PSORIATIC ARTHRITIS IN PSORIASIS PATIENTS: PREVALENCE, PREDICTIVE FACTORS, AND RADIOGRAPHIC FINDINGS

Shefaa Saleh Almashagbeh, MD, Diana Aliammal, MD*, Samer Falah Alqudah. MD*. Walid Ahmad Mohammad Alnozami. MD*, Raad Youssef Al Tahat. MD**

* Departments of Dermatology,

ABSTRACT

Objectives: To evaluate the prevalence of psoriatic arthritis as well as its predictive factors and radiographic findings in patients diagnosed with psoriasis.

Method: A retrospective, cross-sectional study was conducted among 88 patients diagnosed withpsoriasis in the Department of Dermatology at Royal Medical Services between January 2019 and March 2021. Electronic medical files were reviewed for demographics of psoriatic patients, clinical data (age of disease onset, family history, duration of psoriasis, psoriasis area andseverity index, nail involvement, psoriasis type, treatments modalities and clinical form ofpsoriatic arthritis), and imaging findings.

Results: Sixteen (18.2%) out of 88 patients with psoriasis had psoriatic arthritis. The plaque typeaccounted for 61.4% of cases, and the guttate type for 23.9% of cases. The least common type was reported for the inverse type of psoriasis (1.1%). Asymmetric oligoarthritis (56.2%) was the most prevalent clinical type of psoriatic arthritis followed by enthesitis (37.5%), dactylitis (31.2%), polyarthritis (25%), distal interphalangeal arthritis (18.7%), and spondyloarthritis (6.2
%). Nail involvement (OR 3.15, 95% CI: 1.32-3.81, P = 0.01) and severity of psoriasis (OR 1.68,95% CI: 1.09-2.43, P = 0.036) were predictors of psoriatic arthritis.

Conclusions: The study highlights the importance of demographics and clinical data of patients with psoriasis. Patients showing severe psoriasis and nail involvement should be investigated for psoriatic arthritis incidence. Radiological and frequent clinical evaluation should be performed for early detection of psoriatic arthritis.

Keywords: psoriasis, psoriatic arthritis, prevalence, radiological findings, predictive factors

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INTRODUCTION

Psoriasis is a chronic and immune-mediated skin disease of a recurrent nature and multifactorial etiology (1). Its prevalence varies from 0.14% to 5.32% in the general population (2). Current evidence shows an association of psoriasis with other comorbidities such as psoriatic arthritis, diabetes, cardiovascular disease, and inflammatory bowel disease (3, 4). One in four patients with psoriasis have psoriatic arthritis (PsA), which is a chronic inflammatory disease that shares clinical manifestations of seronegative spondyloarthropathies (SpA) (ex, ankylosing spondylitis, enteropathic spondylitis and reactive arthritis) (5). Approximately, 20% of those with chronic psoriasis develop PsA within 30 years of diagnosis (6)

Psoriatic arthritis and SpA group are both characterized primarily by the presence of joint lesions. Psoriatic arthritis is different than rheumatoid arthritis (RA). Except for the destructive variety, most cases are far less severe than RA (7). Joint involvement is often but not always asymmetric in patients with PsA, but it is primarily symmetric in patients with RA (8). Rheumatoid arthritis is distinguished by bone erosions, the absence of new bone formation, and cervical spine involvement. PsA is distinguished by axial spine involvement, psoriasis, and nail dystrophy (7).

It is critical to define individuals who have a high probability of getting PsA because this prepares the way for more focused preventive efforts and earlier treatment. Psoriasis and PsA both have an increased prevalence of obesity, diabetes, hypertension, hyperlipidemia, and metabolic syndrome (9-11). Several studies have shown that obesity may play an important role in the pathological development of both PsA and psoriatic skin disease as well as the previous conditions (12-14). The amplitude of the risk link between an elevated body mass index (BMI) and a future risk of PsA was also reported in the scientific studies (15). In terms of genetic factors, one-third of the entire genetic contribution comes from chromosome 6p21.3, which has the most consistent and dominant impact. There are 36 genes that contribute to 22% of PsA heredity (16). Recent reviews have found three clinically silent phases following the development of psoriasis and before clinically-diagnosed PsA (17): (a) The preclinical phase is characterized by aberrant activation of the immune system that may originate from the skin, intestinal mucosa, or the entheses. (b) Subclinical PsA features soluble biomarkers and imaging findings but no clinical symptoms. (c) Prodromal PsA is defined as arthralgia and fatigue with no synovitis or enthesitis on physical examination.

