

## Oral Health Issues in Psoriasis: An Overview of the Literature

Research Article

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### Abstract

**Background:** Psoriasis and oral health are overlap in different ways, sometimes with complex and uncertain outcomes.

**Objective:** It is to map the knowledge about the oral health status issues for psoriasis.

**Methods:** We conducted qualitative systematic review of clinical trials literature.

**Results:** There are different issues about oral health status related to the observed outcomes. It was recovered 830 studies, 11 were able to fill partially the inclusion criteria for this review with 293.231 participants. The highest level of evidence obtained was 2 A (Randomized Clinical Trial), for the oral psoriasis arthritis forms at TMJ issue with one study. About the periodontal diseases issue was obtained the second highest level of evidence 2B (Clinical Trial Case-Control), with 10 studies.

**Limitations:** The main limitation was the lack of inclusion of unpublished studies.

**Conclusions:** For clinicians It is important consider oral implications for all psoriasis patients. Among possible issues, it is relevant to state that the conventional treatments for psoriasis are able to produce oral adverse events [75]. Periodontal diseases, seems to be related to the severity of psoriasis, because the level of evidence was only 2B, although its intrinsic mechanisms are not known. Further studies are required to state a minimum dental care protocol. In general, for better outcomes in Psoriasis, professional must adopt an assessment risk scales, such as the “physical status classification system” from the American Society of Anesthesiologists (ASA) and observe statements, such those the American Dental Association, prior to any interventions, concerning to the degree of coverage and invasiveness of each dental procedure and the risk of adverse events before, during and after the consultation for these patients.

**Keywords:** Dental Care for Chronically Disease; Drug Utilization; Psoriasis; Morbidity; Risk Factors.

### Introduction

Psoriasis is defined as an immune-mediated multiple-cause disease of genetic basis [1] and different phenotypes [2] that affects up to 8.5% of the population in the Western countries and requires careful management [3]. Among the skin chronic forms of psoriasis, those with circumscribed thick white to silver plaques, surrounded by areas redness are more common [4]. Psoriasis can spread to the elbows, knees, shins, scalp, lower back, nails, genitals, mouth and joint areas with many grades of damage, leading to the emotional consequences with negative impact in the patient's life [3, 6]. Oral cavity can reveals details about systemic health status. Oral diseases also have immune-involvement with multiple causes and can lead to local and systemic complications.

Oral care are the health treatments that people more often have performed [74]. Relying on surgical resources and increasingly advanced pharmacological therapy, these treatments can lead to the damages, even in healthy patients [4]. In some conditions, dental treatments can be invasive and for Psoriasis it can cause problems in complex ways. The oral aspects for psoriasis were not assessed with a comprehensive literature review and accurate inferences are possible only if a previous systematic analysis of risk factors was done [5].

### Methods

In order to map the knowledge, according the Health Based Evi-

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dence criteria, a P.I.C.O.T. question was made, “Which are the oral issues for psoriasis? It was observed different issues concerning the theme:

## 1. Issues related to the pathogenesis of Psoriasis

- 1.1. Oral findings in psoriasis.
- 1.2. Oral psoriasis arthritis at temporomandibular joint (TMJ).

## 2. Issues related to the clinical implications due Psoriasis

- 2.1. Periodontal diseases related to the psoriasis.
- 2.2. Conventional treatments and oral outcomes.
  - 2.2.1. Inducing oral adverse outcomes.
  - 2.2.2. Worsening oral adverse outcomes.
  - 2.2.3. Inducing oral favorable outcomes.
- 2.3. Conventional treatments for diseases related to psoriasis inducing oral adverse events.
  - 2.3.1. For Prior Morbidities related to psoriasis.
  - 2.3.2. For Co Morbidities related to psoriasis.
  - 2.3.3. For Post Morbidities related to psoriasis.
- 2.4. Dental treatments and psoriasis:
  - 2.4.1. Inducing systemic favorable outcomes to psoriasis.
  - 2.4.2. Triggering systemic psoriasis.
  - 2.4.3. Worsening psoriasis.
- 2.5. Oral risk factors able to induce exacerbation to psoriasis.

