REVIEW

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Periodontal Disease and Celiac Disease – A systematic review regarding the Clinical Significance.

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Abstract
Introduction. Celiac disease is an autoimmune condition caused by the reaction of the body to gluten in people who are genetically sensitive. Periodontal disease is a chronic inflammation of the gums and tissues that support the teeth, caused by harmful bacteria and an overactive immune response. Recent research has showed that these two diseases are connected and a complex interplay exists.
Aim of the study. The present paper aims to explore and synthesize the scientific evidence concerning the complex interrelationship between celiac disease and periodontal disease.
Methods. This review synthesizes data of studies published between 2020 and 2025 concerning the clinical, immunological, and microbiological associations between celiac disease and periodontal disease. Articles were identified through PubMed and Scopus searches using the terms 'celiac disease', 'periodontal disease', and 'oral manifestations of celiac disease'.
Results. Based on the analysis of 14 articles extracted from the literature, the findings clearly demonstrate that celiac disease and periodontal disease are interconnected through complex immunological, nutritional, and microbial pathways, supporting the concept of a gut-oral inflammatory axis.
Conclusions. The coexistence of celiac disease and periodontal disease illustrates the systemic nature of mucosal inflammation. Interdisciplinary cooperation among dentists, gastroenterologists, and nutritionists is essential for early recognition, prevention, and integrative treatment.

Keywords: periodontal disease, celiac disease, oral manifestations, systemic inflammation, gut-oral health, oral health.

Introduction

Celiac disease is a chronic autoimmune disorder caused by an abnormal immune reaction to gluten, a protein found in wheat, barley, and rye, in genetically predisposed individuals, primarly those carrying HLA-DQ2 and HLA-DQ8 haplotypes [1]. The ingestion of gluten leads to abnormal activation of T lymphocytes and overproduction of proinflammatory cytokines such as IFN-γ, IL-15, and TNF-α. This reaction leads to inflammation of the intestinal lining, damage to the villi, and nutrient malabsorption, resulting in various systemic effects [1,2].

In recent years, celiac disease has come to be regarded not just as an intestinal disorder but as a systemic immune-inflammatory condition that can affect many organs. The classical intestinal forms are typically associated with diarrhea, abdominal pain, abdominal distension, insufficient weight gain, and signs of malnutrition [1]. In contrast, the non-classical or extraintestinal manifestations may include short stature, osteopenia, osteoporosis, arthritis, dermatitis herpetiformis, as well as various autoimmune disorders [1]. Moreover, several studies have highlighted that celiac disease may also present with specific oral manifestations. Among the most frequently reported oral conditions are recurrent aphthous stomatitis, dental enamel defects, and delayed dental development, which together can offer important clinical clues suggestive of underlying celiac disease [1]. This wider perspective has sparked interest in its link with other chronic inflammatory diseases, particularly periodontal disease.

Periodontal disease is a multifactorial inflammation of the tissues supporting the teeth, caused by an imbalance in the oral bacteria and an excessive immune response [3,4]. Is is primarily initiated by bacterial biofilm accumulation at the gingival margin, which triggers a local immune response [4]. However, the progression and severity of periodontal disease are not solely determined by bacterial factors but also by the complex

interaction between microbial agents and the immune-inflammatory mechanisms of the host [5]. The inflammatory process involves the activation of immune cells and the release of pro-inflammatory cytokines such as interleukin-1β (IL-1β), tumor necrosis factor-α (TNF-α), and prostaglandins, which contribute to connective tissue breakdown and alveolar bone resorption [6]. Furthermore, genetic susceptibility plays a significant role in modulating the host response. Studies have shown that polymorphisms in genes regulating cytokine production or immune receptor activity can increase individual vulnerability to periodontal destruction [7]. In addition, recent evidence suggests that autoimmune mechanisms may also be implicated in periodontal disease pathogenesis. Autoantibodies directed against host tissue components have been detected in some patients, indicating that an autoimmune component might exacerbate local inflammation and tissue degradation [8]. Therefore, periodontal disease should not be regarded merely as a localized bacterial infection but rather as a multifactorial immunoinflammatory disorder influenced by microbial, genetic, and autoimmune factors [8]. Both celiac disease and periodontal disease share similar mechanisms, such as chronic inflammation and increased levels of cytokines like IL-1β, IL-6, and TNF-α [2,5].