The inflammatory process extends from the synovial membrane to the spine and sacroiliac joints.This process—as well as the lack of serological indicators—have delayed the diagnosis (18). Hence, images are more important than ever in this context because they provide a way to quantify the inflammatory process, guide diagnosis and therapy, and evaluate disease progression. The most valuable imaging modalities are conventional radiology and magnetic resonance imaging (MRI), but ultrasound (US) is becoming increasingly used because of its feasibility and high sensitivity for peripheral disease manifestations. Conventional radiology is useful for detecting structural lesions (19). In terms of structural damage, CT is considered a reference technique (20). High resolution CT differentiates the morphology of erosion between PsA (Ω-shaped and T-shaped) and RA (U-shape) (21). Conventional radiology, CT, and high- resolution CT are all ionizing techniques that do not have enough information about soft tissue. Ultrasound is a non-ionizing tool that can identify synovitis, tenosynovitis, enthesitis, and dactylitis with excellent accuracy (22). MRI can detect inflammatory and structural lesions in deep or superficial areas (20). This study evaluated the prevalence of psoriatic arthritis as well as its predictive factors and radiographic findings among patients diagnosed with psoriasis.

METHOD

We conducted a retrospective and comparative evaluation of patients diagnosed with psoriasis in the Department of Dermatology at Royal Medical Services between January 2019 and March 2021 and/or referred to the department of rheumatology with a preliminary diagnosis of PsA.

Patient demographics, clinical data, and image findings were retrieved from medical files and radiology archives. The following data were recorded and evaluated in the medical file: (a) patients' demographic characteristics including age, sex, BMI, smoking history, alcohol consumption; (b) psoriasis-related data such as age of onset, disease duration, type of psoriasis, family history of psoriasis, and presence of psoriatic arthritis according to the Classification Criteria for Psoriatic Arthritis Criteria (CASPAR) (23) and the severity of psoriasis evaluated via the Psoriasis Area Severity Index (PASI) (24); (c) radiographs as evaluated by a radiologist for the presence of PsA; (d) presence of comorbidities such as hypertension, diabetes mellitus, hyperlipidemia, and cardiovascular disease (CVD). Patients were divided into two categories based on their PASI scores: mild (PASI score ≤ 10) and moderate to severe (PASI score of >10). In terms of psoriasis, patients were grouped into two categories: those with psoriasis associated with psoriatic arthritis and those with psoriasis only. All data were retrieved and evaluated by two dermatologists and three radiologists. All patient data was handled with strict confidentiality, and data was analyzed anonymously by patient ID number. No contact was made with patients or their relatives. This study was approved by the Ethics Review Board at Royal Medical Services.

Data analysis was performed using the SPSS program for Windows version 22 (SPSS Inc., Chicago, IL, USA). Means, standard deviations, frequencies, and percentage of patients' characteristics were provided. An independent t-test was performed to determine the quantitative differences between the two groups. The chi squared test (X^2) or Fisher's exact test were used to test for probable differences among qualitative variables when the predicted frequency is less than 5. Binary logistic regressions were utilized to identify PsA risk variables. A significance level of $P < 0.05$ was used throughout.

RESULTS

Eighty-eight patients with psoriasis attending the Department of Dermatology at Royal Medical Services between January 2019 and March 2021 were enrolled. Psoriatic arthritis was present in 16 patients (18.2%), and they were diagnosed during the previous mentioned period. The mean age of the patients with PsA (39.93±13.73) was higher than that of patients without psoriatic arthritis (36.25±14.19), but the difference was not significant (P = 0.347). Most patients in both groups were male (70.5%). Sex subgroup analysis showed no significant difference between the two groups (P = 0.546). The mean BMI was statistically higher in patients with psoriatic arthritis (26.50±2.30) than those without psoriatic arthritis (23.20±3.56) (P = 0.001).

With regard to the age of disease onset, the mean age of disease onset in our study was 31.88±13.42, and there was no significant difference between the two groups of patients (P

= 0.570). Similarly, no significant difference was reported between the two groups with regard to disease duration (P = 0.098). The mean age of disease duration in our study was 4.93±3.68.

More than half of the patients in our study were smokers (56.8%). Smoking was statistically more frequent in patients with PsA than those without (87.5% versus 50%; P = 0.01). Moreover,
alcohol consumption was statistically more frequent in patients with PsA than in those without (31.3% versus 5.6%; P = 0.009).

Eighty seven percent of the patients with PsA had moderate-to-severe psoriasis, and the mean PASI values in patients with PsA were significantly higher than patients without PsA (14.25±3.49 versus 9.20±4.43; P = 0.001). A family

history of psoriasis was presented in 14.8% of the patients in our study. There was no significant difference between the two groups with regard to their family history of psoriasis (P = 0.243).