It was conducted a systematic review in accordance to the Cochrane Collaboration for Qualitative Research Group (CCQR; Bangor University, Wales, UK) [8] within the Evidence-Based Health Program model at the service (GEPSES) Grupo de Estudos e Pesquisas Saúde Oral e Sistêmica Baseada em Evidências, Ambulatório Multidisciplinar Psoríase I Departamento Dermatologia, Escola Paulista de Medicina Unifesp in São Paulo, Brazil, and received ethics committee approval from the Ministry of Health of Republic of Brazil. Its prior protocol project was structured based on PRISMA (Preferred reporting items for systematic reviews and meta-analyses). For the assessment of the risk of bias of each included study was used using the criteria described in the Cochrane Handbook for Systematic Reviews of Interventions [8, 9] according to the following domains:

1. Random sequence generation (selection bias);
2. Allocation concealment (selection bias);
3. Blinding of participants and personnel (performance bias);
4. Blinding of outcome assessment (detection bias);
5. Incomplete outcome data (attrition bias);
6. Selective reporting (reporting bias);
7. Other bias (other sources of bias related to a particular trial design, e.g. cross-over or cluster-randomized, or specific circumstances, e.g. interventions mixed).

Each of the items is judged as low risk of bias, high risk of bias or unclear risk of bias, for included studies [9]. (Table 2)

The assessment of methodological quality was done according

the Consolidated Standards of Reporting Trials CONSORT statements [7], and was applied Appendix B Criteria Used in Quality Assessment of Non-Randomized Studies Scale [10]. Amstar Scale for systematic reviews and Higgins domains tools scale [9], were used for assessment of the methodological quality and for risk of bias, respectively. (TABLE 3)

The study also was submitted to the register at International Prospective Register of Systematic Reviews PROSPERO, University of York/UK. The search included both randomized controlled trials and controlled trials that investigated dental improvement of psoriasis as the primary end point without limit for either date of publication or language.

We used the following databases as source up to 28 May 2015: Cochrane Skin Group Specialized Register; Cochrane Central Register of Controlled Trials (CENTRAL) 2014, Issue 5; MEDLINE from 1946 (via Pubmed); Embase from 1974; CINAHL (Cumulative Index to Nursing and Allied Health Literature) from 1981; Salford Database of Psoriasis trials; ISI Web of Science; HealthSTAR; LILACS (Literatura Latino-Americana e do Caribe em Ciências da Saúde); IBECS (Índice Bibliográfico Español en Ciencias de la Salud) and hand search at Unifesp Library. The search strategy for MEDLINE can be seen in Box 1.

We aimed to identify all relevant Randomized Clinical Trials and other studies regardless of language or publication status (published, unpublished, in press, or in progress). The studies retrieved were assessed for eligibility by reading the title and abstract. All eligible studies were read in full text in the evaluation for inclusion. Both the process of assessing eligibility for the inclusion of studies was performed by two independent evaluators regarding the validity, content and disagreements were consensus resolved. The extraction of data from selected studies was based on the standard Cochrane Collaboration data extraction forms modified to meet the needs of the present review.

## Results

According to PRISMA statement the flow of information through the different phases of a systematic review concerning the identification, screening, eligibility and inclusion of studies was made [11]. (Table 1)

There are different issues about oral health status related to the observed outcomes. None of included studies was able to answer PICO question completely. It was recovered 2085 studies, 11 were able to fill partially the inclusion criteria for this review despite 293.231 participants (Table 2).

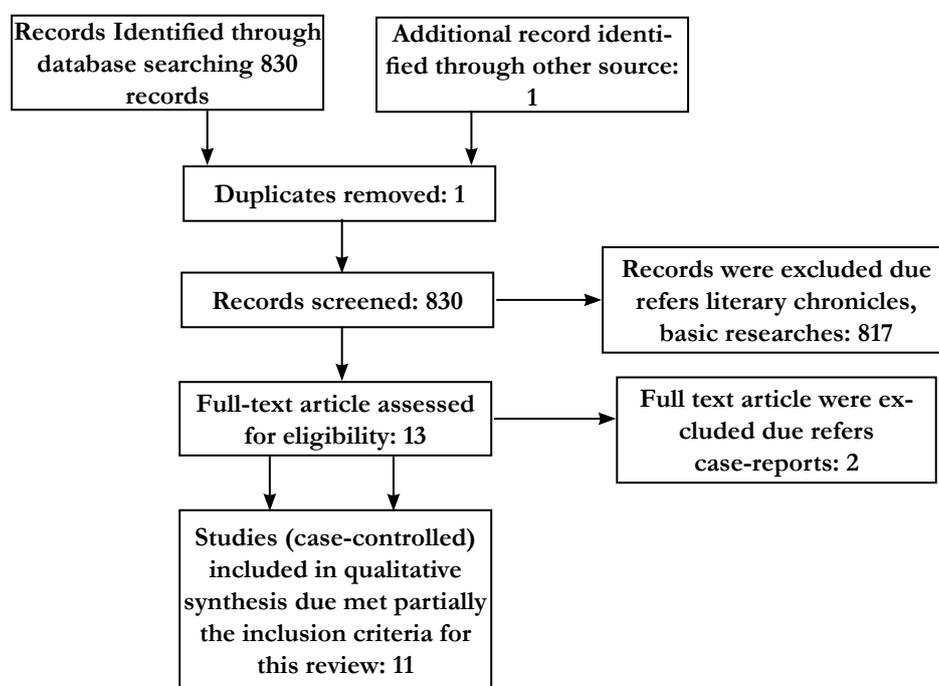
The highest level of evidence obtained was 2 A (Randomized Clinical Trial), for the oral psoriatic arthritis forms at TMJ issue with one study. About the periodontal diseases issue was obtained the second highest level of evidence 2B (Clinical Trial Case-Control), with 10 studies. The concordance rate between evaluators was 98% [12]. Under these circumstances, and due the practical relevance of the theme, it was performed a qualitative analysis of included studies [10].

