Incidence and Prevalence of Psoriatic Arthritis: A Systematic Review

YANNIS ALAMANOS, PARASKEVI V. VOULGARI, and ALEXANDROS A. DROSOS

ABSTRACT. ***Objective.*** Descriptive epidemiological studies of psoriatic arthritis (PsA) in the general population were very limited until the year 2000. Recently, several incidence and prevalence studies of PsA have been reported, suggesting a considerable variation of the disease frequency among different populations. We present a systematic review of incidence and prevalence studies of PsA published after 1987 until December 2006, in order to evaluate and compare their methodology and to summarize their results, and to investigate the possible geographic variations of occurrence of PsA.

Methods. We conducted a MedLine search including all articles published on PsA incidence and prevalence in the general adult population until December 2006. From each study identified, we extracted the country, year of publication, type of study, criteria of case identification, and incidence or prevalence rates. Methodological criteria for quality included the type of study (prospective or retrospective for incidence studies and retrospective or cross-sectional for prevalence studies), the type of incidence and prevalence rates (crude or adjusted), the criteria of case definition, and the description of the characteristics of the population studied.

Results. A total of 13 studies were identified from the literature search meeting our inclusion criteria. There is a wide variation of annual incidence of PsA (median 6.4, range 0.1–23.1 cases per 10^5 inhabitants). One incidence study used European Spondylarthropathy Study Group (ESSG) criteria for case definition, while the other studies were based on a coexistence of psoriasis and arthritis in several ways. Three prevalence studies used ESSG criteria for case identification, while the other studies were based on a coexistence of psoriasis and arthritis in several ways. The prevalence estimates vary from 1 case per 10^5 population in a Japanese study to 420 cases per 10^5 population in an Italian study (median 180).

Conclusion. The occurrence and epidemiological profile of PsA are likely to present important variations among countries and areas of the world. However, several methodological issues and mainly the absence of validated or consensual criteria for case identification and classification of the disease put important limitations on the interpretation of epidemiological data. The establishment of standardized criteria for the diagnosis and classification of PsA cases is necessary for further, valid investigation of the disease epidemiology. (First Release May 1 2008; J Rheumatol 2008;35:1354–8)

Key Indexing Terms:
PSORIATIC ARTHRITIS INCIDENCE PREVALENCE

Psoriatic arthritis (PsA) is a chronic inflammatory arthropathy associated with psoriasis. It was first described as a variant of rheumatoid arthritis (RA). However, PsA is considered a unique arthropathy with distinct clinical and radiological features[1-3].

From the Department of Public Health, Medical School, University of Patras, and the Rheumatology Clinic, Department of Internal Medicine, Medical School, University of Ioannina, Ioannina, Greece.

Y. Alamanos, MD, Associate Professor of Hygiene and Epidemiology, Department of Public Health, Medical School, University of Patras; P.V. Voulgari, MD, Assistant Professor of Rheumatology, Rheumatology Clinic, Department of Internal Medicine, Medical School, University of Ioannina; A.A. Drosos, MD, FACR, Professor of Medicine/Rheumatology, Rheumatology Clinic, Department of Internal Medicine, Medical School, University of Ioannina.

Address reprint requests to Prof. A.A. Drosos, Department of Internal Medicine, Medical School, University of Ioannina, 45110 Ioannina, Greece. E-mail: adrosos@cc.uoi.gr

Accepted for publication February 18, 2008.

Descriptive epidemiological studies of PsA in the general population were very limited until the year 2000. Lately, several incidence and prevalence studies of PsA have been reported, suggesting a considerable variation of disease frequency among different populations[4,5]. These studies are expected to present important methodological differences, mainly related to the absence of validated or consensual criteria for case identification and classification of the disease.

We undertook a systematic review of incidence and prevalence studies of PsA, in order to evaluate and compare their methodology and to summarize their results, as well as to investigate the possible geographic variations of occurrence of PsA suggested by these studies.

MATERIALS AND METHODS

We conducted a MedLine search including all articles published on incidence and prevalence of PsA in the general adult population, until December 2006 (key words: "psoriatic arthritis" and "incidence" and "prevalence"). Additional relevant articles were identified using the option

"related articles" in the MedLine database, for the articles meeting the inclusion criteria. Studies published in any language and reporting the incidence and/or prevalence of PsA in general adult populations, based on any identification criteria, were considered eligible for inclusion. The study population should be a general adult population in a defined study area. Studies carried out in selected populations, such as specific age groups, hospitalized patients, psoriatic patients, blood donors, or HLA-positive patients were excluded.

