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# Prevalence of psoriatic arthritis in patients with psoriasis

## A systematic review and meta-analysis of observational and clinical studies

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# TITLE PAGE

## Title

Prevalence of psoriatic arthritis in patients with psoriasis: A systematic review and meta-analysis of observational and clinical studies

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**Author Contributions**

Drs. Alinaghi and Calov had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Egeberg and Thyssen. *Acquisition, analysis, and interpretation of data:* All authors. *Drafting of the manuscript:* Alinaghi and Egeberg. *Critical revision of the manuscript for important intellectual content:* All authors. *Statistical analysis:* Egeberg. *Obtained funding:* Not applicable. *Administrative, technical, or material support:* Egeberg and Thyssen. *Study supervision:* Egeberg and Thyssen.

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**Drs. Alinaghi** and **Calov** have declared no conflicts of interest. **Dr. Kristensen** has received fees for speaking and consultancy from Pfizer, MSD, AbbVie, UCB, Eli Lilly, Novartis, Celgene, Janssen Pharmaceuticals, Roche, Forward Pharma and BMS. **Dr. Gladman** has received consultancy fees and/or grant support from AbbVie, Amgen, BMS, Celgene, Eli Lilly, Janssen, Pfizer, Novartis and UCB. **Dr. Coates** have reported no conflicts of interest. **Dr. Jullien** has received research funding from Pfizer, and honoraria as consultant and/or speaker from Abbvie, Amgen, Celgene, Eli Lilly, Janssen Pharmaceuticals, MSD, Novartis, and Pfizer. **Dr. Gottlieb** has received honoraria as consultant and/or speaker from Janssen Inc.; Celgene Corp., Bristol Myers Squibb Co., Beiersdorf, Inc., Abbvie, UCB, Novartis, Incyte, Lilly,

Reddy Labs, Valeant, Dermira, Allergan, and Sun Pharmaceutical Industries, and received research funding from Janssen, Incyte, Lilly, Novartis, Allergan, and Leo Pharma. **Dr. Gisondi** has received honoraria as consultant and/or speaker from AbbVie, Celgene, Eli Lilly, Janssen, Leo Pharma, MSD, Novartis, Pfizer, and UCB. **Dr. Wu** is an investigator for AbbVie, Amgen, Eli Lilly, Janssen, Novartis, and Regeneron. **Dr. Thyssen** is supported by an unrestricted grant from the Lundbeck Foundation and has received speaker honoraria from Galderma, Sanofi-Genzyme and MEDA and attended advisory board meetings for Roche and Sanofi-Genzyme. He is an investigator for LEO Pharma. **Dr. Egeberg** has received research funding from Pfizer, Eli Lilly, the Danish National Psoriasis Foundation, and the Kgl Hofbundtmager Aage Bang Foundation, and honoraria as consultant and/or speaker from Almirall, Leo Pharma, Samsung Bioepis Co., Ltd., Pfizer, Eli Lilly, Novartis, Galderma, and Janssen Pharmaceuticals.

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## Abstract

### Background

Wide-ranging prevalence estimates of psoriatic arthritis (PsA) in patients with psoriasis have been reported.

### Objectives

To assess the prevalence and incidence of PsA in patients with psoriasis.

### Methods

Two authors independently searched three databases for studies reporting on the prevalence or incidence of PsA in patients with psoriasis. A proportion meta-analysis was performed to calculate the pooled proportion estimates of PsA in patients with psoriasis.

### Results

A total of 266 studies were included, examining 976,408 patients with psoriasis. Overall, the pooled proportion (95% confidence interval) of PsA among patients with psoriasis was 19.7% (18.5%-20.9%). In children and adolescents (<18 years), the pooled prevalence was 3.3% (2.1%-4.9%). The PsA prevalence was 22.7% (20.6%-25.0%) in European, 21.5% (15.4%-28.2%) South American, 19.5% (17.1%-22.1%) North American, 15.5% (0.009%-51.5%) African, and 14.0% (11.7%-16.3%) in Asian psoriasis patients. The prevalence of PsA was 23.8% (20.1%-27.6%) in studies where the ClASsification criteria for Psoriatic ARthritis (CASPAR) was applied. The incidence of PsA among psoriasis patients ranged from 0.27 to 2.7 per 100 person-years.

### Limitations

Between-study heterogeneity may have affected the estimates.

### Conclusions

We found that one in five patients with psoriasis have PsA. With the growing recognition of CASPAR, more homogenous and comparable prevalence estimates are expected to be reported.

## Capsule summary

- Wide-ranging estimates have been reported for the occurrence of psoriatic arthritis in patients with psoriasis.
- We found an overall pooled prevalence of 19.7% for psoriatic arthritis in patients with psoriasis and 24.6% in patients with moderate-to-severe disease.
- Screening psoriasis patients for psoriatic arthritis may be warranted, especially for those with moderate-to-severe disease..

Key words: Psoriasis, psoriatic, arthritis, arthropathy, incidence, prevalence.

## Introduction

Psoriatic arthritis (PsA), classified as a seronegative spondyloarthropathy, is strongly associated with cutaneous psoriasis; dactylitis and enthesitis represent the hallmarks of the disease[1]. Since its formal acceptance as a distinct entity, several attempts have been made to devise the most sensitive and specific set of diagnostic criteria[2-10]. In 1973, Moll and Wright defined PsA as the presence of inflammatory arthritis with the concurrent existence of psoriasis and seronegativity for rheumatoid factor[2], and in 2006 the ClASsification for Psoriatic ARthritis (CASPAR) criteria were introduced[10].

Despite the increasing recognition of PsA as a distinct disease, the lack of a widely accepted and validated case definition has yielded considerable variability in PsA prevalence estimates[11-15]. Several observational studies have investigated the latter issue[16, 17], but no meta-analysis has yet been performed to estimate the exact prevalence in patients with psoriasis. Applying a broad and inclusive search strategy, we examined the occurrence of PsA in patients with psoriasis in a systematic review and meta-analysis.

# Methods

### Literature search

This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), and a study protocol was developed *a priori* (supplementary materials).
All articles from database inception through November 2017 were potentially eligible for inclusion. Two authors independently screened the three databases (Pubmed, Web of Science and EMBASE) using the following search terms: "(psoriasis) AND (psoriatic OR arthritis OR arthropathy OR incidence OR prevalence)".

**Inclusion and exclusion criteria**

To qualify for inclusion, studies had to a) be original, b) be written in English and available in full-text, c) have a source population of patients with psoriasis, d) include absolute numbers or percentage of PsA cases to calculate a prevalence of PsA among patients with psoriasis. Studies were excluded if they reported the occurrence of "arthritis" without distinctly specifying the type of arthritis. Studies of juvenile idiopathic arthritis (JIA) were not included since this may comprise several different types of arthritis. Furthermore, we discerned PsA from psoriatic arthropathy as the latter is a vague term referring to musculoskeletal pain and complaints in general that may be unrelated to PsA.

**Data-extraction and quality assessment**

Records were screened according to the title and abstract. The relevant abstracts, or articles without abstract, were selected for full-text review. References from the included studies were also screened for additional studies not identified through the initial search strategy. The extracted data from each study are presented as a supplementary dataset on Mendelay and can be accessed here: [INSERT LINK]. Quality assessment was performed using the Newcastle-Ottawa Scale (NOS)[18]. An adapted version was used for cross-sectional studies where a maximum score of either 8 or 10 could be achieved. Thus, studies receiving 6 or above and 7 or above, respectively, were considered of high quality. For case-control studies and cohort studies, those receiving a score of 7 or above were considered of high quality.

**Data analysis**

All statistical analyses were performed using StatsDirect version 3.1.4 (StatsDirect Ltd., Cheshire, UK). The Freeman-Tukey double arcsine method was applied to transform proportions[19], and an inverse-variance weighted random effects meta-analysis was performed using the DerSimonian and Laird method[20]. *A priori*, we opted for the DerSimonian-Laird random effects methods since we expected to find significant between-study heterogeneity. A proportion meta-analysis was completed to obtain pooled proportions with 95% confidence intervals (CIs) of PsA in patients with psoriasis. Heterogeneity of included studies was

assessed using the Cochran Q test and $I^2$ statistics, and forest plots were constructed. Furthermore, we calculated the prevalence of PsA in psoriasis patients for the following stratifications: all studies, by gender, by decade published (pre-2000, 2000-2009, and 2010-2017), children and adolescent populations only, i.e. those <18 years), studies of adults only (≥18 years), diagnosis according to CASPAR, diagnosis according to the Moll and Wright criteria, by population size (n<500, 500-1000, and ≥1000), by study type (clinical, register-based, population-based, and observational studies), by geographic area and country, and by Newcastle Ottawa Scale (NOS) score (good quality or fair/poor quality), and by severity of psoriasis disease defined as moderate-to-severe disease (psoriasis area severity index (PASI) ≥10 or body surface are (BSA) ≥10) and mild disease (PASI <10 or BSA <10).

# Results

We identified 6331 records through database searching (PubMed=2139; Web of Science=1217; EMBASE=2975); 4323 non-duplicate records were screened by title and abstract, yielding 1302 articles for full-text assessment. Combined with the additional 41 studies identified by screening references, 287 studies were included for data-extraction and 266 studies were selected for quantitative analysis (figure 1), including 976,408 psoriasis patients (12,884 children/adolescents). The results of all analyses performed are summarized in table 1.

**Prevalence of PsA in patients with psoriasis**

Overall, quantitative analysis of 266 studies yielded a pooled PsA prevalence (95% CI) of 19.7% (18.5%-20.9%) in patients with psoriasis (supplementary figure 1). Twenty-one studies[21-41] reported data on children/adolescents yielding a pooled prevalence of 3.3% (2.1%-4.9%) (supplementary figure 2), and a total of 245 studies[11-17, 42-279] reported data for PsA in adults with psoriasis with a pooled prevalence of 21.6%

(20.3%-22.9%) (supplementary figure 3). Thirty-six studies[11, 14, 22, 42, 44, 48, 49, 52, 57, 63, 64, 69, 70, 80, 91, 100, 112, 117, 140, 156, 159, 169, 177, 179, 188, 189, 200, 208, 214, 217, 223, 239, 241, 245, 275, 280] reported data on PsA stratified by sex (supplementary figures 4 and 5), with the prevalence for men and women being 23.3% (19.4%-27.5%) and 24.0% (20.1%-28.1%), respectively. Forty-five studies[11, 14, 90, 119, 129, 130, 135, 137, 141, 142, 146-148, 155, 156, 159, 163, 164, 174, 177, 180, 186, 197, 198, 200, 208-210, 217, 218, 229, 231, 233, 235, 241, 245, 247, 249, 257-259, 271, 273, 275, 280] used CASPAR as the underlying diagnostic approach for PsA assessment, with a pooled prevalence of 23.8% (20.1%-27.6%) (supplementary figure 6). Similarly, twenty studies[43, 44, 47, 49, 57, 63, 75, 80, 87, 88, 92, 93, 102, 157, 199, 219, 239, 240, 276, 281] used the Moll and Wright criteria, yielding a prevalence of 24.1% (15.0%-34.5%) (supplementary figure 7).