The strengths of the present study were in the broad literature search, explicit methods, selection and evaluation of duplicate

Box 1.

#1	“Psoriasis” [Mesh] OR “Psoriasis” [Text Word] OR “Pustulosis of Palms and Soles” [Text Word] OR “Pustulosis Palmaris et Plantaris” [Text Word] OR “Palmoplantaris Pustulosis” [Text Word] OR “Pustular Psoriasis of Palms and Soles” [Text Word] OR “Arthritis, Psoriatic” [Mesh] OR “Psoriatic Arthritis” [Text Word] OR “Psoriasis Arthropathica” [Text Word] OR “Psoriasis, Arthritic” [Text Word] OR “Arthritic Psoriasis” [Text Word] OR “Psoriasis, Arthritis” [Text Word] OR “Glossitis, Benign Migratory” [Mesh] OR “Benign Migratory Glossitis” [Text Word] OR “Migratory Glossitis, Benign” [Text Word] OR “Tongue, Fissured” [Text Word] OR “Glossitis Areata Exfoliativa” [Text Word] OR “Geographic Tongue” [Text Word] OR “Stomatitis Areata Migrans” [Text Word]
#2	“Oral Health” [Mesh] OR “Dentistry” [Mesh] OR “Tongue” [Mesh] OR “Tongue, Fissured” [Mesh] OR “Fissured Tongue” [Text Word] OR “Fissured Tongues” [Text Word] OR “Tongues, Fissured” [Text Word] OR “Lingua Plicata” [Text Word] OR “Scrotal Tongue” [Text Word] OR “Tongue, Furrowed” [Text Word] OR “Furrowed Tongue” [Text Word] OR “Furrowed Tongues” [Text Word] OR “Tongues, Furrowed” [Text Word] OR “Tongues, Fissure” [Text Word] OR “Stomatitis” [Mesh] OR “Stomatitides” [Text Word] OR “Oral Mucositis” [Text Word] OR “Mucosities, Oral” [Text Word] OR “Oral Mucosities” [Text Word] OR “Oromucositis” [Text Word] OR “Oromucosities” [Text Word] OR “Mucositis, Oral” [Text Word]
#3	Rct OR Cct OR Random
#4	#1 AND #2 AND #3

Table 1. Prisma FLOW.



studies, assessment of the methodological quality of the included studies, summaries of the findings. The retrieved studies varied widely in many aspects. The main limitations of present review were due to the lack of inclusion of unpublished studies and due to sparse studies with poor methodological quality which did not allow us to make any statistical analysis, nor measure of treatment effect, the impossibility to state any unit of analysis issues, nor subgroup analysis and investigation of heterogeneity either, even it was not available to consider the P value for each assessed study. Additional points; the limitations of the review were to show how to avoid these limitations, or make them less likely to influence the results. It was not possible to establish any comparison of results with the existing literature as this did not exist. However, it would be interesting to compare dental health studies in other systemic autoimmune diseases (lupus, for example) or chronic skin (vitiligo, for example) but also no such studies were found. In order to allow a comprehensive mapping of knowledge it were stated

issues but at practices all these different clinical conditions often overlap resulting in the complex observed outcomes. No study had high enough methodological standards to be able to permit the establishment a cause-effect relationship between the conditions. About the issues, only one of those had 10 studies which was able to fill partially the inclusion criteria for this review. The methodological quality and risk of bias were assessed by APPENDIX B scale and Higgins domains tools, respectively.

Discussion

Psoriasis and oral health status can influence themselves reciprocally with relevance for observed outcomes.

1. Issues Related to the Pathogenesis of Psoriasis: It Means That Present Issues are the Oral Manifestations of Disease

Table 2. APPENDIX B. Criteria Used in Quality Assessment of Non-Randomized Studies.