From each study included, we extracted the country, year of publication, type of study, criteria of case identification, description of the population studied, methods of case ascertainment, and prevalence or incidence rates, and for the incidence studies the duration of the study period, the sex ratio and the mean age at diagnosis. Mean annual incidence rates were considered when an incidence study included an observation period longer than 1 year. For prevalence surveys we also considered the sampling methods, and the response rate, when available. When a study reported to the crude and the adjusted incidence and prevalence rates we considered the age-adjusted rates. When a study reported only the crude rates we considered these. As for the criteria of case identification, we considered the reference to specific published identification criteria or the description of inclusion and exclusion criteria stated by the authors.

RESULTS

A total of 13 studies were identified from the literature search meeting the inclusion criteria of the systematic review[6-18]. Three were incidence studies[6,9,11], 7 were prevalence studies[12-18], and 3 estimated both prevalence and incidence rates[7,8,10].

Table 1 summarizes the results of the MedLine search and Table 2 presents the main characteristics of PsA incidence studies meeting the inclusion criteria. Three incidence studies were carried out in North European countries, one in a South European country, one in Japan, and one in the USA. There is a wide variation of annual incidence of PsA (median 6.4, range 0.1–23.1 cases per 10^5 inhabitants). A study in the Japanese population found an impressively low incidence of the disease. Four European studies found relatively similar incidence rates, while one of the 2 studies carried out in Finland found a 4-fold higher incidence than the other study from the same country.

One study from Greece[10] used the European Spondylarthropathy Study Group (ESSG) criteria for case definition[19], while the other studies were based on a coexistence of psoriasis and arthritis in several ways. One study from Finland[6] used drug-reimbursement certificates to identify patients with chronic inflammatory rheumatic disease, and those who had psoriatic skin or nail disease and arthritis or spinal disease were ascertained as PsA cases. A study from the USA identified patients with psoriasis confirmed by a dermatologist, and those who had associated inflammatory arthritis were assumed to have PsA[7]. A Japanese study was based on a questionnaire sent to all medical institutions of the country with potential to be attended by patients with spondyloarthropathy (SpA). Physicians at the institutes were requested to answer the questionnaires by reviewing the medical records, and the identification criteria for PsA are not stated in the article[8]. A study from Sweden used as identification criteria the existence of psoriasis with arthritis with a negative test for rheumatoid factor[9]. Another Finnish study used as identification criteria the coexistence of peripheral arthritis with psoriasis, excluding rheumatoid factor-positive polyarthritis or spondylitis with psoriasis[11].

The observation period for the study by Kaipiainen-Seppanen[6] was 1 year, and the study area covered about 1 million inhabitants of a defined area of Finland. In the study by Shbeeb, *et al*[7] the observation period was 11 years, and the study population included all residents of Olmsted County, Minnesota, USA. The study by Hukuda, *et al*[8] had a 7-year observation period and the study population was the adult population of Japan. The study by Soderlin, *et al*[9] had an observation period of 1 year and the study population included 132,000 adult inhabitants of a defined area of Sweden. The observation period for the study by Alamanos, *et al*[10] was 20 years and the study population included about 400,000 adult inhabitants of a defined area of Greece. The

Table 1. Results of MedLine search and inclusion criteria for psoriatic arthritis incidence and prevalence studies.

Search Procedure	No. Publications
"Psoriatic arthritis" and "incidence" and "prevalence"	258
Descriptive epidemiological studies of PsA incidence and prevalence	21
General population age 16–20 years and over	13
Incidence studies	3
Prevalence studies	7
Incidence and prevalence studies	3

Table 2. Incidence studies of PsA.

