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The Periodontal–Systemic Axis: Why Oral Health Belongs in Mainstream Medical Practice A Narrative Review for Interprofessional Practice

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Abstract
Periodontitis, one of the most prevalent chronic inflammatory diseases worldwide, is increasingly recognized as more than a localized oral condition. A growing body of evidence links periodontal inflammation to systemic diseases, including type 2 diabetes mellitus, cardiovascular disease, adverse pregnancy outcomes, and respiratory infection, through shared mechanisms such as microbial translocation, chronic low-grade inflammation, and immune dysregulation. This review synthesizes current literature on the biological pathways connecting periodontal and systemic health and examines the clinical implications for both dental and medical practitioners. Closer integration between dentistry and general medicine, achieved through shared risk-factor screening, bidirectional referral pathways, and interprofessional education, may improve outcomes for patients with chronic disease and should be considered a public health priority.
Keywords: Periodontitis; Systemic Inflammation; Diabetes Mellitus; Cardiovascular Disease; Interprofessional Care; Oral–Systemic Health.

1. Introduction

Periodontal disease affects a substantial proportion of adults globally, with severe periodontitis alone estimated to affect several hundred million people, making it one of the most prevalent noncommunicable diseases worldwide [1,2]. For much of the twentieth century, dentistry managed periodontal disease almost exclusively, conceptually separating it from general medical care. Over the past two decades, however, mechanistic and epidemiological research has substantially revised this view. Periodontitis is now understood as a chronic, biofilm-driven inflammatory disease that can exert effects well beyond the oral cavity. At the same time, several systemic conditions can, in turn, worsen periodontal status—a relationship increasingly described as bidirectional [3,4].

This shift in understanding has practical consequences. If periodontal inflammation contributes causally, even to a modest degree, to conditions such as diabetes and cardiovascular disease, then periodontal screening and treatment may represent an underutilized strategy in chronic disease management. Physicians may also underutilize dental referral as part of preventive care. This review summarizes the mechanistic basis of the periodontal–systemic relationship, evaluates the evidence for its major systemic associations, and outlines practical implications for collaborative dental and medical practice.

2. Biological Mechanisms Linking Oral and Systemic Health

Periodontitis begins with a dysbiotic subgingival biofilm that triggers a sustained local inflammatory and immune response. In susceptible individuals, this response fails to resolve, leading to soft tissue destruction, alveolar bone loss, and ulceration of the pocket epithelium. This ulcerated epithelium provides a substantial

surface area—often compared to the size of an adult palm across all periodontal pockets combined—through which bacteria, bacterial products such as lipopolysaccharide, and inflammatory mediators can enter the bloodstream [3,5].

Three overlapping mechanisms are generally proposed to explain downstream systemic effects. First, direct microbial translocation allows periodontal pathogens to reach distant sites, where they have been identified in atherosclerotic plaques and other tissues. Second, periodontitis elevates circulating levels of inflammatory mediators—including C-reactive protein, interleukin-6, and tumor necrosis factor-alpha—contributing to chronic low-grade systemic inflammation, a recognized driver of insulin resistance and vascular dysfunction. Third, periodontal pathogens can promote broader immune dysregulation, including effects on myelopoiesis and trained innate immunity, that may amplify inflammatory responses at sites distant from the mouth [3,5]. Because these pathways are shared with several chronic diseases, periodontitis is best conceptualized as one contributor within a network of interacting risk factors rather than an isolated causal agent.

3. Periodontitis and Type 2 Diabetes Mellitus

The relationship between periodontitis and type 2 diabetes mellitus is the most extensively studied oral–systemic association and is widely regarded as genuinely bidirectional. Hyperglycemia impairs neutrophil function and promotes formation of advanced glycation end-products, both of which worsen periodontal tissue destruction; conversely, the systemic inflammatory burden of periodontitis can impair insulin signaling and contribute to poorer glycemic control [6,7]. Several intervention studies have reported modest but clinically meaningful reductions in glycated hemoglobin (HbA1c) following nonsurgical periodontal therapy in patients with diabetes, supporting the view that periodontal treatment may serve as an adjunct—not a substitute—to standard diabetes management.

