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Source / Izvornik: **Reumatizam, 2017, 64, 8 - 16**

**Journal article, Published version**

**Rad u časopisu, Objavljena verzija rada (izdavačev PDF)**

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:184:476731>

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Download date / Datum preuzimanja: **2025-01-29**



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# EPIDEMIOLOGY OF AND CLASSIFICATION CRITERIA FOR PSORIATIC ARTHRITIS

## EPIDEMIOLOGIJA PSORIJATIČNOG ARTRITISA I KLASIFIKACIJSKI KRITERIJI ZA PSORIJATIČNI ARTRITIS

Nadica Laktašić-Žerjavić<sup>1</sup>, Tea Schnurrer-Luke-Vrbanić<sup>2</sup>

<sup>1</sup>University of Zagreb, School of Medicine, University Department of Rheumatology and Rehabilitation, University Hospital Centre Zagreb, Kispaticeva 12, 10000 Zagreb, Croatia

<sup>2</sup>University Department of Physical and Rehabilitation Medicine, University Hospital Centre Rijeka, Tome Strizica 3, 51000 Rijeka, Croatia

Corresponding author address:

Nadica Laktašić-Žerjavić, MD, PhD

University of Zagreb, School of Medicine

University Department of Rheumatology and Rehabilitation

University Hospital Centre Zagreb

Kispaticeva 12, 10000 Zagreb, Croatia

E-mail: nadica\_laktasic@yahoo.com

Received/Primljeno: 29. 6. 2017.

Accepted/Prihvaćeno: 21. 7. 2017.

### ABSTRACT

Psoriatic arthritis (PsA) is a chronic inflammatory arthritis associated with psoriasis. It is a member of the spondyloarthritis (SpA) group and its most frequent subtype. It is difficult to determine the epidemiology of PsA due to the absence of universally accepted diagnostic criteria. The prevalence of PsA among patients with psoriasis is around 30% (varying from 6% to 42%). It is higher in Europe and the USA. In Asian countries, the prevalence of PsA among patients with psoriasis has been estimated to be less than 10%. There is still a high prevalence of undiagnosed PsA in patients with psoriasis (up to 30%). Dermatologists should be encouraged to regularly screen their patients for PsA using several accepted screening tools. Prevalence estimates of PsA in Europe range from 0.05% in Turkey and the Czech Republic to 0.42% in Italy. Prevalence estimates of PsA in South America and Asia are lower than in Europe, and range from 0.02% in China to 0.07% in Argentina. The annual incidence of PsA in patients with psoriasis is 2 to 3%. Patients with severe psoriasis and nail changes are at greater risk of developing PsA. The first classification criteria for PsA were proposed by Moll and Wright in 1973. In 1991, the European Spondyloarthropathy Study Group (ESSG) criteria established for the first time that PsA can also occur in the absence of psoriasis. The ASAS criteria for axial and peripheral SpA can be used in combination for the entire SpA population, including patients with PsA. The CASPAR criteria, developed by the Group for Research and Assessment of Psoriasis and PsA (GRAPA), have very high specificity and sensitivity (98.7% and 91.4%, respectively). Although they are not diagnostic criteria, the CASPAR criteria have been accepted not only in research, but in clinical practice as well.

**KEYWORDS:** Arthritis, psoriatic – classification, diagnosis, epidemiology; Spondylarthritis – classification, diagnosis

### SAŽETAK

Psorijatični artritis (PsA) kronični je upalni artritis povezan sa psorijazom i član je grupe spondiloartritisa (SpA) te je najčešća podvrsta SpA. Teško je odrediti epidemiologiju PsA zbog nedostatka općeprihvaćenih dijagnostičkih kriterija. Prevalencija PsA kod pacijenata sa psorijazom iznosi oko 30% (varira od 6 do 42%). Viša je u Europi i SAD-u. U azijskim zemljama prevalencija PsA kod pacijenata sa psorijazom procjenjuje se nižom od 10%. Još i sad se često PsA ne dijagnosticira u bolesnika sa psorijazom (do 30%). Stoga dermatologe treba poticati da redovito pregledavaju svoje pacijente na PsA koristeći se s nekoliko prihvaćenih alata za probir. Procjene prevalencije PsA u Europi kreću se od 0,05% u Turskoj i Češkoj do 0,42% u Italiji. Procjene prevalencije PsA u Južnoj Americi i Aziji niže su nego u Europi, kreću se u rasponu od 0,02% u Kini do 0,07% u Argentini. Godišnja incidencija PsA u bolesnika sa psorijazom iznosi 2 do 3%. Pacijenti s teškom psorijazom i promjenama nokata imaju viši rizik od razvoja PsA. Prve kriterije razvrstavanja za PsA predložili su Moll i Wright 1973. godine. Godine 1991. prvi se put u kriterijima Europske studijske grupe za SpA (ESSG) prepoznalo da se PsA može pojaviti i u odsutnosti psorijaze. Kriteriji ASAS za aksijalni SpA

i periferni SpA mogu se kombinirati u cijeloj populaciji bolesnika sa SpA, uključujući i bolesnike sa PsA. Kriteriji CASPAR koje je osmislila grupa za istraživanje i procjenu psorijaze i PsA (GRAPA) pokazuju vrlo visoku specifičnost i osjetljivost (98,7% i 91,4%). Iako nisu dijagnostički kriteriji, kriteriji CASPAR prihvaćeni su ne samo za istraživanja nego i za kliničku praksu.