Study	Country	Type of Study	Population, age, yrs	Case Definition	Annual Incidence, Cases/10^5 (95% CI)	Male/Female
Kaipiainen-Seppanen[6], 1996	Finland	Retrospective	16+	Arthritis + psoriasis	6.1 (4.6–7.6)	1.3
Shbeeb[7], 2000	USA	Retrospective	20+	Arthritis + psoriasis	6.6 (5.0–8.2)	0.9
Hukuda[8], 2001	Japan	Retrospective	16+	Arthritis + psoriasis	0.1	Not done
Soderlin[9], 2002	Sweden	Prospective	16+	Arthritis + psoriasis	8 (4–15)	0.4
Alamanos[10], 2003	Greece	Retrospective	16+	ESSG criteria	3.0 (1.6–4.5)	1.0
Savolainen[11], 2003	Finland	Prospective	16+	Arthritis + psoriasis	23.1 (13.2–37.5)	0.7

ESSG: European Spondylarthropathy Study Group[19].

study by Savolainen, *et al* had a 1-year observation period and the study population included 69,354 adult inhabitants of the city of Kuopio, Finland[11].

Four studies estimated the incidence of PsA retrospectively based on medical records[6-8,10] and 2 studies were prospective[9,11]. The two prospective studies found the highest incidence rates. The male/female ratio also varied significantly among studies (median 0.9, range 0.4–1.3). The mean age at diagnosis varied between 40.7 and 52.0 years (median 47.7). Four studies presented incidence rates adjusted for age to the national population, while 2 studies presented crude incidence rates.

Table 3 presents the main characteristics of PsA prevalence studies meeting the inclusion criteria. Four prevalence studies were carried out in South European countries, 3 in a North European Country, 2 in the USA, and one in Japan. The prevalence estimates vary from 1 case per 100,000 population in the Japanese study to 420 cases per 100,000 population in the Italian study (median 180). Three studies used ESSG criteria for case identification, while the other studies were based on a coexistence of psoriasis and arthritis in several ways. Four studies were retrospective, based on medical records[7,8,10,16], and 6 studies were cross-sectional surveys[12-15,17,18]. Cross-sectional surveys tend to present higher prevalence estimates than retrospective studies, even when carried out in the same country, with the exception of 2 older studies published in 1969 and 1984[12,13]. Seven studies presented age-adjusted prevalence estimates, while 3 studies presented crude prevalence rates.

The cross-sectional surveys differed significantly according to their sampling methods. The study by Hellgren[12] was conducted in several defined populations in Sweden. In the study by van Romunde, *et al*[13] all residents in the town of Zotermeer, The Netherlands, aged 20 years and older were asked to participate in a study on arthritis and allied conditions. In the study by Gelfand, *et al*[14] subjects 18 years of age or older with a residential telephone number from the contiguous 48 US states were selected via random digital dialing techniques and were interviewed. In the study by Salaffi, *et al*[15] the sample consisted of subjects aged 18 years and over, selected from the practice lists of 16 general practitioners in a defined area of Italy. The study by Trontzas, *et al*[17] was conducted on the total adult population of 2 urban, one suburban, and 4 rural communities, and on a randomly selected sample of adult inhabitants of one suburban and one rural community of Greece. In the study by Saraux, *et al*[18] a 2-stage random sample was constituted in 7 areas of France from the national telephone directory and the next-birthday method in each household. All the articles presenting these cross-sectional surveys give information about response rates, while none of them compares characteristics between responders and nonresponders.

DISCUSSION

The results of this systematic review suggest a wide variation of the incidence and prevalence of PsA among several countries and areas of the world. The studies meeting the inclusion criteria still differ considerably in their methods. The methodological differences concern mainly the methods of case identification and case recording, as well as the type of incidence and prevalence rates.

The differences in the methods of case identification reflect the absence of commonly accepted criteria for diagnosis and classification of the disease[20]. Three prevalence studies and one incidence study included were based on the ESSG criteria[19]. The other studies were based on a coexistence of psoriasis and arthritis in different ways.

According to a recent study comparing the accuracy of published classification criteria for the diagnosis of PsA the ESSG criteria have an inadequate sensitivity for identification and differential diagnosis of PsA[21]. This could lead to an underestimation of the disease frequency when applying these criteria in an epidemiological study. Other published criteria (Vasey and Espinoza[22], McGonagle, *et al*[23], Gladman, *et al*[24]) have improved sensitivity and a similar specificity. However, the epidemiological studies do not

Table 3. Prevalence studies of PsA.

