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Gender differences in psychological features and determinates of quality of life in axial spondyloarthritis and psoriatic arthritis: a cross-sectional study

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Abstract

Background Investigating gender-specific differences in rheumatology is crucial for improving personalized treatment. The present study aimed to explore gender differences in psychological characteristics and features associated with impaired physical and mental quality of life in male and female patients affected by axial spondyloarthritis or psoriatic arthritis.

Methods The present study is cross-sectional. Quality of life was evaluated using a Medical Outcome Study 36-item Short Form health survey (SF-36), and physical and mental component scores were presented. Data about disease activity, anxiety and depression, fatigue, perceived stress, and coping strategies were collected. The patients were stratified by gender, and clinical and psychological data were compared.

Results A total of 119 patients with axial spondyloarthritis [age 49.0 (SD 11.7); 45.4% F] and 198 patients with psoriatic arthritis [age 56.9 (SD 11.6); 62.6% F] were included. Female patients with axial spondyloarthritis and psoriatic arthritis had worse scores on fatigue, pain, perceived stress, physical quality of life, dysfunctional coping strategies, mental quality of life (only in axial spondyloarthritis), and anxiety (only in psoriatic arthritis) than men. In multivariable analysis, physical quality of life is mainly explained by fatigue and pain, and mental quality of life by fatigue, anxiety and stress in women with axial spondyloarthritis and psoriatic arthritis. Fatigue, pain and anxiety were significant variables across the models with male patients.

Conclusions The study indicates that female patients with axial spondyloarthritis and psoriatic arthritis experience worse scores in psychological variables compared to men. Additionally, women's quality of life is significantly lower when compared to men's one, primarily due to factors such as fatigue, stress, pain, and anxiety. To enhance patient well-being, therapeutic strategies should be tailored to address the unique clinical and psychological needs that arise from gender differences.

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Plain English summary

This study explored how men and women with certain arthritis types, specifically axial spondyloarthritis and psoriatic arthritis, experience their conditions differently, particularly in relation to mental health and overall quality of life. Understanding these differences is crucial, as personalized treatment approaches for each gender can significantly enhance overall well-being. By evaluating 119 patients with axial spondyloarthritis and 198 with psoriatic arthritis, researchers used a health survey to assess factors like fatigue, pain, anxiety, depression, stress and quality of life. The results indicated that women with either type of arthritis reported a worse overall health status compared to men. They were hit harder by fatigue, pain, stress, especially women with axial spondyloarthritis who also had lower quality of life scores and higher anxiety levels. Further analysis revealed that for women, fatigue and pain had a substantial impact on their physical quality of life, while their mental well-being was predominantly influenced by anxiety and stress. Notably, in women with axial spondyloarthritis, also fatigue significantly affected mental health. For men, fatigue, pain, and anxiety were also concerning, affecting physical and mental well-being; however, the impact manifested slightly different compared to women. Overall, the findings suggest that women are more adversely affected by psychological factors related to arthritis than men. Therefore, it's essential for healthcare providers to recognize and address these mental health issues during treatment, tailoring effective care for individuals dealing with arthritis. As doing so could greatly improve the overall health and happiness of patients, particularly among women.

Highlights

- Women with axial spondyloarthritis and psoriatic arthritis experience a higher level of fatigue, pain, anxiety, and stress.
- In rheumatological diseases, women's quality of life is more severely compromised than men's.
- Physical and mental quality of life are mainly associated with fatigue, stress, pain, and anxiety in both genders.

Keywords Axial spondyloarthritis, Psoriatic arthritis, Gender differences, Health-related quality of life, Psychological factors

Background

Axial spondyloarthritis (axSpA) is an inflammatory chronic disease with different manifestations in female and male patients due to gender variations in the immunological, hormonal, and genetic responses or sex differences in body anatomy or psychological functioning [1, 2]. Specifically, women with axSpA generally had reduced quality of life and experienced higher levels of fatigue and pain and more impaired functional status than men [3].

Psoriatic arthritis (PsA) is a common, debilitating arthritic condition associated with severe comorbidities and reduced life expectancy [4]. Several differences in PsA manifestations between men and women are stated both in clinical conditions and disease outcomes [5, 6]. Recent studies have shown that female patients experience a more severe course of PsA, higher levels of disease activity with higher levels of pain and fatigue, lower quality of life, and increased functional limitations and work disability than male patients [5, 7–9].

