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Association of psoriasis and periodontitis in the north Indian population

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ABSTRACT

Background: Psoriasis is a chronic, non-communicable condition of the skin with an immune-mediated etiology. Periodontitis is a chronic inflammatory disease of the tooth-supporting tissues and is now recognized as an established risk factor for various systemic diseases. The present observational study aims to assess the prevalence of periodontitis and its related indices in individuals with psoriasis and to compare them with individuals without psoriasis. A cross-sectional case-control study was performed in a hospital setting, including 200 diagnosed cases of psoriasis and 200 age- and sex-matched healthy controls.

Methods: The case group included patients diagnosed with psoriasis (defined as ICD-10 L40.0-L40.9) by a trained dermatologist. Controls included age- and sex-matched healthy individuals. After history-taking, a detailed dermatological and periodontal examination was done for all the enrolled subjects. The results were statistically analyzed using SPSS software.

Results: The study group had a significantly higher mean GI, PI, PPD and CAL in comparison to the controls. Psoriasis patients had significantly greater scores for GI and PI (1.68 ± 0.61 and 1.57 ± 0.54, respectively) as compared to controls (1.48 ± 0.56 and 1.39 ± 0.60, respectively). Periodontitis was also found to be more prevalent among the cases. Stage II and Stage III periodontitis were found in 41.0 % of cases and 30.5 % of controls, while 12.5 % of cases and 6.0 % of controls had stage IV periodontitis. This difference was statistically significant.

Conclusion: An association between psoriasis and periodontitis was found in the present study, as the individuals with psoriasis had a higher severity and prevalence of periodontitis.

1. Introduction

Psoriasis is a T-cell mediated, chronic inflammatory multi-system disease, predominantly having manifestations in the skin and joints, and approximately 0.4–4% of the general population is affected by it.[1] It is characterized by the presence of scaly, red, and well-circumscribed skin plaques as a result of hyperproliferation of keratinocytes, inflammatory cell infiltration, angiogenesis, and vasculogenesis.[2] Additionally, psoriasis may affect nails and joints. Th-1 cells, Th-17 cells, and inflammatory cytokines play a cardinal role in its pathogenesis, and psoriasis is now regarded as a systemic disease.[3]

Psoriasis being a systemic disease, affects the general well-being and quality of life of the individuals affected by the disease. The damaging effects of psoriasis are not limited to its cutaneous manifestation and psychosocial distress. Recently, psoriasis has been associated with multiple comorbidities. It has been found through various observational studies that psoriasis is linked with cardiovascular disease, metabolic syndrome (MS), cancer, pulmonary diseases, mental health issues, inflammatory disease of the gastrointestinal tract, and osteoporosis.[4]

Periodontitis is a chronic inflammatory disease destructively affecting the tooth-supporting tissues.[5] The interactions between the causative pathogens and the host immune response play an important role in its pathogenesis. Periodontitis is clinically manifested as periodontal pocket formation, bleeding gums, clinical connective tissue attachment loss, mobility of teeth, and destruction of alveolar bone, as visible on radiographic examination. The prevalence of periodontal disease among adults in India is 51 %.[6] The relationship of periodontitis with various immune-mediated inflammatory diseases, like chronic obstructive pulmonary disease (COPD),[7] chronic diseases affecting kidneys,[8] and rheumatoid arthritis[9] has been attributed to the interrelationships between periodontal pathogens and the immune responses of the host.

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The relationship between psoriasis and periodontitis has also been investigated. Psoriasis and periodontitis both involve an exaggerated and extended immune response. Smoking, diabetes mellitus, and obesity are the common risk factors for both of these conditions. Certain studies have concluded that patients with psoriasis, especially those affected by severe psoriasis and psoriatic arthritis, have an increased risk of periodontitis compared with healthy controls.[10–15] Additionally, a meta-analysis concluded that patients with periodontitis pose significantly higher chances for psoriasis.[16] Several studies reported that gingivitis and periodontitis are more prevalent in psoriasis-affected individuals compared with controls, but the significance threshold could not be achieved.[15,17]

A higher incidence of periodontitis in psoriasis patients poses an important effect on their overall health and quality of life. The present study was conducted for additional clarification on the potential association between periodontitis and psoriasis in the north Indian population. Hence, this study aims to assess the prevalence of periodontitis and its related indices in individuals with psoriasis in comparison to individuals without psoriasis.

