Original Article

The association of psoriasis and psoriatic arthritis with periodontitis: A hospital-based case-control study

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Abstract

Background: Periodontitis can trigger and perpetuate inflammation in several chronic inflammatory diseases. The association of periodontitis with psoriasis has been investigated earlier, but data are incomplete and the influence of confounders has not been fully evaluated.

We examined the relationship of dental and periodontal health parameters in patients with psoriasis and/or psoriatic arthritis.

Methods: This hospital-based cross-sectional analytical study was conducted in patients with chronic plaque psoriasis, psoriatic arthritis or both, and compared with controls. Dental and periodontal health parameters were assessed based on the WHO oral health assessment method. Multivariate logistic regression was done on variables with significant or near-significant values to find the association between periodontitis and psoriasis and/or psoriatic arthritis after adjusting for confounders.

Results: Psoriasis and/or psoriatic arthritis were independently and significantly associated with periodontal pockets ≥4 mm in depth.

Limitations: Causality and temporal relationship cannot be established as this was a cross-sectional study. As in all observational studies, the possibility of unmeasured or unknown confounders exists. Psoriatic arthritis was present only in a small subset of patients.

Conclusion: Patients with psoriasis and/or psoriatic arthritis have significant periodontal inflammation. This needs to be addressed by dental examination and intervention.

Key words: Psoriasis, psoriatic arthritis, periodontitis, inflammation

Plain Language Summary

Periodontitis is a chronic inflammatory disease affecting the tissues surrounding the teeth. It may play a role in triggering other chronic inflammatory diseases, including psoriasis. This hospital-based study examined the dental and periodontal health parameters in patients with psoriasis and/or psoriatic arthritis and compared them with patients without psoriasis and/or psoriatic arthritis. We found that patients with psoriasis and/or psoriatic arthritis were more likely to have inflammation and tissue loss surrounding their teeth.

Introduction

Periodontitis is a chronic inflammatory condition affecting the tissue supporting the teeth. It is associated with several diseases including diabetes and ischaemic heart disease.[1] Epidemiological, serological and clinical associations between rheumatoid arthritis and periodontitis have been reported.

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Th17 cells drive bone erosion in periodontitis.[2,3] These cells have also been implicated in the pathogenesis of psoriasis.[4] The increased risk of psoriasis in patients with periodontitis has been studied[4] but data are sketchy and often influenced by confounders.[5]

Oral health parameters are often neglected in the routine examination of patients with psoriasis and psoriatic arthritis. We aimed to critically examine the association between dental and periodontal health parameters and psoriasis or psoriatic arthritis in a South Indian population.

Methods

Study design, setting and duration

This hospital-based cross-sectional analytical study was conducted from April 2021 to January 2022 in a tertiary care Institute located in South India. Institutional Ethics Committee approval was obtained. After informed consent, 100 patients with psoriasis or psoriatic arthritis and 100 controls were included in the study.

Study participants

The study participants included patients with chronic plaque psoriasis, psoriatic arthritis or chronic plaque psoriasis with psoriatic arthritis. The controls were patients with minor skin conditions (e.g., abrasions, warts or naevi).

In both the groups, patients less than 18 years of age, or those who had other conditions such as pregnancy, chronic systemic inflammatory diseases, autoimmune disorders or cancer were not included in the study. Patients at increased risk of endocarditis or those on treatment with immunosuppressive drugs for diseases other than psoriasis or psoriasis arthritis were also excluded.

Demographic and other general data were collected with questionnaires. These included the age, sex, education, smoking status, alcohol intake, diabetes, preventive dental visits, frequency of daily tooth brushing, interdental cleaning, regular oral fluoride application, frequency of sugary snacks/beverages, recent periodontitis therapy, duration of psoriasis and medications used in the previous one month. The body mass index was calculated based on the participants' weight (in kilograms) divided by the square of height (in metres).

The diagnosis of chronic plaque psoriasis, assessment of psoriasis area severity index,[6] dermatology life quality index,[7] and percentage of body surface area in patients was done by dermatologists. Patients with chronic plaque psoriasis were screened for psoriatic arthritis with the Psoriasis Epidemiology Screening Tool.[8] The diagnosis of psoriatic arthritis was made by orthopaedic surgeons based on the Classification criteria for Psoriatic Arthritis (CASPAR).[9]

Periodontal and dental status health parameters (community periodontal index modified, the loss of attachment index and the decayed, missing and filled teeth index) were assessed by dentists based on the WHO oral health assessment method (2013).[10] The dermatologic diagnosis was not revealed to the dentists.

