CORRELATION BETWEEN ORAL HEALTH AND SOME COMMON MUCOCUTANEOUS CONDITIONS

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ABSTRACT

INTRODUCTION: It is a well-known fact that oral and general health are directly related. Numerous systemic and dermatological conditions have oral manifestation and vice versa—the oral microbiome affects the general status. It has been noted recently that dental and particularly periodontal health could be a significant modifying factor in the etiopathogenesis of various mucocutaneous conditions, such as Behçet's disease, psoriasis, lichen planus, mucous membrane pemphigoid, pemphigus, atopic dermatitis, etc.

AIM: The current review article aims to evaluate the role of oral health in the course of some common dermatological conditions, determine the correlation if there is any, and find the research gaps in the literature.

MATERIALS AND METHODS: The study is based on 88 keyword-matching articles. An electronic search using PubMed, MEDLINE, and Google Scholar databases was conducted until June 2022. We performed a meticulous analysis of the available data and gave some major guidelines for further research.

RESULTS: Oral involvement is a common feature of various mucocutaneous diseases. What is still a subject of interest is whether and how poor oral health influences the course and prognosis of these conditions. It has been suggested that chronic periodontitis could be a significant modifying factor, considering its bacterial etiology. Some authors even claim that adequate periodontal treatment could lead to remission of the skin disease.

CONCLUSION: There is strong evidence that general and oral health are closely related. Further research is still necessary to determine the exact role of periodontal status and oral hygiene in the etiopathogenesis of the above-mentioned dermatological conditions.

Keywords: *periodontitis, oral health, atopic dermatitis, Behçet's disease, psoriasis, lichen planus, mucous membrane pemphigoid, pemphigus*

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INTRODUCTION

There is a close relationship between oral status and general health. On the one hand, alterations of the oral mucosa are a common manifestation of various oral, skin, and general diseases. As Barber (1) noted back in 1927, the earliest symptoms of the majority of systemic diseases could be found on the skin and mucous membranes.

On the other hand, imbalance in the oral environment and its microbiome activates an immune response with oral and sometimes systemic reactions. Microorganisms, especially the streptococcal strains, play a crucial role in the course of numerous acute and chronic conditions. Once they start growing rapidly and increase their virulence, effects on both local and general health could be observed. The latter is a result of tissue invasion and the spread of microorganisms and their toxins through the bloodstream and lymphatic system (1).

It has been suggested recently that dental status and especially periodontal health could be a modifying factor for the course of some mucocutaneous conditions.

AIM

The present article aims to determine the correlation between oral health and some dermatological conditions, such as Beh**çet's** disease, psoriasis, atopic dermatitis, lichen planus, mucous membrane pemphigoid, and pemphigus. The review summarizes the current knowledge, identifies the research gaps in the literature, and gives recommendations for future research.

MATERIALS AND METHODS

Electronic searches using PubMed, MEDLINE, and Google Scholar were conducted up to June 2022. The articles, matching our keywords, were carefully summarized in a concise, unbiased review. Although there is some study heterogeneity, most of the data confirmed the bidirectional correlation between oral health and the clinical manifestations of the above-listed skin diseases.

RESULTS

Oral health could be directly correlated to the etiopathogenesis of some dermatological conditions. Barber (1) classified skin diseases related to oral status as follows:

1. Diseases caused by direct infection from the oral mucosa, such as impetigo contagiosa, perlèche, etc.
2. Diseases spread through the digestive tract, e.g., acne rosacea.
3. Diseases due to reduced resistance to pyogenic infections from active oral foci, e.g., some streptococcal skin conditions.
4. Diseases, caused by epidermal sensitization to toxins, such as eczema.
5. Diseases due to systemic sensitization—urticarial, angioneurotic edema.
6. Skin diseases, primarily affecting the nervous and endocrine systems—herpes zoster, alopecia areata, scleroderma, vitiligo, prurigo, Raynaud's disease.
7. Diseases caused by an inflammatory response, e.g., lupus erythematosus, erythema multiforme, erythema nodosum, etc.

The close relationship between oral hygiene, specific bacterial species, and some mucocutaneous diseases has been recently discussed and evaluated.

Periodontitis is an infectious inflammatory disease that causes progressive destruction of the tooth-supporting apparatus. Its severity is associated with dental plaque and calculus as a reservoir for bacterial colonization and can be influenced by patients' general health and lifestyle.

Inflammatory mediators, such as interleukins, tumor necrosis factor-α, and prostaglandins, are released into the circulation and cause systemic reactions (2). As a result, high C-reactive protein levels could be observed (3).

There is also a hypothesis, according to which systemic reactions could be triggered by cross-reaction between heat-shock proteins of oral microflora and human Hsp60 (4).