**Variations in PsA prevalence by geographic region and country**

There were 119 studies[11, 16, 17, 21, 31-36, 41, 42, 44, 45, 48, 49, 51, 52, 55, 57, 58, 62, 65, 66, 68-71, 74, 90, 93, 100, 104, 106, 107, 111-113, 115, 116, 123, 127, 129, 131, 133, 135, 136, 139-142, 149-152, 156-159, 162-164, 167, 168, 170, 171, 173-176, 178-180, 188, 191, 192, 194, 197, 199, 200, 202-205, 211, 215, 220, 223, 224, 226, 227, 229-231, 234, 235, 237-239, 242, 249-251, 253, 254, 260, 261, 264, 265, 268-270, 272, 276, 277, 279, 282-284] from Europe with a resulting pooled prevalence of 22.7% (20.6%-25.0%). From Asia, there were fifty-nine studies[12-15, 22-24, 27, 37, 39, 54, 59, 60, 63, 72, 73, 80, 88, 94, 102, 103, 105, 108, 110, 117, 128, 130, 132, 138, 146, 147, 155, 160, 184, 186, 198, 206, 216, 217, 221, 222, 233, 240, 241, 244-248, 255, 257, 258, 263, 266, 267, 271, 273-275] included for analysis, yielding a pooled prevalence of 14.0 (11.7%-16.3%). Furthermore, forty-seven studies[25, 28, 29, 46, 47, 50, 53, 56, 61, 64, 75, 76, 79, 81, 86, 87, 91, 95-98, 109, 118, 120, 121, 125, 143, 144, 148, 154, 161, 169, 183, 193, 196, 201, 212, 214, 218, 232, 236, 243, 252, 259, 262, 280, 285] were included from North America with a pooled prevalence of 19.5% (17.1%-22.1%). There were ten studies[126, 137, 145, 172, 177, 190, 208, 209, 219, 228] from South America resulting in a pooled estimate of 21.5% (15.4%-28.2%). We included three studies[40, 43, 119] from Africa; the pooled prevalence was 15.5% (0.009%-51.5%).

By country, the following estimates were calculated: 30.5% (24.8%-36.4%) from Italy[11, 21, 35, 44, 49, 52, 65, 69, 71, 74, 112, 115, 116, 135, 136, 139, 141, 142, 150, 158, 163, 164, 173, 174, 178, 179, 191, 197, 199, 211, 220, 225, 229, 230, 238, 253], 18.7% (15.0%-22.7%) from Spain[58, 113, 123, 133, 149, 170, 175, 176, 192, 194, 200, 205, 215, 224, 250, 253, 254], 20.5% (17.6%-23.5%) from Germany[17, 36, 70, 93, 107, 129, 171, 180, 189, 231, 237, 253], 19.2% (9.2%-31.8%) from The Netherlands[26, 32, 104, 127, 152, 162, 167, 168, 235, 261, 279], 22.4% (16.4%-29.0%) from Sweden[16, 33, 55, 57, 66, 140, 188, 265], 24.1% (9.2%-43.2%) from Denmark[16, 42, 189, 203, 260], 18.2% (3.6%-40.6%) from Greece[31, 45, 131, 239, 276], 17.0% (6.2%-31.7%) from Poland[62, 151, 268, 272] , 30.0% (25.3%-35.0%) from Finland[16, 48], 27.1% (13.3%-43.7%) from Norway[16, 51], 16.3% (7.9%-26.9%) from France[34, 41, 189, 202, 226, 253, 282], 19.4% (12.5%-27.6%) from UK[90, 156, 204, 223, 227, 242, 253, 270, 277, 283] , 22.0% (10.7%-35.9%) from Iceland[16, 68], 14.2% (8.6%-21.0%) from Turkey[12, 23, 27, 39, 59, 63, 72, 102, 103, 138, 160, 198, 241, 248, 258], 13.5% (7.8%-20.6%) from India[22, 105, 108, 110, 128, 147, 186, 216, 233, 244, 247, 257, 263, 266, 271], 8.3% (1.6%-19.6%) from Japan[13, 60, 94, 273, 275], 4.9% (1.9%-9.3%) from China[15, 73, 130, 132, 146], 35.5% (11.8%-64.0%) from Thailand[14, 184, 222, 240], 18.5% (5.8%-36.3%) from Taiwan[206, 255, 267], 10.4% (8.3%-12.8%) from South Korea[54, 217, 245], 13.0% (5.5%-23.0%) from Iran[80, 117], 41.8% (35.8%-48.0%) from Pakistan[88, 246], 19.0% (16.3%-21.8%) from the United States[28, 29, 46, 47, 50, 53, 56, 61, 64, 75, 79, 86, 87, 96-98, 109, 118, 120, 121, 125, 134, 144, 148, 154, 169, 189, 193, 201, 212, 214, 232, 243, 252, 262, 286], 24.6% (17.3%-32.7%) from Canada[91, 95, 189, 196, 218, 236, 280], 25.2% (18.6%-32.3%) from Brazil[137, 172, 190, 208, 209, 219, 228], and 17.8% (12.4%-24.0%) from Argentina[145, 177](Figure 2 and supplementary table 1).

**Prevalence estimates by population size**

The population size per study ranged from 25 to 198,366 patients with psoriasis.

There were 173 studies[11, 12, 21-26, 29, 30, 32-34, 36-45, 47, 50-55, 57, 59, 62, 63, 66, 67, 69, 72, 74-76, 79-81, 85-88, 90, 92, 98, 102-105, 107, 108, 110, 113, 115-119, 123-129, 131, 136-142, 144-147, 149-152, 155-160, 163-170, 172-181, 184, 185, 190, 191, 194, 196-200, 205, 229, 230, 233, 234, 236, 238-248, 250, 257-259, 263, 266-268, 271-273, 275-277, 279, 280, 282, 283, 287] with a population of <500

psoriasis patients, with a pooled prevalence of 22.2% (20.0%-24.4%). Thirty-five studies[27, 31, 49, 61, 64, 65, 70, 73, 77, 82, 91, 94, 95, 101, 106, 109, 111, 114, 121, 133, 189, 193, 195, 208, 211, 213-215, 218, 249, 251, 253, 264, 270, 274] had study size between 500 and 1000 patients, with a pooled prevalence of 18.5% (15.0%-22.3%), and fifty-seven studies[13, 15, 17, 28, 46, 48, 56, 58, 60, 68, 71, 83, 84, 89, 93, 96, 97, 100, 112, 120, 130, 132, 135, 143, 148, 154, 161, 162, 171, 182, 186-188, 192, 201, 203, 204, 207, 212, 221, 227, 231, 232, 235, 237, 252, 254-256, 260-262, 265, 269, 278, 285, 286] had a study population of 1000 or greater resulting in a prevalence of 14.4% (12.5%-16.3%).

**Prevalence of PsA by publication year and study design**

Stratified by year of publication, there were 13 studies[21, 42-53] from pre-2000, resulting in a pooled prevalence estimate of 22.0% (16.1%-28.5%).

There were 51 studies[12, 16, 17, 22-25, 54-77, 79-97, 282] and 202 studies[11, 13-15, 26-41, 98, 100-121, 123-133, 135-182, 184-212, 214-280, 285-288] published between 2000-2009 and 2010-2017, respectively. The corresponding pooled prevalence estimates were 16.5% (13.1%-20.3%) and 20.4% (19.1%-21.8%), respectively.

There were 34 clinical studies[25, 42, 61, 67, 76, 77, 81-85, 101, 111, 114, 118, 121, 125, 143, 161, 165, 166, 181, 185, 187, 195, 207, 213, 256, 264, 273, 278, 282, 287, 289], resulting in a pooled prevalence of 22.9% (20.7%-25.2%).

Moreover, there were 160 observational studies[11-15, 21, 23, 24, 26, 27, 29-31, 33-41, 43-47, 49, 50, 52, 54, 55, 62, 63, 65, 66, 69, 70, 72-75, 79, 80, 87, 88, 92, 98, 100, 102-108, 110, 113, 116, 117, 119, 123, 126-133, 135-142, 145, 147, 149-151, 155, 157-160, 163, 164, 167, 169, 170, 172-180, 184, 186, 189-191, 194, 195, 197-200, 205, 206, 208-211, 214-220, 222, 224, 225, 228-230, 233, 238-241, 243-248, 253, 257-259, 263, 266-268, 270-273, 275-277, 280, 283], yielding a pooled prevalence of 20.7% (18.3%-23.2%). Pertaining to the register-based studies, 48 such studies[22, 28, 32, 35, 53, 56, 57, 59, 86, 90, 94-97, 112, 115, 120, 144, 148, 152, 154, 168, 171, 182, 188, 201, 203, 204, 212, 221, 223, 226, 227, 232, 234-236, 250, 252, 254, 255, 260-262, 265, 269, 274, 279] were included in the analysis, with a pooled prevalence of 15.1% (13.3%-17.1%). Finally, 46 population-based studies[16, 17, 48, 51, 56-58, 60,

64, 68, 71, 86, 89-91, 93, 95-97, 109, 112, 120, 146, 148, 154, 156, 162, 188, 192, 193, 201, 202, 212, 221, 223, 227, 231, 235, 237, 242, 249, 251, 260, 262, 285, 286] were included with a pooled prevalence estimate of 15.6% (13.7%-17.7%).

**Prevalence of PsA by severity of disease**

There were 122 studies[17, 25, 32, 35, 36, 38, 42, 46, 47, 61, 67, 69, 70, 74, 76, 77, 80-85, 87, 88, 91-93, 95, 100, 101, 104, 106, 107, 109, 111-119, 121-123, 125, 127, 129, 136, 138, 141, 143, 152, 157, 161-163, 165, 166, 168, 171, 173-175, 178, 179, 181, 182, 184, 185, 187, 191, 192, 194-197, 201, 203-207, 210, 211, 213, 214, 216, 217, 220, 222, 224, 226, 229, 230, 233, 234, 236, 241, 243, 250, 252-254, 256-258, 264-269, 273, 274, 277-279, 282, 283, 289] including psoriasis patients with moderate-to-severe disease resulting in a pooled prevalence of 24.6% (22.9% - 26.4). Furthermore, there were 58 studies[11, 12, 16, 28, 31, 33, 52, 53, 59, 64, 65, 79, 90, 102, 103, 105, 120, 130, 135, 139, 140, 142, 144, 145, 147, 149, 155, 156, 160, 164, 167, 170, 172, 183, 186, 198, 200, 212, 215, 223, 225, 227, 228, 235, 237, 238, 240, 242, 245, 247, 248, 251, 259, 260, 263, 270, 272, 280] with mild disease resulting in a pooled estimate of 15.8% (14.3% - 17.2%).

**Study quality and bias assessment**

A total of 134 studies[15-17, 21, 22, 27-34, 36, 38, 39, 41, 54, 56, 57, 62, 63, 65, 68-71, 74, 79, 80, 92-95, 97, 98, 100, 103, 104, 106, 107, 112, 115, 117, 119, 120, 127-132, 136, 137, 141, 142, 144, 147-149, 154, 156-160, 162-164, 167, 170-173, 175-178, 180, 182-184, 186, 188-192, 194, 197, 199, 201-204, 206, 209, 211, 212, 215, 218-221, 226, 227, 229, 231, 232, 235, 237, 240, 242, 243, 246-248, 250-252, 254, 255, 260, 262, 263, 265, 268-270, 274-276, 279, 285] had good quality according to the NOS, with a pooled prevalence of 18.1% (16.6%-19.6%). Furthermore, there were 84 studies[11-14, 23, 24, 40, 43-53, 55, 58-60, 64, 66, 72, 73, 75, 86-91, 102, 105, 108, 110, 113, 116, 125, 126, 133, 135, 138-140, 145, 146, 151, 155, 169, 174, 193, 198, 200, 205, 208, 210, 214, 216, 217, 223, 225, 228, 230, 233, 234, 236, 238, 239, 241, 244, 245, 249, 253, 257, 258, 261, 266, 267, 271, 272, 280, 283] categorized as fair or poor quality, entailing an estimate of 21.5% (17.7%-25.6%). Studies categorized as fair or poor quality scored a maximum of 2 regarding the representativeness of the study population. Correspondingly, for studies with good quality 66 of 134 scored at least 4 with a minimum score of 3 for all studies (supplementary table 2).

Furthermore, the Egger test indicated a significant risk of bias for all studies included ($p<0.0001$).
There was a very high level of heterogeneity between all studies included given by the $I^2$ of 99.5% (99.5% to 99.5%). The high level of heterogeneity persisted in all subgroups except from Pakistan, South Korea and Argentina from the subgrouping by country where the Cochran Q test was not significant (supplementary table 3).

