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Increased Risk of Periodontitis in Patients with Crohn's Disease

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Abstract

Background and aim: Inflammatory Bowel Disease (IBD) is divided into several types, with one of the most prevalent being Crohn's disease (CD). CD is an inflammatory disease that affects almost the entire digestive tract. Several studies have indicated that patients with Crohn's disease experience issues in the oral cavity, with one of the most common complaints being periodontitis. This study aims to analyze the increased risk of periodontitis in patients with Crohn's disease.

Purpose: To analyze the increased risk of periodontitis in patients with Crohn's disease and identify the underlying mechanisms that link both conditions.

Methods: This research employed a literature review method using PubMed and Google Scholar databases.

Results: Identified five relevant literature sources using the predetermined keywords. Among the five sources, four concluded that Crohn's disease is associated with an increased risk of periodontitis. In fact, there is a two-way relationship between the two conditions due to the interaction between the environment and the immune system within the body.

Conclusion: Crohn's disease can lead to an increased risk of periodontitis. Both conditions exhibit a two-way relationship due to environmental interactions and the body's immune response to the inflammatory process.

Keywords: Inflammatory Bowel Disease; Crohn's Disease; Periodontitis; Oral Cavity; Inflammatory Disease

1 Introduction

Inflammatory Bowel Disease (IBD) is a chronic disease of the gastrointestinal tract mediated by immune system mechanisms. The pathogenesis of IBD is generally associated with immune system dysregulation triggered by environmental factors. IBD is typically chronic and characterized by recurrent relapses (5). IBD can be classified into several types, with the two main forms being Crohn's Disease (CD) and Ulcerative Colitis (UC) (8). CD is an inflammatory disorder of the gastrointestinal tract that can affect almost all segments of the digestive system. Globally, the epidemiology of CD ranges from 0.0 to 29.3 per 100,000 population annually (8). In Europe, more than 1.3 million individuals are affected by this disease, with Northern European countries appearing to be more impacted than those in Southern Europe (1). Approximately 9% of patients with IBD present with oral disease manifestations, one of the most common being periodontitis (9). Periodontitis is defined as a persistent inflammation induced by oral bacterial dysbiosis of the tooth-supporting tissues, resulting in periodontal tissue destruction and alveolar bone loss (2).

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Patients with IBD have an increased risk of gingival bleeding compared with control groups. In addition, patients with IBD exhibit higher bacterial loads, increasing the risk of opportunistic infections. Several studies have also reported that the gut microbiome of patients with IBD is often more similar to the oral microbiome. Consequently, IBD may increase the risk of periodontitis, while periodontitis may also act as a risk factor for IBD (1). Local inflammation in periodontal disease can influence systemic autoimmune or inflammatory diseases. The presence of periodontitis in patients with IBD suggests that both inflammatory conditions may share common pathogenic pathways (5). IBD can involve any part of the gastrointestinal system, including the oral cavity. The prevalence of periodontitis is significantly higher in patients with CD compared with control groups; however, the underlying pathophysiology linking these two diseases remains unclear (3). Nevertheless, several studies have indicated that the etiopathogenesis of CD and periodontitis shares certain similarities, particularly in the excessive inflammatory response of the intestinal or oral mucosa, both of which may be triggered by microbial factors (1). The pathogenesis of periodontitis resembles that of IBD and mainly involves interactions between the host immune response and oral pathogens. As a result, the host inflammatory response to these pathogens leads to destruction of both soft and hard periodontal tissues. Poor oral hygiene is frequently associated with a higher incidence of periodontitis and has been reported to correlate inversely with IBD (9).

This study aims to determine the increased risk of periodontitis in patients with Crohn's disease. Furthermore, this study is conducted to analyze the relationship between periodontitis and Crohn's disease.

2 Methodology

2.1 Search Strategy

Articles were searched using predetermined databases in June 2024. The literature search was conducted through PubMed and Google Scholar databases. The keyword used in this literature search was "Periodontitis in Patients with Crohn's Disease." Additional relevant articles were identified through manual searching of the reference lists of the selected literature.

