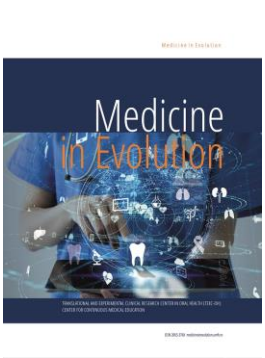
Periodontal Diseases and Cardiovascular Health: An Analysis of Clinical and Behavioral Risk Factors



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Abstract

Cardiovascular diseases (CVDs) and periodontal diseases are prevalent chronic inflammatory conditions that may share common pathogenic mechanisms and risk factors. This study aimed to investigate the relationship between periodontal diseases and cardiovascular disorders and to evaluate the associations between oral health, cardiovascular diseases, metabolic abnormalities, and lifestyle-related risk factors. A retrospective observational study was conducted on 100 adults with previously diagnosed cardiovascular diseases from ten private dental and medical clinics in Timişoara, Romania. Demographic, clinical, behavioral, and oral health data were extracted from anonymized medical records and analyzed using descriptive statistics and Pearson (Phi) correlation coefficients. Gingivitis and periodontitis were identified in 52% and 56% of participants, respectively, while hypertension (41%) and hypercholesterolemia (39%) were the most prevalent cardiovascular conditions. Correlation analyses revealed predominantly weak associations between periodontal and cardiovascular diseases; however, periodontitis showed positive correlations with myocardial infarction and atrial fibrillation, whereas obesity was more closely associated with cardiovascular and metabolic disorders. These findings support the concept of an oral–systemic health continuum and highlight the importance of interdisciplinary collaboration between dental and medical professionals. Larger prospective studies including standardized periodontal examinations and systemic inflammatory biomarkers are needed to clarify the causal relationship between periodontal and cardiovascular diseases.

Keywords: periodontal disease; periodontitis; gingivitis; cardiovascular diseases; oral-systemic health; chronic inflammation; myocardial infarction; hypertension; obesity; cardiovascular risk.

INTRODUCTION

Cardiovascular diseases (CVDs) continue to represent the leading cause of mortality worldwide and remain among the most important contributors to disability, reduced quality of life, and healthcare expenditures. Despite significant advances in diagnostic technologies, pharmacological therapies, and preventive strategies, the global burden of cardiovascular diseases continues to increase, largely driven by population aging, urbanization, sedentary lifestyles, unhealthy dietary habits, obesity, diabetes mellitus, and tobacco consumption [1,2]. The multifactorial nature of cardiovascular disease has encouraged researchers to investigate not only traditional risk factors but also the role of chronic inflammatory conditions and systemic disorders that may contribute to cardiovascular pathogenesis and progression.

Among these conditions, oral diseases, particularly periodontal diseases, have emerged as important subjects of interest due to their high prevalence and potential systemic consequences. Periodontal diseases comprise a group of chronic inflammatory disorders affecting the supporting tissues of the teeth, including the gingiva, periodontal ligament, cementum, and alveolar bone [3,4,5]. Gingivitis represents the earliest and most common form of periodontal disease and is characterized by inflammation confined to the gingival tissues without loss of periodontal attachment [6,7,8]. Although reversible when appropriate oral hygiene measures are implemented, persistent gingival inflammation may progress to periodontitis, a more severe condition associated with irreversible tissue destruction, alveolar bone resorption, tooth mobility, and eventual tooth loss [4,9,10].

Periodontal diseases are highly prevalent worldwide and constitute a major public health concern. Epidemiological studies indicate that gingivitis affects a substantial proportion of both children and adults, while severe periodontitis is among the most common chronic diseases globally [3,11]. Beyond their local effects, periodontal diseases may significantly impair mastication, aesthetics, speech, nutrition, and overall quality of life. Furthermore, the economic burden associated with periodontal treatment and tooth loss places considerable pressure on healthcare systems, emphasizing the importance of preventive interventions and early diagnosis [11].

The pathogenesis of periodontal disease involves a complex interaction between microbial biofilm accumulation and the host immune-inflammatory response. While dental plaque serves as the primary etiological factor, disease progression is strongly influenced by environmental, behavioral, genetic, hormonal, and systemic determinants [2,5,6,8,13,14]. Smoking, obesity, diabetes mellitus, stress, poor dietary habits, and socioeconomic status have all been identified as important contributors to periodontal disease susceptibility and severity [11,12,15]. Consequently, periodontal diseases should be viewed not merely as localized infections but as multifactorial chronic inflammatory disorders influenced by a wide range of host and environmental factors.

Growing scientific evidence has highlighted the concept of oral-systemic health, recognizing the oral cavity as an integral component of overall health rather than an isolated anatomical entity. The oral microbiome represents one of the most diverse microbial ecosystems in the human body and plays a critical role in maintaining both local and systemic homeostasis. Under dysbiotic conditions, however, pathogenic microorganisms may trigger persistent inflammatory responses capable of extending beyond the oral environment [16]. The ulcerated epithelium lining periodontal pockets provides a direct pathway for microorganisms, endotoxins, and inflammatory mediators to enter the systemic circulation, facilitating bacteremia and promoting systemic immune activation [1,17,18].

