Association Between Comorbidities and Quality of Life in Psoriatic Arthritis: Results from a Multicentric Cross-sectional Study

Wallis Bavière, Xavier Deprez, Eric Houvenagel, Peggy Philippe, Valerie Deken, Rene-Marc Flipo, and Julien Paccou

ABSTRACT. ***Objective.*** In psoriatic arthritis (PsA), comorbidities add to the burden of disease, which may lead to poorer quality of life. The purpose of this study was to evaluate the relationship between comorbidities and quality of life (QOL).

Methods. Patients from a multicentric, cross-sectional study on comorbidities in PsA were included in the analysis. Data on comorbidities were collected and were subsequently used to compute the modified Rheumatic Disease Comorbidity Index (mRDCI). The Medical Outcomes Study Short Form-36 questionnaire physical (PCS) and mental component summary (MCS) scales were used to assess QOL.

Results. In total, 124 recruited patients fulfilled the ClASsification for Psoriatic ARthritis criteria (CASPAR): 62.1% were male; mean age and mean disease duration were 52.6 ± 12.6 years and 11.3 ± 9.6 years, respectively. The number of comorbid conditions was 2.0 ± 1.3, with 30.6% of the sample having currently or a history of 3 or more comorbidities. In the multivariate linear regression analysis, only anxiety remained significantly related to mental health ($p < 0.0001$). Anxiety alone accounted for 28.7% of the variance in MCS scores. Moreover, MCS was also significantly associated with the mRDCI score, which explained 4.9% of the variance in MCS [$\beta = -1.56$ (standard error 0.64), $R^2 = 0.049$, $p = 0.0167$]. In contrast, PCS was not significantly associated either with type or number of comorbidities.

Conclusion. In this study, the type of comorbidity appeared to have a greater effect than the number of comorbidities. Indeed, anxiety in PsA was independently associated with QOL and would thus be an important factor to take into account in daily clinical practice. (J Rheumatol First Release November 1 2019; doi:10.3899/jrheum.181471)

Key Indexing Terms:
PSORIATIC ARTHRITIS COMORBIDITIES QUALITY OF LIFE

Psoriatic arthritis (PsA) is a member of the spondyloarthritis (SpA) family[1]. The protean cutaneous and rheumatic manifestations result in a variety of presentations. Since the development of classification criteria by Moll and Wright in 1973[2], five patterns of PsA have been described: polyarthritis, oligo-polyarthritis, distal interphalangeal arthropathy, predominantly axial disease, and arthritis mutilans[1,3]. Among the many classification schemes proposed for PsA, the most recent is the ClASsification for Psoriatic ARthritis criteria (CASPAR) system, which was developed in 2006 by a panel of international experts[4,5]. A multidisciplinary treatment strategy is mandatory and must address not only the rheumatic manifestations but also the skin disease[6,7,8,9].

The COMOrbidities in SPondyloArthritis (COMOSPA) study reveals a high prevalence of related comorbidities in SpA, and their assessment and management is a real concern[10,11]. PsA is also associated with multiple comorbid conditions including cardiovascular (CV) comorbidities[12,13,14] and other PsA-related comorbidities such as diabetes, anxiety, fatigue, smoking, alcohol use, obesity or overweight, depression, and osteoporosis[1,14,15,16,17,18,19]. Comorbidities and their effect on disease outcomes are generally well described for rheumatoid arthritis, but less so for PsA[15,20,21,22]. However, in a cohort of Danish patients with PsA (DANBIO), the presence of comorbidities was associated with higher baseline disease activity, shorter tumor necrosis factor inhibitor (TNFi) persistence, and reduced

From Service de rhumatologie, Centre Hospitalier Universitaire (CHU) Lille, Lille; Service de rhumatologie, CH de Valenciennes, Valenciennes; Service de rhumatologie, Hôpital Saint-Philibert, Lomme; Département de Biostatistiques, EA 2694 – Santé publique: épidémiologie et qualité des soins, Université de Lille, CHU Lille, Lille, France.