**Incidence of PsA among patients with psoriasis**

Ten studies reported incidence estimates of PsA among psoriasis patients. Wilson et al.[96] conducted a population-based retrospective cohort study based on medical chart reviews in 1593 psoriasis patients from the United States. Patients were followed for up to 30 years (1970-1999) and the incidence rate was 2.7 per 1000 person-years. Furthermore, a cumulative incidence of 1.7%, 3.1%, and 5.1% was reported at 5-, 10-, and 20-years follow-up, respectively. Li et al.[290] reported an annual incidence of 2.1% during 15-years follow-up (1991-2005) in a US population-based setting of women from the Nurses' Health Study. Furthermore, in a population-based cohort study from UK[291] an incidence rate of 26.5 per 10,000 person-years was reported during 15-years follow-up (1995-2010). In a European study enrolling patients from UK, Italy, France, Spain and Germany, Christophers et al.[100] followed 1560 patients with plaque psoriasis from secondary care units for a total of 30 years. The cumulative PsA incidence was 13% at 20-years follow-up. Eder et al.[292] followed 313 Canadian psoriasis patients for 4 years (2006-2010), mainly enrolled from secondary care clinics, and reported an incidence rate of 1.9 per 100 person-years.
In a study from Italy[139] an annual mean incidence of 1.7% was reported at 3-years follow-up (2008-2011) for psoriasis patients attending an outpatient dermatology clinic. Tinazzi et al.[11] from Italy, enrolling patients with severe psoriasis, reported a cumulative incidence of 8.4% at 12-months follow-up. Brunasso et al.[115] from Italy reported an incidence rate of 22.7 per 1000 person-years during a mean follow-up of 39 months for 55 psoriasis patients treated with Efalizumab. In a study from Canada[218] a cumulative incidence

of 8.4% was reported during 8-years follow up (2006-2014). In another prospective cohort study from Canada[293] the incidence rate was reported to be 2.7 per 100 person-years at 8-years follow-up (2006-2014).

# Discussion

Quantitative analysis of 266 studies yielded a PsA prevalence of 19.7% among 976,408 patients with psoriasis. The prevalence of PsA was markedly lower in children and adolescents when compared to adults, but equally frequent in both sexes. Notably, higher estimates were found in psoriasis patients with moderate-to-severe psoriasis compared to patients with mild psoriasis suggesting that increased attention is warranted among this group of patients.

The prevalence of PsA among psoriasis patients was lowest in Asia. Previously, Tam et al.[294] reported a prevalence range of 1-9% in psoriasis patients from Asia. Moreover, our data show congruence in the estimates from Europe and North America, which is supported by previous findings. Furthermore, the pooled estimate for South America was unexpectedly high in light of a previous review which reported complete absence of psoriasis in the Andean region[295]. Studies have shown that both psoriasis and PsA have strong genetic components[99, 296]. Accordingly, HLA-C*06 positivity in psoriasis patients is generally higher in Caucasians compared to Asians[297]. Moreover, strong genetic associations have linked HLA-B7, HLA-B27 and HLA-B39 with PsA in particular[298] and data has shown higher occurrence of HLA-B27 in non-Hispanics whites.

It is generally accepted that PsA is uncommon in children, which is supported by the pooled prevalence of 3.3%. The low estimate might, at least in part, be explained by lack of clear segregation of PsA from JIA. However, juvenile PsA represents approximately 5% of patients with JIA, emphasizing the importance of

discerning it from JIA as a distinct entity[299]. Moreover, PsA in children often presents before psoriasis[300]. We only examined studies of those children with psoriasis, and thus children with PsA that developed cutaneous manifestations later on could have been missed in our study. Furthermore, we observed decreasing proportion estimates as the population size increased. This might partly be explained by more thorough examination of psoriasis patients in smaller studies and underdiagnosis of PsA in larger ones, e.g. in register-based studies where PsA assessment is based on diagnostic codes, as such studies may tend to predominantly capture those patients with more severe joint symptoms.

The reported incidence rates ranged from 0.27 per 100 person-years, reported by Wilson et al.[96] and Love et al.[291] to 2.7 per 100 person-years, reported in a prospective setting by Eder et al[293]. Interestingly, both studies reporting the lowest estimates were conducted in a non-selected population-based setting. However, the higher incidence rates could also be explained by improving diagnostic abilities as there seems to be a link between more recent studies and higher incidence rates.

High levels of heterogeneity were observed between studies both overall and across subgroups. Such heterogeneity may be attributed to the lack of widely accepted diagnostic criteria in the past, different study designs, geographical variations, ethnicity, the remitting and relapsing nature of the disease, and study inclusion criteria, e.g. whether patients with psoriasis were selected from primary, secondary, or tertiary care settings.

In 2015, Villani et al. reported a 15.5% prevalence of undiagnosed PsA among psoriasis patients in a systematic review and meta-analysis[301]. However, the focus was only directed to the occurrence of newly diagnosed PsA among patients with cutaneous psoriasis. While few review articles have examined the prevalence of PsA among patients with plaque psoriasis[301-303], these studies have generally applied a narrow search strategy, thus excluding a vast number of relevant studies.

Strengths of this study include the sheer number of studies, the focused inclusion of PsA patients rather than any type of arthritis, the liberal inclusion of various types of study populations and designs and lastly the inclusion of all types of diagnostic methods for PsA. On the other hand, our study was limited by the few studies from Africa and Australia complicating an accurate assessment of the prevalence of PsA among psoriasis patients in these regions. The exclusion of studies written in languages other than English, and a significant risk of publication-bias may also have affected our estimates. Furthermore, due to lack of available data we were not able to assess whether severity of psoriasis could explain the lower prevalence of PsA observed in children and in patients from Asia and Africa.

In conclusion, this meta-analysis showed that one in five patients with psoriasis have PsA, with very consistent results across numerous strata. However, high levels of heterogeneity were observed between the included studies, which may affect interpretation.

# References


1. Coates, L.C. and P.S. Helliwell, *Psoriatic arthritis: state of the art review.* Clinical Medicine, 2017. **17**(1): p. 65-70.
2. Moll, J.M. and V. Wright, *Psoriatic arthritis.* Seminars in arthritis and rheumatism, 1973. **17**(1): p. 55-78.
3. Bennett, R.M., *Psoriatic arthritis. In: McCarty DJ, editor. Arthritis and allied conditions. 9th ed.* Philadelphia: Lea & Febiger, 1979: p. 645.
4. Vasey, F.a.E.L.R., *Psoriatic arthropathy. In: Calin A, editor. Spondyloarthropathies.* . Orlando (FL): Grune & Stratton 1984: p. 151-85.
5. Gladman, D.D., et al., *PSORIATIC-ARTHRITIS (PSA) - AN ANALYSIS OF 220 PATIENTS.* Quarterly Journal of Medicine, 1987. **62**(238): p. 127-141.
6. Amor, B., M. Dougados, and M. Mijiyawa, *[Criteria of the classification of spondylarthropathies]*. Rev Rhum Mal Osteoartic, 1990. **57**(2): p. 85-9.
7. Dougados, M., et al., *The European Spondylarthropathy Study Group preliminary criteria for the classification of spondylarthropathy.* Arthritis and Rheumatism, 1991. **34**(10): p. 1218-1227.
8. McGonagle, D., P.G. Conaghan, and P. Emery, *Psoriatic arthritis: A unified concept twenty years on.* Arthritis and Rheumatism, 1999. **42**(6): p. 1080-1086.
9. Fournie, B., et al., *Proposed classification criteria of psoriatic arthritis. A preliminary study in 260 patients.* Revue du Rhumatisme (English Edition), 1999. **66**(10): p. 446-456.
10. Taylor, W., et al., *Classification criteria for psoriatic arthritis - Development of new criteria from a large international study.* Arthritis and Rheumatism, 2006. **54**(8): p. 2665-2673.
11. Tinazzi, I., et al., *The early psoriatic arthritis screening questionnaire: a simple and fast method for the identification of arthritis in patients with psoriasis.* Rheumatology, 2012. **51**(11): p. 2058-2063.
12. Soy, M., et al., *Susceptibility to Atherosclerosis in Patients with Psoriasis and Psoriatic Arthritis as Determined by Carotid-Femoral (Aortic) Pulse-Wave Velocity Measurement.* Revista Espanola De Cardiologia, 2009. **62**(1): p. 96-99.
13. Ohara, Y., et al., *Prevalence and Clinical Characteristics of Psoriatic Arthritis in Japan.* Journal of Rheumatology, 2015. **42**(8): p. 1439-1442.
14. Chiowchanwisawakit, P., et al., *Developing the Thai Siriraj Psoriatic Arthritis Screening Tool and validating the Thai Psoriasis Epidemiology Screening Tool and the Early Arthritis for Psoriatic Patients questionnaire.* Rheumatology International, 2016. **36**(10): p. 1459-1468.
15. Chen, K., et al., *Clinic characteristics of psoriasis in China: a nationwide survey in over 12000 patients.* Oncotarget, 2017. **8**(28): p. 46381-46389.
16. Zachariae, H., et al., *Quality of life and prevalence of arthritis reported by 5,795 members of the Nordic Poriasis Associations - Data from the Nordic Quality of Life Study.* Acta Dermato-Venereologica, 2002. **82**(2): p. 108-113.
17. Radtke, M.A., et al., *Prevalence and clinical features of psoriatic arthritis and joint complaints in 2009 patients with psoriasis: results of a German national survey.* Journal of the European Academy of Dermatology and Venereology, 2009. **23**(6): p. 683-691.
18. Wells, G.A., et al., *The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.*
19. Miller, J.J., *Inverse of the Freeman-Turkey Double Arcsine Transformation.* The American Statistician, 1978. **32**(4): p. 1.

20. DerSimonian, R. and N. Laird, *Meta-analysis in clinical trials.* Control Clin Trials, 1986. **7**(3): p. 177-88.
21. Biondi Oriente, C., R. Scarpa, and P. Oriente, *Prevalence and clinical features of juvenile psoriatic arthritis in 425 psoriatic patients.* Acta Dermato-Venereologica, Supplement, 1994(186): p. 109-110.
22. Kumar, B., et al., *Epidemiology of childhood psoriasis: A study of 419 patients from northern India.* International Journal of Dermatology, 2004. **43**(9): p. 654-658.
23. Seyhan, M., et al., *Psoriasis in childhood and adolescence: Evaluation of demographic and clinical features.* Pediatrics International, 2006. **48**(6): p. 525-530.
24. Al-Mutairi, N., Y. Manchanda, and O. Nour-Eldin, *Nail changes in childhood psoriasis: A study from Kuwait.* Pediatric Dermatology, 2007. **24**(1): p. 7-10.
25. Paller, A.S., et al., *Etanercept Treatment for Children and Adolescents with Plaque Psoriasis.* New England Journal of Medicine, 2008. **358**(3): p. 241-251.
26. Chiam, L.Y., et al., *Juvenile psoriasis in European and Asian children: similarities and differences.* Br J Dermatol, 2011. **164**(5): p. 1101-3.
27. Ozden, M.G., et al., *Environmental risk factors in pediatric psoriasis: A multicenter case-control study.* Pediatric Dermatology, 2011. **28**(3): p. 306-312.
28. Kimball, A.B., et al., *Risks of developing psychiatric disorders in pediatric patients with psoriasis.* Journal of the American Academy of Dermatology, 2012. **67**(4): p. 651-657.
29. Mercy, K., et al., *Clinical manifestations of pediatric psoriasis: Results of a multicenter study in the United States.* Pediatric Dermatology, 2013. **30**(4): p. 424-428.
30. Paller, A.S., et al., *Association of pediatric psoriasis severity with excess and central adiposity: an international cross-sectional study.* JAMA Dermatol, 2013. **149**(2): p. 166-76.
31. Moustou, A.E., et al., *Childhood and adolescent psoriasis in Greece: A retrospective analysis of 842 patients.* International Journal of Dermatology, 2014. **53**(12): p. 1447-1453.
32. Van Geel, M.J., et al., *Methotrexate in pediatric plaque-type psoriasis: Long-term daily clinical practice results from the Child-CAPTURE registry.* Journal of Dermatological Treatment, 2015. **26**(5): p. 406-412.
33. Lysell, J., et al., *Clinical Characterisation at Onset of Childhood Psoriasis - A Cross Sectional Study in Sweden.* Acta Dermato-Venereologica, 2015. **95**(4): p. 457-461.
34. Mahe, E., et al., *Psoriasis and obesity in French children: a case-control, multicentre study.* British Journal of Dermatology, 2015. **172**(6): p. 1593-1600.
35. Di Lernia, V., et al., *Effectiveness and safety of cyclosporine in pediatric plaque psoriasis: A multicentric retrospective analysis.* Journal of Dermatological Treatment, 2016. **27**(5): p. 395-398.
36. Reich, K., et al., *Retrospective data collection of psoriasis treatment with fumaric acid esters in children and adolescents in Germany (KIDS FUTURE study).* JDDG - Journal of the German Society of Dermatology, 2016. **14**(1): p. 50-58.
37. Bhuiyan, M.S.I., et al., *Clinico-epidemiological study of childhood psoriasis.* Med Univ J, 2017. **10**(2): p. 119-22.
38. Bronckers, I., et al., *Safety of Systemic Agents for the Treatment of Pediatric Psoriasis.* JAMA Dermatol, 2017. **153**(11): p. 1147-1157.
39. Ergun, T., et al., *Efficacy, safety and drug survival of conventional agents in pediatric psoriasis: A multicenter, cohort study.* Journal of Dermatology, 2017. **44**(6): p. 630-634.
40. Kelati, A., et al., *Pediatric psoriasis: Should we be concerned with comorbidity? Cross-sectional study.* Pediatrics International, 2017. **59**(8): p. 923-928.
41. Pourchot, D., et al., *Nail Psoriasis: A Systematic Evaluation in 313 Children with Psoriasis.* Pediatric Dermatology, 2017. **34**(1): p. 58-63.