2.2 Inclusion Criteria

The inclusion criteria for this study were as follows: articles available in full text, written in English, published as journal articles or accepted manuscripts, involving human subjects, and addressing the association between periodontitis and Crohn's disease.

2.3 Exclusion Criteria

The exclusion criteria were as follows: articles published in languages other than English, studies involving non-human subjects, and articles that were not available in full text or accessible for full review.

2.4 Quality Assessment and Data Synthesis Strategy

The analysis method was based on the relevance and compatibility of each article with the objectives of the study. Selected studies were systematically grouped according to the author's name, year of publication, research methodology, and reported findings related to periodontitis and Crohn's disease.

3 Result

Based on the results of the literature search, five studies were identified as relevant to the keywords used in this research. Based on the results of this study, four studies concluded that Crohn's disease causes a significant difference in periodontal conditions among patients. Table 1 presents the data extracted from the five studies that were identified.

4 Discussion

One study reported that Crohn's disease is associated with periodontal conditions in patients (5). In patients with Crohn's disease, the total DMFT index and DMFT scores of the dental regions were significantly higher than those of the control group (8). Patients with IBD also reported significantly poorer oral health and a greater prevalence of periodontal problems compared with controls (1). However, one of the five studies identified reported that early-stage periodontitis did not increase intestinal colonization by oral bacteria. The presence of early-stage periodontitis did not affect clinical outcomes in patients with Crohn's disease (3).

Table 1 Data Extraction

Author	Year	Research Findings
Bertl et al (1)	2021	This study employed a survey-based research method distributed online to collect information on general medical history, IBD diagnosis, and oral health status. Outcome parameters included overall dental and gingival health conditions, the presence of severe periodontitis, and tooth loss. The online questionnaire was available for a period of six months, from July 2020 to December 2020. The analysis was based on responses from 1,108 patients with IBD and 3,429 individuals in the control group. The results demonstrated that patients with IBD reported significantly poorer oral health and a higher prevalence of periodontal problems compared with the control group. Furthermore, patients with Crohn's disease showed a 91% higher likelihood of having fewer than 20 remaining teeth.
Imai et al (3)	2022	This study involved 69 patients with IBD (48 with ulcerative colitis and 21 with Crohn's disease) and individuals without IBD who were registered at Hachioji Hospital in Tokyo, Japan, with an age range of 16–39 years. Disease relapse in patients with Crohn's disease was assessed using the sCDAI score. The study analyzed saliva and fecal samples collected from 60 patients with IBD, including 42 patients with UC and 18 patients with CD. Saliva and fecal samples were collected during the same time period. The results indicated that, in patients with Crohn's disease, the gut microbiome was significantly more similar to the oral microbiome, suggesting increased intestinal colonization by oral bacteria in patients with IBD. However, early-stage periodontitis did not enhance intestinal colonization by oral bacteria. The presence of early-stage periodontitis did not affect clinical outcomes in patients with Crohn's disease. Nevertheless, early-stage periodontitis was associated with more severe clinical symptoms in some patients with Crohn's disease.
Tan et al (8)	2021	This study employed an electronic health record–based research method at the Academic Centre for Dentistry Amsterdam (ACTA). Patients with Crohn's disease (CD) or ulcerative colitis (UC) were randomly selected to participate in the study. A total of 229 patients with IBD were identified from the AxiUm database, consisting of 133 females (58%) and 96 males (42%), with a mean age of 51 ± 16 years. The DMFT (Decayed, Missing, and Filled Teeth) index was obtained from dental charts according to World Health Organization criteria. The Dutch Periodontal Screening Index (DPSI) was retrieved from the most recent examination records or the latest periodontal charts and recorded for each sextant. The results showed that the total DMFT index was significantly higher in the IBD group compared with the control group. In patients with CD, the total DMFT index and DMFT scores in the maxillary anterior, mandibular anterior, and mandibular premolar and molar regions were significantly higher than those in the control group. No significant differences in DPSI scores were observed for patients with CD or UC when compared with their respective control groups. The incidence of edentulism in patients with CD was significantly higher than that in the control group in sextants 1, 2, 3, 4, and 6.
Zhang et al (9)	2021	This study employed a research method based on a systematic literature search of the Web of Science, PubMed, and Embase databases to investigate the risk of periodontitis in patients with IBD from January 2000 to November 2020. The included articles reported the number of individuals with IBD who were diagnosed with periodontitis and compared these findings with control groups. Pooled odds ratios (ORs) and corresponding confidence intervals were calculated to evaluate the association between periodontitis and IBD. The results showed that six studies were included in the meta-analysis. The risk of periodontitis was significantly higher in patients with IBD compared with controls. Specifically, both Crohn's disease (CD) and ulcerative colitis (UC) were associated with an increased risk of periodontitis. Patients with IBD demonstrated a higher risk of periodontitis than the control group, and subgroup analyses confirmed that this increased risk remained significant when CD or UC were analyzed separately. Furthermore,