W. Bavière, MD, Service de rhumatologie, CHU Lille; X. Deprez, MD, Service de rhumatologie, CH de Valenciennes; E. Houvenagel, MD, Service de rhumatologie, Hôpital Saint-Philibert; P. Philippe, MD, Service de rhumatologie, CHU Lille; V. Deken, PhD, Département de Biostatistiques, EA 2694 - Santé publique: épidémiologie et qualité des soins, Université de Lille, CHU Lille; R.M. Flipo, MD, Service de rhumatologie, CHU Lille; J. Paccou, MD, PhD, Service de rhumatologie, CHU Lille.

Address correspondence to Dr. J. Paccou, Service de rhumatologie, Hôpital Roger Salengro, Rue Emile Laine, CHU, 9037 Lille Cedex, France. E-mail: julien.paccou@chru-lille.fr

Accepted for publication May 28, 2019.

clinical response rates[23]. Moreover, obesity was associated with a lower probability of achieving sustained minimal disease activity (MDA) among patients with PsA[24].

Further, comorbidities add to the burden of disease and may lead to poorer quality of life (QOL), which is also an outcome of great interest. A few studies have shown associations between individual comorbidities and QOL in patients with SpA[25] or particularly with PsA. In a study by Husted, *et al*[26], the authors found that fibromyalgia (FM), neurological disorders, and obesity were most strongly associated with decreased physical health [physical component summary (PCS) scale of the Medical Outcomes Study Short Form-36 questionnaire (SF-36)], whereas FM and depression/anxiety disorders were most strongly associated with decreased mental health [mental component summary (MCS) scale]. There is still a lack of data on the relationship between comorbidities and outcomes in PsA.

The purpose of our study was to assess the relationship between comorbidities and QOL in patients with PsA in a well-phenotyped cohort from the Les Hauts-de-France region of France. We hypothesized that the effect of comorbidity on QOL in PsA was more closely related to type of comorbidity than number of comorbidities.

MATERIALS AND METHODS

Study design and patient recruitment. This is a multicenter, cross-sectional observational study with 3 participating centers (Lille University Hospital, Lille Catholic Hospitals, and Valenciennes Hospital). Patients with PsA admitted in conventional hospital units, day hospitalization, or in outpatient clinics were invited to participate. Consecutive patients (aged ≥ 18 yrs) with a clinical diagnosis of peripheral PsA (polyarthritis and oligo-polyarthritis patterns) were included in this study, provided they were able to understand and complete the questionnaires. For this study, analyses were restricted to patients fulfilling the CASPAR criteria for PsA[4]. Exclusion criteria were lack of understanding of French, pregnancy or breastfeeding, severe cognitive disorders, guardianship, and lack of social welfare access.

The study protocol was approved by the local Institutional Review Board (reference 2018-A00449-46), and the study procedures complied with the ethical standards of the relevant institutional and national Human Experimentation Ethics Committees (reference CPP 3590-NI) and the Helsinki Declaration of 1975, as revised in 2000. All patients provided written informed consent.

Outcome measure. In this study, the outcome of interest was measured using the SF-36 questionnaire as a generic measure of QOL[27]. Specifically, the PCS and MCS were used. We used the revised version of the SF-36 version 1 questionnaire (amendment QMO46180, license agreement amended QMO44954). Both scales are linear combinations of the 8 SF-36 subscales, with the PCS heavily weighting the physical function, bodily pain, and role disabilities due to physical limitations subscales, and the MCS heavily weighting the mental health, social function, and role disabilities–emotional limitations subscales. Scores < 50 reflected below-average function. Very low PCS scores reflected severe bodily pain and substantial limitations in self-care, physical activities, and role performance. Very low MCS scores indicated frequent psychological distress and role disability due to emotional problems.

Comorbidities. Data on comorbidities were based on both self-report and physician report, as per the self-administered questionnaire developed by Pouplin, *et al*[28]. Each patient's electronic medical file was systematically checked by the investigator (WB) to complete and rectify the self-reported data. For each patient, the type and the number of comorbidities (range 0–9) were collected. Types of comorbidity included CV disease, malignancy, diabetes mellitus (DM), excess weight, pulmonary problems, depression, anxiety, FM, and osteoporosis.