**KLJUČNE RIJEČI:** Psorijatični artritis – dijagnoza, epidemiologija, klasifikacija; Spondiloartritis – dijagnoza, klasifikacija

## Introduction

Psoriatic arthritis (PsA) is chronic inflammatory arthritis associated with psoriasis. The manifestation of psoriasis usually precedes that of arthritis by 10 years on average, although in 20% of cases arthritis and psoriasis occur simultaneously, or arthritis precedes the skin disease. In this situation, a family history of psoriasis is an important clue. Psoriasis may be hidden, so it is important to look for psoriatic skin and nail changes in patients with a clinical picture compatible with spondyloarthritis (SpA). In most cases of PsA exacerbations and remissions of skin and joint disease occur with little or no apparent relationship. Around 30 percent of people with psoriasis develop PsA. PsA can start slowly with mild symptoms, or it can start quickly and be severe. The typical clinical presentation shows asymmetrical peripheral oligoarthritis or polyarthritis with dactylitis and distal interphalangeal joint (DIP) involvement. When present, sacroiliitis is usually asymmetric, and spondylitis may also be present. However, the pattern of disease may change over time. Serologically, it is characterized by an absence of rheumatoid factor (RF), and radiologically by juxta-articular new bone formation, absence of periarticular osteopenia, and relative preservation of the joint space. PsA is a chronic erosive disease and treatments are similar to those used in rheumatoid arthritis (RA) (1, 2). PsA is a member of the SpA group of chronic inrelated inflammatory arthropathies. The SpA group includes axial SpA with ankylosing spondylitis (AS), peripheral SpA, PsA, reactive arthritis (ReA), inflammatory bowel disease-related arthritis, and juvenile spondyloarthritis. Common features that link these entities are an association with human leukocyte antigen *B27* (*HLA-B27*), a characteristic pattern of peripheral arthritis that is asymmetric, oligoarticular manifestation and predominance in the lower extremities, and possible sacroiliitis, spondylitis, enthesitis, dactylitis, and inflammatory eye disease (1). Patients with psoriasis and PsA more often present with comorbidities. Evidence shows an association of psoriasis and PsA with depression, metabolic syndrome (central obesity, dyslipidemia, hypertension, and insulin resistance), non-alcoholic fatty liver disease (NAFLD), cardiovascular diseases, and osteoporosis. Comorbidities are believed to be related to the chronic inflammation present in

psoriasis and PsA (3). Despite clinical improvement with conventional synthetic disease-modifying antirheumatic drug (csDMARD) treatment, PsA results in radiological damage in up to 47% of patients at a median interval of two years (4). Biologic DMARDs (bDMARDs) have been used in the treatment of PsA for the last decade (tumor necrosis factor alpha inhibitors (TNFi) and the more recently developed anti-interleukin-17 (anti-IL-17)) (5).

## History of psoriasis and psoriatic arthritis

Psoriasis is a several-thousand-year-old disease. It was discovered on Egyptian mummies. Galen (133–200 AD) identified psoriasis as a skin disease and was the first to call it psoriasis, based on the Greek word *psora*, which means to itch. Psoriasis was believed to be contagious, and was confused with leprosy. The skeletal remains of nine males and one female dating from the fifth century AD, unearthed in 1983 from the tomb of Paulus in the Byzantine monastery of Martyrius in the Judean desert, showed visual and radiographic features consistent with PsA. The presence of these cases of PsA within a desert monastery indicates that people suffering from psoriasis used to be isolated (6, 7). In the 1840s psoriasis was finally distinguished from leprosy. In the 1960s PsA was identified as a specific clinical entity (6). The first classic description of the clinical features of PsA was published in 1973 by Moll and Wright (8). They concluded that epidemiological, clinical, radiological, and serological evidence suggests that PsA is a specific entity rather than the coincidental occurrence of two common diseases, psoriasis and RA. They defined PsA as psoriasis associated with inflammatory arthritis (peripheral arthritis and/or spondylitis) with a usually negative serological test for RF. Using these criteria, Moll and Wright described five subgroups of PsA: involvement of DIP joint only, asymmetrical oligoarthritis, polyarthritis, spondylitis, and arthritis mutilans (Table 1).

## Epidemiology of psoriatic arthritis

PsA is the most frequent subtype of SpA, followed by AS and undifferentiated spondyloarthritis (USpA) (9). PsA usually starts at 30 to 50 years of age, but PsA can begin as early as during childhood. The mean time between the occurrence of psoriasis and PsA is 10 years.