The data collected by dermatologists and dentists were entered in a Microsoft Excel spreadsheet.

Sample size and statistical analysis

A sample size of 43 cases and 43 controls was calculated based on the study conducted by Goeste *et al.* with a 90% power and 95% confidence interval.[11] In their study, 69.8% of cases and 34.6% of controls had ≥4 mm gingival or periodontal pockets. However, because of conflicting results in other studies with similarly small sample sizes and the possibility of several co-founders, we included a larger sample size of 100 cases and 100 controls.

Descriptive statistics were used to compare baseline characteristics in cases and controls. Non-parametric continuous variables were compared using the Mann–Whitney *U* test. Categorical variables were compared using the chi-square test, and Fisher's exact test was used when the data was sparse. Multivariate logistic regression was done to find the adjusted *P*-value by including all significant ($P < 0.05$) and near-significant variables ($P < 0.1$) detected in primary analysis from all major variables. The backward conditional method was applied to find the best fit.

The community periodontal index was converted into a dichotomous variable based on pocket depth (absence of condition and pocket depth of ≥4 mm). Loss of attachment was also converted into a dichotomous variable (loss of attachment less than 3 mm and loss of attachment ≥4 mm). Nested multivariate logistic regression analysis in a backward stepwise manner was also carried out to find the association of periodontitis (pocket ≥ 4 mm) with the severity of psoriasis and the presence of psoriatic arthritis.

The SPSS software (Statistical Package for Social Sciences Version 26.0 for Windows, Chicago, IL) was used for statistical analysis. Statistical significance was set at 0.05 using two-sided tests.

Results

The factors that could influence oral health in patients with psoriasis or psoriatic arthritis and controls are summarised in Table 1. No participant in either group had undergone preventive dental check-ups or had used oral fluoride. The mean and median frequency of use of sugary snacks or beverages was 2.16 (standard deviation 1.59; interquartile range 2) in the study group and 1.39 (standard deviation 1.14; interquartile range 1) in the controls, respectively.

The study group included 85 patients with chronic plaque psoriasis, 14 patients with both chronic plaque psoriasis and psoriatic arthritis and a single patient with only psoriatic arthritis. The mean Psoriasis Area Severity Index was 6.32 (standard deviation 6.25). A score of ≥10 for the Psoriasis Area and Severity Index, Body Surface Area and the Dermatology Life Quality Index each constitute a criterion for moderate-to-severe psoriasis. Eighteen of the patients had a Psoriasis Area Severity Index ≥ 10, 48 had

a Body Surface Area ≥ 10 and 7 had a Dermatology Life Quality Index ≥ 10.

The factors that could influence oral health in cases and controls, the *P*-value on univariate analysis and the adjusted *P*-value on multivariate analysis are shown in Table 1. The dental and periodontal health parameters in cases and controls are listed in Table 2.

Multivariate logistic regression in backward conditional analysis for the best fit was performed. The adjusted *P*-values for bleeding on probing was 0.103 (adjusted odds ratio 2.26; 95% confidence interval 0.847–6.047), for frequency on sugary snacks or beverages it was 0.020 (adjusted odds ratio 2.10; 95% confidence interval 1.126–3.915) while for pocket more than 4 mm in depth it was <0.001 (adjusted odds ratio 3.751; 95% confidence interval 1.904–7.390).

On nested multivariate analysis for pocket depth ≥ 4 mm, psoriatic arthritis retained a significant association (*P*-value 0.010) whereas Psoriasis Area Severity Index ≥ 10 (*P*-value 0.313) and Body Surface Area ≥ 10 (*P*-value 0.140) did not show an independent significant association. On multivariate logistic regression for best fit, psoriatic arthritis showed an adjusted *P*-value of 0.001 (adjusted odds ratio 16.09, 95% confidence interval 3.176–81.461).