Several biological mechanisms have been proposed to explain the relationship between periodontal diseases and cardiovascular pathology. Chronic periodontal inflammation is associated with increased circulating levels of inflammatory mediators, including C-reactive protein, interleukin-1β, interleukin-6, and tumor necrosis factor-alpha, all of which have been implicated in endothelial dysfunction, vascular inflammation, and atherosclerotic plaque formation [17,18,19]. Moreover, periodontal pathogens and their virulence factors have been identified within atherosclerotic lesions, providing further support for a potential mechanistic link between oral infections and cardiovascular disease development [1,17].

Inflammation is increasingly recognized as a fundamental component of cardiovascular disease pathophysiology. In addition to traditional cardiovascular risk factors, chronic low-grade systemic inflammation contributes significantly to endothelial injury, plaque instability, thrombogenesis, and adverse cardiovascular outcomes. Given that periodontitis represents one of the most common chronic inflammatory conditions affecting adults, it has been proposed as a potential non-traditional cardiovascular risk factor capable of influencing both the onset and progression of cardiovascular diseases [1,18,20].

Numerous observational studies, systematic reviews, and meta-analyses have reported associations between periodontal diseases and various cardiovascular conditions, including hypertension, coronary artery disease, myocardial infarction, stroke, heart failure, and atrial fibrillation [19,20,21). Although the magnitude of these associations varies among studies, the overall body of evidence suggests that individuals affected by periodontitis exhibit a greater cardiovascular risk than periodontally healthy individuals [1,2,19]. Furthermore, the severity of periodontal destruction appears to correlate with the extent of cardiovascular impairment, reinforcing the hypothesis that chronic oral inflammation may contribute to systemic disease burden [17,18].

The relationship between oral and cardiovascular health is further strengthened by the existence of several shared risk factors. Smoking, obesity, diabetes mellitus, dyslipidemia, poor nutritional habits, and socioeconomic disadvantage have been consistently associated with both periodontal diseases and cardiovascular disorders [11,15,18]. Smoking, for example, alters the composition of the oral microbiota, impairs immune responses, and accelerates periodontal tissue destruction while simultaneously promoting endothelial dysfunction and atherogenesis [1,15]. Similarly, obesity contributes to systemic inflammation through the release of adipokines and pro-inflammatory cytokines, increasing susceptibility to both periodontal breakdown and cardiovascular disease progression [11,18].

Recent consensus reports published by the European Federation of Periodontology and cardiovascular health organizations emphasize the importance of recognizing periodontal disease as a component of comprehensive patient care [18,22]. These reports advocate interdisciplinary collaboration between dental practitioners, cardiologists, and primary care physicians in order to improve prevention, risk assessment, and patient outcomes. Such recommendations reflect the growing awareness that oral health should be considered an integral part of systemic health and that early management of periodontal inflammation may contribute to reducing overall disease burden.

Despite the increasing volume of scientific evidence supporting the association between periodontal diseases and cardiovascular disorders, important questions remain regarding the strength, direction, and clinical significance of these relationships. Differences in study design, population characteristics, diagnostic criteria, and confounding factors continue to generate heterogeneous findings across the literature. Consequently, further investigations exploring the interactions between oral conditions, cardiovascular diseases, metabolic disorders, and behavioral risk factors remain essential for improving our understanding of the complex oral-systemic health continuum.

Despite the growing body of evidence supporting the association between periodontal diseases and cardiovascular disorders, several important knowledge gaps remain. Most available studies have primarily focused on periodontitis as an isolated condition or have investigated specific cardiovascular outcomes without simultaneously evaluating the coexistence of multiple cardiovascular diseases, metabolic disorders, behavioral risk factors, and oral health conditions within the same patient population. Furthermore, considerable heterogeneity in study design, diagnostic criteria, and population characteristics has resulted in inconsistent findings regarding the strength and clinical relevance of these associations. In addition, evidence from Eastern European populations remains relatively limited, particularly in real-world clinical settings involving multidisciplinary patient management. Therefore, further observational studies are needed to better characterize the relationship between periodontal diseases and cardiovascular disorders while considering the influence of common metabolic and lifestyle-related risk factors.

Aim and objectives

The present study aimed to investigate the relationship between oral health conditions and cardiovascular diseases in a cohort of patients diagnosed with cardiovascular disorders. Given the growing body of evidence supporting the existence of an oral-systemic connection, particular attention was directed toward the potential associations between periodontal diseases, cardiovascular pathology, metabolic risk factors, and lifestyle-related behaviors.

The specific objectives were to characterize the demographic and clinical profile of the study population, to determine the prevalence of major cardiovascular conditions and periodontal diseases, and to evaluate the distribution of behavioral and metabolic risk factors, including smoking, obesity, and hypercholesterolemia. Furthermore, the study sought to explore potential correlations between gingivitis, periodontitis, cardiovascular diseases, and selected metabolic conditions in order to identify patterns of association that may contribute to a better understanding of the complex interactions between oral and systemic health.