TABLE 1 The Moll and Wright Criteria for psoriatic arthritis proposed in 1973 and five subgroups of psoriatic arthritis (modified according to reference No. 8)

TABLICA 1. Mollovi i Wrightovi kriteriji za psorijatični artritis predloženi 1973. godine i pet oblika psorijatičnog artritisa (prilagođeno prema referenciji br. 8)

<p><b>Moll and Wright Diagnostic Criteria for PsA *</b>            Inflammatory arthritis (peripheral arthritis and/or sacroiliitis or spondylitis)            Presence of psoriasis            Usual absence of serological tests for rheumatoid factor</p> <p><b>Based on these criteria Moll and Wright described five subgroups of PsA:</b>            DIP joint only            Asymmetrical oligoarthritis            Polyarthritis            Spondylitis            Arthritis mutilans</p>
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sensitivity 91%; specificity 98% / senzitivnost 91%; specifičnost 98%  
 Legend: PsA – psoriatic arthritis / psorijatični artritis

The mean age of psoriasis onset appeared to be similar among patients with skin disease alone and in those with PsA. In 10 to 15% of patients psoriasis and PsA start simultaneously, and in 5–10% of patients PsA either starts before skin involvement, or skin involvement does not occur (10, 11, 12). The prevalence of PsA among patients with psoriasis is around 30% (varying from 6% to 42%) (13, 14). It is higher in Europe and the USA. However, in Asian countries, the prevalence of PsA among patients with psoriasis has been estimated to be less than 10% (15). The annual incidence of PsA in patients with psoriasis is 2 to 3%. Patients with severe psoriasis and nail changes are at greater risk of developing PsA (16). A number of studies have examined the overall prevalence and incidence of PsA in countries all over the world. The reported numbers differ, depending on the criteria used and the geographic region. PsA has an estimated prevalence of below 0.5 % in the general population and is generally distributed equally across men and women. Prevalence and incidence rates of PsA are higher in Europe and Northern America than in Asia (Table 2) (17).

There is a trend of rising PsA incidence in some countries. Although these findings might be explained by an increased awareness of the patients and physicians, there is still a high prevalence of undiagnosed PsA in patients with psoriasis (up to 30%) (11, 18). Because skin psoriasis precedes the onset of PsA in the majority of cases, dermatologists have an important role in screening psoriasis patients for PsA, especially those with rheumatic symptoms. There are several validated screening tools (questionnaires) developed with the aim of helping dermatologists and GPs identify patients who might suffer from PsA: the Psoriasis Epidemiology Screening Tool (PEST), the Toronto Psoriatic Arthritis Screening (ToPAS and ToPAS2), and the Psoriatic Arthritis Screening and Evaluation (PASE) ques-

tionnaire. They have comparable sensitivities and specificities (19, 20, 21, 22). PEST is a simple screening tool frequently used by non-rheumatologists to screen psoriasis patients for signs or symptoms of PsA (21). If a total score is indicative of PsA, it is recommended to refer these patients to a rheumatologist for further assessment (Table 3).

The Toronto Psoriatic Arthritis Screen 2 (ToPAS 2) is a screening instrument for identifying PsA both in patients with psoriasis and in individuals from the general population. It includes 13 questions about the psoriasis, nail lesions, joint pain and swelling, back pain and stiffness, and dactylitis. The questionnaire contains images representing skin and nail lesions, joint disease, and dactylitis to help physicians recognize the symptoms. It has a specificity of 82.7% and a sensitivity of 87.2% in recognizing patients with PsA (19, 22). In real world settings these screening tools seem to have insufficient sensitivity but a good specificity when used by dermatologists (23). Despite the insufficient sensitivity of these screening tools, non-rheumatologists (GPs and dermatologists) should be encouraged to regularly screen their patients for signs or symptoms of PsA. It seems that no clinical type of psoriasis is specifically associated with PsA, including pustular psoriasis of the palms and soles, but patients with psoriasis and PsA have more severe skin disease. Rouzaud found that there is a trend towards an association between the Psoriasis Area and Severity Index (PASI) and the PsA risk (mean difference 3.39) and a higher frequency of nail changes (Odds Ratio (OR) 2.92), particularly onycholysis (OR 2.38) (24). Moreover, Rouzaud confirmed that nail psoriasis is also associated with distal interphalangeal joint arthritis. Therefore, it is recommended that psoriasis patients with such clinical features (high PASI score and nail changes) should be closely monitored for early detection of PsA (24).