Study	Participants	Outcomes assessed and reported	Measurement same for all subjects	Confounding controlled	Interventions
Preus 2010	155 Psoriasis / 155 Control	Yes	Yes	No	Yes
Keller 2012	115 365 Psoriasis / 115 365 Control	Yes	Yes	No	Yes
Lazidouou 2013	100 Psoriasis /100 Control	Yes	Yes	No	Yes
Nakib S et al., 2013	60,457 women	Yes	Yes	Yes	Yes
Antal M et al., 2014	82 psoriasis patients and 89 controls	Yes	Yes	Yes	No
Sharma et al., 2015	33 psoriasis patients and 35 healthy controls	Yes	Yes	Yes	Yes
Fadel 2013	85 Psoriasis /54 Control	Yes	Yes	No	Yes
Rahul et al., 2011	100 patients, 50 with CP and 50 with psoriasis	Yes	Yes	Yes	Yes
Üstün 2013	51 Psoriasis / 51 Control	Yes	Yes	No	Yes
Skudutyte-Rysstad 2014	50 Psoriasis/ 121 Control	Yes	Yes	No	Yes

**1.1. Oral findings in psoriasis:** Although it is found different types of oral lesions related to psoriasis (whitish minimum round or oval zones, when scraped to leave the mucous surface bloody [17]); (surrounded whitish plaque reddened similar to psoriasis skin lesions [17]); (bright red mucosal lesions). Often they are in pustular psoriasis forms, erythrodermic psoriasis and Reiter's syndrome [17] as well.

Benign migration glossitis or geographic tongue (G.T) and stomatitis are at a migration [17, 36, 51, 52] (SAM), have more published studies and are psoriasis.

(G.T.) is one the most prevalent [89, 95, 97] and is an oral lesion that affects adults and children [98]. It is a benign inflammatory disorder at the dorsum and margins of the tongue where occurs the replacement the filiform papilla epithelium to irregular central erythematous patches surrounded by elevated whitish band-like border. The lesions are able to change the location, size, and pattern over a period of time, and may spontaneously exhibit periods of remission and exacerbation, with generally good prognosis. (G.T.) sometimes causes pain and burning sensation and poor response to ordinary remedies [90].

Often (G.T.) and (S.A.M.) are clinical findings with few understanding, and there is not yet consensus between authors [121], about many aspects of pathogenesis, despite already is known that both lesions share histological similarities to psoriasis [17, 66, 67]. Under these circumstances (G.T.) and (S.A.M.) is important to be stated these lesions are psoriasis, including, sometimes they can overlap with other genetic diseases and to be present in different clinical conditions [87, 93, 96, 123] and syndromes [85, 86, 88, 92, 94], where this oral psoriasis forms must to be faced as comorbidities [17]. In a time line, there are reports about (G.T. and S.A.M.) were induced by anti-cancer therapies when the drugs were used for the treatment of psoriasis systemic [75, 76].

In other hand, there is a report about anti psoriatic therapy with etretinate that was observed a remarkable regression in the (G.T.) [75] suggesting the (G.T.) is a typical symptom of psoriasis pustulosa generalisata [75].

**1.2. Oral psoriasis arthritis forms at temporomandibular joint:** Reports about the existence of manifestation of psoriasis arthritis in the temporomandibular joint (TMJ) including imaging features, and TMJ anquilosis for both gender, in different ethnics, and ages [54, 55, 99-111].

A cross-sectional survey randomly selected sample of 690 elderly people in Africa to assess oral mucosal lesions and temporomandibular joint impairment, and (22.46%) had one or more oral pathology lesions, representing infection-related swelling, non-infection-related swelling, pre-malignant lesions, denture stomatitis, non denture based ulcers, angular cheilitis, geographic tongue, scrotal tongue, lichen planus, hyper-pigmentation and TMJ impairment [101]. There are reports about well successful surgical approaches for the TMJ disorders in the psoriatic arthritis [103], Although one recovered study stated to be randomized, for the issue psoriasis at TMJ, it was not possible assess completely the criteria high level of biases.

## 2. Issues related to the clinical implications due the psoriasis:

It means when the disease are able to induce oral manifestations and oral health status are able to lead psoriasis at different outcomes.

**2.1. Periodontal diseases related to the psoriasis:** No study was able to state which disease came first. The scope of present study was to assess the possibility that the periodontal disease can to contribute to inducing or worsening psoriasis lesions [126].

The global prevalence of dental diseases is high. Some between 4% to 12% adults in U.S.A. are affected with advanced periodontitis [58]. Evidence shows that psoriasis has multi factor origins, with the coexistence of underlying endogenous factors to its onset, in both, for triggering and for exacerbation, like skin trauma [46] (physical, pharmacological, electrical, surgical), successive upper respiratory tract infections [47], improper bowel, liver functions, inadequate nutrition, metabolic, immune disorders [84] and periodontal diseases [6, 43, 44, 48-50, 78, 83].