MATERIAL AND METHODS

A retrospective observational study was conducted between January and March 2026 in ten private dental and medical clinics located in Timișoara, Romania. The study included 100 adult patients previously diagnosed with one or more cardiovascular diseases. Clinical and medical information was retrieved from existing patient records and anonymized prior to analysis to ensure confidentiality and data protection.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and complied with the General Data Protection Regulation (GDPR) requirements. All participants had provided written informed consent allowing the use of their anonymized clinical data for research purposes.

The inclusion criteria were: age ≥18 years, documented diagnosis of at least one cardiovascular condition, availability of complete medical records, and documented information regarding oral health status. Patients were excluded if they had incomplete medical records, missing information regarding cardiovascular or periodontal status, active malignant disease, severe systemic infections at the time of data collection, or conditions that could substantially affect immune function and compromise data interpretation.

The study database included demographic, medical, behavioral, and oral health-related variables. Demographic variables comprised age and sex. Cardiovascular conditions included arterial hypertension, angina pectoris, myocardial infarction, atrial fibrillation, congenital cardiac malformations, and endocarditis/myocarditis. Oral health variables included the presence of gingivitis and periodontitis, as documented in the patients' clinical

records. The diagnosis of gingivitis and periodontitis recorded in the patients' files was based on the clinical criteria routinely used in the participating dental practices, following the current periodontal classification whenever applicable. Additional variables included obesity, hypercholesterolemia, smoking status, alcohol consumption, history of allergies, and current medication use. Data were entered into a Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA) and subsequently analyzed using Python version 3.11. Data processing and management were performed using the Pandas library, while graphical representations were generated using Matplotlib and Seaborn.

Categorical variables were coded as binary variables (0 = absence, 1 = presence). Descriptive statistical analysis included the calculation of frequencies, percentages, means, and standard deviations where appropriate. The prevalence of cardiovascular diseases, periodontal conditions, and behavioral risk factors was evaluated within the study population. Potential associations between variables were assessed using Pearson correlation coefficients (Phi coefficients for dichotomous variables). Correlation matrices and graphical visualizations were generated to facilitate the interpretation of relationships among cardiovascular diseases, periodontal conditions, metabolic disorders, and lifestyle-related risk factors. Correlation coefficients were interpreted according to conventional thresholds, with values below 0.30 considered weak, values between 0.30 and 0.50 moderate, and values above 0.50 strong associations.

RESULTS

The results provide an overview of the demographic characteristics, cardiovascular status, oral health conditions, and associated risk factors identified among the participants included in the study.

Table 1. Demographic and Clinical Characteristics of the Study Population

Variable	n (%)
Age, years (mean ± SD)	49.96 ± 13.53
Age range, years	19–82
Male	57 (57.0)
Female	43 (43.0)
Alcohol consumption	44 (44.0)
Smoking	41 (41.0)
Hypertension	41 (41.0)
Hypercholesterolemia	39 (39.0)
Angina pectoris	33 (33.0)
Obesity	31 (31.0)
Myocardial infarction	30 (30.0)
Endocarditis/Myocarditis	29 (29.0)
Atrial fibrillation	27 (27.0)
Congenital cardiac malformations	32 (32.0)
Gingivitis	52 (52.0)
Periodontitis	56 (56.0)

Table 1 summarizes the demographic and clinical characteristics of the study population. A total of 100 patients were included in the analysis, with a mean age of 49.96 ± 13.53 years (range: 19–82 years). Male participants represented 57% of the cohort, while females accounted for 43%. Hypertension (41%) and hypercholesterolemia (39%) were the most prevalent cardiovascular-related conditions. Regarding oral health status, gingivitis and

periodontitis were identified in 52% and 56% of participants, respectively, indicating a high prevalence of periodontal conditions among patients with cardiovascular disorders.