42. Nyfors, A., *BENEFITS AND ADVERSE DRUG EXPERIENCES DURING LONG-TERM METHOTREXATE TREATMENT OF 248 PSORIATICS.* Danish Medical Bulletin, 1978. **25**(5): p. 208-211.
43. Green, L., et al., *Arthritis in psoriasis.* Annals of the Rheumatic Diseases, 1981. **40**(4): p. 366-369.
44. Scarpa, R., et al., *PSORIATIC-ARTHRITIS IN PSORIATIC PATIENTS.* British Journal of Rheumatology, 1984. **23**(4): p. 246-250.
45. Economidou, J., et al., *HUMAN-LYMPHOCYTE ANTIGEN-A, ANTIGEN-B, AND ANTIGEN-C IN GREEK PATIENTS WITH PSORIASIS - RELATION TO AGE AND CLINICAL EXPRESSION OF THE DISEASE.* Journal of the American Academy of Dermatology, 1985. **13**(4): p. 578-582.
46. Stern, R.S., *THE EPIDEMIOLOGY OF JOINT COMPLAINTS IN PATIENTS WITH PSORIASIS.* Journal of Rheumatology, 1985. **12**(2): p. 315-320.
47. Gottlieb, A.B., et al., *MARKED INCREASE IN THE FREQUENCY OF PSORIATIC-ARTHRITIS IN PSORIASIS PATIENTS WITH HLA-DR+ KERATINOCYTES.* Arthritis and Rheumatism, 1987. **30**(8): p. 901-907.
48. Kononen, M., P. Ekholm, and E. Makila, *Craniomandibular disorders in elderly with psoriasis.* Comprehensive gerontology, 1987. **Section A, Clinical and laboratory sciences. 1**(1): p. 25-28.
49. Oriente, C.B., et al., *Psoriasis and psoriatic arthritis. Dermatological and rheumatological co-operative clinical report.* Acta Dermato-Venereologica, Supplement, 1989. **69**(146): p. 69-71.
50. Zanolli, M.D. and J.S. Wikle, *Joint complaints in psoriasis patients.* International Journal of Dermatology, 1992. **31**(7): p. 488-491.
51. Falk, E.S. and O. Vandbakk, *Prevalence of psoriasis in a Norwegian Lapp population.* Acta Dermato-Venereologica, Supplement, 1993(182): p. 6-9.
52. Salvarani, C., et al., *Prevalence of psoriatic arthritis in Italian psoriatic patients.* Journal of Rheumatology, 1995. **22**(8): p. 1499-1503.
53. Fleischer Jr, A.B., et al., *Disease severity measures in a population of psoriasis patients: The symptoms of psoriasis correlate with self-administered psoriasis area severity index scores.* Journal of Investigative Dermatology, 1996. **107**(1): p. 26-29.
54. Baek, H.J., et al., *Spondylitis is the most common pattern of psoriatic arthritis in Korea.* Rheumatology International, 2000. **19**(3): p. 89-94.
55. Lundberg, L., et al., *Health-related quality of life in patients with psoriasis and atopic dermatitis measured with SF-36, DLQI and a subjective measure of disease activity.* Acta Dermato-Venereologica, 2000. **80**(6): p. 430-434.
56. Shbeeb, M., et al., *The epidemiology of psoriatic arthritis in Olmsted County, Minnesota, USA, 1982-1991.* Journal of Rheumatology, 2000. **27**(5): p. 1247-1250.
57. Alenius, G.M., et al., *Inflammatory joint manifestations are prevalent in psoriasis: Prevalence study of joint and axial involvement in psoriatic patients, and evaluation of a psoriatic and arthritic questionnaire.* Journal of Rheumatology, 2002. **29**(12): p. 2577-2582.
58. Ferrandiz, C., et al., *Psoriasis of early and late onset: A clinical and epidemiologic study from Spain.* Journal of the American Academy of Dermatology, 2002. **46**(6): p. 867-873.
59. Kundakci, N., et al., *The evaluation of the sociodemographic and clinical features of Turkish psoriasis patients.* International Journal of Dermatology, 2002. **41**(4): p. 220-224.
60. Kawada, A., et al., *A survey of psoriasis patients in Japan from 1982 to 2001.* Journal of Dermatological Science, 2003. **31**(1): p. 59-64.

61. Leonardi, C.L., et al., *Etanercept as Monotherapy in Patients with Psoriasis.* New England Journal of Medicine, 2003. **349**(21): p. 2014-2022.
62. Chodorowska, G., D. Wojnowska, and M. Juszkiewicz-Borowiec, *C-reactive protein and alpha<inf>2</inf>-macroglobulin plasma activity in medium-severe and severe psoriasis.* Journal of the European Academy of Dermatology and Venereology, 2004. **18**(2): p. 180-183.
63. Dervis, E. and E. Dervis, *The prevalence of temporomandibular disorders in patients with psoriasis with or without psoriatic arthritis.* Journal of Oral Rehabilitation, 2005. **32**(11): p. 786-793.
64. Gelfand, J.M., et al., *Epidemiology of psoriatic arthritis in the population of the United States.* Journal of the American Academy of Dermatology, 2005. **53**(4): p. 573-577.
65. Gisondi, P., et al., *Prevalence of psoriatic arthritis and joint complaints in a large population of Italian patients hospitalised for psoriasis.* European Journal of Dermatology, 2005. **15**(4): p. 279-283.
66. Mallbris, L., et al., *Psoriasis phenotype at disease onset: Clinical characterization of 400 adult cases.* Journal of Investigative Dermatology, 2005. **124**(3): p. 499-504.
67. Reich, K., et al., *Infliximab induction and maintenance therapy for moderate-to-severe psoriasis: A phase III, multicentre, double-blind trial.* Lancet, 2005. **366**(9494): p. 1367-1374.
68. Gudjonsson, J.E., et al., *Distinct clinical differences between HLA-Cw*0602 positive and negative psoriasis patients - An analysis of 1019 HLA-C- and HLA-B-typed patients.* Journal of Investigative Dermatology, 2006. **126**(4): p. 740-745.
69. Ojetti, V., et al., *Malabsorption in psoriatic patients: Cause or consequence?* Scandinavian Journal of Gastroenterology, 2006. **41**(11): p. 1267-1271.
70. Sommer, D.M., et al., *Increased prevalence of the metabolic syndrome in patients with moderate to severe psoriasis.* Archives of Dermatological Research, 2006. **298**(7): p. 321-328.
71. Altobelli, E., et al., *Analysis of health care and actual needs of patients with psoriasis: A survey on the Italian population.* BMC Public Health, 2007. **7 (no pagination)**(59).
72. Dayangac-Erden, D., A. Karaduman, and H. Erdem-Yurter, *Polymorphisms of vitamin D receptor gene in Turkish familial psoriasis patients.* Archives of Dermatological Research, 2007. **299**(10): p. 487-491.
73. Fan, X., et al., *Comparison of clinical features of HLA-Cw*0602-positive and -negative psoriasis patients in a Han Chinese population.* Acta Dermato-Venereologica, 2007. **87**(4): p. 335-340.
74. Gisondi, P., et al., *Prevalence of metabolic syndrome in patients with psoriasis: A hospital-based case-control study.* British Journal of Dermatology, 2007. **157**(1): p. 68-73.
75. Husni, M.E., et al., *The PASE questionnaire: Pilot-testing a Psoriatic Arthritis Screening and Evaluation tool.* Journal of the American Academy of Dermatology, 2007. **57**(4): p. 581-587.
76. Krueger, G.G., et al., *A human interleukin-12/23 monoclonal antibody for the treatment of psoriasis.* New England Journal of Medicine, 2007. **356**(6): p. 580-592.
77. Menter, A., et al., *A randomized comparison of continuous vs. intermittent infliximab maintenance regimens over 1 year in the treatment of moderate-to-severe plaque psoriasis.* Journal of the American Academy of Dermatology, 2007. **56**(1): p. 31.e1-31.e15.
78. Poulalhon, N., et al., *A follow-up study in 28 patients treated with infliximab for severe recalcitrant psoriasis: Evidence for efficacy and high incidence of biological autoimmunity.* British Journal of Dermatology, 2007. **156**(2): p. 329-336.

79. Schmitt, J. and D.E. Ford, *Understanding the relationship between objective disease severity, psoriatic symptoms, illness-related stress, health-related quality of life and depressive symptoms in patients with psoriasis - a structural equations modeling approach.* General Hospital Psychiatry, 2007. **29**(2): p. 134-140.
80. Jamshidi, F., et al., *The prevalence of psoriatic arthritis in psoriatic patients in Tehran, Iran.* Archives of Iranian Medicine, 2008. **11**(2): p. 162-165.
81. Kimball, A.B., et al., *Safety and efficacy of ABT-874, a fully human interleukin 12/23 monoclonal antibody, in the treatment of moderate to severe chronic plaque psoriasis: Results of a randomized, placebo-controlled, phase 2 trial.* Archives of Dermatology, 2008. **144**(2): p. 200-207.
82. Leonardi, C.L., et al., *Efficacy and safety of ustekinumab, a human interleukin-12/23 monoclonal antibody, in patients with psoriasis: 76-week results from a randomised, double-blind, placebo-controlled trial (PHOENIX 1).* The Lancet, 2008. **371**(9625): p. 1665-1674.
83. Menter, A., et al., *Adalimumab therapy for moderate to severe psoriasis: A randomized, controlled phase III trial.* J Am Acad Dermatol, 2008. **58**(1): p. 106-15.
84. Papp, K.A., et al., *Efficacy and safety of ustekinumab, a human interleukin-12/23 monoclonal antibody, in patients with psoriasis: 52-week results from a randomised, double-blind, placebo-controlled trial (PHOENIX 2).* Lancet, 2008. **371**(9625): p. 1675-84.
85. Rich, P., et al., *Baseline nail disease in patients with moderate to severe psoriasis and response to treatment with infliximab during 1 year.* J Am Acad Dermatol, 2008. **58**(2): p. 224-31.
86. Callis Duffin, K., et al., *Psoriatic arthritis is a strong predictor of sleep interference in patients with psoriasis.* Journal of the American Academy of Dermatology, 2009. **60**(4): p. 604-608.
87. Dominguez, P.L., et al., *Validity, reliability, and sensitivity-to-change properties of the psoriatic arthritis screening and evaluation questionnaire.* Archives of Dermatological Research, 2009. **301**(8): p. 573-579.
88. Ejaz, A., A. Iftikhar, and N. Iftikhar, *Patterns of psoriatic arthritis.* Journal of the College of Physicians and Surgeons Pakistan, 2009. **19**(9): p. 553-556.
89. Guinot, C., et al., *Psoriasis: characterization of six different clinical phenotypes.* Exp Dermatol, 2009. **18**(8): p. 712-9.
90. Ibrahim, G., R. Waxman, and P.S. Helliwell, *The prevalence of psoriatic arthritis in people with psoriasis.* Arthritis Care and Research, 2009. **61**(10): p. 1373-1378.
91. Lynde, C.W., et al., *The burden of psoriasis in Canada: Insights from the pSoriasis Knowledge IN Canada (SKIN) survey.* Journal of Cutaneous Medicine and Surgery, 2009. **13**(5): p. 235-252.
92. Miele, L., et al., *Prevalence, characteristics and severity of non-alcoholic fatty liver disease in patients with chronic plaque psoriasis.* Journal of Hepatology, 2009. **51**(4): p. 778-786.
93. Reich, K., et al., *Epidemiology and clinical pattern of psoriatic arthritis in Germany: A prospective interdisciplinary epidemiological study of 1511 patients with plaque-type psoriasis.* British Journal of Dermatology, 2009. **160**(5): p. 1040-1047.
94. Takahashi, H., et al., *Analysis of psoriatic patients registered in Asahikawa Medical College Hospital from 1983 to 2007.* Journal of Dermatology, 2009. **36**(12): p. 632-637.
95. Wasel, N., et al., *A Canadian self-administered online survey to evaluate the impact of moderate-to-severe psoriasis among patients.* Journal of cutaneous medicine and surgery, 2009. **13**(6): p. 294-302.

