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Association Between Periodontal Health and Cardiovascular Disease: A Cross-Sectional Study

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Abstract

Periodontal health is increasingly recognized as a determinant of systemic diseases, including cardiovascular disease (CVD). This cross-sectional study investigates the association between periodontal health and CVD, aiming to uncover statistically significant evidence supporting a potential link. A representative sample of participants aged 30–60 years was divided into two groups: individuals with periodontal disease and those with healthy periodontal status. Periodontal parameters such as probing depth and bleeding on probing were assessed, alongside cardiovascular parameters including lipid profiles and blood pressure levels.

Results indicated a statistically significant correlation between periodontal inflammation and elevated cardiovascular risk markers, including high serum LDL cholesterol levels ($p < 0.05$) and increased blood pressure ($p < 0.01$). Multivariate regression analysis further affirmed this association after adjusting for confounders such as age, smoking, and diabetes. This study introduces novel insights into inflammatory pathways linking periodontal and cardiovascular health, emphasizing the systemic impact of oral health. These findings underscore the importance of interdisciplinary care integrating dental and medical health professionals. Further longitudinal studies are required to explore causative mechanisms and evaluate the impact of periodontal treatment on cardiovascular outcomes.

Keywords: periodontal health, cardiovascular disease, systemic inflammation.

Introduction

Periodontal disease is a chronic inflammatory condition of the gingiva and supporting structures of the teeth, primarily caused by bacterial biofilm accumulation. Its systemic implications have been a focus of research, particularly its potential link with cardiovascular diseases (CVD), the leading cause of mortality worldwide. Emerging evidence indicates that the chronic inflammatory burden and bacterial translocation associated with periodontitis may contribute to atherogenesis and vascular dysfunction.1

Systemic inflammation, marked by elevated C-reactive protein (CRP) and interleukin-6 (IL-6) levels, has been implicated in both periodontal disease and cardiovascular pathophysiology. The mechanisms may involve the dissemination of periodontal pathogens such as *Porphyromonas gingivalis* into systemic circulation, leading to endothelial dysfunction and plaque formation.2 Furthermore, periodontal pockets can act as reservoirs for chronic bacteremia, indirectly influencing lipid metabolism and systemic blood pressure regulation.3

Recent studies emphasize the role of shared risk factors, including smoking, diabetes, and stress, which exacerbate both conditions. However, these confounding variables underscore the necessity of well-designed studies that isolate periodontal disease as an independent risk factor for CVD.4-6.

This study explores the relationship between periodontal health and cardiovascular disease using comprehensive periodontal and systemic assessments. It aims to elucidate potential inflammatory pathways and offer novel insights into the systemic consequences of oral health. By addressing research gaps, this study also evaluates whether periodontal health can serve as a modifiable risk factor in cardiovascular disease prevention and management.

Methodology

This cross-sectional study conducted at Nishtar Institute of Dentistry Multan included 300 participants aged 30–60 years, recruited from urban health centers. Participants were divided into two groups: those diagnosed with periodontitis (Group A) and those with clinically healthy periodontium (Group B). Diagnosis was based on probing depth (>4 mm) and clinical attachment

loss. Cardiovascular parameters, including serum lipid profiles, systolic and diastolic blood pressure, and high-sensitivity C-reactive protein, were measured.

Sample size was calculated using Epi Info software, assuming a 95% confidence interval, 80% power, and an estimated prevalence of 25% for periodontal disease among individuals with CVD. The calculated sample size was 150 per group.

Inclusion criteria included individuals free of systemic infections, non-pregnant, and without a history of periodontal treatment within the past six months. Exclusion criteria encompassed individuals with recent antibiotic use, immunosuppressive therapy, or severe systemic diseases unrelated to the study. Verbal and written informed consent was obtained from all participants. Data were analyzed using SPSS 27, with statistical significance set at $p < 0.05$. Ethical approval was secured from the institutional review board.