This connection supports the idea of a "gut-oral axis," showing how intestinal and oral health are linked through immune and metabolic pathways [5].

In patients with celiac disease, intestinal barrier dysfunction and dysbiosis promote systemic inflammation, which may exacerbate periodontal tissue breakdown. Conversely, chronic periodontal infection can contribute to persistent systemic immune activation, reinforcing a vicious cycle of inflammation [4]. The interplay between these two diseases exemplifies how local and systemic immune responses are interdependent and highlights the importance of considering oral health within the broader context of systemic well-being [4].

Recognizing the oral and periodontal signs of celiac disease is clinically important. Common oral findings include recurrent aphthous ulcers, smooth tongue, enamel defects, and dry mouth, which can appear before digestive symptoms [6,7].

Dentists can play a key role in identifying undiagnosed cases by noticing these oral changes and referring patients for further testing. This highlights the importance of collaboration between dentists, gastroenterologists, and nutritionists for accurate diagnosis and effective management [8].

Modern dentistry extends far beyond the confines of the oral cavity, reflecting a growing understanding of the mouth as an integral component of systemic health [4,8].

The mouth serves as both a mirror and a gateway to systemic well-being, where oral manifestations frequently provide early indicators of underlying metabolic or immunological disorders [1,6].

In the case of celiac disease, recurrent oral lesions and periodontal alterations may offer the first clinical clues to an unrecognized systemic immune dysregulation [2,3].

Understanding the interrelationship between celiac disease and periodontal disease therefore enhances not only the clinician's diagnostic awareness, but also fosters a preventive and holistic approach to comprehensive patient care [4,9].

This paper thus aims to examine in depth the immunological, microbiological, and clinical mechanisms linking celiac disease and periodontal disease, emphasizing their shared inflammatory pathways and the crucial importance of multidisciplinary collaboration in improving both oral and systemic health outcomes.

Material and methods

This review followed a structured approach designed to gather and analyze recent scientific literature addressing the relationship between celiac disease and periodontal disease. A comprehensive search of the PubMed and Scopus databases was conducted to identify relevant studies published in the literature between January 2020 and May 2025.

The search strategy included the following keywords: "celiac disease", "periodontal

disease", "oral manifestations", and "microbiome".

To ensure scientific rigor, only peer-reviewed original research articles, clinical studies, and systematic reviews written in English were included. Studies were selected based on their evaluation of oral manifestations in celiac patients. Publications that lacked primary data or did not directly address the oral-systemic link were excluded to maintain analytical relevance.

Data extraction was performed independently, manually, emphasizing the identification of shared inflammatory mediators, nutritional deficiencies, and microbiome alterations reported across the studies. Each selected article was assessed for methodological quality, population characteristics, and outcomes relevant to periodontal status in celiac individuals.

A qualitative synthesis approach was applied, integrating findings on clinical correlations, immunological markers, and microbial patterns rather than performing meta-analysis due to heterogeneity among study designs.

The final pool of references included key contributions from 2020 to 2025 that collectively outline the systemic-oral inflammatory axis in the context of celiac disease (figure 1).