Prevalence estimates of PsA in Europe range from 0.05% in Turkey and the Czech Republic to 0.42% in Italy (Table 2) (25, 26, 27). Prevalence estimates of PsA in South America and Asia are lower than in Europe, and range from 0.02% in China to 0.07% in Argentina (Table 2) (28, 10). The prevalence and incidence rates of PsA for the year 2002 in Denmark were low. According to the Moll and Wright and CASPAR criteria, the prevalences were 0.15% and 0.14%, respectively. The annual incidence rates based on new self-reported cases in 2002 were 6/100,000 person-years and 11/100,000 person-years, respectively (29). A recent epidemiological study from Denmark revealed a rising trend of PsA incidence. Incidence rates of PsA in Denmark increased from 7.3 in 1997 to a peak incidence of 27.3 in 2010 (per 100,000 person-years). There was a slight female predominance ranging from 50.3% (1998) to 59.2% (2010), and the mean age at the time of diagno-



TABLE 2 Prevalence and incidence rates of psoriatic arthritis in the general population

TABLICA 2. Stope incidencije i prevalencije psorijatičnog artritisa u općoj populaciji

Country	PsA prevalence	PsA incidence	Male to female ratio	Reference
Denmark (for the year 2002)	0.14 %	6 per 100,000 person-years	ND	Pedersen OB, Svendsen AJ, Ejstrup L, Skytthe A, Junker P. The occurrence of psoriatic arthritis in Denmark. <i>Ann Rheum Dis.</i> 2008;67(10):1422–6. (No. 29)
Denmark (for the year 2010)	ND	27.3 per 100,000 person-years	1:1	Egeberg A, Kristensen LE, Thyssen JP, et al. Incidence and prevalence of psoriatic arthritis in Denmark: a nationwide register linkage study. <i>Ann Rheum Dis.</i> 2017 May 8. pii: annrheumdis-2016-210963. doi: 10.1136/annrheumdis-2016-210963. [Epub ahead of print] PubMed PMID: 28483767. (No.18)
Iceland	0.14 %	ND	1:2	Love TJ, Gudbjornsson B, Gudjonsson JE, Valdimarsson H. Psoriatic arthritis in Reykjavik, Iceland: prevalence, demographics, and disease course. <i>J Rheumatol.</i> 2007; 34(10):2082–8. (No.12)
Finland (for the year 1995)	ND	6.1 per 100,000 of the adult population	1.3:1.	Kaipainen-Seppänen O. Incidence of psoriatic arthritis in Finland. <i>Br J Rheumatol.</i> 1996;35(12):1289–91. (No.30)
Finland (for the year 2000)	ND	23 per 100,000 of the adult population	ND	Savolainen E, Kaipainen-Seppänen O, Kröger L, Luosujärvi R. Total incidence and distribution of inflammatory joint diseases in a defined population: results from the Kuopio 2000 arthritis survey. <i>J Rheumatol.</i> 2003;30(11):2460–8. (No. 31)
Sweden	0.25%	ND	more prevalent in women	Haglund E, Bremander AB, Petersson IF, et al. Prevalence of spondyloarthritis and its subtypes in southern Sweden. <i>Ann Rheum Dis.</i> 2011;70(6):943–8. (No. 9)
United Kingdom	0.19 %	ND	ND	Ogdie A, Langan S, Love T, et al. Prevalence and treatment patterns of psoriatic arthritis in the UK. <i>Rheumatology (Oxford).</i> 2013;52(3):568–75. (No. 32)
Czech Republic	0.05 %	3.6 per 100,000 persons	ND	Hanova P, Pavelka K, Holcatova I, Pikhart H. Incidence and prevalence of psoriatic arthritis, ankylosing spondylitis, and reactive arthritis in the first descriptive population-based study in the Czech Republic. <i>Scand J Rheumatol.</i> 2010;39(4):310–7. (No. 26)
Italy	0.42%.	ND	ND	De Angelis R, Salaffi F, Grassi W. Prevalence of spondyloarthropathies in an Italian population sample: a regional community-based study. <i>Scand J Rheumatol.</i> 2007;36(1):14–21. (No. 27)
Turkey	0.05%	ND	ND	Cakir N, Pamuk ÖN, Derviş E, et al. The prevalences of some rheumatic diseases in western Turkey: Havsa study. <i>Rheumatol Int.</i> 2012;32(4):895–908. (No. 25)
China	0.02%	ND	ND	Liao ZT, Pan YF, Huang JL, et al. An epidemiological survey of low back pain and axial spondyloarthritis in a Chinese Han population. <i>Scand J Rheumatol.</i> 2009;38(6):455–9. (No. 28)
Minnesota/USA	0.16 %	7.2 per 100,000 persons	1.5:1	Wilson FC, Icen M, Crowson CS, McEvoy MT, Gabriel SE, Kremers HM. Time trends in epidemiology and characteristics of psoriatic arthritis over 3 decades: a population-based study. <i>J Rheumatol.</i> 2009;36(2):361–7. (No. 11)
Argentina	0.07%	6.3 per 100,000 person-years	ND	Soriano ER, Rosa J, Velozo E, et al. Incidence and prevalence of psoriatic arthritis in Buenos Aires, Argentina: a 6-year health management organization-based study. <i>Rheumatology (Oxford).</i> 2011;50(4):729–34. (No. 10)