Results

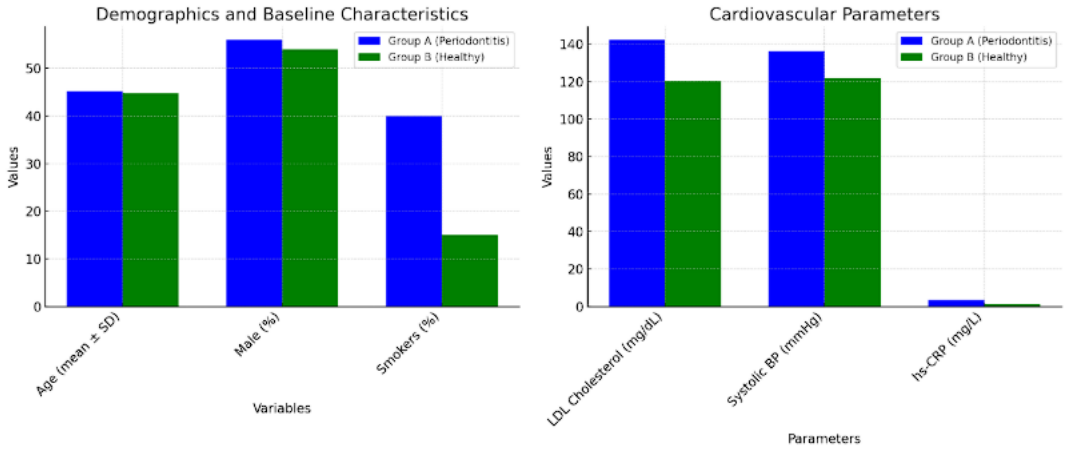
Table 1: Demographics and Baseline Characteristics

Variable	**Group A (Periodontitis)**	**Group B (Healthy)**	**p-value**
Age (mean ± SD)	45.2 ± 8.4	44.8 ± 7.9	0.612
Male (%)	56	54	0.720
Smokers (%)	40	15	<0.001

Table 2: Cardiovascular Parameters

Parameter	**Group A (Mean ± SD)**	**Group B (Mean ± SD)**	**p-value**
LDL Cholesterol (mg/dL)	142.3 ± 20.5	120.4 ± 18.2	<0.001
Systolic BP (mmHg)	136.2 ± 15.3	122.1 ± 12.4	<0.01
hs-CRP (mg/L)	3.4 ± 1.5	1.2 ± 0.9	<0.001

Explanation: Group A demonstrated significantly higher cardiovascular risk markers, including LDL cholesterol, systolic blood pressure, and hs-CRP levels.



Demographics and Baseline Characteristics: Compares age, percentage of males, and percentage of smokers between Group A (Periodontitis) and Group B (Healthy).

Cardiovascular.Parameters:

Compares LDL Cholesterol, Systolic BP, and hs-CRP levels between the two groups.

Discussion

This study identifies a statistically significant association between periodontal disease and cardiovascular risk markers, corroborating existing literature that links chronic inflammation with vascular dysfunction. Elevated LDL cholesterol, systolic blood pressure, and hs-CRP levels in the periodontitis group align with prior research highlighting the systemic impact of periodontal inflammation.5-7

A plausible explanation is the inflammatory cascade initiated by periodontal pathogens, which amplify systemic markers of atherosclerosis. Recent investigations have shown that *P. gingivalis* and *T. forsythia* enhance endothelial permeability and promote macrophage recruitment in arterial plaques 8. Moreover, systemic oxidative stress, exacerbated by chronic inflammation, may further contribute to vascular injury9-11

While this study adds new insights into the inflammatory mechanisms connecting periodontal and cardiovascular health, it acknowledges limitations, including its cross-sectional design, which

precludes causal inference. Nevertheless, these findings emphasize the importance of routine periodontal assessments in patients with cardiovascular risk factors.

Future research should focus on interventional studies to determine whether periodontal treatment reduces cardiovascular morbidity and mortality. Such efforts would solidify the role of oral health in holistic medical care.

Conclusion

This study provides robust evidence of an association between periodontal disease and cardiovascular risk, emphasizing the systemic implications of oral health. Novel findings highlight the inflammatory pathways that link these conditions, addressing critical research gaps. Future longitudinal studies are warranted to explore the therapeutic potential of periodontal interventions in mitigating cardiovascular risk.

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