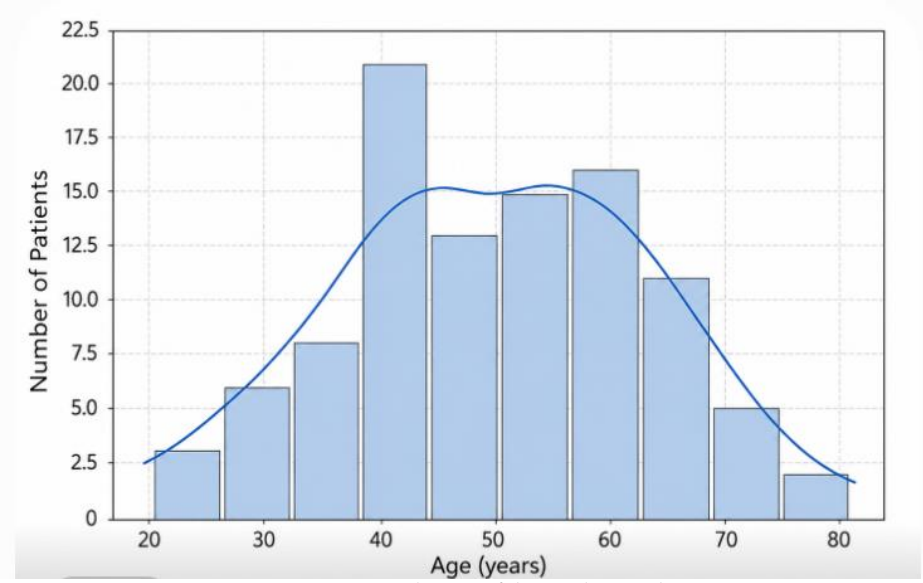

Figure 1. Age Distribution of the Study Population

The age distribution of the study population is presented in Figure 1. Patients ranged in age from 19 to 81 years, with the highest concentration observed between 40 and 60 years of age. The distribution exhibited a peak within the 40–50-year age group, indicating that the majority of participants belonged to the middle-aged adult population. Fewer cases were recorded among younger individuals (<30 years) and older adults (>70 years). Overall, the age distribution showed a predominance of patients in the fifth and sixth decades of life.

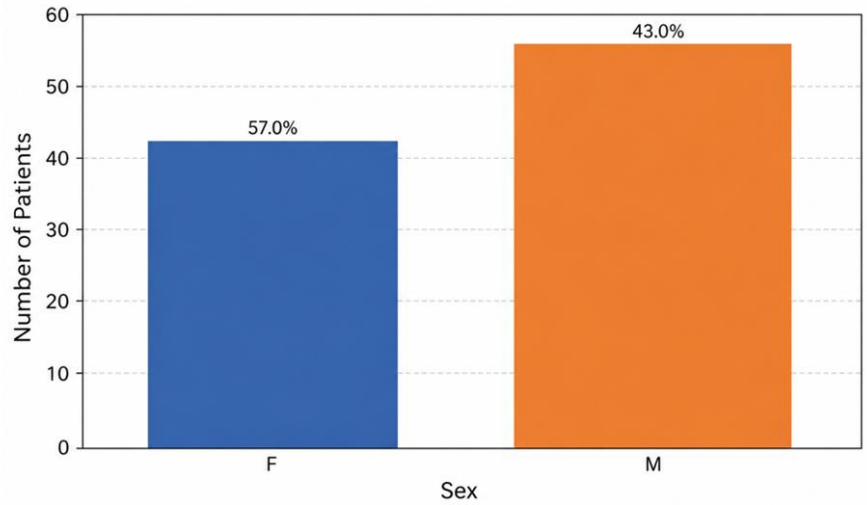

Figure 2. Sex Distribution of the Study Population

Figure 2 illustrates the sex distribution of the study population. Female participants accounted for 57% of the cohort, whereas male participants represented 43%. The findings indicate a slight predominance of females among the patients included in the analysis. This distribution may reflect the demographic characteristics of the investigated population and could also suggest a greater tendency among women to seek preventive and therapeutic healthcare services, including the evaluation and management of oral and cardiovascular conditions.

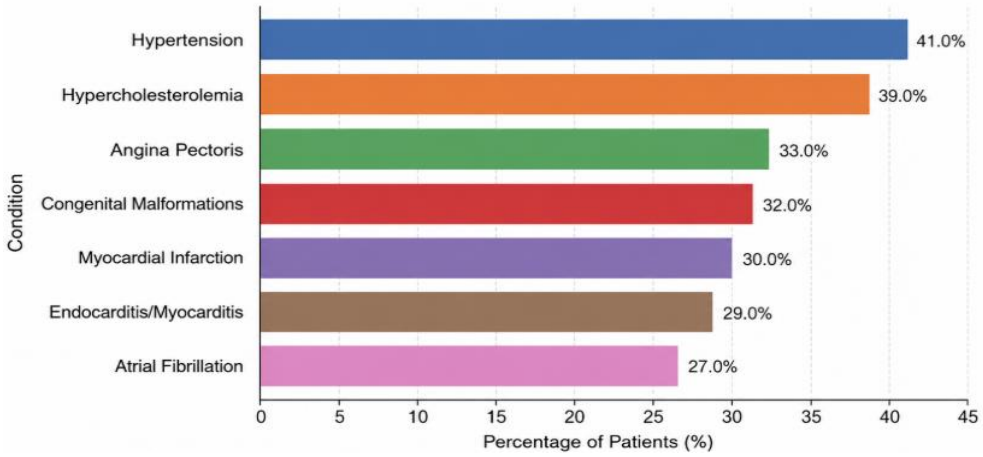

Figure 3. Prevalence of Cardiovascular Conditions in the Study Population

Figure 3 presents the frequency of cardiovascular conditions identified among the study participants. Hypertension was the most prevalent condition, affecting 41% of patients, followed by hypercholesterolemia (39%). Angina pectoris and congenital cardiac malformations were reported in 33% and 32% of cases, respectively.