Legend: PsA – psoriatic arthritis / psorijatični artritis; ND – no data / nema podataka

sis was 47–50 years. Incidence rates were highest for women and patients aged 50–59 years, respectively (18). An epidemiological study on PsA from Reykjavik, Iceland, revealed a prevalence of PsA of at least 0.14%. The disease was strikingly more common in women. The female to male ratio was close to 2:1. The

mean age at skin disease onset was 23 years, with a significantly earlier onset in women (age 20 years in women vs 26 years in men;  $p = 0.01$ ), but there was no significant difference for age at the time of onset of joint disease (12). The annual incidence of PsA in Finland for the year 1995 in the population of 5/21 central

TABLE 3 Psoriasis Epidemiology Screening Tool (PEST) questionnaire for psoriatic arthritis in patients with psoriasis (modified according to reference No. 21)

TABLICA 3. Upitnik PEST (engl. Psoriasis Epidemiology Screening Tool) probira na psorijatični artritis u bolesnika sa psorijazom (prilagođeno prema referenciji br. 21)

Score 1 point for each question answered in the affirmative. A total score of 3 or more is indicative of PsA	yes	no
Have you ever had a swollen joint (or joints)?		
Has a doctor ever told you that you have arthritis?		
Do your fingernails or toenails have holes or pits?		
Have you had pain in your heel?		
Have you had a finger or toe that was completely swollen and painful for no apparent reason?		

sensitivity 92%; specificity 78% / osjetljivost 92%; specifičnost 78%  
Legend: PsA – psoriatic arthritis / psorijatični artritis

hospital districts was 6.1 per 100,000 of the adult population. The mean age at diagnosis was 46.8 years. The peak incidence occurred in the 45–54 year age group. The male to female ratio was 1.3:1 (30). Savolainen reported a higher incidence of PsA among adults than was previously reported from Finland. In this report the annual incidence of PsA, in a defined population of adult inhabitants of Kuopio in the year 2000, was 23/100,000. The mean age at diagnosis was 48.7 years (31). In Sweden the prevalence of PsA was estimated at 0.25%. PsA was more prevalent in women (9). The Health Improvement Network (THIN) is a large population-based medical records database in the UK, and is an important resource for the study of PsA. From the 4.8 million adult patients registered in that database, 9045 patients had at least one medical code for PsA, giving an overall prevalence of 0.19%. Among confirmed psoriasis patients, the prevalence of PsA was 8.6%. PsA was more prevalent among patients with severe psoriasis (OR 3.34), obesity (OR 1.77), and duration of psoriasis for  $\geq 10$  years (OR 7.42) in the fully adjusted model (32). The total annual incidence of PsA in the Czech Republic in adults aged 16 years or older was 3.6/100,000 and the prevalence of PsA was 0.049% (26). The first population-based study conducted in Italy on a target adult population of 20,882 individuals established a very high PsA prevalence of 0.42% (27). The prevalences of psoriasis and PsA in western Turkey were 0.424 % and 0.050%, respectively (25). The prevalence of PsA among patients with psoriasis is relatively higher in Greece compared to other ethnic-based studies. The Greek study included patients with psoriasis 52% of which were male and 48% female. Their median age was 51.41 years, with a median psoriasis-presenting age of 34.52 years. Of these patients 30% had PsA, and among these 51% had psoriatic nail disease (33). A large epidemiological study performed

TABLE 4 Amor criteria for the classification of spondyloarthropathies published in 1990 (modified according to reference No. 37)

TABLICA 4. Amorovi kriteriji za klasifikaciju spondiloartritisa objavljeni 1990. (prilagođeno prema referenciji br. 37)

There is no entry criterion. A score of 6 or more classifies a patient as having SpA.	Score
<b>A. Clinical symptoms or history</b>	
Lumbar or dorsal pain at night or morning stiffness	1
Asymmetrical oligoarthritis	2
Buttock pain (alternating buttock pain)	1 (2)
Sausage-like toe or digit	2
Heel pain or other well-defined enthesopathy	2
Uveitis	1
Nongonococcal urethritis or cervicitis within 1 month before the onset of arthritis	1
Acute diarrhea within one month before the onset of arthritis	1
Psoriasis, balanitis, or inflammatory bowel disease (ulcerative colitis or Crohn's disease)	2
<b>B. Radiological findings</b>	
Sacroiliitis (bilateral grade 2 or unilateral grade 3)	3
<b>C. Genetic background</b>	
Presence of HLA-B27 and/or family history of ankylosing spondylitis, reactive arthritis, uveitis, psoriasis, or inflammatory bowel disease	2
<b>D. Response to treatment</b>	
Clear-cut improvement within 48 h after NSAIDs intake or rapid relapse of the pain after their discontinuation	2