CV disease included history of ischemic disease (myocardial infarction and stroke), angina, stent, carotid atheromatous plaques, and peripheral vascular disease. Malignancy included history of carcinoma of the colon, skin (i.e., melanoma and basocellular carcinoma), breast and cervix (for women), prostate (for men), lymphoma (sought systematically), and others if reported by the patients. DM included history of DM obtained through self-report and physician report. Data on current medications commonly used for patients with DM were collected. Excess weight included overweight [body mass index (BMI) of 25–29.9 kg/m^2] and obesity (BMI ≥ 30 kg/m^2). Pulmonary problems included history of chronic obstructive pulmonary disease (COPD) and asthma. Depression, anxiety, and FM included history of those diseases obtained through self-report and physician report. We also collected data on current medications commonly used for patients who have depression and anxiety. Osteoporosis included history of osteoporosis (defined as a T score < –2.5 at any site), nontraumatic vertebral/peripheral fractures, or antiosteoporotic agent (except vitamin D and calcium).

Information on self- and physician-reported past and current comorbidities was subsequently used to compute the modified Rheumatic Disease Comorbidity Index (mRDCI) to reflect comorbidity burden[29]. The mRDCI score ranges from 0 to 12 and covers lung diseases, CV disease (myocardial infarction, stroke, or other CV disease), hypertension (HTN), ulcer or other gastrointestinal disorders (liver, gall bladder, or other stomach problem), DM, fracture, depression, malignancy, kidney disease (estimated glomerular filtration rate < 60 ml/min/1.73m^2), and obesity (BMI ≥ 30 kg/m^2). Moreover, the Charlson Comorbidity Index (CCI) was computed for each patient. The CCI score ranges from 1 to 42 and covers 19 weighted comorbid conditions, with the conditions and their weightings based on mortality risk[30].

Other independent variables. Other variables of interest potentially influencing the relationship between comorbidities and QOL, aside from age and sex, were sociodemographic factors such as educational status (primary and secondary education vs university education), socio-professional category (in active employment vs others), marital status (married vs others), disease duration, and measures of disease activity such as the 28-joint count Disease Activity Score based on C-reactive protein (DAS28-CRP) and the Psoriasis Area and Severity Index (PASI).

We collected data on HLA-B27 status, smoking status (current, past, and never), and presence of extraarticular manifestations such as uveitis and inflammatory bowel disease (IBD). Data on current use of corticosteroids and nonsteroidal antiinflammatory drugs, as well as current use of conventional synthetic and biologic disease-modifying antirheumatic drugs (bDMARD) were also collected.

Data analysis. Continuous variables were expressed as mean (SD) and median values. Categorical variables were expressed as frequencies and percentages. Normality of distributions was assessed using histograms and the Shapiro-Wilk test.

Associations between each set of QOL scores (PCS and MCS) and predetermined confounding factors (sex, age, marital status, disease duration, educational status, socio-professional category, DAS28-CRP, and PASI) were investigated in univariate analysis by calculating Pearson correlation coefficient for continuous confounding factors (or Spearman rank correlation for non-Gaussian variables), or using the Student t test (or Wilcoxon unpaired test for non-Gaussian variables) for categorical confounding factors.

Associations between each set of QOL scores and comorbidities (individual comorbidities, no. comorbidities, mRDCI, and Charlson scores) were investigated using multiple linear regression models adjusted for predetermined confounding factors (regardless of their univariate associations). Finally, a multivariate linear regression analysis of the individual comorbidities associated with QOL scores in the confounding factors–adjusted model ($p < 0.20$) was performed. The collinearity between the variables

included in the multivariate models was assessed by calculating the variance inflation factor, and the normality of model residuals was checked. Effect sizes for comorbidity variables were expressed as regression coefficients and partial R^2 values.

Statistical testing was performed at the 2-tailed α level of 0.05. All statistical analyses were performed using the SAS software (version 9.4; SAS Institute Inc.).