2. Materials and methods

This was an observational, cross-sectional case-control study conducted in a hospital setting. The study participants included 200 diagnosed cases of psoriasis and 200 age- and sex-matched healthy controls. The sample size was calculated, expecting the prevalence of periodontitis among cases (psoriasis) at 46.1 % and controls at 33.1 %, as in the previous study.[18] The calculated sample size was 153 cases and 153 controls. However, the study was conducted on 200 cases and controls. Participants aged between 14 and 85 years were recruited from the dermatology outpatient department.

The case group included patients diagnosed with psoriasis (defined as ICD-10 L40.0-L40.9) by a dermatologist, cases had the illness for at least 6 months before enrolling in the study. Controls included age and sex-matched individuals referred to the dermatology department for minor cosmetic issues like mole removal, chemical peeling, and localized laser hair reduction without any systemic or generalized involvement. Patients receiving any systemic psoriasis treatment were excluded from the cases. Other exclusion criteria for both groups were obesity (BMI >30), diabetes mellitus, drug abuse, undue alcohol consumption, and local or systemic inflammatory diseases (other than psoriasis). All the recruited individuals provided written informed consent. Ethical clearance was obtained from the Institutional Ethical Committee.

Information on socio-demographic details, general health, and oral health was assembled at baseline for all the recruited individuals. A detailed history, including the onset and duration of illness, other skin conditions, systemic illnesses, and similar illnesses in the family was recorded. All patients went through a detailed general physical, dermatological and oral examination.

2.1. Dermatological examination

A detailed dermatological examination was carried out by a dermatologist. The distribution of the psoriasis was noted. Patients were screened for nail and joint involvement. Psoriasis severity was assessed using the Psoriasis Area and Severity Index (PASI).[19]

2.2. Oral and periodontal examination

A complete periodontal examination was conducted by a single trained periodontist who was unaware of the group allocation of individuals. For examiner alignment, two assessments in a single visit, in randomly selected quadrants were done in 10 individuals who were not part of the study. The intra-class correlation coefficient for PD was 0.68 and for CAL was 0.74. The number of teeth, plaque index, gingival index, probing pocket depth (PPD), and clinical attachment level (CAL) were recorded. All the permanent teeth, except for the third molar, were recorded for the study.

Plaque index was recorded in all teeth as per the plaque index criteria of Silness and Loe[20] and gingival index according to the criteria of Loe and Silness.[21]

For each tooth, PPD and CAL were recorded carefully at six sites, i.e., the mesiobuccal, midbuccal, distobuccal, distolingual, mesiolingual, and midpalatal/lingual sites using a UNC 15 graduated periodontal probe (Hu-Friedy Manufacturing Co., Chicago, IL, USA) by circumferential probing.

The definition of periodontitis was according to the severity and complexity of management. In the present study, individuals with moderate, severe, and advanced periodontitis (stages II, III, and IV, respectively) were considered periodontitis cases. Stage II periodontitis (established periodontitis with distinctive damage to the tooth-supporting structures) is defined as interproximal CAL 3–4 mm, maximum probing pocket depth less than or equal to 5 mm, radiographic bone loss of 15–33 % at the coronal third, and all teeth are present, or in other words, no tooth loss attributable to periodontitis. Stage III was defined as interproximal CAL greater than or equal to 5 mm and radiographic bone loss extending over the middle third of the tooth root, and loss of fewer than four teeth due to periodontitis. Stage IV periodontitis is defined as an interdental CAL of 5 mm or more, deep periodontal disease extending to the apical region, and/or a loss of 5 or more teeth due to periodontitis in the past.[22]

2.3. Statistical analysis

The statistical analysis was conducted using the Statistical Analysis Software SPSS (Statistical Package for Social Sciences) Version 21.0. The data was summarized in numbers (%) and mean ± SD. The chi-square test was used to compare the categorical variables, while to compare the continuous variables, the student 't' test/ANOVA was used. To evaluate the correlation between two continuous variables, Pearson's correlation coefficient was used.