Legend: SpA – spondyloarthritis / spondiloartritis; NSAID – non-steroidal anti-inflammatory drug / nesteroidni protuupalni lijekovi; HLA – human leukocyte antigen / HLA – humani leukocitni antigen

in Olmsted County, Minnesota, USA, revealed a trend of rising PsA incidence and prevalence. The PsA incidence cohort comprised 147 adult subjects, of which 61% were males, with a mean age of 42.7 years. The overall age- and sex-adjusted annual incidence of PsA per 100,000 was 7.2, with a higher incidence in males (9.1) than females (5.4). The age- and sex-adjusted incidence of PsA per 100,000 increased from 3.6 between 1970–1979 to 9.8 between 1990–2000 ( $p$  for trend 0.001). The point prevalence per 100,000 was 0.158% in 2000, with a higher prevalence in males (0.193%) than females (0.127%). At incidence, most PsA subjects had oligoarticular involvement (49%) with enthesopathy (29%) (11). The incidences and prevalences of PsA in Buenos Aires, Argentina, and Latin American countries were similar to those reported in other studies from Europe and the USA. In the study period, 138,288 persons contributed a total of 558,878 person-years, of whom 35 developed PsA (incidence risk-IR 6.26 cases per 100,000 person-years). There were 12

TABLE 5 European Spondyloarthropathy Study Group (ESSG) criteria for the classification of the spondyloarthropathy group as a whole published in 1991 (modified according to reference No. 38)

TABLICA 5. Klasifikacijski kriteriji općenito za grupu spondiloartritisa doneseni od Europske grupe za istraživanje spondiloartritisa (ESSG) i objavljeni 1991. (prilagođeno prema referenciji br. 38)

Entry criterion:	
Inflammatory spinal pain	or Synovitis asymmetric or predominantly in the lower limbs
And one or more of the following:	
Positive family history	Presence in first-degree or second-degree relatives of any of the following: ankylosing spondylitis, psoriasis, acute uveitis, reactive arthritis, inflammatory bowel disease
Inflammatory bowel disease	Past or present Crohn's disease or ulcerative colitis diagnosed by a physician and confirmed by radiographic examination or endoscopy
Psoriasis	Past or present psoriasis diagnosed by a physician
Urethritis, cervicitis, or acute diarrhea within one month before arthritis	Episode of diarrhea occurring within one month before arthritis Nongonococcal urethritis or cervicitis occurring within one month before arthritis
Buttock pain alternating between right and left gluteal areas	Past or present pain alternating between the right and left gluteal regions
Sacroiliitis	Bilateral grade 2–4 or unilateral grade 3–4, according to the following radiographic grading system: 0 = normal, 1 = possible, 2 = minimal, 3 = moderate, and 4 = ankylosis
Enthesopathy	Past or present spontaneous pain or tenderness at examination of the site of the insertion of the Achilles tendon or plantar fascia

sensitivity 87%; specificity 87% / osjetljivost 87%; specifičnost 87%

females (IR 3.64 cases per 100,000 person-years) and 23 males (IR 10.02 cases per 100,000 person-years). In January 2006, 65 prevalent cases were identified (prevalence 0.074%) (10). Among a Chinese population of patients with psoriasis 5.8% had PsA, of which 92% were newly diagnosed cases. Compared with patients without PsA, patients with PsA had more severe skin disease (mean PASI 9.7 vs. 6.0), a higher frequency of nail changes (46.4% vs. 21.0%), and scalp involvement (90.2% vs. 76.4%). The findings are consistent with the low prevalence of PsA among patients with psoriasis in Asia and confirm a high percentage of undiagnosed cases with active arthritis among PsA patients in dermatologists' offices (34). An investigation performed in the Han population of Dalang Town, China, confirmed a low prevalence of PsA in China (0.022%) (28). Although many studies have indicated a low

TABLE 6 Assessment of SpondyloArthritis international Society (ASAS) classification criteria for axial spondyloarthritis (SpA) published in 2009 (modified according to references No. 40 and 41)

TABLICA 6. Kriteriji Međunarodnog društva za mjerenja u spondiloartritisu (ASAS) za aksijalni spondiloarthritis (SpA) objavljeni 2009. (prilagođeno prema referencijama br. 40 i 41)

Entry criteria:	
Patient with chronic back pain (≥3 months) and age at onset of back pain < 45 years	
or	
Sacroiliitis on imaging plus ≥1 SpA feature:	HLA-B27 plus ≥2 other SpA features:
SpA features :	Sacroiliitis on imaging (radiographs or MRI):
Inflammatory back pain**	Active (acute) inflammation on MRI highly suggestive on sacroiliitis associated with SpA*#
Arthritis	Definite radiographic sacroiliitis according to modified New York criteria
Enthesitis (heel)	
Uveitis	
Dactylitis	
Psoriasis	
IBD (Crohn's /colitis)	
Good response to NSAIDs	
Positive family history for SpA	
HLA-B27	
Elevated CRP	

sensitivity 82.9%; specificity 84.4%

/ Osjetljivost 82,9%; specifičnost 84,4%

\*Active inflammatory lesions on MRI (STIR/post-gadolinium T1): bone marrow edema (osteitis), capsulitis, synovitis, enthesitis.