Study	Country	Type of Study	Population, age, yrs	Case Definition	Prevalence Estimate, Cases/10^5 (95% CI)
Hellgren[12], 1969	Sweden	Cross-sectional	Not done	Arthritis + psoriasis	20 (9–40)
Van Romunde[13], 1984	Netherlands	Cross-sectional	20+	Arthritis + psoriasis	40 (6–80)
Shbeeb[7], 2000	USA	Retrospective	20+	Arthritis + psoriasis	101 (81–121)
Hukuda[8], 2001	Japan	Retrospective	16+	Arthritis + psoriasis	1
Alamanos[10], 2003	Greece	Retrospective	16+	ESSG criteria	57 (50–63)
Gelfand[14], 2005	USA	Cross-sectional	18+	Arthritis + psoriasis	250 (180–310)
Salaffi[15], 2005	Italy	Cross-sectional	18+	Arthritis + psoriasis	420 (310–610)
Madland[16], 2005	Norway	Retrospective	20+	Arthritis + psoriasis	195 (180–210)
Trontzas[17], 2005	Greece	Cross-sectional	19+	ESSG criteria	170 (100–240)
Saraux[18], 2005	France	Cross-sectional	19+	ESSG criteria	190 (80–350)

ESSG: European Spondylarthropathy Study Group[19].

refer to specific published diagnostic criteria, with the exception of studies referring to the ESSG criteria[22-24].

The different methods of case ascertainment represent another important methodological difference among studies. Most of the incidence studies had a retrospective design based on medical records, and only 2 of them had a prospective design. Prospective studies tend to present higher incidence rates than retrospective studies, but it is difficult to conclude if this difference is related to the case ascertainment method applied in each study, or to higher occurrence of the disease in the study areas. As for the prevalence studies, 6 of them were cross-sectional based on a population survey and the examination of a sample of the general population, and 4 were retrospective based on medical records. Recent cross-sectional surveys are likely to present higher prevalence estimates than retrospective prevalence studies. This could reflect an increased recognition and recording of milder cases in cross-sectional surveys, as they are based on the examination of a sample of the general population. On the other hand, it is possible that these studies overestimate the prevalence, as their response rate is relatively low and a selection bias may influence the results. Two older prevalence studies carried out during the 1960s and 1980s present low prevalence estimates[12,13]. This finding could be related to an increase of the disease frequency, but could also reflect an increased recognition of the disease during recent years.

Another limitation in data interpretation is that both incidence and prevalence studies used different age-adjustment methods, and some of them did not provide the age-adjusted rates for both sexes. It is unclear whether the same results would be obtained if all studies were assessed using unadjusted rates, or rates adjusted using the same method. We considered the adjusted incidence and prevalence rates when available. Other limitations could be related to the differences of sample sizes, as well as the differing age distributions of the individual study populations.

The methodological differences described above indicate a different methodological quality of the studies included in the systematic review. In this study we considered as methodological quality criteria the type of the study (prospective, retrospective, or cross-sectional), the case-definition and case-ascertainment method, and the type of the estimated rates (crude or adjusted). However, we avoided creating a total quality score for each study, as we think that such a procedure could be considered arbitrary.

Despite these methodological limitations, the results of the studies included suggest a significant geographical variation of occurrence of PsA. This is mainly reflected in the extremely low incidence and prevalence of PsA observed in the Japanese study. That study also found an impressively low frequency of ankylosing spondylitis (AS) and other SpA in the Japanese population[8]. The incidence of PsA in Japan was found to be 64 times lower than the median incidence of all studies, and the prevalence 180-fold lower than the median prevalence of all studies. It is unlikely that such impressive differences may be related to methodological differences between studies and not to a significant variation of occurrence of the disease. The low occurrence of AS and other SpA in the Japanese population has been attributed to the strong association with HLA-B27, which appears with a significantly lower frequency in Japanese than in Caucasians. AS and related SpA are strongly associated with HLA-B27; however, the association of HLA or other genetic factors with PsA remains uncertain. Therefore, the low frequency of PsA in the Japanese study is not likely to be explained by the rarity of HLA-B27 in the Japanese population[4,25-27].