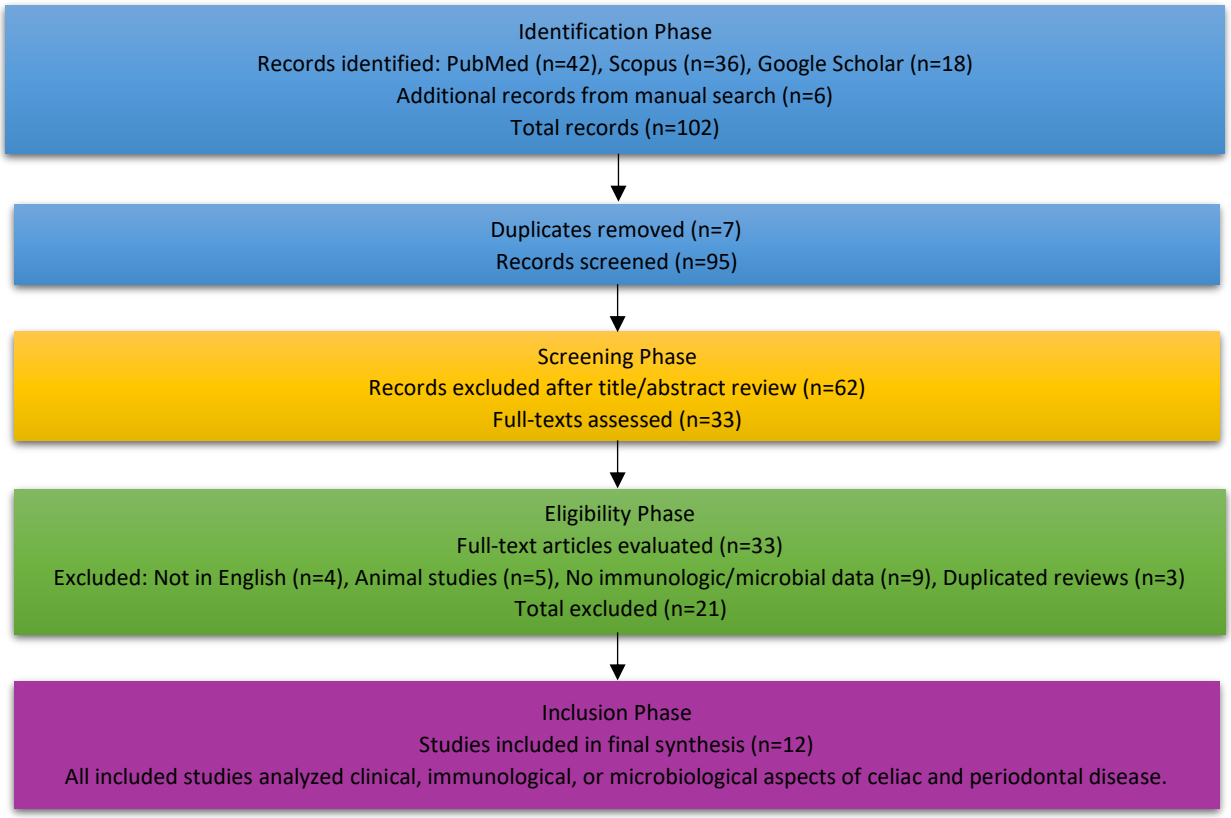

Figure 1. Flow diagram summarizing study selection and inclusion process

Results

The results of the present research are presented in Table 1.

Table 1. Main outcomes of the included studies:

