiological phenomenon arising from the personal perception of the failure of the environment's demand and the individual's ability to respond. It is a clinical problem that brings with it psychological, physiological and behavioral consequences, where interventions are aimed at developing individual coping strategies (Noronha, 2019).Stress provokes stimuli that activate early physiological responses to the brain, causing rapid and adaptive consequences, which can be harmful when dealing with a chronic or long-term problem. Any alteration in the internal or external environments that disturbs or alters the balance, causes several changes in the body, the so-called stress response. There is evidence that stressful situations alter immune cells and organs, atrophy the thymus and other lymphatic structures, in addition to making the person more susceptible to infections (Rosalin et al., 2018).

This probably occurs due to two pathways, these being the Hypothalamic-pituitary-adrenal (HHA) axis and the transition of the HPA axis and immune system. The HPA axis produces as a result of stress infections, inflammations, emotional stress, and the neurons of the hypothalamus release the hormone corticotropin (CRF) which encourages the pituitary to secrete adrenocorticotropic hormone (ACTH), resulting in the release of glucocorticoids. In the transition of the HPA and immune system axis, corticosteroids alter the balance that exists between the different types of T helper (Th) cells, altering the immune response. Two identified subgroups of Th cells are Th1 cells, which encourage cellular immunity through the production of IFN-γ and IL-2, and Th2 cells, which differentiate B cells and humoral immunity by releasing IL-4, IL-5 , IL-6 and IL-10 (Leal, 2019).

The stress response causes physiological imbalances involving the hypothalamic-pituitary-adrenal (HHA) axis and the sympathetic autonomic nervous system, which induce the release of neurotransmitters and hormones, which are mediators between the brain and the body. There is evidence that increased immune suppression to chronic stress can alter host tissue resistance through endocrine mechanisms, increasing the level of corticosteroids and catecholamines (Alves and Gomes, 2020).

Anxiety

Emotional disorders such as anxiety are frequent

symptoms resulting from psychological stress. In 2016, major depressive disorder ranked in the top 10 years lived with a disability (YLDs) in all 195 countries and territories except in just 4 countries. Anxiety disorders also ranked in the top 10 YLDs in more than half of the countries and territories. About that,depression and anxiety disorders have a pronounced comorbidity, with 50 to 60% of individuals depressed individuals fulfilling the lifetime criteria for an anxiety disorder, and anxiety disorders may act as a causal risk factor for later depression (Liu et al., 2018).

Mental disorders like depression and anxiety are widespread problems across the world. Anxiety disorder is also frequent as a feature of modern life. It is a comorbid disorder, and the diagnosis must be made carefully. Although there are psychological and medical therapies to treat this disorder, half of the patients do not follow the treatment and the other half who seek treatment do not receive adequate treatment. Both anxiety and depression can influence an individual's physical health through several pathophysiological mechanisms. The increased risk of infections by modifying the function of the immune system and increasing pro-inflammatory cytokines and, subsequently, inducing vascular inflammation are the most proposed mechanisms of action of depression and anxiety in the human body. There is evidence that these conditions can cause oral and dental problems, since emotional changes can influence the oral mucosa. Several researches have also shown a relationship between anxiety or depression and periodontal health (Mohammadi et al., 2019).

Depression and Anxiety and Periodontal Disease

Periodontal diseases have a multifactorial etiology and their extent and severity depend on the host's immunoinflammatory response, which can be biomodulated by genetic, systemic and biomodulated factors in the specific microbial challenge. Longitudinal controlled clinical studies have demonstrated risk factors for periodontal diseases, pointing to a cause and effect relationship between several studied variables, increasing the risk of incidence, severity and extension when they are exposed to systemic conditions or habits, such as smoking. and diabetes. Nowadays, depression, anxiety and stress are considered risk factors for periodontal diseases, being considered as potential factors that can alter the natural course of periodontal diseases (Rosalin et al., 2018).