Emotional distress, is one of most important risk factor related to Psoriasis because affects the disease in many ways. The implications with periodontal diseases are because often psoriasis patient under negative emotional influences living including periods in which there is a decrease of personal care including proper oral hygiene [37]. It leads to the oral dysbiosis that made the Psoriasis worse [126].

One study compared the prevalence of periodontitis and alveolar bone loss among individuals with skin forms psoriasis and a group of randomly selected controls showed the prevalence of moderate and severe periodontitis was significantly higher among psoriasis (24%) when compared to healthy controls (10%). Psoriasis had significantly more missing teeth and more areas with plaque and bleeding on probing, and 36% of psoriasis cases had one or more sites with radiographic bone loss  $\geq 3$  mm, compared to 13% of controls [44].

One study with 51 patients recommended that periodontal evaluation is important in psoriatic arthritis [6]. Including there is a study about non-plaque-related mucocutaneous disorders related to the chronic diseases, a special form of psoriasis in gums defined as desquamative gingivitis [91].

## **2.2. Conventional treatments for psoriasis inducing oral outcomes.**

**2.2.1. Inducing oral adverse outcomes:** Drugs used to treat psoriasis conventionally are able to be related to the systemic or oral adverse events [13, 14]. No reports about use of topical treatments for psoriasis inducing oral adverse events. There are reports about the use of systemic drugs e.g. retinoids, cyclosporine, vitamin D, and acitretine that are able to produce oral adverse events of light-to-mild severity, e.g., cheilitis, blisters, xerostomia, dental calculus, gingival hyperplasia, concussions, teeth loss or implants loss [4, 15-20].

There is a report of mild to severe primary adverse events, related anti-EGFR-induced mucositis, BRAF-inhibitor-associated hyperkeratosis, osteonecrosis of the jaw observed, (G.T.) (S.A.M.) induced by angiogenesis inhibitors, and other oral lesions of psoriasis specifically linked with imatinib [75]. Report about mucositis due the use of other antineoplastic drugs (e.g. methotrexate) 16 and other substances as bevacizumab [14, 76], but its impact on observed outcomes, and repercussions about costs or quality of life on psoriasis are still unclear [17, 18, 20, 75, 77].

**2.2.2. Worsening oral adverse outcomes:** There is reports about IgA deficiency and opportunistic infections such as herpes labialis, oral candidiasis, folliculitis induced anti-TNF- $\alpha$  treatment in a psoriatic arthritis patient. It also was observed previous lo-

cal risk factors, such as (G.T.), (S.A.M.), (F.T.) and oral dysbiosis overlapped for observed outcomes [79-81]. In a time line, there are reports about (G.T. and S.A.M.) were induced by anti-cancer therapies when the drugs were used for the treatment of psoriasis systemic [75, 76].

**2.2.3. Inducing oral favorable outcomes:** There is a case report about a 7-year-old female patient with generalized pustular psoriasis associated with (G.T.) and anti psoriatic therapy with etretinate that caused a remarkable regression in the tongue lesions [75], suggesting the (G.T.) is a typical symptom of psoriasis pustulosa generalisata [75].

## **2.3. Conventional treatments for diseases related to the psoriasis inducing adverse oral outcomes:**

The scope is not to assess the impact of medications in Dentistry but is relevant to consider the dental issues for drugs used in management of diseases related to the psoriasis, due the potential risk factors can stratify, resulting in adverse outcomes.

In a temporal perspective, it is possible to assess diseases related to psoriasis and its treatments, such as previous, simultaneous and subsequent clinical events to the appearance of skin lesions [17, 28].

**2.3.1. For Prior Morbidities related to the psoriasis:** There are many clinical conditions able to promotes Psoriasis, such hormonal changes [29], chronic inflammation [30], respiratory-tract infections [31], intense emotional distress [32, 37], metabolic syndrome [26, 33], hypertension [34], circulatory diseases [35], recurrent skin infections [17] and mucous diseases [36] and their treatments are among the triggers to the diseases that could be consider prior morbidities in psoriasis [38] because often are overlap with it. Many of these diseases require drugs (e.g. anticoagulants) that are able to produce oral cavity impairment [112] as bleeding. Also drugs used for management chronic illness also can overlap with dental procedures [22] and lead to oral adverse outcomes. Some times these events produce distress in many aspects able enough to result in a new case of Psoriasis as primary outcome [3, 24, 25].

