THERAPEUTIC ADVANCES in
Musculoskeletal Disease

Original Research

Relationship between onset of psoriasis and spondyloarthritis symptoms with clinical phenotype and diagnosis: data from REGISPONSER registry

Ther Adv Musculoskelet Dis

2022, Vol. 14: 1–8

DOI: 10.1177/1759720X221118055

Ignacio Gómez-Garcia, Teresa García-Puga, Pilar Font-Ugalde, Maria Angeles Puche-Larrubia, Nuria Barbarroja, Patricia Ruiz-Limón, Alejandro Escudero-Contreras, Eduardo Collantes-Estévez* and Clementina López-Medina*

Correspondence to:
Ignacio Gómez-Garcia
Department of Rheumatology, Reina Sofia University Hospital, Avda. Menendez Pidal s/n. Hospital Provincial, 14004 Córdoba, Spain.

Maimonides Institute for Biomedical Research of Córdoba (IMIBIC), Córdoba, Spain. University of Córdoba, Córdoba, Spain.
drignaciogomezgarcia@gmail.com

Teresa García-Puga
University of Córdoba, Cordoba, Spain

Pilar Font-Ugalde
Maria Angeles Puche-Larrubia
Alejandro Escudero-Contreras
Eduardo Collantes-Estévez
Department of Rheumatology, Reina Sofia University Hospital, Córdoba, Spain

Maimonides Institute for Biomedical Research of Córdoba (IMIBIC), Córdoba, Spain

University of Córdoba, Córdoba, Spain

Nuria Barbarroja
Maimonides Institute for Biomedical Research of Córdoba (IMIBIC), Córdoba, Spain; University of Córdoba, Córdoba, Spain

Patricia Ruiz-Limón
Department of Endocrinology and Nutrition, Virgen de la Victoria Hospital, Institute of Biomedical Research in Malaga (IBIMA), Málaga, Spain

CIBER in Physiopathology of Obesity and Nutrition (CIBEROBN), Carlos III Health Institute, Madrid, Spain

Abstract

Background: The relationship of psoriasis and spondyloarthritis (SpA) is well-known, and the age of appearance of different manifestations has been described as a determinant of SpA phenotype. However, differences between Spa with psoriasis and psoriatic arthritis (PsA) are still controversial.

Objectives: To evaluate whether the time of onset of psoriasis relative to the appearance of rheumatic symptoms in patients with SpA is associated with a clinical phenotype, a rheumatologist's diagnosis and the evolution of the disease.

Design: This was a cross-sectional study with data extracted from the REGISPONSER (Spondyloarthritis Registry of the Spanish Rheumatology Society) registry.

Methods: All patients had data available for both psoriasis and SpA dates of onset. Patients were classified into two groups depending on the time of appearance of psoriasis: psoriasis before or after rheumatic symptoms. The clinical characteristics, disease activity, radiographic damage, functional ability and received treatments were compared between the two groups. Moreover, the rheumatologists' diagnoses were compared between the two groups. Univariate and multivariate logistic regressions were conducted to evaluate the factors associated with each group.

Results: A total of 433/2367 (18.3%) patients included in the REGISPONSER database had psoriasis: 330 (76.2%) patients had psoriasis before rheumatic symptoms, and 103 (23.8%) had psoriasis after rheumatic symptoms. Patients with psoriasis before rheumatic symptoms had a shorter disease duration and a lower body mass index, a lower prevalence of both HLA-B27 antigens and anterior uveitis, a higher prevalence of dactylitis and an increase in levels of the erythrocyte sedimentation rate (ESR). Furthermore, a higher prevalence of PsA diagnoses (78.1% *versus* 56.4%) and a more frequent fulfilment of the CASPAR criteria (57.5% *versus* 42.2%) were found in these patients. The use of DMARDs was not significantly different between the two groups.

Conclusion: The time of appearance of psoriasis is associated with the clinical phenotype of SpA and could determine a diagnosis of PsA by rheumatologists.

Keywords: psoriasis, psoriatic arthritis, spondyloarthritis

Received: 11 January 2022; revised manuscript accepted: 19 July 2022.

Clementina López-Medina
Department of Rheumatology, Reina Sofia University Hospital, Córdoba, Spain; Maimonides Institute for Biomedical Research of Córdoba (IMIBIC), Córdoba, Spain
*Equal contribution.