		patients with UC were found to have a higher risk of periodontitis compared with patients with CD.
Ozmeric et al (5)	2018	This study employed a research method involving a computerized MEDLINE search to identify relevant articles on IBD and periodontal disease published up to September 2016. The results indicated that periodontal microbiota play a role in the pathogenesis of Crohn's disease, with specific bacterial species such as *Fusobacterium nucleatum*, *Campylobacter rectus*, and *Campylobacter concisus* being implicated. In both IBD and periodontal disease, microbial dysbiosis should be considered a common pathogenic pathway that may influence each condition. These findings suggest that microbial etiology should be carefully considered in future research to further elucidate the shared pathogenic mechanisms underlying chronic inflammatory bowel disease and periodontal disease.

In recent years, growing evidence has suggested a bidirectional relationship between periodontitis and Crohn's disease (CD) can be inferred from the interaction between microbiota and the host immune inflammatory response, as well as genetic and environmental factors. In addition, gut microbiota dysbiosis not only contributes to the development of intestinal disorders but also induces apical periodontitis and periodontal disease. The accumulation and colonization of *Enterobacteriaceae* bacteria in the oral cavity increase patient susceptibility to colitis, which in turn is associated with an elevated risk of CD in humans. Furthermore, oral bacteria are capable of colonizing the intestinal tract of patients with Crohn's disease.

Most patients with IBD were in remission at the time oral and gut microbiome samples were collected. This finding indicates that patients with IBD tend to experience colonization by oral bacteria regardless of the presence of active disease that could disrupt the gut microbiota. Periodontitis can influence host immune activation, thereby contributing to intestinal disease. Periodontitis induces the emergence of pathogenic Th17 cells in the oral cavity. These de novo–generated pathogenic Th17 cells transmigrate to the intestinal mucosa, where they respond to ectopically colonized oral pathobionts and contribute to intestinal inflammation. Thus, it is plausible that immune cells, such as Th17 cells, arise during periodontitis and contribute to intestinal inflammation in cooperation with oral pathobionts in patients with Crohn's disease.

Crohn's disease further aggravates oral microbiota dysbiosis, thereby contributing to the development and progression of periodontitis. In patients with CD and periodontitis, saliva is enriched with *Prevotella nigrescens* and *Prevotella intermedia*, bacterial species closely associated with periodontitis. This oral microbiota dysbiosis leads to reduced tolerance of patients with CD to periodontal pathogenic bacteria. The oral microbiota plays a role in carbohydrate metabolism, amino acid metabolism, vitamin anabolism, energy metabolism, and membrane transport. Bacterial two-component systems involved in phosphate uptake in periodontitis induce microbial adaptation to changes in the host environment by regulating gene expression, as well as the maturation and transport of virulence factors. Short-chain organic acids, including butyrate, have been recognized as important metabolic markers of periodontal inflammation.

5 Conclusion

The relationship between periodontitis and Crohn's disease is a bidirectional causal association. The link between these two conditions arises from interactions between the microbiota and the host immune inflammatory response, as well as genetic and environmental factors. Gut microbiota dysbiosis can lead to the development of Crohn's disease and simultaneously increase the risk of periodontitis by inducing immune-mediated mechanisms and alterations in macromolecule metabolism within the patient's body, particularly through impairment of immune function. Therefore, it can be concluded that Crohn's disease is associated with an increased risk of periodontitis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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