Anxiety and depression are common in both axSpA and PsA [7, 10], and the risk of developing anxiety and depression is higher in women with PsA than in men [7, 11]. In axSpA, men have an increased risk of anxiety than women, while no apparent gender differences were found for the risk of depression [10]. Fatigue is a

persistent problem for people with axial spondylarthritis and psoriaticarthritis [12], with female patients experiencing a higher level than men [11, 13]. Pain is a common symptom in patients with rheumatic diseases [14, 15]. Compared with male patients with inflammatory arthritis, females have worse pain scores that persist throughout the disease course [16, 17]. Some studies showed that health-related quality of life is more detrimental in female patients both in PsA and axSpA [18, 19], while other studies did not find gender differences [20, 21].

SpA and PsA substantially adversely affect health-related quality of life [22, 23]. Female gender is related to impaired quality of life in psoriatic arthritis but not in axial spondyloarthritis [23–26]. In male and female patients with PsA, significant predictors for impairment of the quality of life are pain, number of affected joints, and restricted joint mobility [21]. In women and men with axSpA, worse physical and mental quality of life were associated with high disease activity and living without a partner [27], while only lower mental quality of life was related to fatigue [27, 28].

The above-mentioned differences in disease expression in males and females need to be examined through the lens of gender theoretical concepts, using a coherent and integrated approach [29–31]. The conventional

understanding of gender often emphasizes inherent psychological differences between males and females, suggesting these distinctions are deeply rooted, natural, and carry significant personal and social implications. Conversely, the social constructionist perspective states differences between genders are social constructs and cannot fully represent reality, indicating that gender theories serve as frameworks that shape our understanding and influence social and scientific practices [32, 33]. Moreover, systems and structural theories tend to disregard gender altogether, positioning generation/age as the primary organizing principle within the family while other theories emphasize gender distinctions [32]. For instance, psychodynamic theories portray masculinity and femininity as oppositional, arising from divergent responses to challenges during the preoedipal and oedipal stages, while recent feminist psychodynamic theories accentuate profound and enduring dichotomies between women and men [32, 34]. Parsons's sex role theory posits that gender roles are fixed, separate, and dichotomous, whereas social role theory suggests that shared behavioural expectations are shaped through socialization processes, evident in the differential ways genders manage dependency and distress, with women generally more inclined to seek medical assistance [30, 32, 35]. Additionally, social support theory highlights the importance of social networks in health, noting that women, being more interpersonally oriented, are more prone to seek help and talk about their distress, resulting in better health outcomes. Conversely, societal norms often discourage boys from expressing discomfort, resulting in the denial of pain and avoid admitting weakness [30]. Hegemonic masculinity emphasizes male power through traits such as physical strength and autonomy, reinforcing male dominance over women, while andronormativity in medicine prioritizes male health issues, often neglecting those of females [36]. Despite this, women generally experience more frequent and intense bodily symptoms than men, leading to a poorer perception of physical health and somatic well-being, which may be attributed to their heightened sensitivity to subtle bodily signals and greater bodily vigilance [30].

To our knowledge, no study has specifically examined psychological factors, in addition to clinical and treatment variables, as potential determinants of physical and mental quality of life in patients with axial spondyloarthritis and psoriatic arthritis, focusing on gender differences. The present study aimed 1) to compare psychological characteristics between females and males affected by spondyloarthritis or psoriatic arthritis and 2) to explore which features (with a special focus on psychological characteristics) are associated with impaired physical and mental quality of life in both female and

male patients. Based on the psychological theories, we hypothesize that women will score lower on psychological variables and general well-being.

