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REVIEW ARTICLE

Periodontal disease as a risk factor for cardiovascular disease

Enfermedad periodontal como factor de riesgo para enfermedades cardiovasculares

Oswaldo Damian Miranda-Rosero[1] ✉, **Carmen Salinas-Goodier**[1], **Dayana Dominicque Cisneros-Peñafiel**[1]

[1]Universidad Regional Autónoma de los Andes. Ambato, Ecuador.

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ABSTRACT

Introduction: periodontal and cardiovascular diseases show high prevalence rates globally, and the relationship between the two has been observed in recent decades.
Objective: to analyze the influence of periodontal disease as a risk factor in patients with cardiovascular diseases.
Methods: an exhaustive search was conducted in the PubMed, Science Direct, and Scielo databases, yielding studies previously validated according to inclusion and exclusion criteria. The search and analysis of 14 scientific articles was conducted by compiling sources, discarding, selecting, and analyzing scientific studies on periodontitis and cardiovascular disease. This process was conducted by two independent researchers, with eight articles used in the analysis of the problem studied.
Results: from a practical perspective, periodontal disease can be a strong indicator of atherosclerotic arterial damage, since cardiovascular risk factors are similar in both diseases, establishing a relationship between them. The mechanisms involved in periodontal disease are related to the pathophysiology involved in affecting organs and tissues related to the cardiovascular system. Research with longer follow-up periods in patients with established CVD is recommended to observe more significant changes in their health.
Conclusion: periodontal disease is linked to cardiovascular disease and can increase cholesterol levels. Although treatments reduced periodontal disease and showed some improvement in cardiovascular factors, the studies did not yield significant results.

Keywords: Periodontal Diseases; Risk Factors; Cardiovascular Diseases.

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RESUMEN

Introducción: las enfermedades periodontales y cardiovasculares muestran elevadas tasas de prevalencia a nivel global, en las últimas décadas se ha visto la relación existente entre ambas.
Objetivo: analizar la influencia de la enfermedad periodontal como factor de riesgo en pacientes con enfermedades cardiovasculares.
Métodos: Se realizó una búsqueda exhaustiva en las bases de datos PubMed, Science Direct y Scielo obteniendo estudios previamente validados por los criterios de exclusión e inclusión. La búsqueda y análisis de 14 artículos científicos se realizó mediante la recopilación de fuentes donde se descartó, seleccionó y analizó estudios científicos sobre periodontitis y enfermedades cardiovasculares, este proceso fue realizado por dos investigadores independientes, siendo ocho artículos empleados en el análisis de la problemática estudiada.
Resultados: desde una perspectiva práctica, la enfermedad periodontal puede manifestarse como un fuerte indicador de daño arterial aterosclerótico, ya que los factores de riesgo cardiovascular son similares en ambas enfermedades, estableciendo su relación entre ambas patologías. Los mecanismos involucrados en la enfermedad periodontal guardan relación con la fisiopatogenia implicada con la afectación a los órganos y tejidos relacionados con el sistema cardiovascular. Se recomienda realizar investigaciones con períodos de seguimiento más largos en pacientes con ECV establecidas para observar cambios más relevantes en su salud.
Conclusión: la enfermedad periodontal se relaciona con enfermedades cardiovasculares y puede aumentar los niveles de colesterol. Aunque los tratamientos redujeron la enfermedad periodontal y mostraron cierta mejora en factores cardiovasculares, los estudios no arrojaron resultados significativos.

Palabras clave: Enfermedades Periodontales; Factores de Riesgo; Enfermedades Cardiovasculares.

INTRODUCTION

Periodontal disease is understood as the pathology that affects the supporting tissues of the tooth, beginning with the appearance of gingivitis, which generally manifests with the presence of inflammation, alteration of volume, consistency, and bleeding of the gums. When it is not properly treated, it progresses to the stage of periodontitis involving cementum, bone loss, and periodontal attachment. It is considered a multifactorial silent disease associated with a series of systemic conditions, where the host's inflammatory response causes deterioration of the supporting tissues of the tooth, including the fibers of the periodontal ligament and alveolar bone, which will be perpetuated by the migration of bacterial plaque to the apical region. Periodontitis is considered a chronic non-communicable inflammatory infectious disease with high prevalence levels, affecting 11,2 % of the world's population, and is also the sixth most common disease in humans. [1,2,3,4]

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Cardiovascular diseases (CVD) are considered a causal agent of death. worldwide.[5] In Europe, CVD is estimated to cause approximately 3,9 million deaths, or 45 % of the total. Ischemic heart disease, stroke, and hypertension are the main cardiovascular diseases with the highest mortality rates.

