LITERATURE REVIEW

THE ROLE OF DENTISTS IN THE DIAGNOSIS OF ARTERIAL HYPERTENSION ASSOCIATED WITH PERIODONTAL DISEASE: INTEGRATIVE LITERATURE REVIEW

O PAPEL DO CIRURGIÃO-DENTISTA NO DIAGNÓSTICO DA HIPERTENSÃO ARTERIAL ASSOCIADA À DOENÇA PERIODONTAL: REVISÃO INTEGRATIVA DA LITERATURA

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ABSTRACT

This study aimed to conduct an integrative literature review on the relationship between periodontal disease and arterial hypertension. A search was performed on PubMed using the Boolean operator AND with the following MeSH descriptors: "periodontal disease" and "arterial hypertension". The following filters were applied: randomized controlled trials (RCTs) published in the last ten years. The inclusion criterion involved RCTs that simultaneously evaluated periodontal disease and arterial hypertension. The exclusion criteria referred to studies that evaluated other diseases and articles written in languages other than English. After reading, selecting, and organizing the studies, the final sample for result extraction comprised three articles out of the nine retrieved titles. These RCTs included a total of 308 patients. Although few RCTs have investigated the relationship between periodontal disease and cardiovascular disease, all analyzed studies indicated a beneficial effect of periodontal treatment on the reduction or improvement of arterial hypertension control. Further research is needed to clarify this relationship.

Keywords: Periodontal Disease; Arterial Hypertension; Cardiovascular Diseases; Randomized Controlled Trial.

RESUMO

O objetivo deste artigo é realizar uma revisão integrativa da literatura acerca da relação entre doença periodontal e hipertensão arterial. Foi realizada uma pesquisa no banco de dados eletrônicos PubMed por meio do operador booleano AND, usando os seguintes descritores MeSH: "*periodontal disease*" e "*arterial hypertension*". Também foram usados os seguintes filtros: títulos publicados até dez anos e estudo clínico controlado randomizado (ECCR). O critério de inclusão foi ECCR, que avaliou simultaneamente doença periodontal e hipertensão arterial. Os critérios de exclusão aplicados para a seleção do artigo foram estudos que avaliaram outras doenças e artigos escritos em outras línguas diferentes do inglês. Após a leitura, seleção e organização dos estudos, a amostra final para extração dos resultados foi composta por três artigos dos nove títulos encontrados. Todos eram ECCR, com um total de 308 pacientes avaliados. Embora existam poucos ECCR que investiguem a relação entre a doença periodontal e as doenças cardiovasculares, todos os estudos analisados indicaram um efeito benéfico do tratamento periodontal na redução ou melhoria do controle da hipertensão arterial. Pesquisas adicionais são necessárias para obter maior clareza sobre essa relação.

Palavras-chave: Doença periodontal; Hipertensão arterial; Doenças cardiovasculares; Ensaio clínico controlado randomizado.

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INTRODUCTION

Among healthcare professionals, the dentist examines and diagnoses various diseases (1). Although the diseases that most affect the oral cavity are dental caries and periodontal disease (PD), the dentist is also involved in the diagnosis of systemic diseases, such as arterial hypertension. The involvement of the dentist in this area is justified by the fact that this professional spends more time with patients than other healthcare professionals. In addition, the early diagnosis of systemic diseases also brings benefits such as an improvement in the patient's overall health status and a more effective response to PD treatment (2,3).

Arterial hypertension is a chronic non-communicable disease, similar to PD, and has a direct impact on individual health (4,5). It is widely recognized as a major risk factor for cardiovascular events (6). Moreover, growing evidence points to a bidirectional relationship between this systemic condition and PD (7–11).

PD is a multifactorial, chronic inflammatory disease associated with dysbiotic biofilm and characterized by the progressive destruction of tooth-supporting structures (12,13). It is highly prevalent and linked to elevated circulating levels of inflammatory biomarkers (14). An increasing body of evidence indicates that the periodontal microbiota contributes to multiple systemic diseases associated with higher mortality rates, including arterial hypertension, cardiovascular disease, and diabetes mellitus (15–18). In addition, PD and many systemic conditions share environmental, lifestyle, and genetic risk factors, as well as immunopathological mechanisms (19). In this context, Kapellas et al. demonstrated that PD treatment exerted a positive effect on the progression of carotid artery intima–media thickness (IMT), a noninvasive method for diagnosing atherosclerosis (20).

Moreover, beyond early diagnosis, the dentist should refer these patients to a medical specialist. Thus, the exchange of information regarding these diseases benefits patients' health, aiming for the control of blood pressure. Therefore, the objective of this research is to conduct an integrative literature review on the relationship between PD and arterial hypertension (21, 22).