Alencar et al., (2020) highlighted that pregnancy, age, systemic diseases and psychosocial stress can also stimulate the increase of pathogens in the oral cavity, causing periodontal diseases. The authors added that stressed individuals are more likely to have health habits that put them at risk, which include a poor sleep pattern, food with low nutritional value, sedentary lifestyle and greater propensity to abuse tobacco, alcohol, among others, being that these habits can contribute to the manifestation and progression of periodontitis. Periodontitis is part of a complex chronic inflammatory reaction, which results in loss of connective tissue and tooth support bone, the alveolar bone. It is one of the main causes of toothloss in adults over 40 years of age and affects individuals all over the world. The prevalence of this problem is high, especially in middle-aged people. The prevalence of the most severe form of the disease is approximately 10% to 20% of the entire world population, while mild and moderate forms affect approximately 20 to 50% of the entire population. In the elderly population, this rate can reach 80%, with the moderate and severe form reaching approximately 100 million people, which corresponds to approximately 15% of adults aged between 21 and 50 years, and 30% in people over 50 years of age (Noronha, 2019). Periodontitis, in Brazil, is more prevalent in males, older, brown and low socioeconomic status (Alencar et al., 2020).

Depression and anxiety disorders show pronounced comorbidity, with 50 to 60% of individuals depressed individuals meeting the lifetime criteria for an anxiety disorder, and anxiety disorders may act as a causal risk factor for later depression (Liu et al., 2018). These disorders are potential risk factors for periodontal disease, as stress-related disorders work through a dual process to affect bone mass and remodeling, which are: 1) hypothalamic/adrenal cortex/cortisol signaling axis and 2) direct adrenergic nerve signaling, which collectively affects immune capacity, alters inflammatory signaling, and disrupts bone remodeling balance (Decker et al., 2020).

RESULTS

Twenty-five publications were selected to compose this literature review, with the specific period for selection being established from 2015 to 2022 as shown in Figure 1.

The year 2020 was the year with the most publications on depression and anxiety in periodontal disease, with n=7, followed by the year 2019, with n=5, demonstrating that the information made available here can be considered up-to-date.

Ananalysis of the publications was carried out according to the author(s), title and objective of the study, as shown in Table 1.

DISCUSSION

Psychological stress has been recognized as the pathophysiological origin of many chronic diseases, and periodontitis is no exception. Liu et al., (2018), through a meta-analysis, demonstrated a significant association between emotional disorder (including anxiety and depression) and chronic periodontitis. The authors emphasized that, on the one hand, the altered emotional state would alter health-related behaviors, such as oral hygiene, oral health examination, smoking and diet, which may increase the risk of periodontitis. On the other hand, emotional disturbance has been hypothesized to deteriorate already damaged periodontal tissues, either

Source: Academic (2022)

Figure 1. Publications selected by year

Table 1. Distribution of publications according to author(s), title, year and purpose of the study

Author(s)	Publication Year	Title	objective
Laforgia, A. et al.	2015	Assessment of psychopathological traits in a group of patients with adult chronic periodontitis: study of 108 cases and analysis of Observance during and after periodontal treatment	To investigate the role these psychological disorders play in the initiation and progression of advanced-stage periodontitis.
Oliveira, J. S.	2015	The relationship between stress and periodontal disease - literature review	Identify the pathways of action of stress in the immune system of individuals, seeking to prove the participation of stress in the onset or progression of periodontal disease
Dantas, F. T. et al.	2016	Association between psychological stress and periodontal disease - literature review	To analyze evidence of the association between psychological stress and periodontal disease.
Longoni Domingos, A.	2016	The influence of psychological stress on periodontal disease: a literature review	To analyze the influence of psychological stress on the manifestation and progression of periodontitis.
Pascucci, J. O. et al.	2016	Correlation between stress, smoking and periodontal status in adults living in the city of Mendoza	To investigate the correlation between psychosocial stress, adaptive behaviors and smoking with periodontal status
Jepsen, S. et al.	2017	Prevention and control of dental caries and periodontal disease at population and individual level: EFP/ORCA joint workshop group 3 consensus report on caries and periodontal disease boundaries	To review the current state of knowledge about epidemiology, socio-behavioral aspects, as well as plaque control in relation to dental caries and periodontal diseases.
Almeida, R. S. et al.	2018	Emotional stress and its influence on oral health	To address the influence of stress on the maintenance of oral health problems, discussing the behavior of the dental surgeon in the face of this condition