Introduction

The term spondyloarthritis (SpA) encompasses a heterogeneous group of inflammatory diseases with common characteristics that include axial spondyloarthritis (axSpA) or ankylosing spondylitis (AS), psoriatic arthritis (PsA), reactive arthritis (ReA) or spondyloarthritis associated with inflammatory bowel disease (IBD-SpA).[1]

PsA is a subtype of SpA that combines skeletal involvement (articular, enthesis and axial) and psoriasis. Between 7% and 26% of patients with psoriasis suffer from psoriatic arthritis.[2] It is characterized by a great effect at the level of enthesis (except heel enthesitis) and at the joint level, with a great component of pain and a need for classical synthetic and biological disease-modifying antirheumatic drugs (csDMARDs and bsDMARDs).[3]

Psoriasis could appear before or after musculoskeletal symptoms and SpA diagnosis. However, most patients are diagnosed with PsA after (61.3%) or concomitant (23.8%) with psoriasis, while only 14.8% are first diagnosed with PsA. The median interval between psoriasis and PsA was 7 years.[4] There are no data about the impact of the order of symptom onset, but an earlier age of onset of musculoskeletal symptoms and a shorter latency between psoriasis and SpA have been associated with a positive HLA-B27 antigen.[5,6] A longer psoriasis-arthritis latency, a positive family history of the disease, clinical enthesitis and spondyloarthritis were described in patients with an early onset of psoriasis,[7,8] while patients with an early onset of PsA (<40 years) had higher bilateral sacroiliitis, HLA-B27 positivity, uveitis, isolated axial pattern and enthesitis.[5,9]

We hypothesized that the time of onset of psoriasis with regard to rheumatic symptoms may be associated with the clinical profile and phenotype of SpA and, as a consequence, may influence a rheumatologist's diagnosis. The objectives of this study were to determine the time of psoriasis onset relative to the onset of rheumatic symptoms in patients with SpA and to evaluate its association with the clinical profile and the rheumatologist's diagnosis.

Patients and methods

Patients

This is an ancillary analysis from the cross-sectional study of data from REGISPONSER (Spondyloarthritis Registry of the Spanish Rheumatology Society) registry. Thirty-one Spanish centres participated in the study, and patients with an SpA diagnosis according to the ESSG (European Spondyloarthropathy Study Group)[10] criteria were recruited from 2004 to 2007. Collantes *et al.*[11] described more details about the methodology and data inclusion. All patients who were included fulfilled the classification criteria from the ESSG, had blood tests available within 15 days of the inclusion visit, had completed a radiographic study within the previous year and agreed to complete all the self-administered questionnaires. Each patient was recruited consecutively and assigned a random code in the database to avoid entering personal data in the database.

In this ancillary analysis, patients with psoriasis from those included in the REGISPONSER registry (547 of 2367) were selected. After that, patients with available data for both the onset of psoriasis and the onset of musculoskeletal symptoms ($n=433$ patients) were included. We followed STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines for observational studies (Supplementary Material).

Collected data

Data on age, age at the time of diagnosis and sex were collected. Data on the following SpA diagnoses by a rheumatologist were obtained: AS, PsA, ReA, undifferentiated spondylitis (u-SpA), arthropathy associated with inflammatory bowel disease (a-IBD) or juvenile spondyloarthritis (juvenile SpA). Furthermore, data on the presence of HLA B27 antigens, synovitis, uveitis, inflammatory bowel disease (IBD), dactylitis, heel enthesitis (diagnosed by the responsible rheumatologists, defined as present or past Achilles tendonitis or fasciitis plantaris), hip involvement (pain or limitation with movement) and sacroiliitis on X-ray according to a local reader were collected. The date of psoriasis onset, the date of rheumatic symptom onset and disease duration (defined as the time since the first symptom) were also recorded.

To evaluate disease activity, data on C-reactive protein (CRP) levels, erythrocyte sedimentation rate (ESR), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI)[12] and Ankylosing Spondylitis Disease Activity Score (ASDAS) were collected,[13] while functional ability was evaluated by the Bath Ankylosing Spondylitis Functional Index (BASFI).[14] Both spinal and total (BASRI spine + BASRI hips) structural damage were

evaluated using the Bath Ankylosing Spondylitis Radiology Index (BASRI).[15] The modified New York (mNY) criteria[16] were used to score the sacroiliac joints. Finally, the presence of psoriasis, dactylitis and psoriasis nail involvement was registered as part of the CASPAR (ClASsification criteria for Psoriatic Arthritis)[17] criteria for PsA.