**2.3.2. For Co morbidities related to the psoriasis:** Different uncontrolled clinical conditions can lead to psoriasis, with simultaneous occurrence of the skin lesions [17]. Once the skin lesions, the more out of control are listed above clinical conditions, the greater the chances of occurrence of overlap syndrome. Among the more prevalent comorbidities, gums diseases [28] is one more prevalent and are also related with motivational level concerning self-care patient [126]. An important aspect is regarding mental health issues of psoriasis [32], There are studies related to anxiety disorders occurrence simultaneous to skin lesions (e.g. phobias, panic, generalized anxiety, post-traumatic stress, acute anxiety, attention-deficit, hyperactivity) [37] and dental anxiety [39] as well. Many of these, often requires drugs for control (e.g. lithium) [27] used as co-intervention and able to generate skin unfavorable outcomes [39]. For the management of these problems, there are no pharmacological resources for psoriasis [37].

**2.3.3. For Post Morbidities related to the psoriasis:** Reports about post-morbidities psoriasis and its treatments demonstrated that can produce systemic problems and oral insults. Neural psy-

chiatric disorders, (e.g. mood disorders) [39] alcoholism can lead to damage e.g. hepatitis, cirrhosis, changes in liver function [40] and oral lesions as well, e.g. accumulation of dental plaque, oral dysbiosis and coated tongue, that lead to dental decay, periodontal diseases and tooth loss [33, 36]. The treatments for these diseases usually require many drugs, which can overlap and worsen oral health status, and aggravating psoriasis and even reducing life expectancy [2, 4, 24, 27, 33, 36].

For instance, the administration and discontinuation of systemic corticosteroids may result in worsen of the skin condition, even lead to the development of a severe form of psoriasis e.g. generalized pustular psoriasis which can also be triggered by hypocalcemia, which also affects mouth [17]. Anticonvulsants that affect oral health and can worsen psoriasis [113].

**2.4. Dental treatments and psoriasis:**

**2.4.1. Inducing systemic favourable outcomes to the psoriasis:** There are reports about improvement in skin forms of psoriasis after adequate dental treatments [22, 46, 80, 126](Table 3).

**2.4.2. Triggering the systemic psoriasis:** There is oral dysfunctional interaction between psoriasis and some dental treatments or some substances for dental use [36]. There is a case report specific about dental infection as trigger factor in palmo-plantar psoriasis [5]. It is known that many products used in dentistry, have the composition, chemicals that can lead to frames contact stomatitis, after use, even in people without skin diseases, which already can be considered as an additional risk factor, like acrylic restorations can worsen psoriasis [42].

**2.4.3. Worsening the psoriasis:** There are additional reports about important adverse events relating the worsening of psoriasis to local and systemic adverse outcomes such as dermatologic exacerbation after stressful dental procedures e.g. endodontics procedures, dental implant placement, or failures in dental care planning, that can act as a ‘trigger’ in psoriasis patients or about worsening outcomes e.g. some acrylic dental restorations [28, 43]. The level of evidence for oral implant therapy in patients with systemic conditions is very low [127].

**2.5. Other oral risk factors able to induce exacerbation to the psoriasis:** There are many clinical conditions with the possibility

**Table 3. Assessment Included Studies Characteristics.**

Study	N	Design	Oral disease	Life Style	Outcome	Higgins Domains Tools
Preus 2010	155 Psoriasis / 155 Control	Case-control	Alveolar bone loss on bite-wing x rays	Not cited	Psoriatic patients had more bone loss and loss of teeth compared to controls	High level bias
Rahul et al., 2011	100 patients, 50 with CP and 50 with psoriasis	Cross-sectional	Probing pocket depth(PPD), clinical attachment loss (CAL)and alveolar bone loss	Not cited	Prevalence of periodontitis is higher in psoriasis subjects as compared to controls	High level bias
Keller JJ et al., 2012	115 365 Psoriasis / 115 365 Control	Cohort	Probing pocket depth and clinical attachment loss	Not cited	Increased risk for psoriasis among patients with CPD	High level bias
Lazidouou 2013	100 Psoriasis / 100 Control	Case-control	Probing pocket depth, and other indices	Active smoking status	Periodontitis may be associated with psoriasis	High level bias
Üstün 2013	51 Psoriasis / 51 Control	Case-Control	Probing pocket depth, and other indices	Not cited	Periodontitis may be associated with psoriasis	High level bias
Nakib S et al., 2013	60,457 women	Cohort	Self-reported alveolar bone loss, loss of teeth	Not cited	Periodontal bone loss may increase risk of subsequent psoriasis	High level bias
Fadel HT et al., 2013	89 psoriasis / 54 controls	Case-control	Probing pocket depth, Bleeding on probing and alveolar bone level	Not cited	No difference in periodontal profiles, though psoriatic pt's had few teeth remaining.	High level bias
Skudutyte-Rysstad 2014	60 patients with psoriasis and 120 healthy controls	Cross-sectional	Probing pocket depth(PPD), clinical attachment loss(CAL)and alveolar bone loss	Not cited	Periodontitis more common in moderate/ severe psoriasis compared to controls	High level bias
Antal M et al., 2014	82 psoriasis patients and 89 controls	Case-control	Bleeding on probing, clinical attachment level and probing depth	Active smoking status	Risk of severe periodontal disease in psoriasis was six times higher in smokers than in nonsmokers.	High level bias
Sharma et al., 2015	33 psoriasis patients and 35 healthy controls	Case-control	Probing pocket depth(PPD), clinical attachment loss (CAL)and alveolar bone loss	Not cited	Psoriasis patients had poor periodontal status compared to controls	High level bias