A wide variation of incidence and prevalence rates was observed even among studies carried out in European countries and the USA, as shown in Tables 2 and 3. Even studies from the same country present impressive differences. The age and sex distribution of PsA cases present an important variation as well, suggesting a different epidemiologic profile among countries. It is difficult to interpret the different epidemiologic profile of PsA observed among European and American populations. Genetic, ethnic, environmental, and therapy-related factors have been discussed as being possibly associated with the occurrence and the manifestations of the disease. The role of those factors remains uncertain[4,28-30].

The lack of studies in Africa, large parts of Asia, South America, and Eastern Europe represents another important limitation in the understanding of geographical variations of PsA and of the possible role of genetic and environmental factors in the occurrence of the disease. A number of reports suggest differences in the manifestations of PsA in different ethnic groups, but there are no studies comparing the occurrence and the profile of the disease among different ethnic or racial groups[31,32].

We conclude that the occurrence and the epidemiologic profile of PsA are likely to present important variations among countries and areas of the world. However, several methodological issues and mainly the absence of validated or consensual criteria for case identification and classification of the disease put important limitations on the interpretation of epidemiological data. In addition, the lack of studies for most areas of the world limits the understanding of the total picture of PsA epidemiology worldwide, and the possible role of genetic, ethnic, and environmental factors in occurrence of the disease. The establishment of standardized criteria for the diagnosis and classification of PsA is necessary for further valid investigation of the epidemiology and environmental and genetic factors related to the disease occurrence. From this point of view the criteria suggested by the CASPAR study group could offer a basis for more valid and homogenous epidemiological studies, as they appear to be simple and highly specific for identification of PsA[33,34].

