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A complex relationship among periodontal disease, obesity and diabetes

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Abstract
Introduction: The relationship between periodontal disease, obesity and diabetes is crucial because of their mutual negative impact. Periodontitis worsens glycemic control in diabetics and increases the risk of developing diabetes. Obesity, in turn, increases susceptibility to periodontal disease.
Objective: To analyze the literature on the association of periodontal disease, obesity and diabetes, mainly its diagnosis, prevention and treatment.
Methodology: A search of articles published mainly in the last 5 years was carried out using the PubMed, Scopus and Google Scholar databases. The search was implemented using Boolean operators AND, OR, NOT. Keywords used for the search included: "periodontal disease", "obesity", "diabetes", "diagnosis", "prevention", "treatment".
Results: Early and accurate diagnosis of periodontal disease, diabetes and obesity is essential for proper patient health management. Periodontal examination, HbA1c measurement and waist circumference index assessment are essential tools to identify individuals at risk for developing these conditions and to take preventive measures or initiate timely treatment. Treatment of periodontal disease in people with obesity and diabetes requires a comprehensive approach that includes glycemic control, a healthy diet, regular physical activity, proper oral hygiene and regular dental visits. Implementing these strategies can improve oral health, reduce systemic inflammation and decrease the risk of complications associated with these chronic diseases.
Conclusions: Obesity, diabetes and periodontal disease are interconnected. A comprehensive approach is key to preventing and managing these diseases. Lifestyle changes, oral hygiene and medical care are essential. Improving oral health reduces inflammation, and the risk of complications.

Keywords: Periodontal disease, diabetes, obesity, treatment, diagnosis, prevention

1. Introduction

The interrelationship between obesity, diabetes and periodontal disease has become a topic of great relevance in the current medical field [1,2]. Several studies have shown that these three conditions not only coexist more frequently than expected, but also influence each other, generating a cycle of complications that can significantly affect the overall health of individuals [3, 4].

It is important to note that the relationship between obesity, diabetes and periodontal disease is complex and multifactorial [5, 6].

Several studies have shown that obesity increases the risk of developing periodontal disease [7]. This is because obesity generates a chronic inflammatory state in the body, which favors the accumulation of pathogenic bacteria in the mouth and the destruction of periodontal tissue [8].

Diabetes affects the body's ability to fight infections, making it difficult to control periodontal disease [9].

Because of the complex interrelationship between these three conditions, the co-management of obesity, diabetes and periodontal disease is crucial to improving the overall health of patients [10, 11].

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Due to the increasing prevalence of obesity and diabetes worldwide, and their close association with periodontal disease, it is essential to deepen the understanding of this complex relationship. Approaching this issue from a comprehensive perspective will allow health professionals to identify patients at risk early, implement more effective prevention strategies, and develop personalized treatments that consider the joint management of these three conditions. The main objective of this review article is to analyze in depth the relationship between obesity, diabetes and periodontal disease. It aims to explore the biological mechanisms underlying this complex interaction, evaluate the clinical consequences of these comorbidities, and discuss comprehensive prevention and treatment strategies to improve the oral and systemic health of affected patients.

2. Materials and Methods

Information was collected from articles published in PubMed, Scopus and Google Scholar servers, with emphasis on the last 5 years. The quality of the articles was evaluated based on the standard guidelines, i.e., identification, review, choice and inclusion. The quality of the review was assessed using the measurement instrument for evaluating systemic reviews. Boolean logical operators AND, OR and NOT were used in the search. It was performed with the words “periodontal disease”, “obesity”, “diabetes”, “diagnosis”, “prevention”. The keywords were used individually, as well as each of them related to each other.

3. Results and Discussion

3.1 Diagnosis

Periodontal examination is the standard method of assessing the health of the gum and tooth-supporting tissues. This examination includes measurement of periodontal probing, which is the distance between the gum and the tooth, and evaluation of signs of gingival inflammation and bleeding [12, 13]. Periodontal infections, characterized by inflammation and infection of the gums and tooth-supporting tissues, are associated with an increased risk of developing type 2 diabetes and poor glycemic control in already diabetic patients. This bidirectional link is partly explained by the release of proinflammatory cytokines into the bloodstream from infected periodontal sites [14, 15].

These cytokines, such as interleukin 1β, interferon gamma, IL-4, IL-5 and tumor necrosis factor alpha, may contribute to insulin resistance through several mechanisms, including interference with insulin signaling in muscle and liver cells, decreased insulin production by pancreatic beta cells and increased systemic inflammation [16-18]

Several studies support the usefulness of HbA1c in the diagnosis of diabetes. The American Diabetes Association (ADA) and the International Diabetes Federation recognize it as a primary diagnostic criterion for type 2 diabetes and prediabetes [19, 20].

For prediabetes, HbA1c has also proven to be an effective tool. The ADA defines prediabetes as an HbA1c level between 5.7% and 6.4% [21]. Several studies have shown that prediabetes identified by HbA1c is associated with an increased risk of developing type 2 diabetes in the future [22, 23]. There are positive correlations between Weight-adjusted Waist Circumference Index, a novel obesity index, and moderate/severe periodontitis prevalence through diverse modeling approaches [24,25].

Early and accurate diagnosis of periodontal disease, diabetes and obesity is crucial for proper patient health management. Periodontal examination, HbA1c measurement, and waist circumference index assessment are essential tools to identify individuals at risk for developing these conditions and to take preventive measures or initiate timely treatment. The adoption of healthy lifestyles, such as a balanced diet, regular exercise and weight control, plays a fundamental role in the prevention and management of these chronic diseases.