Nail involvement was present in 19.3% of patients. The number of patients with nail involvement in PsA group was significantly higher than patients without PsA (11 versus 5 respectively; P = 0.001).

A total of 25 patients (28.4%) had comorbidities. Diabetes was present in 10 patients (11.4%), hypertension in eight patients (9.1%), hyperlipidemia in one patient (1.1%), ischemic heart disease in two patients (2.3%), chronic kidney disease in two patients (2.3%), and gout in two patients (2.3%). There was no significant difference between the two groups in terms of comorbidities (P > 0.05). The patients' characteristics are shown in Table 1.

Table I. Baseline characteristics of patients.

Variables	Total (n=88)	Psoriasis with arthritis n (%) 16 (18.2)	Psoriasis without arthritis n (%) 72 (81.8)	P-value
Age, years (mean ±SD)	36.92±14.10	39.93±13.73	36.25±14.19	0.347†
Sex n (%)				0.546**
Male	62 (70.5)	10 (62.5)	52 (72.2)	
Female	26 (29.5)	6 (37.5)	20 (27.8)	
BMI, kg/m^2 (mean ±SD)	23.80±3.59	26.50±2.30	23.20±3.56	0.001†
underweight n (%)	5 (5.7)	0 (0)	5 (6.9)	0.006*
normal weight n (%)	45 (51.1)	3 (18.8)	42 (58.3)	
overweight n (%)	32 (36.4)	11 (68.8)	21 (29.2)	
obese n (%)	6 (6.8)	2 (12.5)	4 (5.6)	
Smoking history n (%)				0.010**
Smoker	50 (56.8)	14 (87.5)	36 (50)	

Non-smoker	38 (43.2)	2 (12.5)	36 (50)	
Age of disease onset (mean ± SD)	31.88±13.42	33.62±13.17	31.50±13.53	0.570†
Disease duration (mean ± SD)	4.93±3.68	6.31±3.47	4.62±3.68	0.098†
PASI (mean ± SD)	10.12±4.68	14.25±3.49	9.20±4.43	0.001†
mild, n (%)	50 (56.8)	2 (12.5)	48 (66.7)	0.001**
moderate to severe n(%)	38 (43.2)	14 (87.5)	24 (33.3)	
Alcohol consumption n (%)				0.009**
Yes	79 (89.8)	5 (31.3)	4 (5.6)	
No	9 (10.2)	11 (68.8)	68 (94.4)	
Family history of psoriasis n (%)				0.243**
Yes	13 (14.8)	4 (25.0)	9 (12.5)	
No	75 (85.2)	12 (75.0)	63 (87.5)	
Nail involvement				0.001**
Yes	17 (19.3%)	11 (64.7%)	5 (7.0%)	
No	71 (80.7%)	6 (35.3%)	66 (93.0%)	
Comorbidities n (%)	25 (28.4)	6 (37.5)	19 (26.3)	0.698**
diabetes	10 (11.4)	3 (18.8)	7 (9.7)	0.380**
Hypertension	8 (9.1)	2 (12.5)	6 (8.3)	0.633**
Hyperlipidemia	1 (1.1)	0 (0)	1 (1.4)	0.818**
ischemic heart disease	2 (2.3)	0 (0)	2 (2.8)	0.668**
chronic kidney disease	2 (2.3)	0 (0)	2 (2.8)	0.668**
Gout	2 (2.3)	1 (6.3)	1 (1.4)	0.332**

SD: standard deviation; BMI: body mass index; PASI: psoriasis area severity index; n: number; %: percentage; †:independent t test; *: chi-square test; **: fisher exact testHere, 61.4% of patients presented with plaque psoriasis; 23.9% were guttate, 8% erythrodermic, 3.4% generalized pustular, 2.3% palmoplanter, and 1.1% inverse. Nail involvement appeared in 19.3% of patients. All patients received topical treatments: 30 (34.1%) were treated with phototherapy, and 46 (52.3%) were treated with systemic treatments.

Methotrexate was the most common type of systemic treatment (22.7%), and three (3.3%) were treated with biologic treatment. Clinical characteristics and treatment

modalities of the patients are shown in Table 2.