to become oral risk for the universe of mouth diseases. The scope was to assess its impact only on oral issues when related to the exacerbations of psoriasis.

At this scenario, some oral structures e.g. (F.T.), coated tongue (C.T.), teeth edges, dental decays can overlap with local environmental factors e.g. oral dysbiosis [36, 53] and produce unfavorable outcomes.

(F.T.) also known as scrotal tongue, lingua plicata, plicated tongue and furrowed tongue is a benign condition, considered a slight variation of the normal pattern [17], related to genetic inheritance, is one of most frequent malformation of the tongue, where the deep crypts (fissures) are observed on the dorsum of the tongue. Although these grooves may look unsettling, the condition is usually painless. Some individuals may complain of an associated burning sensation [17, 81].

It is a relatively common condition, with a prevalence of between 6.8% to 11% found among children [121, 125]. The prevalence of the condition increases significantly with age, occurring in 40% of the population after the age of 40 [28]. Thus, (F.T.) appears in different clinical conditions, and some syndromes, and it can stratify with other risks factors such as dysfunctional nutrition, inflammatory processes and mycosis that allows the worsening not only psoriasis [36, 51, 68, 69-71], but several other conditions that is one of the most prevalent sign, like in Melkersson-Rosenthal syndrome (along with facial nerve paralysis and granulomatous cheilitis). It is also seen in most patients with Down syndrome, in association with geographic tongue, in patients with oral manifestations of psoriasis, and in healthy individuals. Fissured tongue is also sometimes a feature of Cowden's syndrome [71].

In some circumstances (F.T.) can overlap with oral dysbiosis resulting in halitosis, and so, it is important to give instructions to the patients for mechanical tongue cleansing in the oral hygiene routine. Since (F.T.) is entirely benign, no other treatment is indicated and the patient should be reassured that it is a common variance of the normal appearance of the tongue [81, 114, 117].

(C.T.) coated or white tongue occurs when the surface is colonized by bacteria or fungi, and dead cells become trapped between the small structures on the tongue surface.

About tongue lesions a study in India with 4926 patients examined students for two 2 years, and demonstrated that its prevalence is about 12.07%, and among the most common lesion diagnosed was (C.T.) affecting 28.0% of the subjects, followed by (G.T.) 16.4%, (F.T.) 14.9% and hairy tongue (H.T.) 11.5%. Males were more frequently affected than females. The most common systemic condition observed in the patients with tongue lesions was anaemia (189), followed by hypertension (47) and diabetes mellitus (38) [93, 96].

A study compared the prevalence of GT/FT and the correlation between tongue lesions and psoriasis severity using the PASI. 348 psoriasis and 348 healthy controls were selected. According to the age of psoriasis onset, the individuals were classified as having early psoriasis and late psoriasis. The severity of psoriasis was determined according to PASI. There is association between psoriasis intensity and GT and GT is associated with disease severity and may be a marker of the psoriasis severity [97].

The study of Dafar et al., [120] identified an association between GT and anti-hypertensive medications, as well as the use of Swedish snus. Non-referred patients with GT (GTgp; n = 130) and FT (FTgp; n = 62) were examined by general practitioners (gp) and compared to a control group without oral mucosal lesions (C; n = 1029). Referred patients with GT (GTs; n = 166) and FT (FTs; n = 15) were examined by oral medicine specialists (s) and compared to GTgp and FTgp. Statistical analyses were performed using unpaired *t*-test or Fisher's exact test. A multiple logistic regression model was developed to control for age and gender as confounders.