4. Periodontitis and Cardiovascular Disease

Numerous epidemiological studies have observed an association between periodontal disease and cardiovascular disease, with proposed mechanisms including endothelial dysfunction, systemic inflammation, and the detection of periodontal pathogens within atherosclerotic plaque tissue [8]. Oral microbiota imbalance has also been linked to humoral immune responses implicated in atherosclerosis progression. Although these findings suggest a possible connection, inferring a direct causal relationship remains challenging due to shared risk factors such as smoking, obesity, and socioeconomic status that may act as confounders. Nonetheless, professional cardiology and periodontology bodies recognize that the observed association is unlikely to be entirely attributed to confounding variables. Several interventional studies report that periodontal treatment improves surrogate markers of cardiovascular risk, such as endothelial function, further supporting the plausibility of a causal link while acknowledging that definitive evidence is still emerging [4,8].

5. Other Systemic Associations

Beyond diabetes and cardiovascular disease, periodontitis has been associated with adverse pregnancy outcomes, including preterm birth and low birth weight, plausibly mediated by hematogenous spread of oral pathogens to the fetoplacental unit and by systemic inflammatory signaling. Associations have also been reported with respiratory infections in institutionalized or immunocompromised patients, where aspiration of oral pathogens into the lower respiratory tract is thought to play a role, as well as with rheumatoid arthritis, chronic kidney disease, and, more recently, thyroid and metabolic syndrome-related conditions [3,5,9]. The strength of evidence varies considerably across these associations, and for several the literature remains predominantly observational; nonetheless, the consistency of a shared inflammatory mechanism across such a broad range of conditions is notable.

6. Clinical Implications for Interprofessional Practice

The observations carry direct implications for both dental and medical practice. For dental practitioners, screening patients for undiagnosed diabetes risk factors, smoking status, and cardiovascular risk during

periodontal assessment may identify patients who would benefit from medical referral. For physicians and other medical practitioners, asking about oral health, bleeding gums, or tooth mobility as part of chronic disease management—and referring patients with poorly controlled diabetes or established cardiovascular disease for periodontal evaluation—represents a low-cost, low-risk addition to routine care.

Several actionable steps could further the integration of dental and medical care. First, establishing shared or interoperable electronic health records between dental and medical practices would facilitate timely bidirectional referrals, support coordinated care, and minimize duplication of risk-factor screening. Second, incorporating structured, mandatory interprofessional modules on oral–systemic health into both dental and medical school curricula would ensure consistent knowledge acquisition and foster collaboration from early professional development. Third, professional societies should collaboratively create standardized referral protocols and decision support tools, explicitly outlining criteria for when medical practitioners should refer patients for periodontal evaluation (for example, individuals with diabetes, cardiovascular disease, or unexplained inflammatory markers) and when dental practitioners should recommend medical review (such as in cases of poorly controlled periodontitis or new systemic symptoms). These recommendations should be disseminated not only in professional guidelines but also through joint continuing education programs to reach practitioners in both fields [6,8].

7. Limitations

This review is subject to limitations intrinsic to a narrative, rather than systematic, methodology; consequently, it does not incorporate a structured quality assessment of the included primary studies. As most of the evidence linking periodontitis to systemic disease is based on associations derived from observational studies and small-scale interventional trials, there is a substantial risk that unmeasured or inadequately controlled confounding variables—such as smoking, dietary patterns, or socioeconomic factors—may influence observed relationships. The reliance on surrogate endpoints instead of definitive health outcomes further restricts our ability to establish causality or assess the magnitude of clinical benefit. Additionally, narrative reviews are susceptible to selection and publication bias, as study inclusion may not be comprehensive or systematically determined. To address these limitations, future research should prioritize large, rigorously controlled interventional trials designed to evaluate clinically meaningful endpoints, alongside systematic reviews that incorporate formal quality appraisal and meta-analytic methods to strengthen the validity of conclusions regarding the periodontal–systemic relationship.

8. Conclusion

Periodontitis should no longer be considered a condition limited to the oral cavity. The mechanistic plausibility and epidemiological consistency of its associations with diabetes, cardiovascular disease, adverse pregnancy outcomes, and other systemic conditions support a model of chronic disease that is fundamentally interprofessional. Incorporating oral health screening into general medical practice and promoting systemic risk-factor awareness in dental practice represent pragmatic, low-cost strategies that may improve outcomes in both fields. Future research should prioritize large, rigorously designed intervention trials and detailed longitudinal studies to clarify the directionality and magnitude of these associations, address potential confounding factors, and determine the clinical benefits of integrated care strategies.

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