RESULTS

Patient characteristics. Table 1 shows patients' sociodemographic and disease characteristics. The study included a group of 124 patients with PsA who were predominantly male (62.1%) and white (nearly 100%). Age (mean ± SD, median) and disease duration (mean ± SD, median) were 52.6 ± 12.6, 54 years, and 11.3 ± 9.6, 10 years, respectively. DAS28-CRP (mean ± SD, median) was 2.7 ± 1.1, 2.5, and nearly 55% of the patients had a DAS28-CRP score ≤ 2.6. The PASI score (mean ± SD, median) was 2.9 ± 5.4, 0.9, with no skin involvement (PASI = 0) in 46 patients (37.1%). Seventy-one percent of the patients were being treated with bDMARD (mainly TNFi).

Table 1. Patients' sociodemographic and disease characteristics.

Characteristics	Mean ± SD (median) or n (%)
Age, yrs	52.6 ± 12.6 (54)
Male sex	77 (62.1)
Body mass index, kg/m^2	27.9 ± 5.6 (27.3)
Positive HLA-B27 (n = 54)	20/54 (37.0)
Disease duration, yrs	11.3 ± 9.6 (10)
In employment	55 (44.4)
Married	70 (56.4)
Education	
Primary or lower	22 (17.8)
Secondary	68 (54.8)
University	34 (27.4)
Smoking status	
Current	31 (25.0)
Past	39 (31.5)
Never	54 (43.5)
Presence of extraarticular manifestations	
Uveitis	7 (5.7)
IBD	9 (7.2)
DAS28-CRP	2.7 ± 1.1 (2.5)
DAS28-CRP ≤ 2.6	68 (54.8)
PASI	2.9 ± 5.4 (0.95)
Severe psoriasis (PASI ≥ 10)	10 (8.1)
No skin involvement (PASI = 0)	46 (37.1)
Treatment, current	
Biologic DMARD	88 (71.0)
Synthetic DMARD	43 (34.7)
Corticosteroid	16 (12.9)
NSAID	20 (16.1)
Comorbidities	
Excess weight (overweight/obese)	87 (70.2)
Anxiety	55 (44.4)
Depression	36 (29.0)
Cardiovascular disease	22 (17.7)
Diabetes mellitus	16 (12.9)
Osteoporosis	14 (11.3)
COPD/asthma	12 (9.7)
Cancer (any)	9 (7.3)
Fibromyalgia	2 (1.6)
No. comorbidities (0–9)	2.0 ± 1.3 (2)
≥ 3 comorbidities	38 (30.6)
mRDCI (0–12)	2.0 ± 1.8 (2)
Charlson Comorbidity Index (1–42)	2.4 ± 1.6 (2)

IBD: inflammatory bowel disease; DAS-28 CRP: 28-joint Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index; DMARD: disease-modifying antirheumatic drug; NSAID: nonsteroidal antiinflammatory drug; COPD: chronic obstructive pulmonary disease; mRDCI: modified Rheumatic Disease Comorbidity Index.

The number of comorbid conditions (mean ± SD, median), on a scale from 0 to 9, was 2.0 ± 1.3, 2.0 (range 0–6), with 30.6% of the sample having a current or previous history of 3 or more comorbidities. Supplementary Figure 1 (available from the authors on request) shows the prevalence of the 9 main comorbidities that were analyzed, while Supplementary Figure 2 shows the prevalence of all comorbidities. The most frequent comorbidities were anxiety (44.4%), overweight (41.1%), HTN (34.7%), depression (29.0%), obesity (29.0%), dyslipidemia (26.6%), DM (12.9%), and osteoporosis (11.3%). Global prevalences of myocardial infarction and stroke in the study population were 8.1% and 7.3%, respectively. Global prevalences of asthma and COPD were 7.3% and 2.4%, respectively.

Table 2 shows PCS and MCS scores on the SF-36 questionnaire. PCS and MCS values (mean ± SD, median) were 41.2 ± 9.7, 40.8, and 43.2 ± 12.4, 47.0, respectively. The most vulnerable sections were general health perception (47.2 ± 20.2, 46.0), vitality (43.6 ± 20.6, 45.0), role limitations due to physical health problems (48.4 ± 40.9, 50.0), and bodily pain (48.9 ± 26.2, 51.0).