REFERENCES

1. Gladman DD, Stafford-Brady F, Chang CH, Lewandowski K, Russell ML. Longitudinal study of clinical and radiological progression in psoriatic arthritis. J Rheumatol 1990;17:809-12.
2. Jones SM, Armas JB, Cohen MG, Lovell CR, Evison G, McHugh NJ. Psoriatic arthritis: outcome of disease subsets and relationship of joint disease to nail and skin disease. Br J Rheumatol 1999;33:834-9.
3. Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1988;31:315-24.
4. Taylor WJ. Epidemiology of psoriatic arthritis. Curr Opin Rheumatol 2002;14:98-103.
5. Gladman DD, Antoni C, Mease P, Clegg DO, Nash P. Psoriatic arthritis: epidemiology, clinical features, course, and outcome. Ann Rheum Dis 2005;64 Suppl 2:ii14-7.
6. Kaipiainen-Seppanen O. Incidence of psoriatic arthritis in Finland. Br J Rheumatol 1996;35:1289-91.
7. Shbeeb M, Uramoto KM, Gibson LE, O'Fallon WM, Gabriel SE. The epidemiology of psoriatic arthritis in Olmsted County, Minnesota, USA, 1982-1991. J Rheumatol 2000;27:1247-50.
8. Hukuda S, Minami M, Saito T, et al. Spondyloarthropathies in Japan: nationwide questionnaire survey performed by the Japan Ankylosing Spondylitis Society. J Rheumatol 2001;28:554-9.
9. Soderlin MK, Borjesson O, Kautiainen H, Skogh T, Leirisalo-Repo M. Annual incidence of inflammatory joint diseases in a population based study in southern Sweden. Ann Rheum Dis 2002;61:911-5.
10. Alamanos Y, Papadopoulos NG, Voulgari PV, et al. Epidemiology of psoriatic arthritis in northwest Greece, 1982-2001. J Rheumatol 2003;30:2641-4.
11. Savolainen E, Kaipiainen-Seppanen O, Kroger L, Luosujarvi R. Total incidence and distribution of inflammatory joint diseases in a defined population: results from the Kuopio 2000 arthritis survey. J Rheumatol 2003;30:2460-8.
12. Hellgren L. Association between rheumatoid arthritis and psoriasis in total populations. Acta Rheumatol Scand 1969;15:316-26.
13. van Romunde LK, Valkenburg HA, Swart-Bruinsma W, Cats A, Hermans J. Psoriasis and arthritis. I. A population study. Rheumatol Int 1984;4:55-60.
14. Gelfand JM, Gladman DD, Mease PJ, et al. Epidemiology of psoriatic arthritis in the population of the United States. J Am Acad Dermatol 2005;53:573.
15. Salaffi F, De Angelis R, Grassi W; MArche Pain Prevalence; INvestigation Group (MAPPING) study. Prevalence of musculoskeletal conditions in an Italian population sample: results of a regional community-based study. I. The MAPPING study. Clin Exp Rheumatol 2005;23:819-28.
16. Madland TM, Apalset EM, Johannessen AE, Rossebo B, Brun JG. Prevalence, disease manifestations, and treatment of psoriatic arthritis in Western Norway. J Rheumatol 2005;32:1918-22.
17. Trontzas P, Andrianakos A, Miyakis S, et al; The ESORDIG Study Group. Seronegative spondyloarthropathies in Greece: a population-based study of prevalence, clinical pattern, and management. The ESORDIG study. Clin Rheumatol 2005;24:583-9.
18. Saraux A, Guillemin F, Guggenbuhl P, et al. Prevalence of spondyloarthropathies in France: 2001. Ann Rheum Dis 2005;64:1431-5.
19. Dougados M, van der Linden S, Juhlin R, et al. The European Spondylarthropathy Study Group preliminary criteria for the classification of spondylarthropathy. Arthritis Rheum 1991;34:1218-27.
20. Taylor WJ, Fellow DE, Helliwell PS. Case definition of psoriatic arthritis [letter]. Lancet 2000;356:2095.
21. Taylor JW, Marchesoni A, Arreghini M, Sokoll K, Helliwell PS. A comparison of the performance characteristics of classification criteria for the diagnosis of psoriatic arthritis. Semin Arthritis Rheum 2004;34:575-84.
22. Vasey F, Espinoza LR. Psoriatic arthropathy. In: Calin A, editor. Spondylarthropathies. Orlando, FL: Grune and Stratton; 1984:151-85.
23. McGonagle D, Conaghan PG, Emery P. Psoriatic arthritis: a unified concept twenty years on. Arthritis Rheum 1999;42:1080-6.
24. Gladman DD, Shuckett R, Russell ML, Thorne JC, Schachter RK. Psoriatic arthritis (PSA) — an analysis of 220 patients. Q J Med 1987;62:127-41.
25. Yamaguchi A, Tsuchiya N, Mitsui H, et al. Association of HLA-B39 with HLA-B27-negative ankylosing spondylitis and pauciarticular juvenile rheumatoid arthritis in Japanese patients. Evidence for a role of the peptide-anchoring B pocket. Arthritis Rheum 1995;38:1672-7.
26. Barton AC, Bruce IN, Silman AJ. Genetic studies of psoriatic arthritis: dissecting joints and skin. J Rheumatol 2001;28:3-5.
27. Hohler T, Kruger A, Schneider PM, et al. A TNF-alpha promoter polymorphism is associated with juvenile onset psoriasis and psoriatic arthritis. J Invest Dermatol 1997;109:562-5.
28. Hamamoto Y, Tateno H, Ishida T, Muto M. Lack of association between promoter polymorphism of the tumor necrosis factor-alpha gene and psoriatic arthritis in Japanese patients. J Invest Dermatol 2000;115:1162-4.
29. Thumboo J, Uramoto K, Shbeeb MI, et al. Risk factors for the development of psoriatic arthritis: a population based nested case control study. J Rheumatol 2002;29:757-62.
30. O'Neill T, Silman AJ. Psoriatic arthritis. Historical background and epidemiology. Baillieres Clin Rheumatol 1994;8:245-61.
31. Thumboo J, Tham SN, Tay YK, et al. Patterns of psoriatic arthritis in Orientals. J Rheumatol 1997;24:1949-53.
32. Marchesoni A, Helliwell P, Gallazzi M, Gibertini P, Rossetti A, Galli L. Psoriatic arthritis in British and Italian patients: a comparative clinical, radiologic, and scintigraphic study. J Rheumatol 1999;26:2619-21.
33. Taylor W, Gladman D, Helliwell P, Marchesoni A, Mease P, Mielants H; CASPAR Study Group. Classification criteria for psoriatic arthritis. Development of new criteria from a large international study. Arthritis Rheum 2006;54:2665-73.
34. Johnson SR, Goek ON, Singh-Grewal D, et al. Classification criteria in rheumatic diseases: a review of methodologic properties. Arthritis Rheum 2007;57:1119-33.