Behçet's disease (BD) is a chronic inflammatory condition, which involves musculoskeletal, nervous, vascular, and digestive systems, and has mucocutaneous manifestations (5–9). Recurrent oral ulcers are usually the first and most common clinical symptom. Its etiology includes genetic predisposition (HLA-B51), viral and bacterial infections, hormonal imbalance, and immune dysregulations (5–8). Several infectious agents (*Streptococcus* spp., herpes simplex virus, varicella zoster virus, cytomegalovirus, and Epstein-Barr) could trigger the clinical manifestations (10–27).

The barrier function of oral mucosa could be damaged by microbial antigens, mimicry, and cross-

reaction with tissue antigens, especially in cases of ineffective immune response (14,15,28,29).

Several articles on BD and recurrent aphthous stomatitis have proven the role of genetic predisposition in their etiopathogenesis (30,31).

Recent studies have demonstrated the strong correlation between dental and periodontal status and the course and severity of BD (32–35).

The high prevalence of tonsillitis and dental caries in patients with BD, as well as its activation by dental procedures and plaque accumulation, suggest a correlation between streptococcal strains and this condition (10–15,36,37).

Furthermore, increased oral colonization of *S. sanguis*, *S. mitis*, and *S. salivarius* has been registered in patients with BD (10,15,17,38). The antimicrobial therapy has given beneficial results on both mucocutaneous and systemic symptoms (36,39,40).

The main etiological agent for dental caries (*S. mutans*) accumulates in the oral ulcers and shows higher concentrations in male patients with a severe course of the disease (41).

Moreover, the adhesion of *S. sanguis* to the buccal mucosa has been stated to be a critical factor for the initiation of BD (6,15,16,29).

Celenligil-Nazliel et al. reported that the immune response (IgG) to several bacterial agents (*S. oralis*, *S. mutans*, *S. sanguis*, *Actinomyces viscosus*, *Prevotella intermedia*, *Eikenella corrodens*, and *Campylobacter rectus*) was weaker in BD patients, compared to the control group (42).

Behçet's disease severity is related to poor periodontal status (35) with increased plaque accumulation (32).

Though it has been suggested, still there is no strong evidence that improvement of dental and periodontal health would have a beneficial effect on both mucocutaneous and systemic manifestations (19,21–23,34,35,43).

In 2021 Mumcu G and Fortune F have stated that oral bacteria play a significant role in the initiation of BD. They suggested that the elimination of the infection and the improvement of oral health are pivotal steps in disease management (44).

The strongest correlation between poor periodontal status and chronic mucocutaneous conditions was the one observed in patients with **psoriasis** (45–49).

Both conditions show similar genetic predisposition, risk factors, and pathophysiologic mechanisms (50). Research on 60,457 female patients has demonstrated that periodontal bone loss is a significant risk factor for psoriasis (47). Furthermore, it has been demonstrated that surgical periodontal therapy successfully reduced the severity of its course (51).

The role of streptococcal infection in the course of psoriasis has already been confirmed by its improvement and even remission following tonsillectomy (52–55). A cross-reactivity between streptococcal proteins and human keratin has been considered a factor in the pathogenic mechanisms (56,57).

Numerous studies have reported a relationship between the presence of psoriasis and chronic gingival inflammation (45,46,48,49,51,57–63). Some of them (48,49,59,61) even demonstrated that psoriatic patients showed a higher number of extracted teeth. Regarding decayed and filled teeth, Fadel et al. (59) found no statistically significant difference between both groups.

Woaste et al. (50) have conducted prospective research, comparing oral health in 100 psoriatic patients and a control group of 101 nonpsoriatic individuals. The assessment was based on bleeding on probing (BOP), Community Periodontal Index, and DMFT index (D—decayed, M—missing, F—filled teeth). The results suggested that psoriatic patients have significantly worse periodontal status compared to healthy controls. A limitation for further research could be the impact that the therapy for psoriasis has on periodontal status (50, 64). On the other hand, the effect that periodontal treatment has on the course of the disease should be determined, as well.

Atopic dermatitis (AD), also referred to as **atopic eczema**, is one of the most common dermatological conditions. It has multifactorial etiology and affects people of all ages but generally develops in childhood. Atopic dermatitis has been associated with inflammation of gingival tissues and oral mucosa. The evidence, however, is not univocal and several hypotheses have been proposed.

Some studies have shown a close relationship between the above-mentioned skin condition and odontogenic infections. Igawa et al. found that 30%

of the patients in their study group, with AD resistant to the conventional therapy, had odontogenic infections (65). In addition, the authors claimed that AD resolved after dental treatment.

Furthermore, Silverberg et al. have reported a significant correlation between gingival bleeding in children and eczema with the severity of the skin condition directly related to the prevalence of bleeding.

There have been reports on chronic **purpura,** resistant to steroid therapy, which resolved after adequate dental treatment (66–68).