Relationships between confounding factors (sociodemographic variables and disease activity) and patient-reported physical and mental QOL. Table 3A shows that many variables were significantly associated with physical health, as measured by the PCS. Males and employed patients were more likely to report higher PCS scores (or better physical health). Indeed, patients in active employment reported a

Table 2. Physical (PCS) and mental (MCS) component summary scores in SF-36.

Variables	Total Population, n = 124, Mean ± SD, Median
PCS	41.2 ± 9.7, 40.8
Physical function	62.3 ± 26.3, 70.0
Role limitations due to physical health problems	48.4 ± 40.9, 50.0
Bodily pain	48.9 ± 26.2, 51.0
General health perception	47.2 ± 20.2, 46.0
MCS	43.2 ± 12.4, 47.0
Vitality	43.6 ± 20.6, 45.0
Social function	70.1 ± 27.5, 75.0
Role limitations due to emotional problems	59.4 ± 43.7, 66.7
General mental health	58.7 ± 21.3, 60.0

SF-36: Medical Outcomes Study Short Form-36 questionnaire.

Table 3A. Relationships between confounding factors (sociodemographic variables and disease activity) and patient-reported physical (PCS) quality of life.

Variables	Mean ± SD, Median, or Correlation Coefficient (r)	p
Sex		0.045 *
Female	38.9 ± 10.5, 38.5	
Male	42.5 ± 9.0, 41.4	
Age, yrs	–0.095	0.29 **
Marital status		0.30 *
Married	42.0 ± 9.9, 42.6	
Others	40.2 ± 9.4, 38.9	
Disease duration from time of diagnosis, yrs	0.168	0.062 ***
Educational status		0.11 *
University	43.4 ± 10.6, 43.5	
Primary and secondary	40.3 ± 9.2, 40.2	
Socio-professional		< 0.0001 *
In active employment	45.1 ± 8.5, 44.8	
Others	38.1 ± 9.5, 37.9	
DAS28-CRP	–0.491	< 0.0001 ***
PASI	0.085	0.34 ***

* Student test. ** Pearson correlation test. *** Spearman correlation test. PCS: physical component summary of Medical Outcomes Study Short Form-36 questionnaire; DAS28-CRP: 28-joint count Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index.

Table 3B. Relationships between confounding factors (sociodemographic variables and disease activity) and patient-reported mental (MCS) quality of life.

Variables	Mean ± SD, Median, or Correlation Coefficient (r)	p
Sex		0.95 *
Female	43.2 ± 12.7, 45.4	
Male	43.2 ± 12.3, 47.4	
Age, yrs	0.144	0.110 **
Marital status		0.57 *
Married	43.8 ± 12.5, 47.8	
Others	42.5 ± 12.4, 42.7	
Disease duration from time of diagnosis, yrs		0.075 **
Educational status		0.109 *
University	46.1 ± 11.9, 48.7	
Primary and secondary	42.1 ± 12.5, 41.9	
Socio-professional		0.23 *
In active employment	44.9 ± 11.9, 47.9	
Others	41.9 ± 12.7, 41.1	
DAS28-CRP	–0.234	0.009 **
PASI	–0.023	0.80 **

* Wilcoxon unpaired test. **Spearman correlation test. MCS: mental component summary scale of Medical Outcomes Study Short Form-36 questionnaire; DAS28-CRP: 28-joint count Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index.

better physical QOL than patients without professional activity (mean ± SD, median: 45.1 ± 8.5, 44.8, vs 38.1 ± 9.5, 37.9, $p < 0.0001$). Higher disease activity (DAS28-CRP) was associated with lower levels of physical health (or lower PCS scores). DAS28-CRP was associated with level of physical function ($r = –0.491$, $p < 0.0001$), whereas no correlation was found with PASI or disease duration. Table 3B shows that only 1 variable, DAS28-CRP, was significantly associated with MCS ($r = –0.234$, $p = 0.009$), but the r value was very low, suggesting that this is a poor correlation.

Association between comorbidities and QOL. Table 4 shows the results of univariate linear regression analysis of physical and mental health on type of comorbid condition, adjusted for relevant confounders. FM was not evaluated owing to its low prevalence (1.6%). The other 5 comorbid conditions — CV disease, anxiety, depression, respiratory disease, and cancer — were significantly associated ($p < 0.05$) with lower

Table 4. Results for univariate linear regression analysis of physical and mental health on type of comorbid condition, adjusted for relevant confounders.