In recent decades, periodontitis has been linked to systemic conditions such as CVD and diabetes, considering that several studies have shown that patients with periodontal disease are more likely to suffer cardiovascular events such as myocardial infarction, peripheral arterial disease, stroke and heart failure (HF).[6] The pathogens involved in periodontal disease can invade more organs and tissues involving the cardiovascular system, these microorganisms target large arteries. In addition, after bacterial infection, there is an increase in the concentration of inflammatory mediators such as CRP (CRP-positive protein), which has also been proposed as a potential risk factor for the development of CVD.[7]

Normally in the periodontal pocket there is a large amount of gram-negative bacteria that enter the underlying tissue and blood vessels, when periodontal inflammation occurs a chronic subclinical bacteremia begins, as a result a series of cytokines are released such as CRP, haptoglobin, fibrinogen among others, which give way to platelet adhesion and aggregation that stimulates the formation of cholesterol favoring atherosclerosis, thrombosis and other cardiovascular diseases. Another mechanism mentioned is the immunological response, since the rECVción to periodontitis is variable in each individual and this may be due to several factors mainly the secretory capacity of monocytes.[8] The present investigation had the objective of analyzing the influence of periodontal disease as a risk factor in patients with cardiovascular diseases.

METHODS

Data were collected from PubMed, Science Direct, and Scielo using the MesH terms: Periodontitis, cardiovascular, cardiovascular disease, diseases. The key question was strategically established: How is periodontal disease a risk factor for cardiovascular diseases (cardiovascular events such as myocardial infarction, peripheral arterial disease, stroke, and heart failure)? The search strategies used were (periodontitis) and (cardiovascular diseases).

- Inclusion criteria: Articles published in the last five years in English and Spanish were accepted. Randomized clinical trials of diseases such as myocardial infarction, peripheral arterial disease, stroke, heart failure, and periodontitis, as well as human studies, were selected. Studies older than this were excluded.
- Exclusion criteria: Articles with systematic reviews, meta-analyses, old bibliographies, and pathologies not mentioned such as diabetes and metabolic syndrome were excluded.

MesH Terms: Periodontitis, cardiovascular, disease- Periodontitis, cardiovascular, diseases

Search strategy: (periodontitis) and (cardiovascular diseases)
The search and analysis of scientific articles was conducted through bibliographical compilation of sources, from which scientific studies on periodontitis and cardiovascular disease were discarded, selected, and analyzed. This process was conducted by two independent researchers. Only articles that met the aforementioned inclusion criteria were accepted. The conclusions drawn in this research will be based on the information obtained from the analyzed and selected scientific studies. The results will be presented based on the analysis and studies on periodontal disease and CVD.

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The study flowchart is presented in Figure 1. A total of 14 studies were selected, of which five were excluded based on established criteria because they did not meet the information required for the study. Three other articles were discarded after reading their abstracts because they detailed other cardiac pathologies not studied. Finally, two studies were eliminated by full text due to lack of complete information.