AUTHOR	YEAR	STUDY TYPE	SAMPLE / FOCUS	MAIN PATHOGENIC LINK	MAIN FINDINGS / OUTCOMES	KEY CONCLUSIONS
ALSADATFA ET AL. [1]	2021	Case-Control Study	120 children with celiac disease vs controls	Autoimmune mucosal inflammation	Frequent oral findings: aphthous stomatitis, enamel defects, delayed eruption.	Oral lesions may precede intestinal symptoms, aiding early diagnosis.
STØDLE IH ET AL. [2]	2024	Cross-Sectional Study	150 adults (HUNT study cohort)	Systemic immune activation and alveolar bone loss	Higher radiographic alveolar bone loss observed in seropositive celiac disease patients.	Undiagnosed celiac disease predisposes to alveolar bone destruction.
LUCCHESEA ET AL. [3]	2023	Systematic Review	22 studies (oral manifestations of celiac disease)	Cytokine-mediated mucosal injury (IL-1β, TNF-α)	Increased gingival inflammation and attachment loss in celiac disease patients.	Celiac disease-associated cytokine imbalance impacts periodontal health.
LIU J ET AL. [4]	2022	Clinical Study	82 celiac disease patients	Systemic inflammation (TNF-α, IL-6) and salivary gland dysfunction	Persistent elevation of proinflammatory cytokines associated with gingival bleeding.	Celiac disease induces oral mucosal and salivary immune alterations.
WANG A ET AL. [5]	2024	Review	Gut-oral microbiome axis	Microbial dysbiosis and immune signaling	Shared presence of P. gingivalis and P. intermedia between oral and gut sites.	Supports bidirectional inflammatory communication along the gut-oral axis.
COELHO M ET AL. [6]	2023	Observational Study	110 pediatric celiac disease patients	Mucosal immune imbalance / epithelial atrophy	40% presented recurrent aphthous ulcers and enamel hypoplasia.	Oral lesions reflect systemic malabsorption and immune dysregulation.
INCHINGOLO AD ET AL. [7]	2024	Systematic Review	9 studies on enamel defects	Developmental enamel hypoplasia linked to malabsorption	High prevalence of symmetrical enamel hypoplasia in celiac disease children.	Enamel hypoplasia serves as an early diagnostic marker for celiac disease.
WIESER H ET AL. [8]	2023	Narrative Review	Multidisciplinary analysis	Clinical and interdisciplinary relevance	Emphasized the dentist's role in detecting early oral manifestations of celiac disease.	Interdisciplinary collaboration improves diagnosis and treatment outcomes.
MADI M ET AL. [9]	2024	Clinical Study	80 celiac disease patients vs. 80 controls	Cytokine imbalance and immune activation	Elevated salivary IL-17A and IL-18 levels correlated with periodontal inflammation.	Shared cytokine network links intestinal and periodontal inflammation.
AMERICAN DENTAL ASSOCIATION [10]	2023	Clinical Guidance	Professional guidelines	Evidence-based dental recommendations	Highlights importance of recognizing oral celiac disease signs in dental care.	Supports early referral and multidisciplinary coordination.
MANNINENJ ET AL. [11]	2025	Cross-Sectional Study	200 adults with celiac disease	Nutritional deficiency and immune dysregulation	Gluten-free diet reduced gingival inflammation and improved oral health.	Strict gluten-free adherence benefits oral and intestinal recovery.
CICEKCI AV ET AL. [12]	2024	Clinical Study	Pediatric celiac disease cohort	Oral signs as diagnostic markers	Enamel defects and recurrent ulcers predicted intestinal biopsy positivity.	Oral examination can aid non-invasive diagnosis of celiac disease.

Discussions

The findings of the present research, clearly demonstrate that celiac disease and periodontal disease are interconnected through complex immunological, nutritional, and microbial pathways, supporting the concept of a gut-oral inflammatory axis, as previously stated by other researchers [5]. Both conditions exemplify chronic inflammatory disorders in which genetic predisposition, environmental triggers, and microbial dysbiosis converge to generate a systemic immune imbalance that extends beyond local tissue boundaries [2,3].

From an immunological perspective, both celiac disease and periodontal disease are characterized by an overexpression of proinflammatory cytokines and a dysregulated Th1/Th17 response, which collectively promote chronic mucosal inflammation and tissue destruction [2,9]. Gluten-derived peptides in celiac disease activate antigen-presenting cells, inducing a cascade of cytokines such as IFN-γ, IL-15, and TNF-α that perpetuate epithelial damage and increased permeability [4]. In periodontal disease, a similar cytokine pattern-particularly elevated IL-1β and TNF-α, leads to degradation of extracellular matrix and alveolar bone resorption [3,9]. This parallel cytokine network suggests a shared immunopathogenic framework, whereby intestinal inflammation in celiac disease may amplify susceptibility through systemic immune activation [4,5].