Finally, data from the use of the following treatments at any time during the disease were recorded: oral corticosteroids, nonsteroidal anti-inflammatory drugs (NSAIDs), csDMARDs (sulfasalazine, methotrexate) and bDMARDs [anti-TNF (tumour necrosis factor) treatment].

Statistical analysis

Patients were classified into the following groups according to the temporal relationship between psoriasis and rheumatic symptom onset (i.e. any axial, peripheral or entheseal involvement, excluding extra-articular manifestations): psoriasis before rheumatic symptoms or psoriasis after rheumatic symptoms.

Descriptive data were expressed as mean and standard deviation (SD) for quantitative variables and as absolute and relative frequencies for qualitative variables. Sociodemographic data, clinical characteristics and disease activity were compared between psoriasis before rheumatic symptoms and psoriasis after rheumatic symptoms. To evaluate the association of the different variables with the time of onset of psoriasis, a univariate analysis by binary logistic regression was performed. Multivariable logistic regression was conducted using a backward stepwise procedure to evaluate factors independently associated with the time of onset of psoriasis (psoriasis before rheumatic symptom onset *versus* psoriasis after rheumatic symptom onset), using variables with a significant result in the univariate analysis. Variables with a $p < 0.15$ in the multivariable analysis were tested as confounding factors. The Hosmer–Lemeshow test was used to determine the goodness of fit of the logistic regression model. The hypothesis tests were two-tailed, and a p value < 0.05 was considered significant. Data were collected, processed and analysed using IBM SPSS v.25 (IBM Corp., Armonk, NY, USA).

Results

Among a total of 2367 patients included in the REGISPONSER registry, 433 had the dates of both psoriasis and rheumatic symptom onset available. The characteristics of these patients are described in Table 1.

Considering the time of onset of psoriasis with regard to rheumatic symptoms, in 330 (76.2%) patients there was onset of psoriasis, and in 103 (23.8%) patients, the psoriasis appeared after rheumatic symptoms.

Differences in sociodemographic and clinical characteristics

To assess the impact of onset of psoriasis, patients with psoriasis before rheumatic symptoms and patients with psoriasis after rheumatic symptoms were compared.

The comparison of the two groups is summarized in Table 1. Patients with psoriasis before rheumatic symptoms had a shorter disease duration and shorter diagnostic delay. On the other hand, they had a lower prevalence of HLA-B27 antigen, inflammatory axial pain, sacroiliitis and heel enthesitis. However, they presented a higher frequency of dactylitis. Finally, no differences were found in terms of disease activity (evaluated with CRP, ESR, ASDAS-CRP and BASDAI), functional ability (measured by BASFI) or treatments received (neither csDMARDs nor bsDMARDs).

Furthermore, a multivariable analysis was conducted using significant variables from the univariate analysis (Table 1 and Figure 1). Our results show that patients with psoriasis onset before rheumatic symptoms had a shorter disease duration [0.94 (95% confidence interval [CI], 0.91–0.97)], lower body mass index [0.90 (95% CI, 0.83–0.97)] and lower prevalence of HLA-B27 antigens [0.17 (95% CI, 0.08–0.37)] and anterior uveitis [0.20 (95% CI, 0.04–0.93)], a higher prevalence of dactylitis [2.09 (95% CI, 1.03–4.22)] and an increase in the ESR [1.03 (95% CI, 1.00–1.06)] compared with the group of patients with psoriasis after rheumatic symptoms.

Differences in the diagnoses made by rheumatologists

A higher prevalence of PsA diagnoses was found in patients with psoriasis before rheumatic symptoms in comparison with patients with psoriasis after rheumatic symptoms [257 (78.1%) *versus* 57 (56.4%); $p < 0.001$)], as well as a lower prevalence of AS [68 (20.7%) *versus* 38 (37.6%);

Table 1. Demographic and clinical characteristics of the patients of REGISPONSER with available date of psoriasis and rheumatic symptom onset.