Some authors have stated that early exposure to bacteria (even prenatally and perinatally) influenced the innate immune system (69) and its response to different pathogens.

A strong relationship between poor periodontal status and **lichen planus (LP)** has been reported (70). Another study (71) has confirmed this connection after registration of bleeding on probing (BOP), gingival and periodontal indices in 60 patients, half of whom had oral lichen planus (OLP) and the other half were a control group.

High prevalence of some periodontal pathogens, such as *Aggregatibacter actinomycemcommitans*, *Prevotella intermedia*, *Treponema denticola*, *Porphyromonas gingivalis*, and *Tannerella forsythia* was detected in individuals with OLP (72).

Controversially, a study of 142 patients has demonstrated that despite the poor oral hygiene in patients with OLP, their periodontal health was comparable to that of healthy controls (73).

The majority of studies, however, have linked bad oral hygiene to exacerbation episodes of the disease (74). Research among the Chinese population has related the exacerbation of OLP to the following factors: diet, stress, systemic diseases, and poor oral hygiene (75). Likewise, Bajaj et al. have reported that 77 out of 95 patients with OLP have had exacerbation periods, provoked by poor dental hygiene, spicy food, and stress (76). In addition, Holmstrup et al. have reported an improvement in the condition, following dental cleansing and professional training for proper hygiene routine (77).

However, it should be noted that, since LP is a mucocutaneous disease, it is difficult to determine whether poor oral hygiene contributes to its etiopathogenesis or it is a consequence (74).

Another condition that has been correlated to periodontal health is **mucous membrane pemphigoid (MMP)** (78). The poor periodontal status could be partially explained by the presence of pemphigoid lesions. However, lesions at the gingival margin suggest their origin from plaque-associated inflammation.

More severe gingival inflammation has been registered in cases of MMP (79). In addition, greater plaque accumulation has been observed in individuals with active disease, undergoing treatment, rather than those in remission (78).

Scully et al. have reported that desquamative gingivitis, associated with MMP and OLP, showed improvement following adequate oral hygiene measures (80).

In a 5-year follow-up study, Schelick et al. evaluated the periodontal status of patients with MMP. The authors observed high gingival index scores and more gingival recessions in those patients, compared to the control group (81). However, patients with MMP did not show an increased risk of progression of the periodontal disease and it was suggested that the high index score could be due to the concomitant erythema.

Pemphigus has also been associated with poor oral health, especially periodontal indices, pocket depths, and attachment loss (82). The longer the time after the condition has been diagnosed (more than 5 years), the more severe the periodontal status registered (83).

Arduino et al. have suggested that oral care is directly correlated to the severity of the above-mentioned mucocutaneous conditions (84). A pilot study by Gambino et al. confirmed the connection between full-mouth bleeding and pemphigus scores (85).

As Jascholt et al. (86) have suggested, the correlation between periodontitis and pemphigus is bidirectional and they influence the severity of each other.

Choi et al. have emphasized the role of some bacterial agents (*Propionibacterium acnes* or *Cutibacterium acnes* according to the new classification) in both gingival inflammation and skin lesions (87). In addition, the relationship between acne vulgar-

is and the oral environment has been suggested by the successful use of saliva as a diagnostic tool for the disease. Monib et al. found that salivary levels of IL-1β and C-reactive protein were significantly higher in patients with acne (88).

DISCUSSION

The correlation between oral and general health is undisputed and the mechanisms by which oral status affects the organism as a whole have long been elucidated. The current review aims to determine the impact that dental and periodontal diseases have on some common skin disorders. Some authors have already stated that periodontitis and the oral microbiome play a crucial role in the etiopathogenesis of those conditions. In addition, it could be assumed that oral lesions and poor oral hygiene are in a vicious circle, influencing each other and leading to disease progression.

However, the studied articles cannot answer fully the following questions: Are poor oral health and periodontal disease an etiological or a modifying factor for the above-mentioned mucocutaneous disease? Could they be considered comorbidities? Which comes first—the skin or the oral manifestations and what determines the sequence? Could adequate periodontal treatment lead to remission of the disease or just reduce its severity?

To answer these questions and clarify the ambiguities, we suggest further longitudinal studies, randomized controlled trials, and meta-analyses to be conducted. The presence of possible etiological and modifying agents should be considered, and the study groups should be carefully selected. We suggest thorough clinical, microbiological, and laboratory assessment with blood and salivary tests to be performed to understand the exact mechanisms by which periodontitis and skin diseases affect each other.

CONCLUSION

The majority of articles have confirmed the correlation between poor periodontal status and some common dermatological diseases, such as Beh**çet's** disease, atopic dermatitis, psoriasis, lichen planus, pemphigus, and mucous membrane pemphigoid. The role of oral hygiene and the oral microbiome in their etiopathogenesis has been also suggested. However, we detected some research gaps that necessitate further longitudinal research and detailed analyses.

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