Variables	ß (SE)	p	R^2
PCS			
Cardiovascular disease*	–1.31 (1.97)	0.51	0.004
Excess weight (BMI ≥ 25 kg/m^2)	–2.64 (1.56)	0.09	0.024
Diabetes mellitus	0.36 (2.19)	0.87	< 0.001
Pulmonary disease (COPD/asthma)	–2.65 (2.46)	0.28	0.010
Osteoporosis**	–0.68 (2.40)	0.78	0.001
Anxiety	–0.18 (1.49)	0.90	< 0.001
Depression	–1.79 (1.72)	0.30	0.009
Malignancy	0.71 (2.82)	0.80	0.001
Fibromyalgia		NA***	
MCS			
Cardiovascular disease*	**–6.93 (2.96)**	**0.021**	**0.046**
Excess weight (BMI ≥ 25 kg/m^2)	0.39 (2.43)	0.87	< 0.001
Diabetes mellitus	1.03 (3.36)	0.76	< 0.001
Pulmonary disease (COPD/asthma)	**–8.78 (3.70)**	**0.019**	**0.047**
Osteoporosis**	0.03 (3.67)	0.99	< 0.001
Anxiety	**–13.04 (1.92)**	**< 0.0001**	**0.287**
Depression	**–9.96 (2.47)**	**0.0001**	**0.124**
Malignancy	**12.53 (4.17)**	**0.003**	**0.073**
Fibromyalgia		NA***	

Confounders: sex, age, marital status (married vs others), disease duration from the time of diagnosis, educational status (primary and secondary education vs university education), socio-professional category (in active employment vs others), DAS28-CRP, and PASI. ß (SE): estimated linear coefficient with SE. P value: regression linear model adjusted with confounders. R^2: partial coefficient correlation. * Includes history of ischemic disease (myocardial infarction and stroke), angina, stent, carotid atheromatous plaques, and arteritis of the lower limbs. ** Includes history of osteoporosis (defined as a T score of < –2.5 at any site), nontraumatic vertebral/peripheral fractures or anti-osteoporotic agent (except vitamin D and calcium). *** Because of inadequate prevalence (1.6% of patients). Values in bold face are statistically significant. SE: standard error; PCS: physical health component summary of Medical Outcomes Study Short Form-36; MCS: mental health component summary; BMI: body mass index; COPD: chronic obstructive pulmonary disease; NA: not applicable; DAS28-CRP: 28-joint count Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index.

levels of mental health (MCS). Based on the R^2 values, anxiety and depression were the most strongly associated with level of mental health (R^2 = 28.7% and 12.4%, respectively). Physical health (PCS) was not significantly associated with any comorbidity after adjustment for confounding factors, although there was a tendency for excess weight [β = –2.64 (standard error; SE 1.56), R^2 = 0.024, p = 0.09].

Table 5 shows the results of multivariate linear regression analysis of mental health on type of comorbid condition, adjusted for relevant confounders. Anxiety was strongly associated with level of mental health and accounted for 19.4% of the variance in MCS scores [β = –10.81 (SE 2.10), R^2 = 0.194, p < 0.0001], whereas CV disease, malignancy, depression, and pulmonary disease were no longer associated with level of mental health.

Table 6 shows the results of univariate linear regression analysis of physical and mental health on number of comorbid conditions, adjusted for relevant confounders. Number of comorbidities (range 0–6) or mRDCI score (range 0–8) accounted for 14% [β = –3.68 (SE 0.85), R^2 = 0.140, p < 0.0001] and 4.9% [β = –1.56 (SE 0.64), R^2 = 0.049, p = 0.0167] of the variance in MCS scores, respectively. In contrast, PCS was not associated with number of comorbidities, whatever the score used.

We analyzed the univariate association of the PCS with the following variables: smoking, types of PsA, presence of extraarticular manifestations (IBD, uveitis), current enthesitis, current dactylitis, and current treatment (bDMARD and corticosteroid). We included factors associated with p < 0.20 (in addition to predefined confounding factors) in multivariate analyses. Similarly, we performed the same analyses for the MCS. All results were unchanged (data not shown).