	Overall $N = 433$	Psoriasis before rheumatic symptoms $N = 330$	Psoriasis after rheumatic symptoms $N = 103$	Univariate analysis		Multivariate analysis	
				OR (95% CI)	*p* value	OR (95% CI)	*p* value
Age (years)	51.27 (13.17)	51.2 (13.3)	51.6 (12.9)	1.019 (1.002–1.036)	**0.028**		
Sex (male)	261 (60.3%)	191/330 (57.9%)	70/103 (68%)	0.648 (0.406–1.034)	0.069		
Body mass index (kg/m^2)	27.38 (4.86)	27 (4.73)	28.5 (5.1)	0.942 (0.899–0.986)	**0.010**	0.898 (0.832–0.968)	**0.005**
Disease duration (years)	14.34 (11.24)	12.0 (9.4)	21.7 (13.3)	0.928 (0.908–0.948)	<**0.001**	0.935 (0.905–0.965)	<**0.001**
Diagnosis delay (years)	4.75 (7.79)	3.4 (5.8)	9.3 (11.1)	0.917 (0.891–0.945)	< **0.001**		
HLA-B27 antigen	88/282 (31.2%)	42/204 (20.6%)	46/78 (59%)	0.180 (0.103–0.317)	<**0.001**	0.174 (0.083–0.365)	<**0.001**
Inflammatory axial pain	189 (43.6%)	130/330 (39.4%)	59/103 (57.3%)	2.063 (1.317–3.231)	**0.002**		
Synovitis	359 (83%)	278/329 (84.5%)	81/103 (78.6%)	1.481 (0.848–2.586)	0.168		
Familiar background	291/418 (69.6%)	25/301 (8.3%)	18/90 (20.0%)	0.362 (0.187–0.700)	**0.003**		
Inflammatory bowel disease	9 (2.1%)	5/328 (1.5%)	4/103 (3.9%)	0.383–0.101–1.454)	0.159		
Enthesis involvement	107 (24.9%)	73/328 (22.3%)	34/103 (33.3%)	0.573 (0.352–0.932)	**0.025**		
Sacroiliitis	178/429 (41.5%)	117/326 (35.9%)	61/103 (59.2%)	0.385 (0.245–0.607)	<**0.001**		
Anterior uveitis	15/431 (3.5%)	8/328 (2.4%)	7/103 (6.8%)	0.343 (0.121–0.970)	**0.044**	0.200 (0.043–0.934)	**0.041**
Dactylitis	146 (33.8%)	121/329 (36.8%)	25/103 (24.3%)	1.815 (1.097–3.002)	**0.020**	2.179 (0.987–4.809)	0.054
ESR (mm/h)	19.84 (16.03)	20.5 (16.2)	17.7 (15.2)	1.012 (0.96–1.029)	0.148	1.030 (1.004–1.057)	**0.021**
CRP (mg/dl)	8.84 (12.71)	9.15 (13.72)	7.80 (8.39)	1.010 (0.988–1.033)	0.384		
ASDAS	2.65 (1.08)	2.6 (1.1)	2.7 (1.0)	0.942 (0.755–1.176)	0.599		
BASDAI	4.41 (2.49)	4.4 (2.5)	4.6 (2.5)	0.969 (0.884–1.061)	0.498		
BASFI	3.57 (2.73)	3.4 (2.7)	4.1 (2.9)	0.919 (0.846–0.997)	**0.043**		
Spinal BASRI	2.55 (3.19)	2.1 (2.8)	4.0 (3.9)	0.846 (0.790–0.906)	<**0.001**		
Total BASRI	2.90 (3.67)	2.4 (3.2)	4.5 (4.5)	0.871 (0.821–0.924)	<**0.001**		
csDMARD in the visit	214/426 (50.2%)	163/326 (50.0%)	51/100 (51.0%)	0.961 (0.614–1.504)	0.861		
bDMARDs in the visit	72/424 (17%)	52/325 (16.0%)	20/99 (20.2%)	0.752 (0.424–1.335)	0.331		

ASDAS, Ankylosing Spondylitis Disease Activity Score; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; BASFI, Bath Ankylosing Spondylitis Functional Index; BASRI, Bath Ankylosing Spondylitis Radiology Index; CI, confidence interval; CRP, C-reactive protein; csDMARDs and bDMARDs: classical synthetic and biological disease-modifying drugs; ESR, erythrocyte sedimentation rate; OR, odd ratio. A p value < 0.05 was considered significant.