Methods

Clinical sample

Adult patients (≥ 18 years) with previously diagnosed axSpA—according to the Assessment of SpondyloArthritis international Society (ASAS) classification criteria or PsA—according to the CIASsification for Psoriatic ARthritis (CASPAR) criteria were included in this large cohort study with a cross-sectional design [37, 38]. The exclusion criteria included the presence of fibromyalgia, connective tissue diseases (such as Lupus Erythematosus, Sjögren's syndrome, scleroderma, dermatomyositis, and polymyositis), vasculitis, gout, infectious arthritis and polymyalgia rheumatica. Additionally, individuals with severe systemic or infectious conditions—such as cardiac, respiratory, gastrointestinal, neurological, or endocrine disorders, including neoplastic diseases—were excluded, as these conditions can affect disease activity and the functional or psychological status of patients with rheumatic diseases. Finally, participants who lacked knowledge of the Italian language or had other limitations in verbal communication were excluded from the study. All participants provided written informed consent. Following consent, demographic and clinical data were collected, and patients completed self-report outcome measures. Recruitment was carried out sequentially of all patients presented for a routine outpatient visit at the Unit of Rheumatology, Verona, Italy, between March 2016 and February 2017. More study details have been described elsewhere [39, 40]. This study received ethical approval from the Ethics Committee of the Provinces of Verona and Rovigo (Ref. CESC15840, 2016). The investigation was conducted in accordance with the latest version of the Declaration of Helsinki [41].

Measurements

Information about disease duration, family history of rheumatologic diseases, body mass index, comorbidity, erosions, radiographic progression, glucocorticoid and non-steroidal anti-inflammatory drugs (NSAIDs), and antidepressants were collected. The rheumatological treatment was categorized as first-line therapy [conventional synthetic disease-modifying antirheumatic drugs (csDMARDs) and/or anti-TNF (anti-tumor necrosis factor drugs)] and second-line therapy [biological disease-modifying antirheumatic drugs (bDMARDs) and targeted synthetic disease-modifying antirheumatic drugs (tsDMARDs) with or without csDMARDs] (see Tosato et al. [42] for details). Disease activity was measured with the Ankylosing Spondylitis Disease Activity

Score with C-Reactive Protein (ASDAS-CRP) for axSpA and the Disease Activity in Psoriatic Arthritis (DAPSA) for PsA [43, 44].

The Health-Related Quality of Life (HRQoL) was assessed by the Medical Outcome Study 36-item Short Form health survey (SF-36) (internal consistency in the total sample $\alpha = 0.873$; internal consistency (α) for the validation in the Italian sample ranged from 0.770 to 0.930, depending on the specific subscale) [45, 46]. It contains the physical component score (PCS) and the mental component score (MCS). Lower scores indicate worse HRQoL.

The Health Assessment Questionnaire – Disability Index (HAQ-DI) (internal consistency in the total sample $\alpha = 0.890$; internal consistency for the validation in the Italian sample $\alpha = 0.940$) evaluated patients' functional ability to perform everyday activities [47, 48]. Symptoms of anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS) (internal consistency in the total sample $\alpha = 0.887$; internal consistency for the validation in the Italian sample $\alpha = 0.890$) [49, 50]. The Chalder Fatigue Questionnaire (CFQ) was used to assess fatigue (internal consistency in the total sample $\alpha = 0.901$; internal consistency (α) for the validation in the English sample ranged from 0.880 to 0.900) [51, 52]. The Perceived stress scale (PSS) measured the degree of stress experienced in the preceding month (internal consistency in the total sample $\alpha = 0.775$; internal consistency for the validation in the Italian sample $\alpha = 0.740$) [53, 54]. The Visual Analogue Scale (VAS) measured the subjective experience of pain intensity (internal consistency in the total sample $\alpha = 0.946$; internal consistency for the validation in the Italian sample $\alpha = 0.910$) [55, 56]. The Coping Orientation to the Problems Experiences–new Italian version (COPE-NVI) (internal consistency in the total sample $\alpha = 0.893$; internal consistency (α) for the validation in the Italian sample ranged from 0.700 to 0.910, depending on the specific subscale) evaluated how often the “problem-focused coping” (active coping, planning, suppression of competing activities, restraint, seeking of instrumental social support), the “emotion-focused coping” (seeking of emotional social support, positive reinterpretation, acceptance, denial, turning to religion), and the “dysfunctional” (focus on and venting of emotions, behavioral disengagement, mental disengagement) were used [57].