3. Results

The study population included 200 psoriasis cases and 200 controls. Most of the patients were middle-aged between 40 and 60 years, amounting to almost 50 % in both cases and controls. The mean age of cases and controls was 47.48 ± 15.28 and 44.91 ± 14.00 years, respectively, and the age difference was not significant with a p-value of 0.13. Among cases, 55 % of enrolled patients were males, while in controls, males were 47.5 %. There was no significant difference gender-wise in both groups (p-value >0.05). The cases and controls were residents of various parts of Uttar Pradesh, India. Almost 70 % of the cases and controls belonged to urban society, while the rest came from smaller towns and villages. The difference in the demographic profile between cases and controls was not significant ($p > 0.05$), showing the comparability of the groups. The demographic distribution of cases and controls is depicted in Table 1.

It was found that the mean GI, PI, PPD and CAL were significantly higher in the study group in comparison to the controls. Psoriasis patients had significantly greater scores for GI and PI (1.68 ± 0.61 and 1.57 ± 0.54, respectively) as compared to controls (1.48 ± 0.56 and 1.39 ± 0.60, respectively). Further, the probing pocket depth and clinical attachment loss in the psoriasis group were 3.18 ± 1.03 mm and 3.41 ± 1.23 mm, which was significantly more than the control group (Table 2, Graph 1).

In the present study, the prevalence of periodontitis was also found to be higher among cases, reaching a significant level. Stage II and Stage III periodontitis were found in 41.0 % of cases and 30.5 % of controls, while 12.5 % of cases and 6.0 % of controls had stage IV periodontitis (Table 3, Graph 2).

PASI score of cases with stage IV periodontitis (2.74 ± 1.80) was

Table 1
Demographic profile of psoriasis cases and healthy controls.

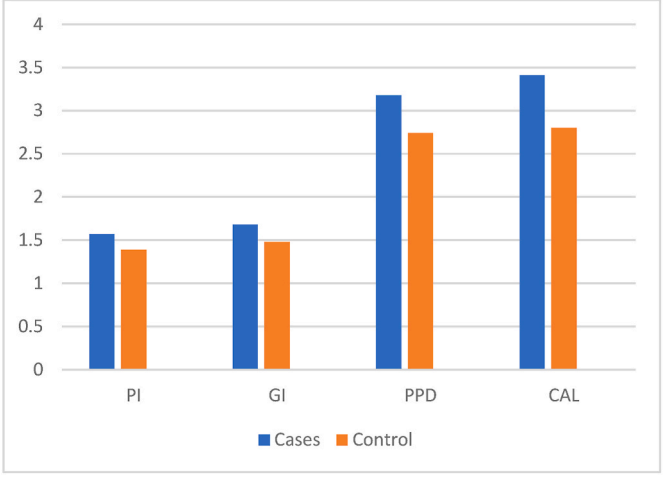
S. No.		Cases (n = 200)	Controls (n = 200)	Significance of differences
1-	Age in years			p = 0.13
	Mean ± SD	47.48 ± 15.28	44.91 ± 14.00	
2-	Gender			
	Female	90 (45.0 %)	105 (52.5 %)	p = 0.133
	Male	110 (55.0 %)	95 (47.5 %)	
3-	Residence			
	Rural	134 (67.0 %)	132 (66.0 %)	p = 0.832
	Urban	66 (33.0 %)	68 (34.0 %)	
4-	Addictions			
	Tobacco/ Smoking	12 (6.0 %)	9 (4.5 %)	p = 0.501
	Alcohol	8 (4.0 %)	5 (2.5 %)	p = 0.398
	No personal history	184 (92.0 %)	186 (93.0 %)	p = 0.704

p > 0.05 – Not significant.

Table 2
Comparison of dental parameters in psoriasis cases and controls.