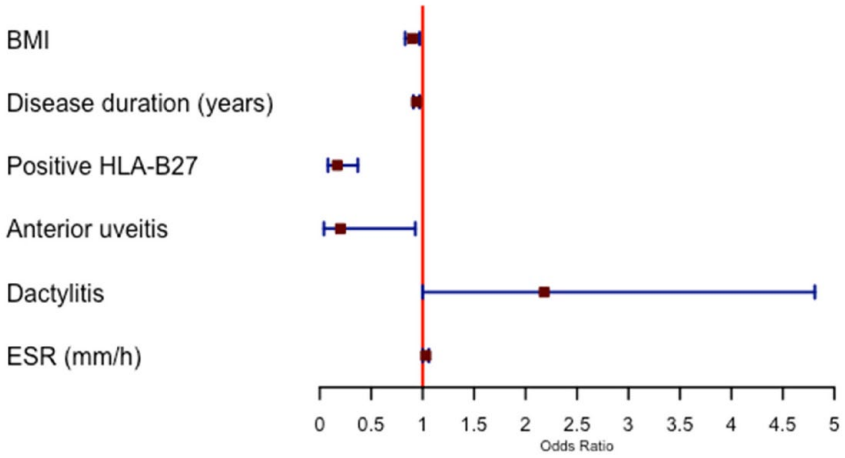

Figure 1. Clinical characteristics: psoriasis as the first symptom *versus* psoriasis onset after rheumatic symptoms. Multivariate analysis.
Forest plot with a multivariate analysis. Variables with $p < 0.1$ were included. An OR >1 referred to a positive association with the onset of psoriasis as the first symptom. Hosmer–Lemeshow test for the multivariate analysis: Chi-square of 5311 ($p = 0.724$). BMI, body mass index; ESR, erythrocyte sedimentation rate.

$p < 0.001$] with an odds ratio (OR) of 2.51 of a PsA *versus* SpA diagnosis (95% CI, 1.55–4.05) ($p < 0.001$).

Indeed, when we evaluated which patients fulfilled the CASPAR criteria for PsA (with no information about the rheumatoid factor or peripheral structural damage, as it was not collected), we obtained a prevalence of 188/327 (57.5%) patients in the group with psoriasis before rheumatic symptoms and 43/102 (42.2%) patients in the group with psoriasis after rheumatic symptoms, with an OR of 1.86 (95% CI, 1.18–2.91) ($p = 0.009$).

Discussion

This study suggests that the time of onset of psoriasis with regard to rheumatic symptoms is associated with the phenotype of the disease. We found that patients with a psoriasis onset before rheumatic symptoms showed a typical PsA phenotype, with a predominance of peripheral involvement and a low prevalence of HLA-B27 antigen, while patients with a psoriasis onset after rheumatic symptoms showed a typical axial phenotype, with a higher prevalence of axial involvement, HLA-B27 antigen and uveitis.

In a previous study carried out by our group, we hypothesized that the time of onset of anterior acute uveitis with respect to rheumatic symptoms could change the prognosis of SpA. We obtained a better prognosis in terms of structural damage and functional ability in patients with a previous episode of anterior acute uveitis when musculoskeletal involvement appeared.[18] To our knowledge, there is no study with similar objectives to ours with psoriasis as a reference. Bilgin *et al.*[19] observed differences in the phenotype of psoriasis without any important impact in terms of PsA in patients with an early onset (<40 years) and late onset (>50 years) of psoriasis.

Currently, there is a debate about whether patients with PsA and axial involvement represent a different entity than those with AS. In this study, we found that a rheumatologist's diagnosis differed depending on the time of onset of psoriasis, possibly driven by differences in the phenotype (i.e. a higher prevalence of peripheral involvement in the group with psoriasis onset before the rheumatic symptoms, especially dactylitis, which is the hallmark of PsA).[20,21] Indeed, patients with psoriasis as the first symptom fulfilled the CASPAR criteria more frequently than patients with psoriasis onset after musculoskeletal symptoms.

The frequency of HLA-B27 antigen in our study is relatively low (31%) in comparison with other European population.[22,23] In the main manuscript of REGISPONSER,[11] authors obtained an overall HLA-B27 antigen prevalence of 72%. However, these findings changed depending on the subtypes of SpA: a prevalence of 84% and 22% HLA-B27 positivity was found in patients

with AS and PsA, respectively. As our population included a higher prevalence of patients with a diagnosis of PsA (325/433) than AS (95/433) due to the presence of psoriasis, this could explain a low prevalence of HLA B27 antigen in comparison with other European populations.