/ Aktivne upalne promjene (STIR/post-gadolinij T1): edem koštane srži (osteitis), kapsulitis, sinovitis, entezitis.

\*\* The ASAS criteria for inflammatory back pain are fulfilled if at least four out of five parameters are present: age at onset <40 years, insidious onset, improvement with exercise, no improvement with rest, pain at night (with improvement upon getting up). / Kriteriji ASAS-a za upalnu bol u leđima ispunjeni su ako su prisutna najmanje četiri od pet parametara: dob pri nastupu križbolje < 40 godina, podmukao nastup, poboljšanje vježbanjem, bez poboljšanja s odmaranjem, bol noću (uz poboljšanje nakon ustajanja).

\*Chronic inflammatory lesions on MRI (normally T1): sclerosis, erosions, fat deposition, bony bridges/ankylosis. / Kronične upalne promjene (obično T1): skleroza, erozije, masna degeneracija, koštana premoštenja/ankiloza.

Legend: SpA – spondyloarthritis / spondiloarthritis; MRI – magnetic resonance imaging / magnetska rezonancija; HLA – human leukocyte antigen / humani leukocitni antigen; IBD – inflammatory bowel disease / upalna bolest crijeva; CRP – C-reactive protein / C-reaktivni protein; NSAID – nonsteroidal anti-inflammatory drug / nesteroidni protuupalni lijekovi

prevalence rate of PsA in patients with psoriasis in the Japanese population, the rate is gradually increasing every year and is estimated to be over 10%. In Japan,



TABLE 7 Assessment of SpondyloArthritis international Society (ASAS) classification criteria for peripheral spondyloarthritis (SpA) published in 2011 (modified according to reference No. 42)

TABLICA 7. Kriteriji Međunarodnog društva za mjerenja u spondiloartritisu (ASAS) za periferni spondiloartritis (SpA) objavljeni 2011. (prilagođeno prema referenciji br. 42)

Entry criterion:	
Arthritis or enthesitis or dactylitis	
or	
plus $\geq 1$ of:	plus $\geq 2$ of the remaining:
Psoriasis	Arthritis
Inflammatory bowel disease – IBD	Enthesitis
Preceding infection	Dactylitis
HLA-B27	IBP in the past
Uveitis	Positive family history for SpA
Sacroiliitis on imaging (radiographs or MRI)	

sensitivity 77.8%; specificity 82.2%

/ Osjetljivost 77,8%; specifičnost 82,2%

Legend: MRI – magnetic resonance imaging / magnetska rezonancija; HLA – human leukocyte antigen / humani leukocitni antigen; IBD – inflammatory bowel disease / upalna bolest crijeva; SpA – spondyloarthritis / spondiloartritis

there was a male predominance. The mean onset age of PsA was 45 years, and the mean onset age for cutaneous psoriasis was under 36 years. The mean time between the occurrence of psoriasis and PsA was 11.2 years, whereas that in patients in whom psoriasis was preceded by arthritis was 4.4 years. The polyarthritis type was most common (36%), followed by the distal interphalangeal (26%) and oligoarthritis (22%) types. Back pain was present in 34.3% of patients. Enthesitis and dactylitis were observed in 28.3% and 59.2%, respectively (35).

### Diagnostic and classification criteria for psoriatic arthritis

Aggarwal defined the diagnostic and classification criteria and pointed out the main differences between them (36).

Diagnostic criteria are a set of signs, symptoms, and tests designed for use in routine clinical settings to guide the physicians in care of the individual patient. They must reflect all the different features of a disease, and be able to accurately identify as many individuals with the condition as possible. There are only a few validated diagnostic criteria in rheumatology (36). As PsA is very heterogeneous disease, the clinical picture may change over the disease course in an individual patient, and there is no golden diagnostic standard for PsA. That is why diagnostic criteria for PsA have not yet been developed and validated.

Classification criteria are primarily intended to create defined cohorts for clinical research. When used in clinical settings they cannot capture all patients with a specific disease, but rather the majority of patients with shared key features. Classification criteria have a high specificity with a somewhat lower sensitivity (36). Only physicians considering the features of individual patients (regardless of the classification criteria) can establish a diagnosis for an individual patient.

The first classification criteria for PsA were proposed by Moll and Wright in 1973. They are the oldest and most widely known guide to diagnosing psoriatic arthritis (8). SpA was formally classified in the Amor criteria in 1990 (Table 4).