3.2 Prevention

Obesity and diabetes share several risk factors, among which unhealthy eating habits, characterized by a high intake of refined sugars, saturated fats and processed carbohydrates, increase the risk of both conditions [26, 27]. Physical inactivity is associated with an increased risk of developing obesity and type 2 diabetes [2,28]. In addition, genetic predisposition, as certain genetic variants may increase susceptibility to obesity and diabetes [29-31].

Strict glycemic control in patients with type 2 diabetes significantly reduces the progression of periodontitis [32,33]. Similarly, a healthy diet rich in fruits, vegetables and fiber, and low in refined sugars and saturated fats, can improve periodontal health and reduce systemic inflammation associated with obesity [34,35].

Regular physical exercise has been shown to be beneficial for periodontal health in people with obesity and diabetes. physical activity reduces the risk of periodontitis [36].

Regular dental checkups allow early detection and timely treatment of periodontal disease, minimizing its impact on overall health. Proper oral hygiene is essential to prevent periodontal disease. This includes brushing teeth twice a day for at least two minutes, flossing once a day, and rinsing the mouth with an antiseptic mouthwash daily [37,38].

In conclusion, prevention of periodontal disease in people with obesity and diabetes requires a comprehensive approach that includes glycemic control, a healthy diet, regular physical activity, proper oral hygiene, and regular dental visits. Implementation of these strategies can improve oral health, reduce systemic inflammation, and decrease the risk of complications associated with these chronic diseases.

3.3 Treatment

Obesity has been shown to increase the risk of developing severe periodontitis. The mechanisms underlying this association include the release of proinflammatory adipokines by visceral adipose tissue, which alter the host immune response and favor pathogenic bacterial colonization [39, 40].

The co-management of diabetes, obesity and periodontal disease is crucial to prevent and control these conditions. Treatment of this complex relationship requires a multidisciplinary approach that addresses both periodontal disease and the underlying conditions of obesity and diabetes, i.e. periodontal management that includes non-surgical periodontal therapy (scaling and root planing) and surgical periodontal therapy. Obesity management with diet and exercise with behavioral therapy (eating behaviors and healthy habits). In some cases, pharmacological therapy may be adjuvant for weight control, always under medical supervision [2, 41, 42]. On the other hand, Laser biostimulation therapy may have a short-term anti-inflammatory contribution to nonsurgical periodontal therapy, only in impaired healing conditions such as diabetes mellitus [43].

The relationship between obesity, diabetes and periodontal disease is complex and multifactorial. The therapeutic approach should be comprehensive, considering periodontal treatment along with the management of systemic

comorbidities. A multidisciplinary approach involving periodontists, general practitioners, nutritionists and psychologists is essential to achieve optimal results and improve patients' quality of life. A comprehensive approach should include lifestyle modifications, periodontal therapy, tight glycemic control and individualized counseling can significantly improve patients' health and quality of life.

3.4 Correlation between periodontal disease and diabetes.

Diabetes increases the risk of developing periodontal disease, and periodontal disease, in turn, worsens glycemic control [44].
Hyperglycemia in diabetes promotes systemic inflammation, which contributes to the development and progression of periodontal disease [2,3].
Effective periodontal treatment reduces gingival inflammation and lowers levels of systemic inflammatory markers, improving glycemic control and reducing the risk of diabetic complications [45,46].
There is a significantly increased risk of tooth loss in patients with diabetes [47,48].
The chronic hyperglycemia associated with diabetes favors the adhesion and proliferation of periodontal bacteria, increasing the risk and severity of periodontal disease [49].
Diabetes also modulates the host immune response, negatively affecting the body's ability to fight periodontal infections [50].
Diabetes affects the body's ability to heal, which hinders proper healing after dental or periodontal procedures [51].
It is critical for people with diabetes to be aware of the increased risk of periodontal disease and take steps to prevent it. Effective periodontal treatment not only improves oral health, but can also help control blood sugar and reduce the risk of diabetic complications. It is crucial that people with diabetes maintain close communication with their dentist to receive proper care.

3.5 Correlation between obesity and periodontal disease

Obesity increases the risk of developing periodontal disease, it is associated with a chronic low-grade inflammatory state, obese individuals are at a higher risk of bleeding on probing [52].
Obesity generates a chronic proinflammatory state which enhances the host inflammatory response to periodontal bacteria, exacerbating periodontal disease by affecting the immune response [53,54].
Advanced periodontal disease leads to loss of alveolar bone, which supports the teeth. Obesity increased the risk of alveolar bone loss in patients with periodontitis [39].
Obesity is associated with alterations in the composition of the oral microbiota, which may contribute to the development of periodontal disease. Obese individuals have a higher abundance of proinflammatory bacteria in dental plaque [55].
Available scientific evidence suggests a strong relationship between obesity and periodontal disease. The oral manifestations of this association include increased gingival inflammation, alveolar bone loss, tooth loss and changes in the oral microbiota. It is important to note that obesity is not the only risk factor for periodontal disease, but it does represent a modifiable risk factor that can be addressed to improve oral health. In conclusion, obese individuals are advised to see a dentist on a regular basis for early detection and treatment of periodontal disease. In addition, they should be counseled on the importance of maintaining a healthy weight to reduce the risk of developing this disease and other obesity-related systemic conditions.

4. Conclusions

Current scientific evidence demonstrates a strong relationship between obesity, diabetes and periodontal disease. Both systemic conditions share pathophysiologic mechanisms that interconnect them and potentiate periodontal disease progression.
It is critical that oral health professionals consider obesity and diabetes as additional risk factors for periodontal disease, and implement comprehensive prevention and management strategies that address these comorbidities together.
Body weight control, proper blood glucose management and the adoption of optimal oral hygiene habits are fundamental pillars to prevent and treat periodontal disease in patients with obesity and diabetes, improving their oral and general health.

5. Conflict of Interest

Not available

6. Financial Support

Not available

7. References

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