Table II.Clinical characteristics and treatment modalities of the patients		
Clinical type n (%)	Plaque	54 (61.4)
	Guttate	21 (23.9)
	Palmoplanter	2 (2.3)
	Inverse	1 (1.1)
	Generalized pustular	3 (3.4)
	Erythrodermic	7 (8.0)
Nail involvement n (%)		17 (19.3)
Treatment modalities n (%)		
Topical		88 (100)
Phototherapy		30 (34.1)
Systemic		46 (52.3)
	Methotrexate	20 (22.7)
	Cyclosporine	11 (12.5)
	Neotigason	15 (17.0)
Biologic		3 (3.3)
	Secukinumab	1 (1.1)
	Ustekinumab	1 (1.1)
	Adalimumab	1 (1.1)

n: number; %: percentage

Regarding joint pattern, the most common clinical forms is asymmetric oligoarthritis—this accounts for 56.2% of cases followed by enthesitis (37.5%), dactylitis (31.2%), polyarthritis (25%), distal interphalangeal arthritis (18.7%), and spondylarthritis (6.2%). Clinical patterns of psoriatic arthritis are shown in Table 3.

Table III. Clinical patterns of psoriatic arthritis (n=16)	
Clinical manifestations	**n (%)**
Asymmetric oligoarthritis	9 (56.2)
Polyarthritis	4 (25)
Distal interphalangeal arthritis	3 (18.7)
Spondyloarthritis	1 (6.2)
Dactylitis	5 (31.2)
Enthesitis	6 (37.5)

n: number; %: percentage

Regarding psoriatic arthritis predictors, binary logistic regression showed that nail involvement (OR 3.152, 95% CI: 1.321-3.818, P = 0.01) and severity of psoriasis (OR 1.686, 95% CI: 1.093-2.431, P = 0.036) were associated with an increased risk of PsA. Psoriatic arthritis predictors are shown in Table 4.

Table IV. Binary logistic regression of psoriatic arthritis

Variables	**B**	**OR**	**95% CI**	**P value**
Age	.039	1.438	0.761-2.326	0.087
Sex	.051	1.611	0.942-2.844	0.062
BMI				
normal weight	-.084	.952	.383-1.411	0.142
overweight	.146	1.831	.721-2.319	0.293
obese	.621	2.692	1.023-3.612	0.081
Smoking	-.378	0.826	.329-1.274	0.309
Alcohol	.519	1.266	.721-1.609	0.079
Age of disease onset	.567	1.381	.895-1.899	0.081
Disease duration	.737	1.892	.972-2.641	0.077
Nail involvement	.921	3.152	1.321-3.818	**0.010**
PASI	.821	1.686	1.093-2.431	**0.036**
Comorbidities				
diabetes	.032	1.332	.722-1.822	0.081
hypertension	.329	0.923	.219-.821	0.166
hyperlipidemia	.825	0.681	.491-1.122	0.172
ischemic heart disease	.448	1.211	.619-1.871	0.281
chronic kidney disease	.731	0.521	.272-1.092	0.069
gout	-.291	0.742	.371-1.238	0.720

OR: odd ratio; CI: confidence interval; PASI: psoriasis area severity index; BMI: body mass index

DISCUSSION

The prevalence of PsA in this study was 18.2% (16 patients) according to the CASPER criteria

and on the basis of radiology. Similarly, 17 out of 100 psoriatic patients were diagnosed with peripheral arthritis based on the CASPER criteria, assessment of the SpondyloArthritis International Society's peripheral and axial SpA criteria, and New York criteria for ankylosing spondylitis based on the Ficco et al. study (25). A recent meta-analysis quantitatively analyzed the results of 266 studies and reported a pooled PsA prevalence of 19.7% (95% CI, 18.5%-20.7%) in patients with psoriasis, which is almost parallel to the result of our study (5). Psoriatic arthritis was found to be most prevalent in Europe (22.7%), while it was shown to be least prevalent in Asia (14%) (5). The criteria utilized to identify PsA, the geographic region, and the time periods of data collection might be responsible for the heterogeneity of PsA prevalence (26).

Psoriatic arthritis affects both sexes almost equally (27-29), but our study found a male predominance in those with the disease (62.5%). Çinar et al (2015) and Kumar et al (2014) have reported similar findings (30, 31). However, sex was not identified as predictors for PsA incidence.

It is widely agreed that the PASI is a useful psoriasis assessment index (32). Here, patients with psoriatic arthritis had significantly higher PASI values than those without arthritis. Thus, a severe skin condition is linked to an increased risk of psoriatic arthritis. This finding agrees with previous studies (30, 33). A recent meta-analysis of the findings of 29 studies confirmed this finding as well (34). Prospective longitudinal studies are necessary to corroborate this evidence and provide dermatologists with a recommendation to utilize psoriasis severity as a valid biomarker for PsA development; hence, most studies are retrospective.