S. No.		Cases (n = 200)		Controls (n = 200)		Significance of differences	
		Mean	SD	Mean	SD	't'	'p'
1-	PI	1.57[a]	0.54	1.39[a]	0.60	3.126	0.002
2-	GI	1.68[b]	0.61	1.48[b]	0.56	3.533	<0.001
3-	PPD	3.18[b]	1.03	2.74[b]	1.18	4.008	<0.001
4-	CAL	3.41[a]	1.23	3.09[a]	1.17	2.603	0.010

PI: Plaque Index.
GI: Gingival Index.
PPD: Probing Pocket Depth.
CAL: Clinical Attachment Level.
*p ≤ 0.05 Significant.
[a] p ≤ 0.01 very significant.
[b] p ≤ 0.001 highly significant.



Graph 1. Comparison of Dental Parameters of Psoriasis Cases and controls.

found to be higher than those with stage II and III periodontitis (1.97 ± 1.90) and in those with healthy dentition (1.95 ± 1.52), but the difference in PASI score of patients with different periodontitis levels was not found to be significant. This indicates the association between the PASI score and the severity of periodontitis was not significant (Table 4).

Table 3
Prevalence of periodontitis in psoriasis cases and controls.

S.No.	Level of Periodontitis	Cases (n = 200)		Controls (n = 200)		Significance of differences	
		No.	%	No.	%	χ^2	'p'
1-	Healthy dentition	93	46.5	127	63.5	12.906	0.002
2-	Stage II and III	82	41.0	61	30.5		
3-	Stage IV	25	12.5	12	6.0		

4. Discussion

Periodontitis has a high prevalence rate, almost similar to other major chronic diseases, and is now considered a leading public health problem. It is no longer considered a localized disease that only affects the supporting structures of the teeth. The association of periodontitis with other systemic conditions like diabetes, pulmonary diseases, and preterm low birth weight has been studied widely in various studies.[23]

The present study aimed to assess an association between psoriasis and periodontitis. It was found that psoriasis-affected individuals have a significantly inferior periodontal clinical condition, as demonstrated by higher PI, GI, PPD, and CAL when compared to individuals without psoriasis. Hence, it may be opined that periodontitis is significantly associated with psoriasis.

A relationship between psoriasis and chronic periodontitis was documented by Preus et al., as manifested by more tooth mortality and reduced bone level in psoriasis cases as compared to healthy individuals. The authors speculated that an important component in the pathogenesis of both conditions is the natural immune response that directs the consequent acquired immune system as manifested by T- and B-cell activation. An up-regulation of Toll-like receptor (TLR)-2 in the skin affected by psoriasis[24] and in the periodontal tissue of patients with periodontitis[25] may intensify the inflammatory response and the resultant activation of T cells.

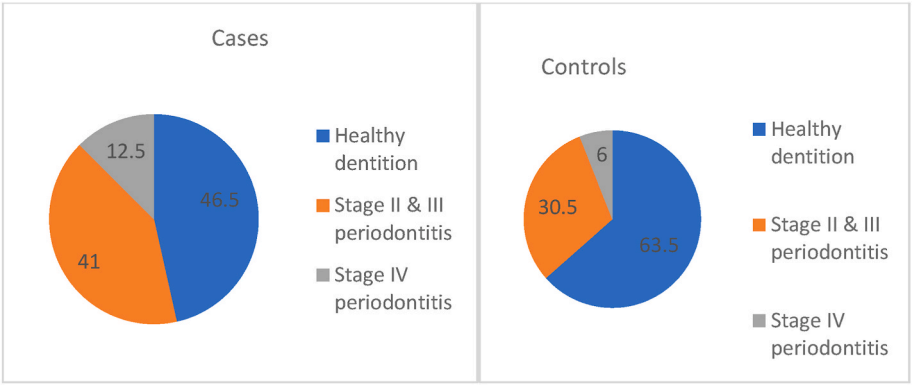
In contrast, another study reported no differences in the caries and periodontal disease profiles between individuals affected or not affected by psoriasis. This difference might be because of the difference in methodology used in our study as well as in most of the other studies, 4/6 sites were examined for all the teeth, while Fadel et al. surveyed only six teeth (community periodontal index of treatment needs). This may have led to an underestimation of the prevalence of periodontitis.[26]