96. Wilson, F.C., et al., *Incidence and clinical predictors of psoriatic arthritis in patients with psoriasis: A population-based study.* Arthritis Care and Research, 2009. **61**(2): p. 233-239.
97. Yu, A.P., et al., *Economic burden of psoriasis compared to the general population and stratified by disease severity.* Current Medical Research and Opinion, 2009. **25**(10): p. 2429-2438.
98. Bandoli, G., et al., *Potentially modifiable risk factors for adverse pregnancy outcomes in women with psoriasis.* British Journal of Dermatology, 2010. **163**(2): p. 334-339.
99. Chandran, V. and S.P. Raychaudhuri, *Geoepidemiology and environmental factors of psoriasis and psoriatic arthritis.* J Autoimmun, 2010. **34**(3): p. J314-21.
100. Christophers, E., et al., *The risk of psoriatic arthritis remains constant following initial diagnosis of psoriasis among patients seen in European dermatology clinics.* Journal of the European Academy of Dermatology and Venereology, 2010. **24**(5): p. 548-554.
101. Griffiths, C.E., et al., *Comparison of ustekinumab and etanercept for moderate-to-severe psoriasis.* N Engl J Med, 2010. **362**(2): p. 118-28.
102. Kacar, C., et al., *Sacroiliac joint involvement in psoriasis.* Rheumatology International, 2010. **30**(9): p. 1263-1266.
103. Karadag, A.S., et al., *Is psoriasis a pre-atherosclerotic disease? Increased insulin resistance and impaired endothelial function in patients with psoriasis.* International Journal of Dermatology, 2010. **49**(6): p. 642-646.
104. Lecluse, L.L.A., et al., *Extent and clinical consequences of antibody formation against adalimumab in patients with plaque psoriasis.* Archives of Dermatology, 2010. **146**(2): p. 127-132.
105. Natarajan, V., et al., *Coexistence of onychomycosis in psoriatic nails: A descriptive study.* Indian Journal of Dermatology, Venereology and Leprology, 2010. **76**(6): p. 723.
106. Palotai, T., et al., *A survey of disease severity, quality of life, and treatment patterns of biologically naive patients with psoriasis in central and eastern Europe.* Acta Dermatovenerologica Croatica, 2010. **18**(3): p. 151-162.
107. Reich, A., E. Hrehorow, and J.C. Szepietowski, *Pruritus is an important factor negatively influencing the well-being of psoriatic patients.* Acta Dermato-Venereologica, 2010. **90**(3): p. 257-263.
108. Singh, U. and S. Singh, *Prevalence of autoantibodies in patients of psoriasis.* Journal of Clinical Laboratory Analysis, 2010. **24**(1): p. 44-48.
109. Soltani-Arabshahi, R., et al., *Obesity in early adulthood as a risk factor for psoriatic arthritis.* Archives of Dermatology, 2010. **146**(7): p. 721-726.
110. Sultan, S.J., Q.M. Ahmad, and S.T. Sultan, *Antigliadin antibodies in psoriasis.* Australasian Journal of Dermatology, 2010. **51**(4): p. 238-242.
111. Thaci, D., et al., *A phase IIIb, multicentre, randomized, double-blind, vehicle-controlled study of the efficacy and safety of adalimumab with and without calcipotriol/betamethasone topical treatment in patients with moderate to severe psoriasis: The BELIEVE study.* British Journal of Dermatology, 2010. **163**(2): p. 402-411.
112. Vena, G.A., et al., *Incidence of psoriasis and association with comorbidities in Italy: A 5-year observational study from a national primary care database.* European Journal of Dermatology, 2010. **20**(5): p. 593-598.
113. Zaragoza, V., et al., *Long-term safety and efficacy of etanercept in the treatment of psoriasis. [Spanish]*. Actas Dermo-Sifiliograficas, 2010. **101**(1): p. 47-53.
114. Barker, J., et al., *Efficacy and safety of infliximab vs. methotrexate in patients with moderate-to-severe plaque psoriasis: results of an open-label, active-controlled, randomized trial (RESTORE1).* Br J Dermatol, 2011. **165**(5): p. 1109-17.

115. Brunasso, A.M.G., et al., *Tolerability and safety of biological therapies for psoriasis in daily clinical practice: A study of 103 Italian patients.* Acta Dermato-Venereologica, 2011. **91**(1): p. 44-49.
116. De Simone, C., et al., *Endothelial dysfunction in psoriasis patients: Cross-sectional case-control study.* European Journal of Dermatology, 2011. **21**(4): p. 510-514.
117. Ghajarzadeh, M., et al., *Depression and quality of life in psoriasis and psoriatic arthritis patients.* Iranian Journal of Dermatology, 2012. **14**(58): p. 123-128.
118. Gottlieb, A.B., et al., *Efficacy and safety of briakinumab vs. etanercept and placebo in patients with moderate to severe chronic plaque psoriasis.* British Journal of Dermatology, 2011. **165**(3): p. 652-660.
119. Abdel Hay, R.M. and L.A. Rashed, *Association between the leptin gene 2548G/A polymorphism, the plasma leptin and the metabolic syndrome with psoriasis.* Experimental Dermatology, 2011. **20**(9): p. 715-719.
120. Kimball, A.B., et al., *Economic burden of comorbidities in patients with psoriasis is substantial.* Journal of the European Academy of Dermatology and Venereology, 2011. **25**(2): p. 157-163.
121. Kimball, A.B., et al., *Efficacy and safety of adalimumab among patients with moderate to severe psoriasis with co-morbidities: Subanalysis of results from a randomized, double-blind, placebo-controlled, phase III trial.* American Journal of Clinical Dermatology, 2011. **12**(1): p. 51-62.
122. Reich, K., et al., *A 52-week trial comparing briakinumab with methotrexate in patients with psoriasis.* New England Journal of Medicine, 2011. **365**(17): p. 1586-1596.
123. Sanchez-Moya, A.I. and E. Dauden, *Incidence of tuberculosis infection in psoriatic patients on anti-TNF therapy: Report of a case series with 144 patients.* Journal of the European Academy of Dermatology and Venereology, 2011. **25**(6): p. 730-733.
124. Saurat, J.H., et al., *Relationship between methotrexate dosing and clinical response in patients with moderate to severe psoriasis: subanalysis of the CHAMPION study.* Br J Dermatol, 2011. **165**(2): p. 399-406.
125. Strober, B.E., et al., *Efficacy and safety results from a phase III, randomized controlled trial comparing the safety and efficacy of briakinumab with etanercept and placebo in patients with moderate to severe chronic plaque psoriasis.* British Journal of Dermatology, 2011. **165**(3): p. 661-668.
126. Valenzuela, F., et al., *Epidemiology and quality of life of patients with psoriasis in Chile.* Actas Dermo-Sifiliograficas, 2011. **102**(10): p. 810-816.
127. van Lumig, P.P., et al., *Relevance of laboratory investigations in monitoring patients with psoriasis on etanercept or adalimumab.* Br J Dermatol, 2011. **165**(2): p. 375-82.
128. Verghese, B., et al., *Serum cytokine profile in psoriasis-A case-control study in a tertiary care hospital from Northern India.* Indian Journal of Clinical Biochemistry, 2011. **26**(4): p. 373-377.
129. Warnecke, C., et al., *Cardiovascular and metabolic risk profile in german patients with moderate and severe psoriasis: A case control study.* European Journal of Dermatology, 2011. **21**(5): p. 761-770.
130. Yang, Q., et al., *Prevalence and characteristics of psoriatic arthritis in Chinese patients with psoriasis.* Journal of the European Academy of Dermatology and Venereology, 2011. **25**(12): p. 1409-1414.
131. Zervou, M.I., et al., *A CD40 and an NCOA5 gene polymorphism confer susceptibility to psoriasis in a Southern European population: A case-control study.* Human Immunology, 2011. **72**(9): p. 761-765.

132. Zhang, C., et al., *The effect of overweight and obesity on psoriasis patients in Chinese Han population: A hospital-based study.* Journal of the European Academy of Dermatology and Venereology, 2011. **25**(1): p. 87-91.
133. Armesto, S., et al., *Psoriasis and hypertension: A case-control study.* Journal of the European Academy of Dermatology and Venereology, 2012. **26**(6): p. 785-788.
134. Armstrong, A.W., C. Schupp, and B. Bebo, *Psoriasis comorbidities: Results from the national psoriasis foundation surveys 2003 to 2011.* Dermatology, 2012. **225**(2): p. 121-126.
135. Bonifati, C., et al., *The diagnosis of early psoriatic arthritis in an outpatient dermatological centre for psoriasis.* Journal of the European Academy of Dermatology and Venereology., 2012.
136. Brazzelli, V., et al., *Prevalence, severity and clinical features of psoriasis in fingernails and toenails in adult patients: Italian experience.* Journal of the European Academy of Dermatology and Venereology, 2012. **26**(11): p. 1354-1359.
137. Carneiro, J.N., A.P. de Paula, and G.A. Martins, *Psoriatic arthritis in patients with psoriasis: Evaluation of clinical and epidemiological features in 133 patients followed at the University Hospital of Brasilia.* Anais Brasileiros de Dermatologia, 2012. **87**(4): p. 539-544.
138. Cemil, B.C., et al., *The association of PASI scores with CRH-R1 expression in patients with psoriasis.* Archives of Dermatological Research, 2012: p. 1-6.
139. De Marco, G., et al., *Not simply a matter of psoriatic arthritis: Epidemiology of rheumatic diseases in psoriatic patients.* Archives of Dermatological Research, 2012. **304**(9): p. 719-726.
140. Ghatnekar, O., et al., *Costs and quality of life for psoriatic patients at different degrees of severity in southern Sweden - a cross-sectional study.* European Journal of Dermatology, 2012. **22**(2): p. 238-245.
141. Gisondi, P., L. Idolazzi, and G. Girolomoni, *Ultrasonography reveals nail thickening in patients with chronic plaque psoriasis.* Archives of Dermatological Research, 2012. **304**(9): p. 727-732.
142. Gisondi, P., et al., *Vitamin D status in patients with chronic plaque psoriasis.* British Journal of Dermatology., 2012.
143. Gordon, K., et al., *Long-term efficacy and safety of adalimumab in patients with moderate to severe psoriasis treated continuously over 3 years: Results from an open-label extension study for patients from REVEAL.* Journal of the American Academy of Dermatology, 2012. **66**(2): p. 241-251.
144. Grozdev, I., et al., *Physical and Mental Impact of Psoriasis Severity as Measured by the Compact Short Form-12 Health Survey (SF-12) Quality of Life Tool.* Journal of Investigative Dermatology., 2011. **29**.
145. Khraishi, M., et al., *High prevalence of psoriatic arthritis in a cohort of patients with psoriasis seen in a dermatology practice.* Journal of Cutaneous Medicine and Surgery, 2012. **16**(2): p. 122-127.
146. Li, R., et al., *Epidemiology of eight common rheumatic diseases in China: A large-scale cross-sectional survey in Beijing.* Rheumatology, 2012. **51**(4): p. 721-729.
147. Madanagobalane, S. and S. Anandan, *The increased prevalence of non-alcoholic fatty liver disease in psoriatic patients: A study from South India.* Australasian Journal of Dermatology, 2012. **53**(3): p. 190-197.
148. Maradit-Kremers, H., et al., *Disease severity and therapy as predictors of cardiovascular risk in psoriasis: A population-based cohort study.* Journal of the European Academy of Dermatology and Venereology, 2012. **26**(3): p. 336-343.