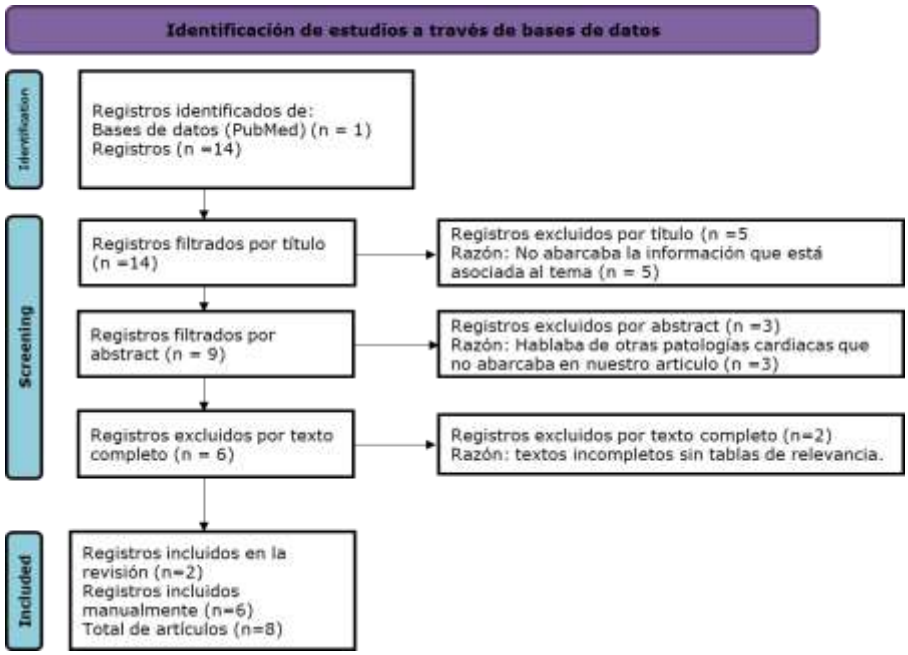

Fig. 1 Flowchart.

DEVELOPMENT

A significant relationship between periodontitis and cardiovascular disease is evident, as there are several risk factors for both pathologies, the compatibility of these diseases based on bacteremia and mild systemic inflammation arising from the proliferation of periodontal microorganisms in the bloodstream after dental procedures in patients with periodontitis.

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Table 1. Results found in the studies analyzed.

Fountain	Methodology	Results and conclusions
Seinost G et al., (2020) [9]	A total of 421 participants were selected, of which only 89 were approved under the inclusion and exclusion criteria. The parameters to be evaluated were three: cholesterol, probing depth > 5 mm and bleeding on probing > 20%. It was divided into two groups: Control group and non-surgical treatment group with and without antibiotic therapy.	Non-surgical periodontal treatment with antibiotic therapy had a better effect than conservative treatment, although both treatments significantly reduced periodontal disease. The study notes that there was no significant correlation between variables, meaning that periodontal treatment did not reduce inflammation of the aortic and carotid artery walls and vessels, thereby reducing the risk of heart attack or cardiovascular disease. From a practical perspective, periodontitis may be a potent cause of atherosclerotic arterial damage, as cardiovascular risk factors are common in both diseases. However, there is no evidence that periodontal treatment reduces the risk of cardiovascular events.
Lobo, M et al., (2019) [10]	The total number of participants was 48, admitted to the hospitalization area between 2012 and 2015, under inclusion and exclusion criteria. The values taken from the study for analysis were cholesterol, probing depth ≥4 mm and bleeding on probing of 79%. Two groups were submitted: Control group and open periodontal treatment group.	The sample subjected to periodontal therapy showed a notable improvement in depth and bleeding on probing in the inflamed pockets after 6 months of treatment. Periodontal treatment was not associated with any adverse events, and the inflammatory profile and cardiovascular events were not significantly different between the two groups. Treatment of periodontal disease improved endothelial function in patients with recent myocardial infarction, with no adverse clinical events. Larger trials are needed to evaluate the benefit of periodontal treatment on clinical outcomes.
Czesnikiewicz-Guzik, M et al.,(2019)[11]	A sample of 101 patients was taken, subject to inclusion and exclusion criteria. The criteria to be evaluated were cholesterol and probing depth of 0.55 mm. The population was divided into two groups: Control group and group undergoing intensive non-surgical periodontal treatment.	Intensive periodontal treatment resulted in significant improvements in periodontal health in all participants. The degree of change in individual blood pressure after 2 months was positively correlated with the change in periodontal probing depth. Patients undergoing intensive periodontal treatment showed improved blood pressure profiles 2 months after treatment, with a clear improvement in endothelial function. The study confirms the causal relationship between periodontitis and hypertension. However, preliminary results require confirmation in a future study with larger hypertensive participants.