Table 1. Continue

Cademartori, M. G.	2018	The effect of depression on oral health and use of dental services in populations	To investigate the effect of depression on the oral health of the population through two systematic reviews, and through a cross-sectional study in the 2015 Pelotas Birth Cohort.
Liu, F. et al.	2018	A meta-analysis of emotional disturbances as possible risk factors for chronic periodontitis	Evaluate scientific evidence on the association between emotional disorder (depression and anxiety) and chronic periodontitis.
Rosalin, Y. E. et al.	2018	Relationship between periodontal disease and indicators of stress and depression	To investigate the association between the presence and extent of periodontal disease and levels of depression and stress symptoms presented by patients.
Leal, M. N.	2019	Influence of psychological stress on periodontal diseases: a literature review	To review in the literature how the relationship between stress and periodontal disease has been contemplated.
Mohammadi, T. M. et al.	2019	Anxiety, depression and oral health: a population-based study in southeastern Iran	To investigate the association between depression/anxiety and oral health indices in Kerman's 15-75 year-old population.
Noronha, E. C. A.	2019	The relationship between depression and periodontitis	Improve knowledge on the subject by realizing the existence or not of a relationship between the pathologies
Rosalin, Y. E. et al.	2019	Relationship between periodontal diseases and indicators of stress and depression	Knowing the relationship between the presence/absence of PD and its extent, with the symptoms and indicators of SS and ND.
Soares, L. M. S.	2019	The relationship between stress and periodontal disease: a literature review	Evaluate the relationship between periodontal disease and stress.
Alencar, A. R. et al.	2020	Emotional disorders such as stress and anxiety as modifying factors of periodontal diseases - a literature review	Conduct a literature review aimed at the effects of stress and anxiety on the human body and its association with periodontal disease.
Alves, S. S.; Gomes, C. S.	2020	Influence of stress on the progression and severity of periodontal disease	To analyze how stress acts on the progression and severity of periodontitis through clinical and psychological parameters, emphasizing the main results of the case studies selected for this review
Bueno, C. H. R.; Castro, M. L.	2020	Consequences of stress on oral health: literature review	Bring learning to dental professionals about the consequences of stress on oral health and the physiological changes triggered by this condition of emotional imbalance.
Decker, A. et al.	2020	The assessment of stress, depression and inflammation as a collective risk factor for periodontal diseases: a systematic review	Provide a new perspective using a biomarker assessment to assess the impact of stress-related disorders on periodontal disease progression and evaluate the growing body of evidence of stress as a risk indicator for periodontal disease progression.
Paiano, H. M. et al.	2020	Relationship between depression and anxiety as oral chronic diseases: an integrative review	Review in the literature articles that relate depression (chronic systemic disease) with chronic oral diseases

Table 1. Continue

Ramlogan, S. et al.	2020	Self-reported stress, coping ability, mental status and periodontal disease among police recruits	To investigate self-reported stress level and coping ability, as well as mental status (anxiety and depression) via the 12-item General Health Questionnaire (GHQ-12) and periodontal status among police academy recruits during their 8 years old.
Silva Junior, R. O.; D'Ajuda, T. P. B.	2020	The influence of stress, depression and anxiety on oral health	Evaluate the influence of stress, depression and anxiety on the oral health of the population.
Palmeira, J. T. et al.	2021	Relationship between emotional stress condition and presence of gingival inflammation in women	To evaluate the prevalence rate of gingival inflammation in women over 30 years of age who are experiencing emotional stress and are treated at the UFCG Dentistry School Clinic.
Petit, C. et al.	2021	Influence of depression and anxiety on non-surgical periodontal treatment outcomes: a 6-month prospective study	To determine its association with non-surgical periodontal treatment outcomes in patients with severe generalized periodontitis (stage III/IV generalized periodontitis) at 6 months.
Maruyama, T. et al.	2022	Relationship between Psychological Stress Determined by Voice Analysis and Periodontal Status: A Cohort Study	To examine the relationship between psychological stress (vitality and mental activity) assessed by the Mind Monitoring System (MIMOSYS) and periodontal status.