Myocardial infarction was recorded in 30% of the study population, while endocarditis/myocarditis and atrial fibrillation were present in 29% and 27% of patients, respectively. Overall, the findings demonstrate a high burden of cardiovascular comorbidities within the investigated cohort, with hypertension and lipid metabolism disorders representing the most frequently reported conditions. The distribution of cardiovascular diseases indicates the coexistence of multiple cardiovascular risk factors and chronic systemic conditions among the participants. These findings provide an important clinical framework for evaluating potential associations between cardiovascular status, oral health conditions, and behavioral risk factors in the study population.

The analysis of myocardial infarction prevalence according to smoking status revealed notable differences between the investigated groups. A history of myocardial infarction was reported by approximately 35% of non-smokers, compared with 22% of smokers. Accordingly, the proportion of participants without a previous myocardial infarction was higher among smokers than among non-smokers.

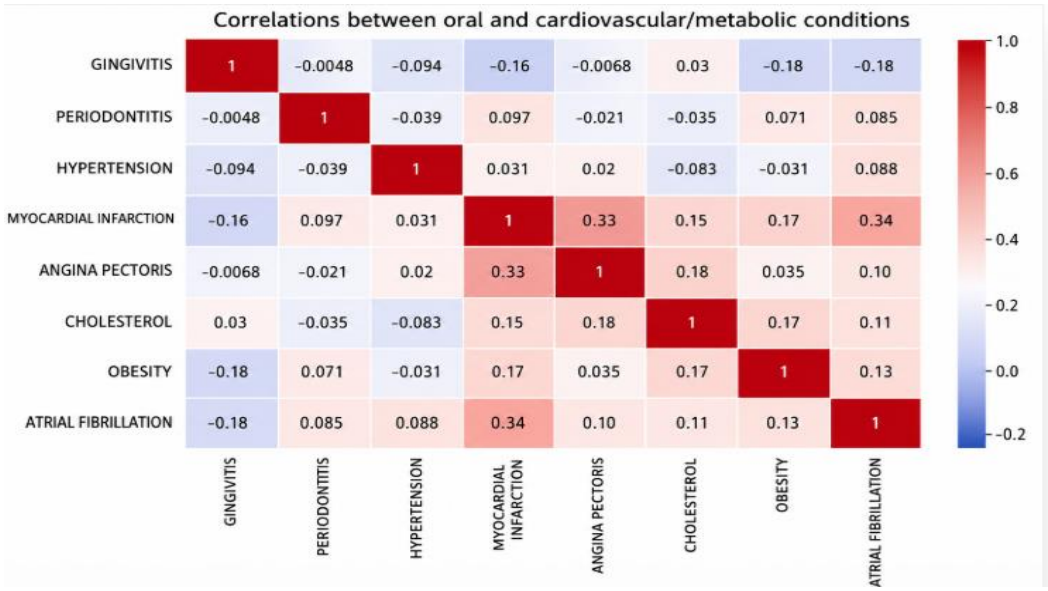

Figure 4. Correlation Matrix of Oral Conditions and Cardiovascular/Metabolic Disorders in the Study Population

Correlation analysis revealed generally weak associations between oral conditions and cardiovascular/metabolic disorders within the study population (Figure 4). Most correlation coefficients were close to zero, indicating limited linear relationships among the investigated variables.

Periodontitis showed weak positive correlations with myocardial infarction (r = 0.097), obesity (r = 0.071), and atrial fibrillation (r = 0.085), while weak negative correlations were observed with hypertension (r = −0.039), angina pectoris (r = −0.021), and hypercholesterolemia (r = −0.035). Gingivitis demonstrated weak negative correlations with myocardial infarction (r = −0.16), obesity (r = −0.18), and atrial fibrillation (r = −0.18).

Among the cardiovascular and metabolic conditions, the strongest positive association was identified between myocardial infarction and atrial fibrillation (r = 0.34), followed closely by the correlation between myocardial infarction and angina pectoris (r = 0.33). Additional weak positive correlations were observed between angina pectoris and hypercholesterolemia (r = 0.18), myocardial infarction and obesity (r = 0.17), myocardial infarction and hypercholesterolemia (r = 0.15), and obesity and hypercholesterolemia (r = 0.17).

Hypertension exhibited only minimal correlations with the remaining variables, with coefficients ranging from −0.094 to 0.088. Overall, the correlation matrix suggests that cardiovascular and metabolic disorders were more strongly associated with one another than with the investigated oral conditions (Figure 5).