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Sen S et al.,(2020)[12]	A sample of 280 participants was taken, chosen according to inclusion and exclusion criteria. The main values studied were cholesterol level, probing depth > 5 mm and bleeding on probing. The population was divided into two groups: Group 1 underwent standard treatment and group 2 intensive treatments	The study demonstrates no significant difference between the cholesterol levels of the two groups over a 12-month period; however, LDL levels did increase slightly in the intensive care patients. Regarding cardiovascular outcomes, no change was noted in blood pressure in either group, but significant improvement was observed in periodontal disease. This analysis of secondary outcomes provides important information about the role of dental treatment in improving risk factor profiles, which may be important in preventing secondary vascular events after a high-risk ischemic stroke/TIA.

These bacteria are known to migrate to atheromatous tissues and invade the endothelium of the vessel wall, causing an increase in systemic inflammatory mediators and thus a proliferation of immunocompetent cells, foam cells and smooth muscle cells, as well as a reduction in the thickness of the vascular wall, the fibrous cap or atheroma, leading to its rupture, which leads to thrombus formation and ultimately to the development of cardiovascular diseases.[13]

In the study published by Seinost G. et al., [9] details that periodontal treatment in ECA patients was successful, that is, there was a great improvement in the decrease of pockets and periodontal bleeding, no significant evolution was evident in cardiovascular diseases, on the contrary, the rate of adverse events in ECV patients increased, inflammation of the vessels of the aorta, carotid and arteries, so it is recommended to carry out more studies on the treatment in ECV patients, despite the insufficient results in periodontal treatments with respect to cardiovascular disease, from a practical perspective, periodontal disease can manifest itself as a strong indicator of atherosclerotic arterial damage, since cardiovascular risk factors are similar in both diseases, establishing their relationship between both pathologies.

This is consistent with the prospective cross-sectional study presented by Donders H et al.,[14] who stated that no significant association was found between tooth loss, plaque, bleeding severity and cardiovascular disease risk predictors. However, this relationship was not significant as no significant association was found between the presence and extent of coronary calcification, periodontitis or dental health. We also did not find a significant connection between endothelial dysfunction and periodontitis or poor dental health.

The contribution made in the research conducted by Lobo M, et al.,[10] on the contrary, emphasizes that periodontal treatment applied in patients with a myocardial infarction significantly improved endothelial function, despite this it also mentions very important findings such as the suggestion to evaluate patients with established CVD since there is an increase in inflammation and worsening of endothelial function during the first hours of periodontal treatment. On the other hand, Seinost,[9] agrees that the treatments do reduce periodontal involvement and maintain the closeness between periodontal involvement and cardiovascular diseases.

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The study by Czesnikiewicz-Guzik M et al., [11] supports that periodontal therapy improves endothelial function. In addition, it confirms the relationship of both pathologies as mentioned by Priyamvara A, et al., [15] inflammation is the main point for the appearance of sclerosis, it has been shown that the treatment of said inflammation decreases the cardiovascular risk. Cardiovascular deterioration is associated with the increase of monocytes that cause an elevation of systemic inflammation. A study by Morón-Araújo M, [16] mentions that chronic inflammation caused by periodontal microorganisms and vascular inflammatory responses explains the relationship between periodontitis and CVD. It is known that patients with periodontitis have an elevation of HDL and LDL cholesterol values that promotes the development of atheroma.

Sen S et al.,[12] It confirms that 40 % of periodontal diseases affect people with strokes, so their relationship has been reported. Furthermore, it mentions that the application of the first stage of short-term periodontal treatment in patients failed to demonstrate a relative result between periodontal disease and the prevention of cardiovascular events and myocardial infarction. However, after six months of intensive treatment, an improvement in oral health associated with endothelial function was observed. In addition, HDL cholesterol results were evaluated, which have a direct relationship in patients with periodontitis, since cholesterol increases the capacity to generate hypertension in patients with gingival inflammation.

On the other hand, Febbraio M,[17] supports the link between periodontal disease and CVD. Indicating an improvement in cardiovascular risk factors after periodontal treatment, although the follow-up periods were mostly short and in some cases with the presence of adverse effects after periodontal treatment, so it is suggested to perform more studies on the relationship of periodontal treatment in patients with already established cardiovascular diseases.

CONCLUSIONS

Periodontal disease is linked to cardiovascular disease and can increase cholesterol levels. Although treatments reduced periodontal disease and showed some improvement in cardiovascular factors, the studies did not yield significant results. Research with longer follow-up periods in patients with established CVD is recommended.observe more significant changes in your health.

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