Source: Academic (2022)

through comprehensive immunosuppression or heightened susceptibility to inflammation.

Decker et al., (2020) state that stress/cortisol levels associated with inflammatory biomarkers have increased the severity of periodontal disease, suggesting further investigation into the relationship between psychological stress and periodontal disease. Laforgia et al., (2015) analyzed 108 individuals, men and women, aged between 24 and 67 years to investigate the role that psychological disorders have in the onset and progression of advanced stage periodontitis and found that for each of the psychological variables considered (depression, anxiety, stress), it was possible to observe a significant correlation with periodontal disease, thus suggesting the importance that these disorders have in the appearance and progression of dental disease. Bueno Castro (2020) carried out a literature review and found that stress favors the appearance of various oral manifestations, such as periodontal disease, which involves several pathological changes in the periodontium (tissues that surround the tooth), causing changes in places such as the gums, alveolar bone, cementum and periodontal ligament. Another point raised by the authors is that there is an important interrelationship between stress and depression, and chronic stress can induce depression. Local variations that may favor bone resorption of the periodontium. Stress conditions cause changes in immune function, and acute stress can cause an increase in the level of leukocytes in the blood, resulting in protection against certain types of infections, but when the state of stress lasts for a long period of time, thesame it becomes chronic, increasing glucocorticoids, such as cortisol, causing immunosuppressive effects, which may lead to the development of infectious diseases.

In disagreement with what was found above, Rosalin et al., (2018) developed a study to know the interrelationship between the presence/absence of periodontal disease and its extension, with the symptoms and indicators of stress and depression, in thirty patients with periodontitis and thirty without periodontitis and concluded that, in the analyzed patients, there was no relationship between the development and level of periodontal disease and psychological indicators of stress and depression. In another study carried out with 166 volunteers of both genders, aged between 25 and 65 years, to assess the correlation between psychosocial stress, adaptive behaviors and smoking with periodontal status, it was found that individuals who present stress, inadequate adaptive behaviors and smoking are more susceptibleto periodontal deterioration. High values of salivary cortisol were associated with greater periodontal deterioration (Pascucci et al., 2016).

Palmeira et al., (2021) evaluated the prevalence rate of gingival inflammation in women over 30 years of age in conditions of emotional stress and found that stress in the

analyzed population had a significant impact on gingival inflammation, although they are not necessary or sufficiently capable of triggering, by itself, gingival changes. However, these can alter periodontal responses to bacterial attack, which indirectly contributes to periodontal disease.

Almeida et al., (2018) point out that emotional stress is an important etiological factor in the perpetuation or predisposition of some oral problems, and can be a complicating factor when combined with other factors, such as depression and anxiety. Thus, it is important to emphasize that this condition requires a different behavior from the professional, including the psychogenic factors involved in order to provide a multidisciplinary and careful clinical management.

CONCLUSION

In this literature review, it was possible to verify that depression and anxiety are factors that may favor the appearance of periodontal diseases, since these psychological changes make the individual's immune response more susceptible to immunoinflammatory changes. It should be noted that the direct association of the individual's psychological states with periodontal disease still needs further studies to be truly proven, but it is important that the Dental Surgeon considers all psycho-emotional aspects, such as anamnesis, detailed physical examinations, treatment plan and multidisciplinary follow-up, if necessary.

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