Nail involvement is more prevalent in PsA patients and is a vital sign supporting the diagnosis of psoriatic arthritis (35). Among patients with PsA, nail involvement is reported to occur in 40% to92% of cases (35-38). We found that 64.7% of psoriatic arthritis patients had nail involvement and it is proposed to be a predictor for PsA development. Similar findings were reportedpreviously (31, 37, 39). Fortunately, it will be possible to record the changes in the psoriatic patient's health that are indicative of the onset of PsA or its existence in the subclinical stage (40). Dermatologists are uniquely qualified to recognize the premature silent changes in the illness before radiological indications and symptoms show because they meet patients with psoriasis before arthritis occurs (41). Early detection and diagnosis may prevent disease progression and bone damage.

Psoriasis has been linked to a family history of the disease in 17.9% and 44.3% of individuals, respectively, in previous studies (42, 43). Less than one-fifth of the patients in our study (14.8%) reported having a family history of psoriasis. The presence of a family history of the illness was also shown to be a factor in the earlier onset of the disease (44). This relationship was not investigated in

our study.

Psoriasis pathogenesis is exacerbated by smoking, which increases free radicals that activate signaling pathways (45). Smoking is an independent risk factor for psoriasis development (45). Smoking was common among our patients (56.8%). Indeed, 87.5% of psoriatic patients with arthritis were smokers, but smoking was not a significant predictor for PsA development. The association between smoking and increased severity of psoriasis has been reported in the literature (46).

As a systemic inflammatory disease, psoriasis is often associated by other conditions including hypertension, diabetes, dyslipidemia, coronary artery disease, and metabolic syndrome. Turan et al. found that 36% of patients had comorbid conditions with hypertension being the most common (12%) (47). Akbulut et al. found comorbidities in 34.5% of their patients (48): 28.4% of patients in our study had a comorbid condition, which is consistent with recent studies. In terms of obesity, 36.4% and 6.8% of patients were overweight and obese, respectively; 68.8% and 12.5% of PsA patients were overweight and obese, respectively. Nevertheless, obesity was not a
significant predictor for PsA development. In contrast, Love et al. found that a higher BMI implies a greater chance of developing PsA (15).

Regarding age of disease onset, the mean age of disease onset was 31.8 years with no significant differences between groups. According to Egeberg and colleagues, having psoriasis diagnosed before the age of 20 or 30 was associated with a reduced chance of developing PsA than having psoriasis diagnosed after the age of 50 (49).

Studies on the relationship between PsA development and the duration of psoriasis have shown contradictory findings. A population-based study reported an increased incidence of PsA with duration of cutaneous symptoms (49). A Chinese population cohort study found that a durationof psoriasis longer than 180 months led to an increased risk of PsA (50). In contrast, the duration of psoriasis was not considered to be a predictor of PsA in the El-Garf et al. study (51). In our study, the mean duration of psoriasis was higher in psoriatic patients with arthritis than those without, but the difference was not significant between the groups. The duration of disease onset was not considered to be a predictor of PsA development.

Psoriasis is known as a heterogeneous disease with different clinical forms. The plaque type of psoriasis reported in literature as the most common type accounted for more than 70% of cases (47, 48). Here, the plaque type accounted for 61.4% of cases and the guttate type for 23.9% of cases. The least common type was reported for the inverse type of psoriasis (1.1%).

Radiological evaluations are important to identify changes that occur during development of PsA including erosion, periosteal reaction, joint space narrowing, lysis, ankylosis and enthesitis (52). However, the harm from radiation limits its frequent use. Regarding the clinical form of PsA, asymmetric oligoarthritis (56.2%) was the most prevalent clinical type in our study

followed by
enthesitis (37.5%). Spondyloarthritis had the lowest prevalence (6.2 %). This result is consistent with the study conducted by Gamonal et al. (33).

Our study evaluated the prevalence**,** predictive factors, and radiographic findings of psoriatic arthritis among patients with psoriasis and in which dermatologists made the diagnosis using the CASPAR criteria and radiology. To the best of our knowledge, this study is the first of its kind inJordan.

Study limitations

The primary limitation of this study is the small number of patients. Its retrospective nature also limits the clinical factors that could be studied.

CONCLUSION

The prevalence of PsA in patients with psoriasis was 18.2%. Nail involvement and severity of psoriasis were significant predictors for PsA. The plaque type of psoriasis was the most prevalent. Asymmetric oligoarthritis was the most prevalent clinical form of PsA followed by enthesitis; spondylarthritis had the lowest prevalence.

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