Discussion

Periodontitis is a chronic inflammatory disease that is initiated by an altered sub-gingival biofilm. The gingival inflammation causes bleeding on probing with subsequent loss of the connective tissue attachment of the tooth and alveolar bone loss, clinically manifesting as deep periodontal pockets.[12]

We included eleven parameters or confounders such as age, sex, BMI, education, smoking, alcohol etc. [Table 1] that could influence dental and periodontal health in our analysis and demonstrated a positive association between periodontitis and psoriasis and/or psoriatic arthritis. Other studies (reviewed by Zhang *et al.*[13]) too have found an association between psoriasis and periodontitis. Different methods for diagnosis of psoriasis and periodontitis including self-reported and database-based diagnosis,

Table 1: Factors that could influence dental and periodontal health in patients with psoriasis and/or psoriatic arthritis and controls

Factor	Psoriasis or psoriatic arthritis (*n* = 100)	Controls (*n* = 100)	*P*-value*	Adjusted *P*-value**
Age in years- mean (SD)	43.63 (11.01)	39.71 (12.64)	**0.009**#	0.856
Sex- *n* (%)				
Male	56 (56)	51 (51)	0.478	—
Female	44 (44)	49 (49)		
Body mass index (BMI)— *n* (%)				
BMI < 25	10 (10)	16 (16)	0.179	—
BMI 25- <30	50 (50)	36 (36)		
BMI ≥ 30	40 (40)	38 (38)		
Smoking- *n* (%)	84 (84)	88 (88)		
Non-smoker former smoker	9 (9)	4 (4)	0.353	—
Active smoker	7 (7)	8 (8)		
Alcohol- *n* (%)				
Yes	16 (16)	10 (10)	0.294	—
No	84 (84)	90 (90)		
Diabetes- *n* (%)				
No diabetes	86 (86)	84 (84)	0.692	—
Diabetes	14 (14)	16 (16)		
Education- *n* (%)				
Primary or lower	22 (22)	18 (18)	**0.070**#	0.557
Secondary	55 (55)	44 (44)		0.611
Graduate or higher	23 (23)	38 (38)		0.695
Frequency of tooth brushing- *n* (%)				
Once-daily	78 (78)	71 (71)	0.256	—
Twice-daily	22 (22)	29 (29)		
Interdental cleaning- *n* (%)				
Yes	1 (1)	6 (6)	**0.054**#	0.246
No	99 (99)	94 (94)		
Recent treatment for periodontitis- *n* (%)				
No	91 (91)	95 (95)	0.268	—
Yes	9 (9)	5 (5)		
Frequency of sugary snacks or beverages- *n* (%)				
0–1	34 (34)	58 (58)	**0.001**#	**0.018**#
>2	66 (66)	42 (42)		

*Mann–Whitney *U* or Chi-square test or Fisher's test as appropriate, **Multivariate logistic regression analysis with significant and near significant values, #Significant and near-significant values, SD: standard deviation

Table 2: Dental and periodontal parameters in patients with psoriasis and/or psoriatic arthritis and controls

Parameter	Psoriasis or psoriatic arthritis (n = 100)	Controls (n = 100)	P-value*	Adjusted P-value**
Gingival bleeding scores- n (%)				
0 (absence of condition)	7 (7%)	29 (29%)	**0.000**[#]	0.094
1 (presence of condition)	93 (93%)	71 (71%)	**(<0.001)**	
Pocket scores- n (%)				
0 (absence of condition)	30 (30%)	70 (70%)		0.069
1 (pocket of 4–5 mm)	53 (53%)	28 (28%)	**0.000**[#]	0.193
2 (pocket of 6 mm or more)	17 (17%)	2 (2%)	**(<0.001)**	**0.024**[#]
Loss of attachment- n (%)				
0 (0–3 mm)	36 (36%)	73 (73%)		0.365
1 (4–5 mm)	43 (43%)	18 (18%)	**0.000**[#]	0.103
2 (6–8 mm)	17 (17%)	8 (8%)	**(<0.001)**	0.550
3 (9–11 mm)	4 (4%)	1 (1%)		0.321
Decayed (D)				
Mean (SD)	1.35 (2.17)	0.81	0.136	––
Median (IQR)	0 (2)	1.35 (1)		
Minimum, maximum	0, 11	0, 8		
Missing (M)				
Mean (SD)	0.96 (1.81)	0.91 (1.82)	0.329	––
Median (IQR)	0 (1)	0 (1)		
Minimum, maximum	0, 10	0, 9		
Filling (F)			0.164	
Mean (SD)	0.54 (1.51)	0.81 (1.79)		––
Median (IQR)	0 (0)	0 (1)		
Minimum, maximum	0, 9	0, 8		
DMFT index***				
Mean (SD)	2.85 (3.37)	2.53 (3.14)	0.415	––
Median (IQR)	2 (4)	1 (4)		
Minimum, maximum	0, 13	0, 13		