The close relationship between metabolic syndrome or obesity and PsA has been evidenced in recent years. Higher values of body mass index were observed in patients with PsA in comparison with other rheumatic diseases, such as rheumatoid arthritis and SpA.[22,24] However, as mentioned in a previous article by our group, it has been suggested that increases in body mass index and other cardiovascular risk factors were caused by the presence of psoriasis rather than PsA.[25,26] In this specific analysis, all the patients had psoriasis at the moment of the inclusion. Thus, we were not able to demonstrate a higher prevalence of obesity in patients with *versus* without rheumatic symptoms. Nevertheless, our results suggest that patients with psoriasis onset before rheumatic symptoms (whose phenotype seemed to PsA) did not have an increase in body mass index; indeed, it was decreased. Another explanation could be that obesity and metabolic syndrome may be associated with the beginning of musculoskeletal symptoms. However, due to the cross-sectional design of this study, we are not able to demonstrate the association between the onset of musculoskeletal symptoms and the increase in body mass index. Thus, prospective studies are needed to confirm this hypothesis.

The limitations of this study are mostly related to the date on which the data were collected. This study was launched in 2004 when the 2009 ASAS criteria were not yet available.[27,28] For this reason, the ESSG criteria were used as an inclusion criteria in this registry. For the same reason, the BASRI for the evaluation of the evaluation of the structural damage was used instead of the mSASSS (modified Stoke Ankylosing Spondylitis Spinal Score).[29,30] Finally, the radiographic interpretation was performed only by the local reader who was trained for the evaluation of X-rays. On the other hand, one of the most important strengths of our work is that this is the first study, to our knowledge, that evaluates the impact of psoriasis as the first symptom in the prognosis of SpA patients with a large number of patients.

In conclusion, our results suggest that an early onset of psoriasis is associated with the clinical phenotype and with a more frequent diagnosis of PsA rather than AS.

Declarations

Ethics approval and consent to participate

The study was conducted in compliance with the recommendations of the Declaration of Helsinki and was centrally approved by the Ethics Committee of the Reina Sofia University Hospital from Córdoba (Spain) on 21 April 2006. All patients gave their written consent to participate in the REGISPONSER registry.

Consent for publication

Not applicable.

Author contributions

Ignacio Gómez-Garcia: Formal analysis; Investigation; Methodology; Writing – original draft.

Teresa García-Puga: Data curation; Formal analysis; Investigation; Methodology; Writing – review & editing.

Pilar Font-Ugalde: Investigation; Methodology; Project administration; Writing – review & editing.

Maria Angeles Puche-Larrubia: Data curation; Investigation; Writing – review & editing.

Nuria Barbarroja: Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Writing – review & editing.

Patricia Ruiz-Limón: Investigation; Methodology; Supervision; Writing – review & editing.

Alejandro Escudero-Contreras: Investigation; Supervision; Writing – review & editing.

Eduardo Collantes-Estévez: Conceptualization; Investigation; Methodology; Supervision; Writing – review & editing.

Clementina López-Medina: Data curation; Formal analysis; Investigation; Methodology; Writing – original draft.

Acknowledgements

The authors are thankful to the member of our group: Ladehesa-Pineda ML, Ruiz-Vilchez D, Ortega-Castro R and Ábalos-Aguilera MC for collaborating in the compilation of data and the REGISPONSER study group – listed are the principal investigators: HU. Reina Sofía: Eduardo Collantes Estévez; H. Bellvitge: Xavier Juanola