The Amor criteria are a list of signs based on a scoring system of laboratory, radiological, and clinical features and do not require an entry criterion. Although sacroiliitis is not mandatory for the diagnosis of SpA when using the Amor criteria, it has the highest score and is considered to be very specific for SpA (37). In 1991, The European Spondyloarthropathy Study Group (ESSG) derived classification criteria intended to capture a wide spectrum of SpA (seronegative oligoarthritis, dactylitis or polyarthritis of the lower extremities, heel pain due to enthesitis). Although the intention of the criteria was aimed at a diagnostic classification of the SpA group as a whole, particular types of SpA, including PsA, can be identified from the published classification criteria as well (Table 5). For the first time, it was recognized that PsA can actually also occur in the absence of psoriasis (38). In 1999, McGonagle proposed a definition of PsA based on enthesopathy, explaining the wide clinical picture of PsA in terms of enthesitis. McGonagle divided the wide clinical spectrum of PsA into common arthropathies (polyarthritis, spinal inflammation, peripheral enthesitis, distal interphalangeal joint arthritis, monoarthritis/oligoarthritis, dactylitis-sausage digits), uncommon arthropathies (palmar plantar pustulosis, synovitis, acne, pustulosis, hyperostosis, and osteolysis – SAPHO syndrome, spondylodiscitis, arthritis mutilans, onycho-pachydermo-periostitis, chronic multifocal recurrent osteomyelitis), and other features (arthralgia, chest pain). There is a significant problem with evaluation of the original McGonagle criteria set because of magnetic resonance imaging (MRI) requirements. Perhaps that is the reason they are not widely used. Nowadays it is likely that ultrasonographic evidence of enthesopathy might substitute MRI (39). In 2009, the Assessment of SpondyloArthritis international Society (ASAS) derived the classification criteria for axial SpA, and in 2011 the classification criteria for peripheral SpA (Table 6, Table 7).

The ASAS criteria for axial SpA and peripheral SpA can be used in combination among the entire SpA pop-



TABLE 8 Classification criteria for psoriatic arthritis (CASPAR criteria) published in 2006 (modified according to references No 2 and 43)  
 TABLICA 8. Klasifikacijski kriteriji za psorijatični artritis (kriteriji CASPAR) objavljeni 2006. (prilagođeno prema referencijama br. 2 i 43)

The CASPAR criteria include established inflammatory articular disease of the joint, spine, or enthesitis with at least 3 of 5 points from the following features (evidence of psoriasis can account for either one point or two points):	Explanation	Score
A. Current psoriasis	Current psoriatic skin or scalp disease as judged by a dermatologist or rheumatologist	2
B. A personal history of psoriasis (unless current psoriasis is present)	History of psoriasis according to the patient or a family doctor, dermatologist, or rheumatologist	1
C. A family history of psoriasis (unless current psoriasis is present or there is a personal history of psoriasis)	History of psoriasis in a first- or second-degree relative according to the patient	1
D. Typical psoriatic nail dystrophy including onycholysis, pitting, and hyperkeratosis	Observed on current physical examination	1
E. Current dactylitis or history of dactylitis recorded by a rheumatologist	Swelling of an entire digit observed on current physical examination or recorded by a rheumatologist	1
F. Negative rheumatoid factor	Based on reference range at local laboratory; there is preference for ELISA, latex is not acceptable	1
G. Juxta-articular new bone formation	Ill-defined ossification near joint margins (excluding osteophyte formation) on plain radiographs of hand or foot	1

sensitivity 91.4%; specificity 98.7% / osjetljivost 91,4%; specifičnost 98,7%

Legend: ELISA: enzyme-linked immunosorbent assay / ELISA: imunoenzimski test

ulation, including patients with PsA. In patients with predominantly axial involvement (back pain), with or without peripheral manifestations, the ASAS criteria for axial SpA should be applied. The criteria for peripheral SpA are applicable to patients with peripheral arthritis (usually predominantly of the lower limbs and/or asymmetric arthritis), and/or enthesitis, and/or dactylitis. In the entire SpA population, sensitivity and specificity of the combined use of the two sets of criteria is 79.5% and 83.3%, respectively (40, 41, 42). The classification for psoriatic arthritis criteria (CASPAR criteria) were published in 2006 (Table 8). They were developed by the Group for Research and Assessment of Psoriasis and PsA (GRAPPA). The CASPAR criteria are easy to use in epidemiological studies. The specificity and sensitivity of these criteria is very high (98.7% and 91.4%, respectively). Although they are not diagnostic criteria, the CASPAR criteria have been gaining acceptance in both research and clinical practice (43).

### Conclusion

As the diagnostic criteria for psoriatic arthritis have not been validated, it is difficult to determine the epidemiology of PsA due to the absence of universally accepted diagnostic criteria. Most patients with a clinical diagnosis of SpA fulfill several classification criteria sets at the same time (44). The CASPAR classification criteria for PsA, developed in 2006 by the GRAPPA, define PsA for the purpose of enrolling patients in clinical trials, but these classification criteria, due to their very high sensitivity and specificity, can also provide

guidance to physicians for diagnosing PsA in everyday clinical practice.

CONFLICT OF INTEREST DECLARATION: The authors have no conflict of interest.

IZJAVA AUTORA O SUKOBU INTERESA: Autori izjavljuju da nisu u sukobu interesa.

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