GT group patients used more anti-hypertensive medications and Swedish snus ( $p < 0.01$ ). The GTgp group consisted of older males ( $p < 0.001$ ) compared to C. Compared to the GTgp group, the GTs group was younger, more likely to have symptomatic lesions ( $p < 0.0001$ ) and comprised of more females. Among the groups examined, FT patients had the highest mean age. It also found differences in the activities and symptoms of the lesions between referred patients and their counterparts of controls who were seen in general dental practice; these parameters influenced the results when these conditions were taken into account.

The study of Al-Maweri et al., [122] about prevalence of Oral Mucosa Lesions (OML) in 310 elderly people in Yemen indicated the most frequently observed lesions were fissured tongue (34.2%), benign tumors (17.1%), hairy tongue (16.5%), and qat-induced white lesions (12.6%). Hairy tongue, qat-induced white lesions, and shammah keratosis were associated with men ( $P < 0.01$ ,  $P < 0.05$ , and  $P < 0.05$ , respectively), whereas geographic tongue was associated with women ( $P < 0.05$ ). The presence of one or more lesions was significantly associated with low education level ( $P < 0.05$ ). Certain OMLs showed a significant association with smoking and qat chewing ( $P < 0.05$ ). No association was found between the occurrence of OMLs and denture wearing ( $P > 0.05$ ).

The study of Pavelic et al., [124] to identify genetic changes that may be the early hallmarks of epithelial cell over proliferation, was searched for p53 and nm23-H1 allelic deletions in oral benign epithelial lesions. In the study group were 25 benign epithelial lesions (lichen planus--17; leukoplakia--8; recurrent aphthous ulcers--2; one specimen diagnosed as benign migratory glossitis). Among 21 samples analysed for exon 4 (p53 gene) LOH, only 6 were informative, with no loss of either allele. Of 23 samples tested for LOH at intron 6 of p53 gene, 8 were informative, again with no presence of LOH. For nm23-H1 gene, the analysis was performed on a total of 24 cases. Of them, 16 were informative, however, none exhibited LOH at this locus. In conclusion, whereas the presence of gross gene alterations (LOH) would have been definitive evidence for the involvement of p53 and/or nm23 in the hyper proliferation process, the absence of LOH does not exclude the presence of either smaller mutations, altered regulation of normal gene, or dysfunction at the level of wild type protein. Alternatively, p53 and nm23-H1 may have no relation to oral lesion formation, and cannot presently be considered as an early step in benign, tissue transformation.

## Conclusions

For clinicians, It is important consider oral implications for all psoriasis patients. Despite the detailed search performed, among

10 selected, no study had high enough methodological standards that could permit establishing a cause-effect relationship between these variables, but the possibility of an association between psoriasis and oral health is known [56]. It is known that dental diseases can influence the individual's overall health, but in psoriasis its influence can generate complex, intricate, and uncertain outcomes [48, 50, 57].

Even not performing the analysis of the intrinsic mechanism of the phenomena, it is known that some factors, such as, the periodontal disease microbiota may aggravate or predispose to systemic diseases [59]. It is known that the lack of control of hygiene can lead into infection of the respiratory tract, especially in patients with some comorbidities, like diabetes which can result in cardiovascular diseases (CVD), frequent in psoriasis [19, 24, 49, 58, 60, 61].

Postmortem studies from cardiovascular diseases patients demonstrate the similarity among microbiota dental bio-films from periodontal disease and those found in the large arteries of atherosclerotic plaques, inclusive, a clinical condition highly prevalent in psoriasis [31, 49, 57, 63].

There are reports about periodontitis and chronic plaque psoriasis [3, 28, 44, 47, 64, 65] and other clinical conditions associated, including one study related the jaw bone loss in patients with moderate to severe psoriasis and periodontal disease is greater than the average bone loss in patient clinically similar conditions, but without periodontal disease [43, 126]. According the results it

is important that further studies should enhance the main aspects of methodological quality and randomized clinical trials with good quality of evidence need to be conducted to ensure that this scenario is adequately evaluated [125]. For the practice, regarding the diagnosis, treatment and control, will give better outcomes than we have be seen today [73].

The adoption of ASA physical status classification system from American Society of Anesthesiologists for assessment clinical risks should be adopted by professionals prior any dental interventions in psoriasis [74, 126] (Table 4).

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**Table 4. American Society of Anesthesiologists (ASA) Scale.**

Scale	Characteristics of individuals or patients
ASA 1	Healthy individuals without systemic disease
ASA 2	Individuals with mild-to-moderate systemic disease
ASA 3	Patients with severe systemic disease, with limited or altered although not disabling activity
ASA 4	Patients with severe systemic disabling disease and constant risk of death
ASA 5	Patients terminally ill
ASA 6	Patient in a state of brain death, with potential organ donor

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