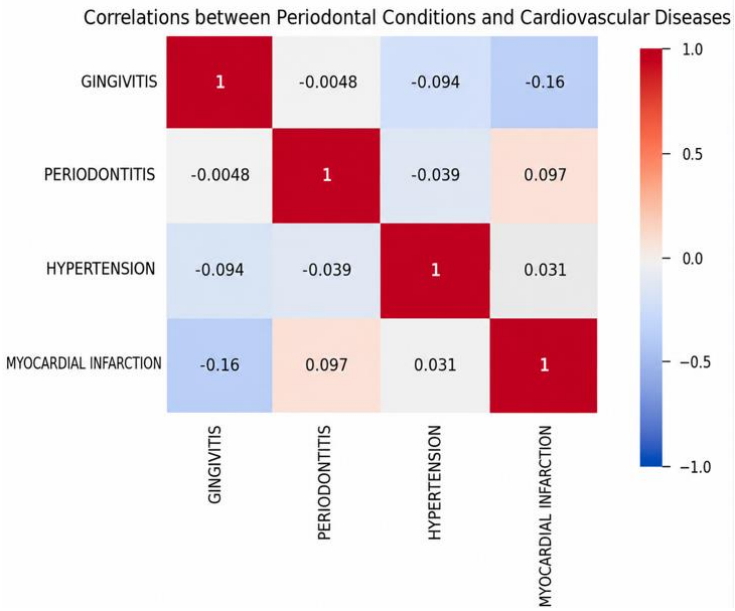

Figure 5. Correlation Matrix Between Periodontal Conditions and Cardiovascular Diseases

The correlation analysis between periodontal conditions and cardiovascular diseases revealed predominantly weak associations among the investigated variables. Gingivitis showed weak negative correlations with hypertension (r = −0.094) and myocardial infarction (r = −0.16), indicating a limited inverse relationship within the study population.

Periodontitis demonstrated weak positive correlations with myocardial infarction (r = 0.097) and weak negative correlations with hypertension (r = −0.039). Similarly, the association between hypertension and myocardial infarction was minimal (r = 0.031), suggesting a negligible linear relationship in the analyzed dataset.

Overall, the correlation coefficients were of low magnitude, indicating that periodontal conditions and cardiovascular diseases exhibited only limited associations within this cohort. Nevertheless, periodontitis showed a slightly stronger relationship with

myocardial infarction than gingivitis, suggesting a potential trend that warrants further investigation in larger populations.

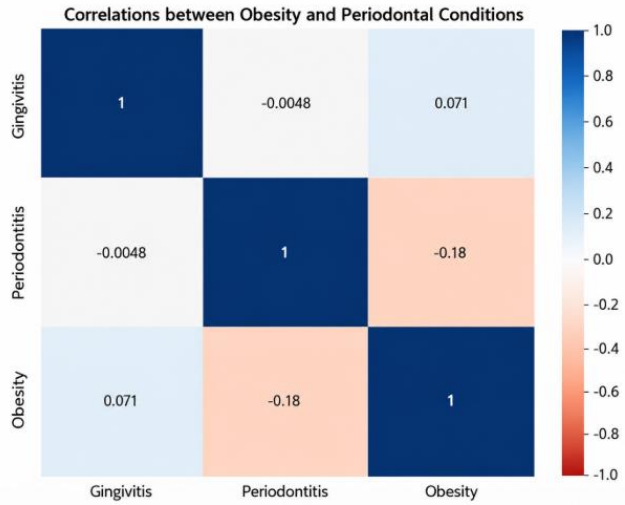

Figure 6. Correlation Matrix Between Obesity and Periodontal Conditions

The correlation analysis between obesity and periodontal conditions revealed generally weak associations within the study population. Obesity demonstrated a weak positive correlation with gingivitis (r = 0.071), indicating a limited tendency for these conditions to coexist. In contrast, a weak negative correlation was observed between obesity and periodontitis (r = −0.18), suggesting an inverse relationship of low magnitude between the two variables.

The correlation between gingivitis and periodontitis was negligible (r = −0.0048), indicating the absence of a meaningful linear association within the analyzed dataset. Overall, the observed correlation coefficients were low, reflecting weak relationships between obesity and the investigated periodontal conditions.

These findings suggest that obesity was not strongly associated with either gingivitis or periodontitis in the present cohort, although slight variations in the direction of the correlations were identified. Further studies involving larger populations and more detailed clinical assessments are required to clarify the nature of these relationships.