Statistical analyses

Variables were described by frequencies if categorical and means (standard deviations) if continuous. Females and males were compared using the Fisher's exact test with the Phi effect size for categorical variables and the t-test (independent samples) with the Cohen's d effect

size for continuous variables. Factors significantly associated (at $p < 0.05$) with physical and mental quality of life in univariate linear regression models were selected to estimate multivariate linear regression models. Key checks for model assumptions were executed after each multivariate model estimation, specifically the Shapiro–Wilk test for Normality of residuals [58], the Breusch–Pagan test for homoscedasticity [59], and the Variance Inflation Factor VIF [60] for multicollinearity. Both independent and dependent variables had complete data. All tests were bilateral at $p < 0.05$. Analyses were done by SPSS 28 for Windows.

Results

Socio-demographic and clinical characteristics

Patients with axSpA ($n = 119$) and PsA ($n = 198$) were included in the study (Additional file 1: Tables 1 and 2). Females and males were similar in age (axSpA: mean 47.2 SD 11.1; PsA: mean 56.1 SD 12.0). In both diagnostic groups, more women were unemployed. Regarding clinical characteristics, females with axSpA and PsA had significantly higher disease activity ($p < 0.001$; $p = 0.003$, respectively). In PsA, men had significantly longer disease duration ($p = 0.048$), while women had more radiographic progression ($p = 0.008$) and physical disability ($p < 0.001$). Females with axSpA were more frequently under second-line therapy ($p = 0.043$), glucocorticoid treatment ($p = 0.006$), and antidepressants ($p = 0.005$).

Psychological characteristics

Considering psychological variables, females had lower scores in PCS both in axSpA ($p = 0.004$) and PsA ($p < 0.001$), with both differences showing a medium effect size. In contrast, only females affected by PsA had lower MCS ($p = 0.042$). Women with axSpA and PsA experience higher fatigue ($p = 0.005$; $p = 0.027$, respectively), perceive higher stress ($p = 0.015$; $p = 0.038$, respectively), and have stronger pain ($p < 0.001$; $p < 0.001$, respectively). Women with PsA experienced more difficulties concerning disability ($p < 0.001$; effect size 0.30). While effect sizes for fatigue and stress were between small and medium, pain showed a large effect size. Female patients had more ineffective coping strategies, such as emotion-focused coping (axSpA: $p = 0.027$; PsA: $p = 0.021$) and dysfunctional coping (axSpA: $p < 0.001$; PsA: $p = 0.023$). Effect sizes were between small and medium, with dysfunctional coping showing a value of 0.68 for axSpA. Moreover, females with axSpA more frequently had moderate or severe anxiety ($p = 0.013$). There was no significant gender difference regarding depression (Table 1).

Table 1 Psychological characteristics of patients with axial spondyloarthritis and psoriatic arthritis, stratified and compared by gender

Psychological characteristics	Spondyloarthritis, n = 119				Psoriatic arthritis, n = 198			
	Females n = 54	Males n = 65	p-value	Effect size	Females n = 124	Males n = 74	p-value	Effect size
Physical quality of life (PCS), mean (sd)	35.7 (8.9)	41.1 (10.8)	0.004^c	0.55 [#]	35.0 (10.3)	40.2 (8.6)	< 0.001^c	0.54 [#]
Mental quality of life (MCS), mean (sd)	46.3 (10.0)	49.4 (8.9)	0.073 ^c	0.33 [#]	45.1 (10.5)	48.3 (11.5)	0.042^c	0.30 [#]
Fatigue (CFQ), n (%)								
No (< = 3)	22 (40.7%)	44 (67.7%)			54 (43.5%)	45 (60.8%)		
Yes (> = 4)	32 (59.3%)	21 (32.3%)	0.005^a	0.27 [§]	70 (56.5%)	29 (39.2%)	0.027^a	0.17 [§]
Stress (PSS), n (%)								
Low (< 20)	24 (44.4%)	44 (67.7%)	0.015^a	0.23 [§]	47 (37.9%)	40 (54.1%)		
High (> = 20)	30 (55.6%)	21 (32.3%)			77 (62.1%)	34 (45.9%)	0.038^a	0.16 [§]
Pain (VAS), mean (SD)	6.0 (2.4)	4.2 (2.7)	< 0.001^c	0.70 [#]	5.8 (2.5)	4.34 (2.2)	< 0.001^c	0.61 [#]
Depression (HADS- D), n (%)								
Normal or Mild (< = 10)	48 (88.9%)	61 (93.8%)	0.509 ^a	-	111 (89.5%)	70 (94.6%)	0.297 ^a	-
Moderate or Severe (> 10)	6 (11.1%)	4 (6.2%)			13 (10.5%)	4 (5.4%)		
Anxiety (HADS-A), n (%)								
Normal or Mild (< = 10)	37 (68.5%)	57 (87.7%)			97 (78.2%)	64 (86.5%)		
Moderate or Severe (> 10)	17 (31.5%)	8 (12.3%)	0.013^a	0.23 [§]	27 (21.8%)	10 (13.5%)	0.188 ^a	-
Problem-focused coping, mean, sd	50.1 (9.7)	46.6 (10.0)	0.059 ^c	-	48.3 (9.8)	48.5 (12.4)	0.893 ^c	-
Emotion-focused coping, mean, sd	45.4 (7.8)	42.0 (8.2)	0.027^c	0.41 [#]	46.2 (8.2)	43.2 (9.6)	0.021^c	0.34 [#]
Dysfunctional coping, mean, sd	23.1 (5.4)	19.8 (4.5)	< 0.001^c	0.68 [#]	23.0 (4.8)	21.2 (5.1)	0.023^c	0.34 [#]