149. Orgaz-Molina, J., et al., *Deficiency of serum concentration of 25-Hydroxyvitamin D in psoriatic patients: A case-Control study.* Journal of the American Academy of Dermatology, 2012. **67**(5): p. 931-938.
150. Stinco, G., et al., *Detection of DNA of Chlamydophila psittaci in subjects with psoriasis: a casual or a causal link?* British Journal of Dermatology, 2012. **167**(4): p. 926-928.
151. Szponar-Bojda, A., et al., *Metabolic syndrome in psoriasis.* Postepy Dermatologii I Alergologii, 2012. **29**(5): p. 356-362.
152. Van Lumig, P.P.M., et al., *Safety of treatment with biologics for psoriasis in daily practice: 5-year data.* Journal of the European Academy of Dermatology and Venereology, 2012. **26**(3): p. 283-291.
153. Wee, J.S., et al., *Infliximab for the treatment of psoriasis in the U.K.: 9 years' experience of infusion reactions at a single centre.* British Journal of Dermatology, 2012. **167**(2): p. 411-416.
154. Wu, J.J., et al., *The association of psoriasis with autoimmune diseases.* Journal of the American Academy of Dermatology, 2012. **67**(5): p. 924-930.
155. Atwa, M.A., et al., *Serum 25-hydroxyvitamin D concentration in patients with psoriasis and rheumatoid arthritis and its association with disease activity and serum tumor necrosis factor-alpha.* Saudi Medical Journal, 2013. **34**(8): p. 806-813.
156. Coates, L.C., et al., *Comparison of three screening tools to detect psoriatic arthritis in patients with psoriasis (CONTEST study).* British Journal of Dermatology, 2013. **168**(4): p. 802-807.
157. Damevska, K., et al., *Metabolic syndrome in untreated patients with psoriasis: Case-control study.* JDDG - Journal of the German Society of Dermatology, 2013. **11**(12): p. 1169-1175.
158. Di Cesare, A., et al., *Frequency of melanocytic nevi in psoriatic patients is related to treatment and not to disease severity.* Journal of the American Academy of Dermatology, 2013. **69**(6): p. 947-953.
159. Haroon, M., B. Kirby, and O. Fitzgerald, *HIGH PREVALENCE OF ARTICULAR INVOLVEMENT IN PATIENTS WITH SEVERE PSORIASIS WITH POOR PERFORMANCE OF SCREENING QUESTIONNAIRES.* Annals of the Rheumatic Diseases, 2013. **71**: p. 569-569.
160. Kilic, B., et al., *Ocular findings in patients with psoriasis.* International Journal of Dermatology, 2013. **52**(5): p. 554-559.
161. Kimball, A.B., et al., *OBSERVE-5 interim analysis: An observational postmarketing safety registry of etanercept for the treatment of psoriasis.* Journal of the American Academy of Dermatology, 2013. **68**(5): p. 756-764.
162. Klaassen, K.M.G., P.C.M. Van De Kerkhof, and M.C. Pasch, *Nail psoriasis: A questionnaire-based survey.* British Journal of Dermatology, 2013. **169**(2): p. 314-319.
163. Lora, V., et al., *Autoantibody induction and adipokine levels in patients with psoriasis treated with infliximab.* Immunologic Research, 2013. **56**(2-3): p. 382-389.
164. Moro, F., et al., *Psoriatic patients have an increased risk of polycystic ovary syndrome: Results of a cross-sectional analysis.* Fertility and Sterility, 2013. **99**(3): p. 936-942.
165. Papp, K.A., et al., *Efficacy and safety of apremilast in subjects with moderate to severe plaque psoriasis: results from a phase II, multicenter, randomized, double-blind, placebo-controlled, parallel-group, dose-comparison study.* J Eur Acad Dermatol Venereol, 2013. **27**(3): p. e376-83.
166. Strohal, R., et al., *The efficacy and safety of etanercept when used with as-needed adjunctive topical therapy in a randomised, double-blind study in subjects with moderate-to-severe psoriasis (the PRISTINE trial).* J Dermatolog Treat, 2013. **24**(3): p. 169-78.

167. Van Der Velden, H.M.J., et al., *Fingernail psoriasis reconsidered: A case-control study.* Journal of the American Academy of Dermatology, 2013. **69**(2): p. 245-252.
168. Van Lumig, P.P.M., et al., *Adalimumab therapy for psoriasis in real-world practice: Efficacy, safety and results in biologic-naive vs. non-naive patients.* Journal of the European Academy of Dermatology and Venereology, 2013. **27**(5): p. 593-600.
169. Walsh, J.A., et al., *Limitations in screening instruments for psoriatic arthritis: A comparison of instruments in patients with psoriasis.* Journal of Rheumatology, 2013. **40**(3): p. 287-293.
170. Albareda, M., et al., *Metabolic syndrome and its components in patients with psoriasis.* Springerplus, 2014. **3**.
171. Augustin, M., et al., *German psoriasis registry PsoBest: Objectives, methodology and baseline data.* JDDG - Journal of the German Society of Dermatology, 2014. **12**(1): p. 48-57.
172. Baeta, I.G.R., et al., *Comorbidities and cardiovascular risk factors in patients with psoriasis.* Anais Brasileiros de Dermatologia, 2014. **89**(5): p. 735-744.
173. Bardazzi, F., et al., *Autoantibodies in psoriatic patients treated with anti-TNF-alpha therapy.* JDDG - Journal of the German Society of Dermatology, 2014. **12**(5): p. 401-406.
174. D'Epiro, S., et al., *Psoriasis and bone mineral density: Implications for long-term patients.* Journal of Dermatology, 2014. **41**(9): p. 783-787.
175. Eiris, N., et al., *Genetic variation at IL12B, IL23R and IL23A is associated with psoriasis severity, psoriatic arthritis and type 2 diabetes mellitus.* Journal of Dermatological Science, 2014. **75**(3): p. 167-172.
176. Fernandez-Torres, R.M., S. Pita-Fernandez, and E. Fonseca, *Quality of life and related factors in a cohort of plaque-type psoriasis patients in La Coruna, Spain.* International Journal of Dermatology, 2014. **53**(11): p. e507-e511.
177. Ficco, H.M., G. Citera, and J.A.M. Cocco, *Prevalence of psoriatic arthritis in psoriasis patients according to newer classification criteria.* Clinical Rheumatology, 2014. **33**(10): p. 1489-1493.
178. Gisondi, P., et al., *Hyperuricemia in patients with chronic plaque psoriasis.* Journal of the American Academy of Dermatology, 2014. **70**(1): p. 127-130.
179. Giunta, A., et al., *Clinical Markers Predictive of Primary Inefficacy: A "real Life" Retrospective Study in Psoriatic Patients Treated with Etanercept.* Drug Development Research, 2014. **75**(Supplement1): p. S27-S30.
180. Henes, J.C., et al., *High prevalence of psoriatic arthritis in dermatological patients with psoriasis: A cross-sectional study.* Rheumatology International, 2014. **34**(2): p. 227-234.
181. Husni, M.E., et al., *Utility of the PASE questionnaire, psoriatic arthritis (PsA) prevalence and PsA improvement with anti-TNF therapy: results from the PRISTINE trial.* J Dermatolog Treat, 2014. **25**(1): p. 90-5.
182. Kimball, A.B., et al., *Incidence rates of malignancies and hospitalized infectious events in patients with psoriasis with or without treatment and a general population in the U.S.A.: 2005-09.* British Journal of Dermatology, 2014. **170**(2): p. 366-373.
183. Kimball, A.B., et al., *Demography, baseline disease characteristics and treatment history of patients with psoriasis enrolled in a multicentre, prospective, disease-based registry (PSOLAR).* British Journal of Dermatology, 2014. **171**(1): p. 137-147.
184. Kokpol, C., W. Aekplakorn, and N. Rajatanavin, *Prevalence and characteristics of metabolic syndrome in South-East Asian psoriatic patients: A case-control study.* Journal of Dermatology, 2014. **41**(10): p. 898-902.

185. Krupashankar, D.S., et al., *Efficacy and safety of itolizumab, a novel anti-CD6 monoclonal antibody, in patients with moderate to severe chronic plaque psoriasis: results of a double-blind, randomized, placebo-controlled, phase-III study.* J Am Acad Dermatol, 2014. **71**(3): p. 484-92.
186. Kumar, R., A. Sharma, and S. Dogra, *Prevalence and clinical patterns of psoriatic arthritis in Indian patients with psoriasis.* Indian Journal of Dermatology, Venereology and Leprology, 2014. **80**(1): p. 15-23.
187. Langley, R.G., et al., *Secukinumab in plaque psoriasis--results of two phase 3 trials.* N Engl J Med, 2014. **371**(4): p. 326-38.
188. Lofvendahl, S., et al., *Validity of diagnostic codes and prevalence of physician-diagnosed psoriasis and psoriatic arthritis in southern Sweden - A population-based register study.* PLoS ONE, 2014. **9 (5) (no pagination)**(e98024).
189. Mease, P.J., et al., *Comparative performance of psoriatic arthritis screening tools in patients with psoriasis in European/North American dermatology clinics.* J Am Acad Dermatol, 2014. **71**(4): p. 649-55.
190. Menegon, D.B., et al., *Psoriasis and comorbidities in a southern Brazilian population: A case-control study.* International Journal of Dermatology, 2014. **53**(11): p. e518-e525.
191. Morisco, F., et al., *Lack of evidence of viral reactivation in HBsAg-negative HBcAb-positive and HCV patients undergoing immunosuppressive therapy for psoriasis.* BMC Gastroenterology, 2014. **14 (1) (no pagination)**(214).
192. Sanchez-Carazo, J.L., J.L. Lopez-Estebaranz, and C. Guisado, *Comorbidities and health-related quality of life in Spanish patients with moderate to severe psoriasis: A cross-sectional study (Arizona study).* Journal of Dermatology, 2014. **41**(8): p. 673-678.
193. Wu, S., et al., *Hypercholesterolemia and risk of incident psoriasis and psoriatic arthritis in US women.* Arthritis and Rheumatology, 2014. **66**(2): p. 304-310.
194. Belinchon, I., et al., *Metabolic syndrome in Spanish patients with psoriasis needing systemic therapy: Prevalence and association with cardiovascular disease in PSO-RISK, a cross-sectional study.* Journal of Dermatological Treatment, 2015. **26**(4): p. 318-325.
195. Bissonnette, R., et al., *Tofacitinib withdrawal and retreatment in moderate-to-severe chronic plaque psoriasis: a randomized controlled trial.* Br J Dermatol, 2015. **172**(5): p. 1395-406.
196. Bourcier, M., et al., *Long-term management of moderate to severe plaque psoriasis patients with etanercept: A case series.* Journal of Cutaneous Medicine and Surgery, 2015. **19**(6): p. 561-569.
197. Campanati, A., et al., *Helicobacter pylori infection in psoriasis: Results of a clinical study and review of the literature.* International Journal of Dermatology, 2015. **54**(5): p. e109-e114.
198. Cinar, N., et al., *The prevalence and characteristics of psoriatic arthritis in patients with psoriasis in a Tertiary hospital.* Archives of Rheumatology, 2015. **30**(1): p. 23-27.
199. Crincoli, V., et al., *Temporomandibular disorders in psoriasis patients with and without psoriatic arthritis: An observational study.* International Journal of Medical Sciences, 2015. **12**(4): p. 341-348.
200. Estebaranz, J.L.L., et al., *Prevalence and clinical features of psoriatic arthritis in psoriasis patients in spain. Limitations of PASE as a screening tool.* European Journal of Dermatology, 2015. **25**(1): p. 57-63.
201. Feldman, S.R., et al., *Economic and comorbidity burden among moderate-to-severe psoriasis patients with comorbid psoriatic arthritis.* Arthritis Care and Research, 2015. **67**(5): p. 708-717.