Various study designs, like case-control studies, cross-sectional studies, and longitudinal studies, have been followed to study the association between psoriasis and periodontitis. Even systematic reviews and meta-analyses have been conducted, but the exact mechanism of the relationship between the two conditions is still under investigation.[16,18,26–28] It may be speculated that periodontitis and psoriasis are related through common pathologic and metabolic pathways, as inflammation is an important component of both diseases. In both periodontitis and psoriasis, there is an intensified host immune response to the microbes on the surface epithelium. Furthermore, it is expected that improving periodontal health by reducing local inflammation or immune response may also reduce and influence systemic inflammation. An important component of psoriasis or other non-communicable diseases is systemic inflammation, so this improvement in local conditions may have an overall effect on the body.

Smoking is considered an independent risk factor for periodontitis. However, smoking did not impact the results of our study, as there was no significant difference in smokers between the two groups.

Stage II, III, and stage IV periodontitis were found more in the psoriasis group compared to healthy individuals, so it may be speculated that psoriasis leads to worsening of the periodontal condition. The prevalence of stage IV periodontitis was almost double in the psoriasis group as compared to healthy individuals.

Systemic inflammation may be one of the reasons for this association. Psoriasis is associated with an exaggerated immune response.



Graph 2. Prevalence of periodontitis in psoriasis cases and controls.

Table 4
Association of level of periodontitis and PASI score.

S.No.	Level of Periodontitis	N	PASI Score		Significance of differences (ANOVA)	
			Mean	SD	F	'p'
1-	Healthy dentition	93	1.95	1.52	2.262	0.107
2-	Stage II and III	82	1.97	1.90		
3-	Stage IV	25	2.74	1.80		

Elevated serum levels of the inflammatory mediators IL-6, IL-8, IL-12, TNF-α and INF-c have been documented in plaque psoriasis.[29] Matrix metalloproteases are released by macrophages and fibroblasts upon stimulation by TNF-α. This may relate to the increased severity of destructive periodontal diseases in psoriasis-affected individuals.

Psychological well-being is compromised in patients suffering from psoriasis. Due to extensive skin involvement, the patients may suffer from stigmatization, psychosocial distress, and mental illness. An increased risk of depression and social anxiety has been reported in various studies.[30,31] As psoriasis individuals are already affected by systemic disease and also under mental stress, they may not be giving importance to their oral hygiene, leading to poor periodontal conditions.

CAL is the initial stage determinant for classifying the severity of periodontitis, and its correlation with PASI was assessed. Though the PASI score was higher in individuals with Stage IV periodontitis in comparison to those with Stage II and III periodontitis, it did not reach statistical significance. Another study reported similar findings, where the investigators studied the association between psoriasis duration, PASI score, and dental parameters like Plaque index (PI), Bleeding points index (BPI) and mean Clinical Attachment Loss (CAL) but no relationship was found in the psoriasis group.[27]

The limitation of this study was the cross-sectional research design. A causal relationship between psoriasis and severe periodontitis could not be established by this design. It does not permit us to have a precise view of whether one condition is the cause or effect of another. It is also uncertain if the association between psoriasis and periodontitis is unidirectional or bidirectional.

It is crucial to conduct long-term prospective studies to thoroughly investigate the direction of this association and determine the likelihood that both psoriasis and periodontitis are part of an inflammatory phenotype. As a result, periodontal diagnosis needs to be included in the routine diagnostic process for patients with psoriasis, and for clinicians to acknowledge the significance of periodontitis as a possible cause of the inflammatory burden in affected individuals.

5. Conclusions

This study concluded by demonstrating a strong association between psoriasis and periodontitis. Various periodontal parameters (PI, GI, PPD, and CAL) were found to be higher among psoriasis patients compared to controls. It was also found that the prevalence of periodontitis was higher in psoriasis-affected individuals. Although this study establishes a strong association, we need further comprehensive prospective and experimental studies aimed at establishing a causal relationship between psoriasis and periodontitis.

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Presentation at meeting

Nil.

Declaration of competing interest

The authors report no conflict of interest related to the study. No funding or material support was received for the study.

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