*Mann–Whitney U or Chi-square test or Fisher's test as appropriate, **Multivariate Logistic Regression analysis with significant and near significant values, ***DMFT: decayed missed and filled teeth, [#]Significant and near-significant values, SD: standard deviation, IQR: interquartile range

variations in periodontal parameters assessment, and variations in the number of addressed confounders such as age, gender, smoking, alcohol, obesity, and others have led to heterogeneous data from these studies.[11,14–17] Gupta *et al*. reported a lack of association between periodontitis and psoriasis. However, confounding factors other than age and gender were not addressed.[18]

Although the number of patients in the psoriatic arthritis subgroup was small, it was significantly associated with periodontitis (pocket depth ≥ 4 mm). Both the Psoriasis Area Severity Index ≥ 10 and Body Surface Area ≥ 10 were significantly associated with pocket depth ≥ 4 mm only when taken in isolation but not in multivariate analysis with psoriatic arthritis and other significant confounders included in the model. Both these severity indices could also have been influenced by the treatment received.

The frequent intake of sugary snacks or beverages was positively associated with psoriasis in our study. An earlier study from Japan had reported a higher intake of sugar or sweeteners in patients with psoriasis[19] and Western diets with a high content of simple sugars have been shown to pre-dispose to psoriasiform inflammation in mouse models.[20] Increased frequency of consumption of added sugars has also been linked to periodontitis.[21]

A population-based study in 115,000 patients with periodontitis from Taiwan found a higher incidence rate for psoriasis compared to controls in the five subsequent years of follow-up (1.88 vs 1.22 per 1000 person-years).[16] The mechanisms between the association of periodontitis and psoriasis need to be explored. Exaggerated immune response against the cutaneous microbiota in psoriasis and the oral microbiota in periodontitis may be mediated by similar genetically predisposed immune cells. The periodontal flora and their products may drive Th-17 cells and interleukin 17 mediated inflammation.[5]

The Taiwan study mentioned earlier noted that surgical interventions for periodontitis reduced the risk for subsequent psoriasis.[16] Non-surgical treatment of periodontitis has also been reported to reduce the activity of rheumatoid arthritis.[22] There is a bidirectional relationship between periodontitis and diabetes—patients with diabetes are at a higher risk for periodontitis and periodontitis worsens glycaemic control. Patients with both diabetes and periodontitis are at a higher risk for ischaemic heart disease and diabetic nephropathy as compared to patients with only diabetes.[23] Thus, treating periodontitis might influence the systemic inflammation of psoriasis and the co-morbidities associated with psoriasis such as diabetes and ischemic heart disease.

The levels of dental hygiene in both patients and controls were poor. None of the patients or controls in our study had a history of preventive fluoride use or had undergone preventive dental examinations. The frequency of twice-daily tooth brushing and inter-dental cleaning was also low in both groups and a high proportion of gingival inflammation or bleeding on probing was seen (93% in study group and 71% in controls). This highlights the need for increased awareness of oral health in India.

Our study provides data on the association between psoriasis and/or psoriatic arthritis and periodontitis in an Indian population. We have included a larger sample size and adjusted for several confounders.

Limitations

As this is a cross-sectional study, causality and temporal relationship cannot be established. The possibility of unmeasured or unknown confounders exists as in all observational studies. Psoriatic arthritis was present only in a small subset of patients. Although information bias could exist, it was reduced by blinding the dentists to the dermatologic diagnosis and collecting data with the same practices and in a similar timeframe. We did not perform a comprehensive dietary assessment as dietary assessment tools need to be culture and region-specific and are difficult to measure accurately with any single method.[24]

Conclusion

We found that psoriasis and/or psoriatic arthritis are independently associated with periodontitis after adjusting for several confounders.

Preventive oral health examinations are a neglected domain in India. Patients with psoriasis and/or psoriatic arthritis require screening for these untended pockets of periodontal inflammation. Further longitudinal studies and periodontal interventional studies in patients with psoriasis and periodontitis are needed in order to evolve strategies to mitigate the systemic inflammatory burden from both psoriasis and periodontitis.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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