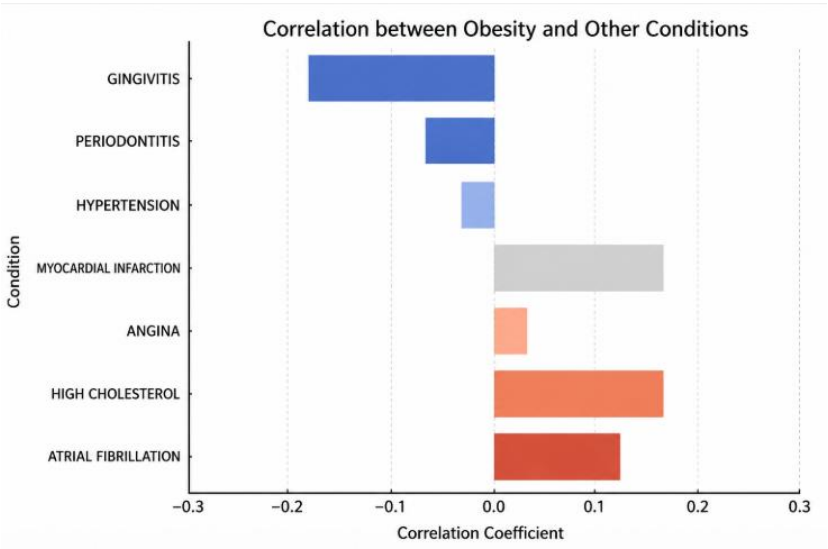

Figure 7. Correlation between obesity and other conditions

The analysis of correlations between obesity and the investigated oral and cardiovascular conditions revealed predominantly weak associations. The strongest positive correlation was observed between obesity and hypercholesterolemia (r = 0.17), followed by myocardial infarction (r = 0.17) and atrial fibrillation (r = 0.13). Weaker positive correlations were identified between obesity and gingivitis (r = 0.071) as well as angina pectoris (r = 0.035).

In contrast, obesity demonstrated weak negative correlations with periodontitis (r = −0.18) and hypertension (r = −0.031). Among the investigated variables, the inverse association between obesity and periodontitis represented the strongest negative correlation, although its magnitude remained low. Overall, the correlation coefficients were small, indicating limited linear relationships between obesity and the analyzed oral and cardiovascular conditions. Nevertheless, obesity appeared to cluster more frequently with metabolic and cardiovascular disorders, particularly hypercholesterolemia, myocardial infarction, and atrial fibrillation, than with periodontal diseases in the studied population.

DISCUSSIONS

The findings of the present study highlight the complex clinical profile of patients with cardiovascular diseases, characterized by the coexistence of demographic, metabolic, behavioral, and oral health-related factors. The predominance of individuals aged 40–60 years is consistent with epidemiological evidence indicating that middle adulthood represents a critical period for the development and progression of chronic non-communicable diseases, including cardiovascular disorders and periodontal diseases.

Hypertension and hypercholesterolemia emerged as the most prevalent cardiovascular comorbidities within the investigated cohort, reflecting current national and international epidemiological trends. The substantial prevalence of angina pectoris, myocardial infarction, and atrial fibrillation further underscores the cumulative impact of cardiovascular risk factors, including obesity, dyslipidemia, smoking, and chronic inflammatory conditions. An unexpected finding was the higher prevalence of myocardial infarction among non-smokers compared with smokers. Although this observation contrasts with established evidence identifying smoking as a major cardiovascular risk factor, it should be interpreted with caution. Potential explanations include differences in age distribution, the presence of post-infarction lifestyle modifications, survivor bias, or the influence of unmeasured confounding factors. Consequently, no causal inference regarding the relationship between smoking status and myocardial infarction can be drawn from the present data.

The correlation analyses demonstrated predominantly weak associations between periodontal and cardiovascular conditions. Periodontitis exhibited weak positive correlations with myocardial infarction and atrial fibrillation, whereas gingivitis showed weak inverse correlations with several cardiovascular variables. These findings may reflect differences in disease severity and biological impact, as periodontitis represents a chronic destructive inflammatory condition with greater potential for systemic dissemination of pathogens and inflammatory mediators than gingivitis. Obesity demonstrated weak positive correlations with myocardial infarction, hypercholesterolemia, and atrial fibrillation, supporting its established role as a major component of the metabolic syndrome and a contributor to cardiovascular risk. In contrast, obesity showed only limited associations with periodontal diseases, including a weak positive correlation with gingivitis and a weak negative correlation with periodontitis. Although these relationships were modest, they suggest that metabolic and cardiovascular factors may cluster more strongly than oral conditions within the studied population. Overall, the observed patterns support the concept of an interrelationship between oral and systemic health, potentially mediated by chronic

inflammation, immune dysregulation, and shared behavioral risk factors. The integration of oral health assessments into cardiovascular prevention programs, as well as the inclusion of cardiovascular risk evaluation within dental care settings, may contribute to earlier identification of high-risk individuals and improved interdisciplinary patient management.

Our findings are partially consistent with those reported by Zardawi et al., 2021, who identified significant associations between periodontitis and cardiovascular diseases, particularly hypertension and myocardial infarction [1]. Although the correlations observed in the present study were weaker, their direction supports the hypothesis of a systemic relationship between oral inflammation and cardiovascular pathology. Differences in study design, population characteristics, and methods of periodontal assessment may explain the discrepancies between findings. Similarly, our results are in agreement with those reported by Schulze-Späte et al., 2024 who described associations between periodontal disease, cardiovascular risk, and systemic inflammatory burden, particularly among individuals presenting metabolic comorbidities [24]. While inflammatory biomarkers were not assessed in the present investigation, the coexistence of periodontitis, myocardial infarction, atrial fibrillation, obesity, and hypercholesterolemia supports the concept of a multifactorial pathogenic network linking oral and cardiovascular health.