MATERIAL AND METHODS

A search was conducted in the PubMed electronic database. The searches were performed using the keywords "periodontal disease" and "arterial hypertension", combined with the Boolean operator AND. The following inclusion and exclusion criteria were also used:

- Inclusion criterion: randomized controlled trials (RCTs) that simultaneously evaluated PD and arterial hypertension, published within the last ten years.
- Exclusion criteria: studies that evaluated other diseases and articles published in languages other than English.

The selected RCTs were evaluated using the Cochrane risk-of-bias tool for RCTs (23). The primary outcome evaluated was the relationship between PD and arterial hypertension.

RESULTS

The flowchart (Figure 1) shows the result of the study selection process.

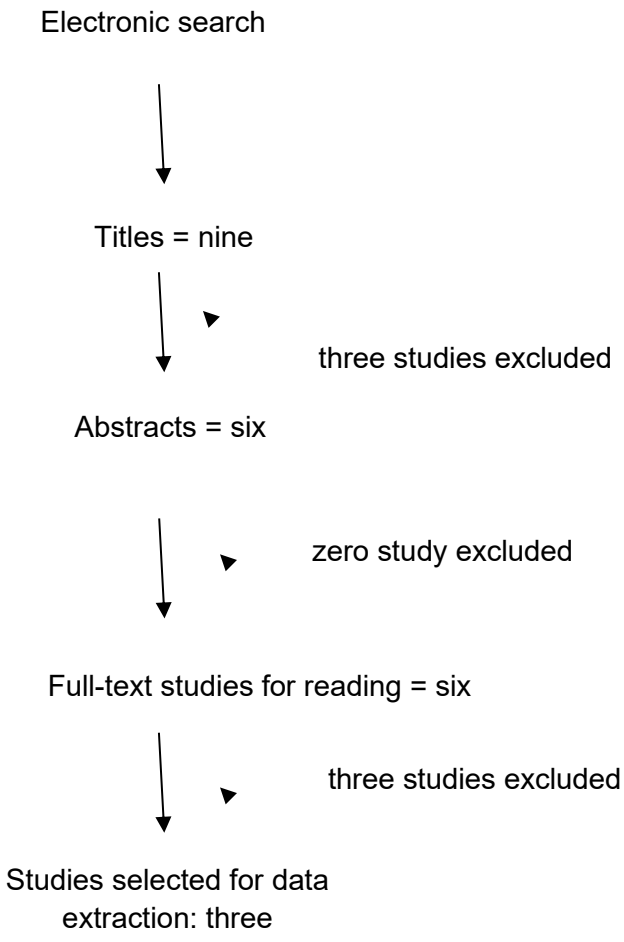

Figure 1 - Flowchart of the study selection process.

The same inclusion and exclusion criteria were applied, and from the six abstracts, all were selected for full-text reading. Of the six selected studies, three were included for data extraction.

Reasons for exclusions

One study investigated chronic obstructive pulmonary disease (24); another assessed the effect

of theaflavin on oral bacteria in Japanese individuals (25); and the last investigated the use of antiseptic mouthwash during pregnancy (26).

Excluded during the full-text reading phase

One study was a retrospective cohort study (27); another measured blood pressure but did not correlate it with PD (20). The last study assessed arterial hypertension only at baseline (present or absent), without correlating it with PD (28).

Table 1 presents a descriptive analysis of the studies selected for data extraction, focusing on the relationship between PD and arterial hypertension. Table 2 shows the risk of bias assessment of the selected studies.

Table 1 - Description of the selected studies comparing the relationship between periodontal disease and arterial hypertension

Author/year	Design of the study	Results	Comments
Zhou *et al*. (2017) (29)	RCT	Periodontal parameters improved significantly (P<0.05) six months after intensive periodontal treatment. The primary outcomes (systolic and diastolic blood pressure and endothelial microparticles) were drastically reduced in the intensive treatment group compared with the control group. The reduction in blood pressure and endothelial microparticle levels was associated with improvements in probing depth (r=0.358, r=0.363, and r=0.676, respectively, according to Pearson's product-moment correlation coefficient; P=0.009, P=0.008, and P<0.001, respectively).	The authors concluded that intensive periodontal intervention, without any antihypertensive drug therapy, may be an effective means of reducing blood pressure levels and endothelial microparticles in patients with prehypertension and PD.
Czesnikiewicz-Guzik *et al*. (2019) (30)	RCT	Mendelian randomization analysis showed a significant relationship between single nucleotide polymorphisms associated with PD and blood pressure phenotypes. There was a substantial reduction in mean systolic blood pressure in the intensive periodontal treatment group compared with the control group (mean difference −11.1 mmHg; 95% CI: 6.5–15.8; P<0.001).	The authors observed a causal relationship between PD and blood pressure. Furthermore, they note that although the mechanisms underlying this relationship require further investigation, there is genetic and experimental evidence linking PD to hypertension. They suggest that these preliminary findings need to be confirmed in a large cohort of hypertensive patients, as they may represent a new non-pharmacological approach to hypertension management.
Pejcic *et al*. (2023) (31)	RCT	Periodontal status was worse in patients in the cardiovascular disease group compared with the control group. A significant association between levels of tooth loss and cardiovascular disease was also observed. In the cardiovascular disease group, tooth loss exceeded 50%. In the control group, tooth loss was about 20% of the total number of teeth.	Considering that hypertension is a cardiovascular risk factor, this article was selected. The authors found a significant association between levels of tooth loss due to PD and the prevalence of cardiovascular disease.