DISCUSSION

To our knowledge, this is one of the first studies to assess the added burden of comorbidity on QOL in PsA. As expected, the prevalence of comorbidity was relatively high in our multicentric cohort of 124 patients, with 30.6% having 3 or more comorbid conditions. After adjustment for disease-related and sociodemographic factors, we were able to demonstrate that the added effect of comorbidity on

Table 5. Results for multivariate linear regression analysis of mental health on type of comorbid condition, adjusted for relevant confounders.

Variables	ß (SE)	p	R^2
Cardiovascular disease*	–4.40 (2.57)	0.09	0.026
Pulmonary disease (COPD/asthma)	–2.59 (3.22)	0.42	0.006
Anxiety	**–10.81 (2.10)**	**< 0.0001**	**0.194**
Depression	–2.84 (2.45)	0.25	0.012
Malignancy	6.15 (3.69)	0.098	0.025

Confounders: sex, age, marital status (married vs others), disease duration from the time of diagnosis, educational status (primary and secondary education vs university education), socio-professional category (in active employment vs others), DAS28-CRP, and PASI. * Includes history of ischemic disease (myocardial infarction and stroke), angina, stent, carotid atheromatous plaques, and arteritis of the lower limbs. ß (SE): estimated linear coefficient with SE. P value: regression linear model adjusted with confounders. R^2: partial coefficient correlation. Values in bold face are statistically significant. SE: standard error; COPD: chronic obstructive pulmonary disease; DAS-28 CRP: 28-joint count Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index.

Table 6. Results for univariate linear regression analysis of physical and mental health on number of comorbid conditions, adjusted for relevant confounders.

Variables	ß (SE)	p	R^2
PCS			
No. comorbidities	–1.02 (0.59)	0.089	0.025
Charlson score	–0.14 (0.56)	0.80	< 0.001
mRDCI score*	–0.44 (0.43)	0.30	0.009
MCS			
No. comorbidities	**–3.68 (0.85)**	**< 0.0001**	**0.140**
Charlson score	–0.96 (0.85)	0.26	0.011
mRDCI score*	**–1.56 (0.64)**	**0.0167**	**0.049**

Confounders: sex, age, marital status (married vs others), disease duration from the time of diagnosis, educational status (primary and secondary education vs university education), socio-professional category (in active employment vs others), DAS28-CRP, and PASI. * Includes lung diseases, cardiovascular disease (myocardial infarction, stroke, or other), hypertension, ulcer or other gastrointestinal disease, diabetes mellitus, fracture, depression, malignancy, kidney disease (eGFR < 60 ml/min/1.73m^2), and obesity (BMI ≥ 30 kg/m^2). ß (SE): estimated linear coefficient with SE. P value: regression linear model adjusted with confounders. R^2: partial coefficient correlation. Values in bold face are statistically significant. SE: standard error; PCS: physical component summary of Medical Outcomes Study Short Form-36; MCS: mental component summary; mRDCI: modified Rheumatic Disease Comorbidity Index; DAS-28 CRP: 28-joint count Disease Activity Score based on C-reactive protein; PASI: Psoriasis Area and Severity Index; eGFR: estimated glomerular filtration rate; BMI: body mass index.

patient-reported mental health in PsA was more closely related to type of comorbidity — especially anxiety — than number of comorbidities. Moreover, no association was found between patient-reported physical health and the type or number of comorbid conditions after adjustment for those confounding factors.

Patients with PsA have more comorbidities than the general population[12,13]. In our study, the most prevalent comorbidities were excess weight (overweight/obesity, 70.2%), anxiety (44.4%), and depression (29%). Overweight and obesity are classically reported to be frequent in patients with PsA[15,19]. Patients with PsA also have a high risk of depression and/or anxiety[18,26], which appears to be greater than for patients with psoriasis alone[31].