The present findings also align with the contemporary perspective summarized by Gianos et al., 2021, who emphasized the bidirectional relationship between periodontitis and cardiovascular disease through mechanisms involving bacteremia, systemic inflammation, and endothelial dysfunction [2]. Although the observed associations were of limited magnitude, they remain compatible with the proposed biological framework. Furthermore, the results are broadly consistent with the systematic review conducted by Hardan et al., 2023, which highlighted the association between periodontitis and major cardiovascular events [19]. The authors identified chronic low-grade inflammation, endothelial dysfunction, and bacterial translocation as potential mechanisms underlying this relationship. The positive associations observed between periodontitis and selected cardiovascular outcomes in our study provide additional support for these hypotheses, although the relatively weak correlations warrant cautious interpretation.

Several limitations should be acknowledged. First, the cross-sectional and retrospective design precludes causal inference. Second, oral health variables were based on self-reported information rather than standardized clinical periodontal examinations, which may have resulted in misclassification or underestimation of disease prevalence. Third, inflammatory biomarkers such as C-reactive protein or interleukin-6 were not assessed, limiting the evaluation of potential biological pathways linking oral and cardiovascular diseases. Finally, the sample size and the lack of detailed information regarding exposure duration, disease severity, and treatment adherence may have reduced the ability to detect stronger associations and adequately control for confounding variables.

From a clinical perspective, the findings support the integration of oral health assessments into cardiovascular prevention programs. Although the observed associations were generally weak, the coexistence of periodontal and cardiovascular conditions highlights the need for multidisciplinary collaboration between dentists, cardiologists, and primary care physicians. This recommendation is consistent with the review published by Hopkins et al. (2024), who emphasized that oral health should be considered an essential component of cardiovascular risk assessment and that closer collaboration between oral healthcare professionals and medical practitioners may improve prevention and long-term patient outcomes [21]. Early identification and management of oral inflammatory conditions may therefore contribute to reducing the overall burden of systemic disease.The strengths of the present study include the inclusion of patients from multiple clinical centers, the evaluation of

both oral and cardiovascular variables, and the exploration of behavioral and metabolic risk factors within the same analytical framework.

The findings of the present study support the growing recognition of oral health as an integral component of cardiovascular risk assessment. The high prevalence of gingivitis and periodontitis among patients with cardiovascular diseases highlights the importance of interdisciplinary collaboration between dentists, cardiologists, and primary care physicians. Incorporating periodontal evaluation into routine cardiovascular screening programs may contribute to earlier identification of high-risk individuals and promote more comprehensive preventive strategies.

CONCLUSIONS

The present study demonstrated a high prevalence of periodontal diseases among patients diagnosed with cardiovascular disorders, with both gingivitis and periodontitis affecting more than half of the investigated cohort. Among the cardiovascular conditions identified, hypertension, hypercholesterolemia, angina pectoris, and myocardial infarction were the most frequently reported, highlighting the considerable burden of cardiovascular comorbidities within this population and supporting previous epidemiological evidence regarding the coexistence of oral and systemic diseases.

Correlation analyses revealed predominantly weak associations between periodontal conditions and cardiovascular diseases. Nevertheless, periodontitis showed positive correlations with myocardial infarction and atrial fibrillation, whereas obesity exhibited stronger associations with cardiovascular and metabolic disorders, particularly hypercholesterolemia, myocardial infarction, and atrial fibrillation. Although the observed correlation coefficients were relatively modest, the direction of these relationships is consistent with the growing body of literature suggesting that chronic periodontal inflammation may contribute to the development and progression of cardiovascular pathology through shared inflammatory mechanisms and common risk factors.

The present findings further reinforce the concept of the oral–systemic health continuum, according to which periodontal diseases, metabolic abnormalities, and cardiovascular disorders are interconnected through complex biological pathways involving chronic inflammation, immune dysregulation, endothelial dysfunction, and behavioral risk factors. These observations emphasize the importance of incorporating oral health assessment into comprehensive cardiovascular risk evaluation and support the recognition of periodontal health as an integral component of overall systemic health. From a clinical perspective, the results underline the importance of strengthening interdisciplinary collaboration between dental practitioners, cardiologists, and primary care physicians. Early identification, prevention, and appropriate management of periodontal diseases may contribute to a more comprehensive strategy for reducing cardiovascular risk and improving long-term patient outcomes. Furthermore, larger prospective studies incorporating standardized periodontal examinations together with the assessment of systemic inflammatory biomarkers are required to clarify the causal nature of the observed associations and to better define the contribution of oral health to cardiovascular disease prevention and management.

Overall, the present study confirms the high prevalence of periodontal diseases among patients with cardiovascular disorders and highlights the frequent coexistence of hypertension and hypercholesterolemia, reflecting the complex clinical profile of this population. Although the associations identified between periodontal diseases and cardiovascular conditions were generally weak, positive relationships were observed between periodontitis, myocardial infarction, and atrial fibrillation, while obesity appeared to be more closely associated with cardiovascular and metabolic abnormalities than with periodontal

disease. Collectively, these findings provide additional support for the growing evidence indicating a close interaction between oral health and systemic cardiovascular conditions and reinforce the need for integrated preventive and therapeutic approaches in clinical practice.

Conflicts of Interest

The authors declare no conflict of interest.

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