Table 2 - Cochrane Risk of Bias Scale used for randomized clinical trials (RCTs)

Study	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective outcome reporting	Other sources of bias
Zhou et al. (2017) (29)	Low	Low	Low	Low	Low	Low	Low
Czesnikiewicz-Guzik et al. (2019) (30)	Low	Low	Low	Low	Low	Low	Low
Pejcic et al. (2023) (31)	Unclear	Unclear	Unclear	Unclear	Low	Low	Unclear

Low: low risk of bias; Unclear: insufficient information.

DISCUSSION

Since the 1980s, the interrelationship between PD and other systemic diseases has gained relevance (32), leading the field to adopt a new focus known as Periodontal Medicine (33). Arterial hypertension and PD are two highly prevalent

conditions worldwide, with a significant impact on cardiovascular disease complications (11).

The potential mechanism by which PD influences hypertension involves the translocation of periodontal pathogens into the bloodstream, causing direct damage to endothelial cells, potentially leading to atherosclerosis and hypertension. Furthermore, bacterial endotoxins enter the circulation and trigger the release of pro-inflammatory cytokines such as interleukin-1 (IL-1), IL-6, IL-17, C-reactive protein (CRP), tumor necrosis factor alpha (TNF-α), prostaglandin E-2 (PGE-2), and interferon-gamma (IFN-γ). These mediators activate the immune-inflammatory response involving the liver, kidneys, cardiovascular system, and sympathetic nervous system, thereby inducing hypertension. Moreover, periodontal treatment can significantly reduce the number of bacteria entering the bloodstream, either directly decreasing atherosclerosis formation or indirectly reducing the immune-inflammatory reaction, thus reducing or improving blood pressure levels and improving its regulation across multiple organ systems (34).

In the search strategy, a filter was applied to select RCTs. However, upon full-text reading, it was verified that the article by Chou et al. was a cohort study and was therefore not included in the data extraction phase (27). Although Cullinan et al. conducted an RCT involving patients with cardiovascular disease and PD, the authors evaluated only the effect of a triclosan-containing toothpaste on cardiovascular risk biomarkers obtained through annual blood tests over five years. For this reason, the study was also excluded, as no periodontal treatment was performed (28).

Kapellas et al. reported a reduction in carotid intima–media thickness (IMT) with periodontal treatment, but no direct association with hypertension was observed (20). The study concluded that periodontal therapy was effective in reducing IMT, suggesting a significant association between PD and atherosclerosis. After the selection of studies for data extraction, the Cochrane Risk of Bias tool was applied (Table 2). Of the three studies selected in this integrative literature review, two showed a low risk of bias (29, 30).

Pejcic et al. assessed periodontal status and the number of teeth lost due to periodontal disease in patients with cardiovascular disease, investigating the relationship between the severity of PD and the occurrence of cardiovascular disease. They observed a positive association between the number of missing teeth and cardiovascular disease, although this study presented an unclear risk of bias in several domains. In the domains of random sequence generation and allocation concealment, the authors did not provide information on how the randomization sequence was generated, and no data were reported regarding blinding of participants or personnel (31).

Zhou et al. evaluated the association between intensive PD treatment and the reduction of blood pressure and endothelial microparticles (EMPs). Such microparticles play an important role in the initiation and progression of arterial hypertension. In this study, patients received intervention for four consecutive weeks and were followed up for six months. Blood pressure and EMP levels were assessed at baseline, and after one, three, and six months after the intervention. The study concluded that intensive PD intervention, without any antihypertensive medication, is an effective means to reduce blood pressure levels in patients with prehypertension and PD (29).

Another study investigated the causal association between PD and arterial hypertension through a RCT of non-surgical periodontal therapy in hypertensive patients, with 24-hour ambulatory blood pressure monitoring as the primary outcome. The findings demonstrated a significant reduction in systolic blood pressure in the periodontal treatment group compared with the control group. In addition, the study provided genetic evidence that PD is linked to arterial hypertension through a pleiotropic gene (30).

CONCLUSION

Despite the limited number of RCTs evaluating the relationship between PD and cardiovascular disease, the findings are consistent. All selected studies indicated a positive effect of periodontal treatment on the reduction and improvement of arterial hypertension control.

The authors declare no conflict of interest.

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