Roura; HU. Juan Canalejo: José Luis Fernández Sueiro; HU. Gregorio Marañón: Carlos González Fernández; H. Parc Taulí: Jordi Gratacós Masmitjá; Clínica Puerta Hierro: Juan Mulero Mendoza; H. Monte Naranco: Juan Carlos Torre Alonso; H. Doce de Octubre: Pilar Fernández Dapica; H. Ramón y Cajal: Ma Elia Brito Brito; HU. Alicante: Enrique Batlle Gualda; H. Virgen de la Arrixaca: Luis F. Linares Ferrando; H. Virgen del Perpetuo Socorro: Enrique Judez Navarro; H.G. San Jorge: Carlos Vázquez Galeano; H. de Palamós: Teresa Clavaguera Poch; H. Mostoles: M. Cruz Fernández Espartero; HU. Carlos Haya: Enrique Calero Secall; H. Mutua de Terrassa: Manuel Pujol Busquets; H. Doctor Negrín: Carlos Rodríguez Lozano; H. Santa María del Rosell: Manuel J. Moreno Ramos; HU. Príncipe de Asturias: Eduardo Cuende Quintana; HU. de Guadalajara: Manuel Fernández Prada; HU. Central de Asturias: Rubén Queiro Silva; H. San Rafael: Estefanía Moreno Ruzafa; HU Virgen de la Vega: Carlos Montilla Morales; H. Virgen del Rocío: Alicia García López; HU. Miguel Servet: Eugenio Giménez Úbeda; H. Fundación Son Llatzer: Antonio Juan Mas; H. Internacional Merimar: Cristina Medrano Le Quement; HU. Navarra: Enrique Ornilla.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The REGISPONSER registry was funded by the Spanish Society of Rheumatology. There was no funding for this subanalysis.

Competing interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Availability of data and materials

Not applicable.

ORCID iDs

Ignacio Gómez-Garcia https://orcid.org/0000-0002-4607-5644

Maria Angeles Puche-Larrubia https://orcid.org/0000-0002-1526-0978

Nuria Barbarroja https://orcid.org/0000-0002-0962-6072

Clementina López-Medina https://orcid.org/0000-0002-2309-5837

Supplemental material

Supplemental material for this article is available online.

References

1. Sieper J and Poddubnyy D. Axial spondyloarthritis. *Lancet* 2017; 390: 73–84.
2. Prey S, Paul C, Bronsard V, *et al.* Assessment of risk of psoriatic arthritis in patients with plaque psoriasis: a systematic review of the literature. *J Eur Acad Dermatol Venereol* 2010; 24: 31–35.
3. López-Medina C, Ortega-Castro R, Castro-Villegas MC, *et al.* Axial and peripheral spondyloarthritis: does psoriasis influence the clinical expression and disease burden? Data from REGISPONSER registry. *Rheumatology* 2021; 60: 1125–1136.
4. Tillett W, Charlton R, Nightingale A, *et al.* Interval between onset of psoriasis and psoriatic arthritis comparing the UK Clinical Practice Research Datalink with a hospital-based cohort. *Rheumatology* 2017; 56: 2109–2113.
5. Queiro R, Tejón P, Alonso S, *et al.* Age at disease onset: a key factor for understanding psoriatic disease. *Rheumatology* 2014; 53: 1178–1185.
6. Queiro R, Sarasqueta C, Belzunegui J, *et al.* Psoriatic spondyloarthropathy: a comparative study between HLA-B27 positive and HLA-B27 negative disease. *Semin Arthritis Rheum* 2002; 31: 413–418.
7. Queiro R, Alperi M, Alonso-Castro S, *et al.* Patients with psoriatic arthritis may show differences in their clinical and genetic profiles depending on their age at psoriasis onset. *Clin Exp Rheumatol* 2012; 30: 476–480.
8. Winchester R, Minevich G, Steshenko V, *et al.* HLA associations reveal genetic heterogeneity in psoriatic arthritis and in the psoriasis phenotype. *Arthritis Rheum* 2012; 64: 1134–1144.
9. Queiro R, Alperi M, Lopez A, *et al.* Clinical expression, but not disease outcome, may vary according to age at disease onset in psoriatic spondylitis. *Joint Bone Spine* 2008; 75: 544–547.
10. Dougados M, Linden S, van der Juhlin R, *et al.* The European Spondylarthropathy Study Group preliminary criteria for the classification of spondylarthropathy. *Arthritis Rheum* 1991; 34: 1218–1227.
11. Collantes E, Zarco P, Muñoz E, *et al.* Disease pattern of spondyloarthropathies

in Spain: description of the first national registry (REGISPONSER) – extended report. *Rheumatology* 2007; 46: 1309–1315.