202. Gilet, H., et al., *Development and psychometric validation of the REFlective evaLuation of psoriasis Efficacy of Treatment and Severity (REFLETS) questionnaire: A common measure of plaque-type psoriasis severity and treatment efficacy for patients and clinicians.* Journal of the European Academy of Dermatology and Venereology, 2015. **29**(3): p. 498-506.
203. Gniadecki, R., et al., *Comparison of long-term drug survival and safety of biologic agents in patients with psoriasis vulgaris.* British Journal of Dermatology, 2015. **172**(1): p. 244-252.
204. Iskandar, I.Y.K., et al., *Demographics and disease characteristics of patients with psoriasis enrolled in the British Association of Dermatologists Biologic Interventions Register.* British Journal of Dermatology, 2015. **173**(2): p. 510-518.
205. Llamas-Velasco, M., et al., *Liver Injury in Psoriasis Patients Receiving Ustekinumab: A Retrospective Study of 44 Patients Treated in the Clinical Practice Setting.* Actas Dermo-Sifiliograficas, 2015. **106**(6): p. 470-476.
206. Ng, C.Y., et al., *SF-36 healty survey on psoriasis quality-of-life: A study of 414 Taiwanese patients.* Journal of Dermatology, 2015. **42**(2): p. 159-165.
207. Papp, K.A., et al., *Tofacitinib, an oral Janus kinase inhibitor, for the treatment of chronic plaque psoriasis: results from two randomized, placebo-controlled, phase III trials.* Br J Dermatol, 2015. **173**(4): p. 949-61.
208. Ranza, R., et al., *Prevalence of psoriatic arthritis in a large cohort of brazilian patients with psoriasis.* Journal of Rheumatology, 2015. **42**(5): p. 829-834.
209. Schons, K.R.R., et al., *Nail involvement in adult patients with plaque-type psoriasis: Prevalence and clinical features.* Anais Brasileiros de Dermatologia, 2015. **90**(3): p. 314-319.
210. Spelman, L., et al., *Frequency of undiagnosed psoriatic arthritis among psoriasis patients in Australian dermatology practice.* Journal of the European Academy of Dermatology and Venereology, 2015. **29**(11): p. 2184-2191.
211. Tabolli, S., et al., *Factors associated with the prescription of "traditional" or "biological" systemic treatment in psoriasis.* Journal of Dermatological Treatment, 2015. **26**(1): p. 37-40.
212. Takeshita, J., et al., *Psoriasis in the US medicare population: Prevalence, treatment, and factors associated with biologic use.* Journal of Investigative Dermatology, 2015. **135**(12): p. 2955-2963.
213. Thaci, D., et al., *Secukinumab is superior to ustekinumab in clearing skin of subjects with moderate to severe plaque psoriasis: CLEAR, a randomized controlled trial.* Journal of the American Academy of Dermatology, 2015. **73**(3): p. 400-409.
214. Truong, B., et al., *Demographics, clinical disease characteristics, and quality of life in a large cohort of psoriasis patients with and without psoriatic arthritis.* Clinical, Cosmetic and Investigational Dermatology, 2015. **8**: p. 563-569.
215. Vanaclocha, F., et al., *Immune-Mediated Inflammatory Diseases and other Comorbidities in Patients With Psoriasis: Baseline Characteristics of Patients in the AQUILES Study.* Actas Dermo-Sifiliograficas, 2015. **106**(1): p. 35-43.
216. Vijay, G.A., *PREVALENCE OF PULMONARY FUNCTION DEFECTS IN PSORIASIS PATIENTS RECEIVING METHOTREXATE IN A TERTIARY CARE HOSPITAL IN TAMILNADU, INDIA.* Journal of Evolution of Medical and Dental Sciences-Jemds, 2015. **4**(83): p. 14553-14563.
217. You, H.S., et al., *Screening for Psoriatic Arthritis in Korean Psoriasis Patients Using the Psoriatic Arthritis Screening Evaluation Questionnaire.* Annals of Dermatology, 2015. **27**(3): p. 265-268.

218. Abji, F., et al., *Brief Report: CXCL10 Is a Possible Biomarker for the Development of Psoriatic Arthritis Among Patients With Psoriasis.* Arthritis and Rheumatology, 2016. **68**(12): p. 2911-2916.
219. Cardili, R.N., et al., *HLA-C and TNF gene polymorphisms are associated with psoriasis in Brazilian patients.* International Journal of Dermatology, 2016. **55**(1): p. e16-e22.
220. Carpentieri, A., et al., *Retrospective analysis of the effectiveness and costs of traditional treatments for moderate-to-severe psoriasis: A single-center, Italian study.* Journal of Dermatological Treatment, 2016. **27**(5): p. 399-405.
221. Syed Nong Chek, S.R., et al., *Clinical characteristics of patients with facial psoriasis in Malaysia.* International Journal of Dermatology, 2016. **55**(10): p. 1092-1095.
222. Chularojanamontri, L., et al., *Metabolic syndrome and psoriasis severity in South-East Asian patients: An investigation of potential association using current and chronological assessments.* Journal of Dermatology, 2016. **43**(12): p. 1424-1428.
223. Coates, L.C., et al., *Comparison of screening questionnaires to identify psoriatic arthritis in a primary-care population: a cross-sectional study.* British Journal of Dermatology, 2016. **175**(3): p. 542-548.
224. Elberdin, L., et al., *Positive correlation between etanercept concentration and the decrease in Psoriasis Area and Severity Index scale value.* International Journal of Clinical Pharmacy, 2016. **38**(5): p. 1142-1148.
225. Esposito, M., et al., *From patients' needs to treatment outcomes in psoriasis: Results from the 'pSORRIDI' experience.* Journal of International Medical Research, 2016. **44**(1_suppl): p. 95-99.
226. Finet, A., et al., *Liver test abnormalities in patients admitted for severe psoriasis: prevalence and associated risk factors.* Journal of the European Academy of Dermatology and Venereology, 2016. **30**(10): p. 1742-1748.
227. Fuxench, Z.C.C., et al., *The Risk of Cancer in Patients With Psoriasis A Population-Based Cohort Study in the Health Improvement Network.* Jama Dermatology, 2016. **152**(3): p. 282-290.
228. Garbers, L.E.F.M., et al., *Incidence, clinical manifestations and clipping of nail psoriasis in the dermatology center of the Hospital Universitario Evangelico de Curitiba.* Anais Brasileiros de Dermatologia, 2016. **91**(3): p. 300-305.
229. Gisondi, P., E. Barba, and G. Girolomoni, *Non-alcoholic fatty liver disease fibrosis score in patients with psoriasis.* Journal of the European Academy of Dermatology and Venereology, 2016. **30**(2): p. 282-287.
230. Gisondi, P. and G. Girolomoni, *Glomerular filtration rate in patients with psoriasis treated with etanercept.* Journal of International Medical Research, 2016. **44**: p. 106-108.
231. Harle, P., et al., *Sensitivity of the GEPARD Patient Questionnaire to Identify Psoriatic Arthritis in Patients with Psoriasis in Daily Practice: The GEPARD-Life Study.* Dermatology, 2016. **232**(5): p. 597-605.
232. Hsu, D.Y., K. Gordon, and J.I. Silverberg, *The inpatient burden of psoriasis in the United States.* Journal of the American Academy of Dermatology, 2016. **75**(1): p. 33-41.
233. Indhumathi, S., et al., *The HLA-C*06 allele as a possible genetic predisposing factor to psoriasis in South Indian Tamils.* Archives of Dermatological Research, 2016. **308**(3): p. 193-199.
234. Jungo, P., et al., *Superiority in Quality of Life Improvement of Biologics over Conventional Systemic Drugs in a Swiss Real-Life Psoriasis Registry.* Dermatology, 2016. **232**(6): p. 655-663.

235. Karreman, M.C., et al., *Prevalence of Psoriatic Arthritis in Primary Care Patients with Psoriasis.* Arthritis and Rheumatology, 2016. **68**(4): p. 924-931.
236. Klufas, D.M., J.M. Wald, and B.E. Strober, *Treatment of moderate to severe pediatric psoriasis: A retrospective case series.* Pediatric Dermatology, 2016. **33**(2): p. 142-149.
237. Langenbruch, A., et al., *Quality of psoriasis care in Germany: results of the national health care study "PsoHealth3".* Archives of Dermatological Research, 2016. **308**(6): p. 401-408.
238. Luca, M., et al., *Psychopathological variables and sleep quality in psoriatic patients.* International Journal of Molecular Sciences, 2016. **17 (7) (no pagination)**(1184).
239. Papadavid, E., et al., *Prevalence of psoriatic arthritis and its correlates amongpatients with psoriasis in Greece: results from a largeretrospective study.* JEADV, 2016. **30**(10): p. 1749-52.
240. Pongpit, J., et al., *Liver Stiffness Measurement in Psoriasis: Do Metabolic or Disease Factors Play the Important Role?* BioMed Research International, 2016. **2016 (no pagination)**(7963972).
241. Resorlu, H., et al., *Psoriatic arthritis in psoriasis patients: Evaluation of clinical and radiological features.* Turk Osteoporoz Dergisi, 2016. **22**(2): p. 88-91.
242. Rutter, M.K., et al., *Primary care-based screening for cardiovascular risk factors in patients with psoriasis.* British Journal of Dermatology, 2016. **175**(2): p. 348-356.
243. Santilli, S., et al., *Visualization of atherosclerosis as detected by coronary artery calcium and carotid intima-media thickness reveals significant atherosclerosis in a cross-sectional study of psoriasis patients in a tertiary care center.* Journal of Translational Medicine, 2016. **14 (1) (no pagination)**(217).
244. Sherin, R. and P. Udaykumar, *Assessment of possible drug interactions in patients with psoriasis and associated comorbid medical conditions: An observational study.* Reviews on Recent Clinical Trials, 2016. **11**(2): p. 128-134.
245. Shin, D., et al., *Clinical features of psoriatic arthritis in Korean patients with psoriasis: a cross-sectional observational study of 196 patients with psoriasis using psoriatic arthritis screening questionnaires.* Rheumatology International, 2016. **36**(2): p. 207-212.
246. Siddiqui, S., Z. Wahid, and H. Talat, *Frequency and clinical patterns of psoriatic arthritis in patients of psoriasis.* Journal of Pakistan Association of Dermatologists, 2016. **26**(4): p. 328-331.
247. Sudhesan, A., et al., *Association of C-reactive protein (rs1205) gene polymorphism with susceptibility to psoriasis in South Indian Tamils.* Journal of Clinical and Diagnostic Research, 2016. **10**(10).
248. Temel, A.B., et al., *Prevalence of restless legs syndrome among psoriasis patients and association with depression and sleep quality.* Turk Dermatoloji Dergisi, 2016. **10**(3): p. 110-115.
249. Urbancek, S., et al., *Screening of Patients with Psoriasis for Psoriatic Arthritis in the Slovak Republic.* Acta Medica Martiniana, 2016. **16**(3): p. 32-42.
250. Vilarrasa, E., et al., *ORBIT (Outcome and Retention Rate of Biologic Treatments for Psoriasis): A retrospective observational study on biologic drug survival in daily practice.* Journal of the American Academy of Dermatology, 2016. **74**(6): p. 1066-1072.
251. Wade, A.G., et al., *Severity and management of psoriasis within primary care.* BMC family practice, 2016. **17**(1): p. 145.
252. Asgari, M.M., et al., *Malignancy rates in a large cohort of patients with systemically treated psoriasis in a managed care population.* Journal of the American Academy of Dermatology, 2017. **76**(4): p. 632-638.