Nutritional deficiencies, especially in vitamin D, zinc, and iron, represent another crucial intersection between celiac disease and periodontal disease [9]. Malabsorption caused by intestinal villous atrophy compromises not only general health but also periodontal integrity by impairing collagen synthesis and bone metabolism [2,4]. Vitamin D deficiency, in particular, has been correlated with impaired immune regulation and reduces antimicrobial peptide activity in gingival tissues, further aggravating periodontal inflammation [8,9]. Therefore, nutritional repletion plays an essential role in restoring periodontal homeostasis among celiac patients.

Emerging evidence reinforces the existence of a bidirectional gut-oral microbiome communication, mediated through immune signaling, bacterial translocation, and systemic circulation of inflammatory mediators [5,10]. The identification of Porphyromonas gingivalis and Prevotella intermedia as overlapping dysbiosis species in both oral and intestinal niches suggests that microbial interactions may influence immune tolerance and systemic inflammation [3,5]. This finding supports the hypothesis that microbiome modulation-through probiotics or dietary interventions-could represent a therapeutic adjunct to both gluten-free dietary management and periodontal therapy [4].

Clinically, the coexistence of celiac disease and periodontal disease shows the close link between oral and general health [4,8]. Studies also show that following a strict gluten-free diet helps not only intestinal healing, but also decreases gum inflammation, emphasizing the value of combined treatment approaches [4,9]. The concept of the gut-oral axis suggests that inflammation can increase systemic immune activity [4,5].

Nutritional deficiencies further weaken bone metabolism and periodontal repair, but correcting them and following a strict gluten-free diet can reduce both intestinal and gum inflammation [8,9].

Additionally, the comparative analysis of the studies presented in the table supports these conclusions by demonstrating specific oral manifestations commonly observed in celiac patients, such as recurrent aphthous ulcers, enamel hypoplasia, and delayed dental development [10].

These manifestations, together with the higher incidence of bone resorption and elevated bleeding indices in affected individuals, reinforce the notion that chronic systemic inflammation and nutritional deficiencies extend their effects to the oral cavity [11].

The association between intestinal villous atrophy and reduced alveolar bone density may explain the observed increase in periodontal bone loss [12].

Furthermore, heightened bleeding scores reflect persistent microvascular inflammation, providing clinical evidence for the systemic nature of the immune response linking the gut and oral environments.

The coexistence of celiac disease and periodontal disease highlights the importance of multidisciplinary care involving dentists, gastroenterologists, and nutritionist to improve diagnosis, treatment, and quality of life [4,8]. Understanding these links strengthens the view of dentistry as a key part of systemic health [2,5].

Recent findings also point toward new therapeutic perspectives that may be relevant for understanding and managing the inflammatory link between celiac disease and periodontal disease. Recent findings suggest that a fasting-mimicking diet used as an adjunct to nonsurgical periodontal therapy helped reduce inflammatory biomarkers such as IL-6, IL-β and CRP, suggesting that dietary modulation can influence periodontal inflammation and healing [13].

Similarly, an experimental study demonstrated that administration of Rhus coriaria extract attenuated oxidative stress and alveolar bone loss in ligature-induced periodontitis by improving the RANKL/OPG balance [14].

These observations reinforce the importance of nutrition and metabolic balance in controlling oral inflammation. In the context of celiac disease, where both oxidative stress and nutrient malabsorption are common, such dietary and antioxidant approaches could help restore immune homeostasis and support periodontal health. Overall, these studies further strengthen the concept of the gut-oral axis, showing how systemic inflammation and nutrition directly influence oral tissues [13,14].

Limitations and Future Research Perspectives

Most current studies investigating the celiac disease and periodontal disease relationship are cross-sectional and limited by small sample sizes. Further longitudinal and interventional studies are needs to clarify causality and molecular mechanisms linking intestinal and periodontal inflammation.

Future research should explore microbiome modulation via probiotics and the role of dietary polyphenols in reducing oxidative stress and mucosal permeability.

Conclusions

Recent research shows that celiac disease and periodontal disease are closely connected through shared immune, microbial, and nutritional mechanisms that maintain chronic systemic inflammation .

Both conditions involve overproduction of cytokines, leading to tissue damage and immune imbalance .

Conflict of interest: None to declare.

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