12. Garrett S, Jenkinson T, Kennedy LG, *et al.* A new approach to defining disease status in ankylosing spondylitis: the bath ankylosing spondylitis disease activity index. *J Rheumatol* 1994; 21: 2286–2291.
13. Lukas C, Landewé R, Sieper J, *et al.* Development of an ASAS-endorsed disease activity score (ASDAS) in patients with ankylosing spondylitis. *Ann Rheum Dis* 2009; 68: 18–24.
14. Calin A, Garrett S, Whitelock H, *et al.* A new approach to defining functional ability in ankylosing spondylitis: the development of the Bath Ankylosing Spondylitis Functional Index. *J Rheumatol* 1994; 21: 2281–2285.
15. MacKay K, Mack C, Brophy S, *et al.* The bath ankylosing spondylitis radiology index (BASRI): a new, validated approach to disease assessment. *Arthritis Rheum* 1998; 41: 2263–2270.
16. van der Linden S, Valkenburg HA and Cats A. Evaluation of diagnostic criteria for ankylosing spondylitis. A proposal for modification of the New York criteria. *Arthritis Rheum* 1984; 27: 361–368.
17. Taylor W, Gladman D, Helliwell P, *et al.* Classification criteria for psoriatic arthritis: development of new criteria from a large international study. *Arthritis Rheum* 2006; 54: 2665–2673.
18. Gómez-García I, Ladehesa-Pineda ML, Puche-Larrubia MÁ, *et al.* Uveitis as the first symptom in spondyloarthritis and its association with the evolution of the disease. Results from the REGISPONSER registry. *Joint Bone Spine* 2021; 88: 105136.
19. Bilgin E, Aydin SZ, Tinazzi I, *et al.* Disease characteristics of psoriatic arthritis patients may differ according to age at psoriasis onset: cross-sectional data from the psoriatic arthritis-international database. *Clin Exp Rheumatol* 2021; 39: 532–536.
20. Feld J, Chandran V, Haroon N, *et al.* Axial disease in psoriatic arthritis and ankylosing spondylitis: a critical comparison. *Nat Rev Rheumatol* 2018; 14: 363–371.
21. Feld J, Ye JY, Chandran V, *et al.* Is axial psoriatic arthritis distinct from ankylosing spondylitis with and without concomitant psoriasis? *Rheumatology* 2020; 59: 1340–1346.
22. Valero-Jaimes JA, López-González R, Martín-Martínez MA, *et al.* Body mass index and disease activity in chronic inflammatory rheumatic diseases: results of the cardiovascular in rheumatology (Carma) Project. *J Clin Med* 2021; 10: 382.
23. Hollick RJ, Stelfox K, Dean LE, *et al.* Outcomes and treatment responses, including work productivity, among people with axial spondyloarthritis living in urban and rural areas: a mixed-methods study within a national register. *Ann Rheum Dis* 2020; 79: 1055–1062.
24. Landgren AJ, Dehlin M, Jacobsson L, *et al.* Cardiovascular risk factors in gout, psoriatic arthritis, rheumatoid arthritis and ankylosing spondylitis: a cross-sectional survey of patients in Western Sweden. *RMD Open* 2021; 7: e001568.
25. Barbarroja N, Arias-de la Rosa I, López-Medina C, *et al.* Cardiovascular risk factors in psoriatic disease: psoriasis versus psoriatic arthritis. *Ther Adv Musculoskelet Dis* 2019; 11: 1–3.
26. Dai Y-X, Shen Y-J, Chou Y-J, *et al.* Obesity, but not metabolic diseases, is associated with risk of psoriasis: a population-based cohort study in Taiwan. *Dermatology* 2020; 236: 521–528.
27. Rudwaleit M, van der Heijde D, Landewé R, *et al.* The development of Assessment of spondyloarthritis international society classification criteria for axial spondyloarthritis (part II): validation and final selection. *Ann Rheum Dis* 2009; 68: 777–783.
28. Rudwaleit M, Landewé R, van der Heijde D, *et al.* The development of assessment of spondyloarthritis international Society classification criteria for axial spondyloarthritis (part I): classification of paper patients by expert opinion including uncertainty appraisal. *Ann Rheum Dis* 2009; 68: 770–776.
29. Creemers MC, Franssen MJ, van't Hof MA, *et al.* Assessment of outcome in ankylosing spondylitis: an extended radiographic scoring system. *Ann Rheum Dis* 2005; 64: 127–129.
30. Wanders AJ, Landewé RB, Spoorenberg A, *et al.* What is the most appropriate radiologic scoring method for ankylosing spondylitis? A comparison of the available methods based on the outcome measures in rheumatology clinical trials filter. *Arthritis Rheum* 2004; 50: 2622–2632.