253. Augustin, M., et al., *Incremental burden of cardiovascular comorbidity and psoriatic arthritis among adults with moderate-to-severe psoriasis in five European countries.* Journal of the European Academy of Dermatology and Venereology, 2017. **31**(8): p. 1316-1323.
254. Belinchon, I., et al., *Adverse events associated with discontinuation of the biologics/classic systemic treatments for moderate-to-severe plaque psoriasis: data from the Spanish Biologics Registry, Biobadaderm.* Journal of the European Academy of Dermatology and Venereology, 2017. **31**(10): p. 1700-1708.
255. Chi, C.C., et al., *Risk of uveitis among people with psoriasis: A nationwide cohort study.* JAMA Ophthalmology, 2017. **135**(5): p. 415-422.
256. Crowley, J., et al., *Long-term safety and tolerability of apremilast in patients with psoriasis: Pooled safety analysis for >/=156 weeks from 2 phase 3, randomized, controlled trials (ESTEEM 1 and 2).* J Am Acad Dermatol, 2017. **77**(2): p. 310-317.e1.
257. Daulatabad, D., et al., *Clinical and serological characteristics of nail psoriasis in Indian patients: A cross-sectional study.* Indian Journal of Dermatology, Venereology and Leprology, 2017. **83**(6): p. 650-655.
258. Dogan, S., et al., *Evaluation of psoriasis patients with a rheumatologic questionnaire efficiently aids in early detection of psoriatic arthritis.* Turkderm-Archives of the Turkish Dermatology and Venerology, 2017. **51**(3): p. 88-91.
259. Eder, L., et al., *The Development of Psoriatic Arthritis in Patients With Psoriasis Is Preceded by a Period of Nonspecific Musculoskeletal Symptoms: A Prospective Cohort Study.* Arthritis and Rheumatology, 2017. **69**(3): p. 622-629.
260. Egeberg, A., et al., *The relationship between duration of psoriasis, vascular inflammation, and cardiovascular events.* Journal of the American Academy of Dermatology, 2017. **77**(4): p. 650-656.e3.
261. Eppinga, H., et al., *Prevalence and Phenotype of Concurrent Psoriasis and Inflammatory Bowel Disease.* Inflammatory Bowel Diseases, 2017. **23**(10): p. 1783-1789.
262. Feldman, S.R., et al., *Economic burden of comorbidities in psoriasis patients in the United States: results from a retrospective U.S. database.* BMC health services research, 2017. **17**(1): p. 337.
263. Girisha, B.S. and N. Thomas, *Metabolic syndrome in psoriasis among urban south indians: A case control study using SAM-NCEP criteria.* Journal of Clinical and Diagnostic Research, 2017. **11**(2): p. WC01-WC04.
264. Griffiths, C.E.M., et al., *The EGALITY study: a confirmatory, randomized, double-blind study comparing the efficacy, safety and immunogenicity of GP2015, a proposed etanercept biosimilar, vs. the originator product in patients with moderate-to-severe chronic plaque-type psoriasis.* British Journal of Dermatology, 2017. **176**(4): p. 928-938.
265. Hagg, D., et al., *Severity of Psoriasis Differs Between Men and Women: A Study of the Clinical Outcome Measure Psoriasis Area and Severity Index (PASI) in 5438 Swedish Register Patients.* American Journal of Clinical Dermatology, 2017. **18**(4): p. 583-590.
266. Herakal, K.C., et al., *A CLINICAL STUDY OF PSORIASIS AND ITS ASSOCIATION WITH SERUM LIPID PROFILE.* Journal of Evolution of Medical and Dental Sciences-Jemds, 2017. **6**(23): p. 1898-1902.
267. Hsiao, C.Y., et al., *Serial QuantiFERON-TB Gold testing in patients with psoriasis treated with ustekinumab.* Plos One, 2017. **12**(9).
268. Kisiel, B., et al., *The association between 38 previously reported polymorphisms and psoriasis in a Polish population: High predicative accuracy of a genetic risk score combining 16 loci.* PLoS ONE, 2017. **12 (6) (no pagination)**(e0179348).

269. Kojanova, M., et al., *Characteristics and risk profile of psoriasis patients included in the Czech national registry BIOREP and a comparison with other registries.* International Journal of Dermatology, 2017. **56**(4): p. 428-434.
270. Lamb, R.C., et al., *Screening for anxiety and depression in people with psoriasis: a cross-sectional study in a tertiary referral setting.* British Journal of Dermatology, 2017. **176**(4): p. 1028-1034.
271. Mishra, S., et al., *Comparison of four validated psoriatic arthritis screening tools in diagnosing psoriatic arthritis in patients with psoriasis (COMPAQ Study).* British Journal of Dermatology, 2017. **176**(3): p. 765-770.
272. Mysliwiec, H., et al., *Increase in circulating sphingosine-1-phosphate and decrease in ceramide levels in psoriatic patients.* Archives of Dermatological Research, 2017. **309**(2): p. 79-86.
273. Saeki, H., et al., *Efficacy and safety of ixekizumab treatment for Japanese patients with moderate to severe plaque psoriasis, erythrodermic psoriasis and generalized pustular psoriasis: Results from a 52-week, open-label, phase 3 study (UNCOVER-J).* Journal of Dermatology, 2017. **44**(4): p. 355-362.
274. Shalom, G., et al., *Biologic drug survival in Israeli psoriasis patients.* Journal of the American Academy of Dermatology, 2017. **76**(4): p. 662-+.
275. Tsuruta, N., S. Imafuku, and Y. Narisawa, *Hyperuricemia is an independent risk factor for psoriatic arthritis in psoriatic patients.* Journal of Dermatology, 2017. **44**(12): p. 1349-1352.
276. Vassilatou, E., et al., *No association of psoriasis with autoimmune thyroiditis.* Journal of the European Academy of Dermatology and Venereology, 2017. **31**(1): p. 102-106.
277. West, J., et al., *HLA-Cw6-positive patients with psoriasis show improved response to methotrexate treatment.* Clinical and Experimental Dermatology, 2017. **42**(6): p. 651-655.
278. Winthrop, K.L., et al., *Herpes zoster in psoriasis patients treated with tofacitinib.* J Am Acad Dermatol, 2017. **77**(2): p. 302-309.
279. Zweegers, J., et al., *Frequency and predictors of a high clinical response in patients with psoriasis on biological therapy in daily practice: results from the prospective, multicenter BioCAPTURE cohort.* British Journal of Dermatology, 2017. **176**(3): p. 786-793.
280. Chandran, V. and S.P. Raychaudhuri, *Geoepidemiology and environmental factors of psoriasis and psoriatic arthritis.* Journal of Autoimmunity, 2010. **34**(3): p. J314-J321.
281. Chen, Y.J., et al., *Increased Risk of Sexual Dysfunction in Male Patients with Psoriasis: A Nationwide Population-Based Follow-Up Study.* Journal of Sexual Medicine, 2013. **10**(5): p. 1212-1218.
282. Poulalhon, N., et al., *A follow-up study in 28 patients treated with infliximab for severe recalcitrant psoriasis: evidence for efficacy and high incidence of biological autoimmunity.* Br J Dermatol, 2007. **156**(2): p. 329-36.
283. Wee, J.S., et al., *Infliximab for the treatment of psoriasis in the U.K.: 9 years' experience of infusion reactions at a single centre.* British Journal of Dermatology, 2012. **167**(2): p. 411-416.
284. Esposito, M., et al., *From patients' needs to treatment outcomes in psoriasis: Results from the 'pSORRIDI' experience.* Journal of International Medical Research, 2016. **44**: p. 95-99.
285. Armstrong, A.W., C. Schupp, and B. Bebo, *Psoriasis comorbidities: results from the National Psoriasis Foundation surveys 2003 to 2011.* Dermatology, 2012. **225**(2): p. 121-6.
286. Kimball, A.B., et al., *Demography, baseline disease characteristics and treatment history of patients with psoriasis enrolled in a multicentre, prospective, disease-based registry (PSOLAR).* Br J Dermatol, 2014. **171**(1): p. 137-47.

287. Reich, K., et al., *A 52-week trial comparing briakinumab with methotrexate in patients with psoriasis.* N Engl J Med, 2011. **365**(17): p. 1586-96.
288. Thaci, D., et al., *Secukinumab is superior to ustekinumab in clearing skin of subjects with moderate to severe plaque psoriasis: CLEAR, a randomized controlled trial.* J Am Acad Dermatol, 2015. **73**(3): p. 400-9.
289. Saurat, J.H., et al., *Relationship between methotrexate dosing and clinical response in patients with moderate to severe psoriasis: subanalysis of the CHAMPION study.* British Journal of Dermatology, 2011. **165**(2): p. 399-406.
290. Li, W., J. Han, and A.A. Qureshi, *Obesity and risk of incident psoriatic arthritis in US women.* Annals of the Rheumatic Diseases, 2012. **71**(8): p. 1267-1272.
291. Love, T.J., et al., *Obesity and the risk of psoriatic arthritis: A population-based study.* Annals of the Rheumatic Diseases, 2012. **71**(8): p. 1273-1277.
292. Eder, L., et al., *Incidence of arthritis in a prospective cohort of psoriasis patients.* Arthritis care & research, 2011. **63**(4): p. 619-622.
293. Eder, L., et al., *The Incidence and Risk Factors for Psoriatic Arthritis in Patients with Psoriasis: A Prospective Cohort Study.* Arthritis and Rheumatology, 2016. **68**(4): p. 915-923.
294. Tam, L.S., Y.Y. Leung, and E.K. Li, *Psoriatic arthritis in Asia.* Rheumatology, 2009. **48**(12): p. 1473-1477.
295. Toloza, S.M., R. Valle-Onate, and L.R. Espinoza, *Psoriatic arthritis in South and Central America.* Curr Rheumatol Rep, 2011. **13**(4): p. 360-8.
296. Duffin, K.C., et al., *Genetics of psoriasis and psoriatic arthritis: Update and future direction.* Journal of Rheumatology, 2008. **35**(7): p. 1449-1453.
297. Chen, L. and T.F. Tsai, *HLA-Cw6 and psoriasis.* Br J Dermatol, 2017.
298. Barton, A.C., *Genetic epidemiology psoriatic arthritis.* Arthritis Research, 2002. **4**(4): p. 247-251.
299. Stoll, M.L. and M. Punaro, *Psoriatic juvenile idiopathic arthritis: A tale of two subgroups.* Current Opinion in Rheumatology, 2011. **23**(5): p. 437-443.
300. Osier, E., et al., *Pediatric psoriasis comorbidity screening guidelines.* JAMA Dermatology, 2017. **153**(7): p. 698-704.
301. Villani, A.P., et al., *Prevalence of undiagnosed psoriatic arthritis among psoriasis patients: Systematic review and meta-analysis.* Journal of the American Academy of Dermatology, 2015. **73**(2): p. 242-248.
302. Prey, S., et al., *Assessment of risk of psoriatic arthritis in patients with plaque psoriasis: A systematic review of the literature.* Journal of the European Academy of Dermatology and Venereology, 2010. **24**(SUPPL. 2): p. 31-35.
303. Ogdie, A. and P. Weiss, *The Epidemiology of Psoriatic Arthritis.* Rheumatic Disease Clinics of North America, 2015. **41**(4): p. 545-568.