CV disease and high risk of metabolic disease are classically reported to be frequent in patients with PsA[12,13,14,16] and our results are consistent with this finding. Nevertheless, prevalence of CV disease seems to be higher in our study and may possibly be due to the local characteristics of the population or low enrollment. In our study, 17.7% of the patients had a history of CV disease, compared to 7.6% in the study conducted by Husted, *et al*[26] on patients with PsA, and 7.5% in the COMOSPA study[10] on axial and peripheral SpA patients. Moreover, 34.7% of our patients had a history of HTN, in accordance with the current literature on PsA[15,19] and more generally on SpA[10]. History of DM was found in 12.9% of our patients, comparable to previously reported data[15,19]. Surprisingly, the prevalence of FM was very low (1.6%) and not in line with the current data on patients with PsA[32]. This is probably because we did not use any specific

tools, such as the American College of Rheumatology criteria, to collect and quantify FM data. Indeed, in our study, data on FM were based on both self-report and physician report.

Patients with PsA have significantly poorer health-related QOL than the general population[33]. Using SF-36 to measure QOL has been validated in PsA[34] and is common in the literature[20,26,35]. Several scores are derived from the original SF-36 score, such as SF-12 or SF-8. We chose to use the original Ware-36 (SF-36) score. In our study, SF-36 was given preference on account of its nonspecialized features, its assessment of the various domains of QOL, and its ease of use as part of our self-assessment questionnaire. The QOL findings in our study seem to be comparable to others found in the current literature[20,35].

Our findings show some consistency with studies that have investigated the effects of comorbidity on patient-reported health in PsA and other inflammatory rheumatic diseases. A study by Husted, *et al*[26] was, to our knowledge, the first to analyze the added effect of comorbidity on QOL in PsA. In that study, the authors reported a reduction in mental function in patients with depression and anxiety. These results are consistent with our findings. Nevertheless, associations were found between patient-reported physical health and some types of comorbidities[26], contrary to our findings. In a study by Kotsis, *et al*, anxiety and concern about bodily symptoms attributed to the illness were independent correlates of physical QOL in PsA[18]. In our study, anxiety alone accounted for 28.7% of the variance in MCS scores. MCS was also significantly associated with number of comorbidities and mRDCI score, which explained 14.0% and 4.9% of the variance in MCS, respectively. As was the case in our study, Husted, *et al*[26] found that the type of comorbidity appears to have a greater effect than the number of comorbidities. In a study by Rosen, *et al*[36], the authors found that CCI was associated with poor QOL in both psoriasis and PsA patients (n = 201 in each group).

The important strengths of our study include its multicentric design with patients from across 3 centers from Les Hauts-de-France, and the real-life setting that enabled us to study associations between comorbid conditions and QOL. Clinical evaluations and systematic proofreading of all medical records were performed by a single investigator (WB), which ensured that no data were missing and permitted a meaningful comparison of measures of disease activity such as PASI and DAS28-CRP. We acknowledge several limitations to our study, including its cross-sectional features, which only allow for the study of associations between independent variables and outcomes of interest, precluding causal inferences. In addition, the comorbidity data, especially those based on patient self-report, may represent a source of inaccuracies, even though all electronic medical files were systematically checked by the investigator to complete and rectify the self-reported data. One criticism of the mRDCI is that it does not include all possible comorbidities, although the major pulmonary and CV diseases, and depression, are recorded. Moreover, we used the DAS28-CRP to measure the disease activity in patients with PsA. However, the DAS28-CRP is not a tool that is used specifically for this disease. MDA and the Disease Activity Index for PsA should be used for further studies examining the relationship between QOL and comorbidities in patients with PsA. Another criticism is that we did not use any specific tools to collect and quantify anxiety and FM data.

Increasing awareness of the effect of comorbidities in PsA and other inflammatory rheumatic diseases, and the recognition that they are suboptimally screened for and managed clinically, have resulted in several recommendations and suggest that they should be considered as part of the screening, prevention, and monitoring of these diseases. In this study, anxiety in PsA is independently associated with mental QOL, and the type of comorbidity appears to have a greater effect than the number. The effect of psychological distress on QOL needs further attention and is of importance, because anxiety is frequently seen in PsA and may be treatable. Screening for anxiety, rating its severity, and managing anxiety symptoms could lead to better QOL in patients with PsA.

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