PCS Physical component score, MCS Mental component score, CFQ Chalder fatigue questionnaire, PSS Perceived stress scale, HADS-D Hospital anxiety and depression scale – depression, HADS-A Hospital anxiety and depression scale – anxiety

^a Fisher's exact test

^b Chi-square test

^c T-test

[#] Cohen's d

[§] Phi

Determinants of quality of life

By considering axSpA, quality of life was associated with a series of characteristics for all patients, and it was gender-specific in the univariate models (Additional file 1: Table 3). After estimating the multivariate models, a lower PCS result was associated with higher CFQ and VAS in females and a higher ASDAS-CRP in males (Table 2). A lower MCS was associated with a higher HADS-A in all patients. In contrast, family history of rheumatologic diseases, second-line treatment, higher PSS and CFQ were associated only in females. Moreover, in this group, being employed was associated with a higher MCS.

Analogously, also in PsA PCS and MCS results were associated with a series of factors for all patients and were gender-specific in the univariate models (Additional file 1: Table 4). After estimating the multivariate models, all patients had a lower PCS associated with NSAID treatment and higher CFQ and VAS (Table 3). Males only showed negative associations with age and glucocorticoid

treatment. A lower MCS was associated with higher HADS-A and CFQ in all patients, while higher HADS-D and PSS were associated only with the female gender. Finally, being employed was negatively associated with MCS only in males.

The key checks for assumptions of multivariate linear regression models estimated in Tables 2 and 3 confirmed the hypothesis of Normality of residuals ($p > 0.05$ Shapiro–Wilk tests), the hypothesis of homoskedasticity ($p > 0.05$ Breusch-Pagan tests), and the absence of multicollinearity problems (no VIF value was greater than 10) (Additional file 1: Tables 5 and 6).

Discussion

In this cross-sectional study, some gender differences are reported. First, female patients had higher scores on most psychological features in both axSpA and PsA. Second, in females affected by axSpA and PsA, impaired physical quality of life is mainly explained by high levels of fatigue

Table 2 Multivariate linear regression models by sex in axial spondyloarthritis [each cell contains Beta coefficient (*p*-value)]

Dependent variable	SF36 Physical		SF36 Mental	
	F	M	F	M
<i>Socio-demographic characteristics</i>				
Marital status		-	-	-
Married/cohabitant	-0.046 (0.741)			
Separated/divorced/widowed	0.009 (0.945)			
High education	-	0.089 (0.372)	-	0.116 (0.338)
Employed	0.037 (0.765)	0.166 (0.125)	0.151 (0.043)	-
Age	-0.118 (0.340)	-0.082 (0.422)	-	-
<i>Clinical characteristics</i>				
Family history of rheumatologic diseases	-	-	-0.179 (0.010)	-
ASDAS-CRP	0.005 (0.975)	-0.489 (0.022)	0.007 (0.954)	-
Erosions	-	-0.087 (0.399)	-	-
Radiographic progression	-	-0.050 (0.643)	-0.075 (0.290)	-
<i>Treatment characteristics</i>				
Rheumatological treatment	-	-		-
Second line therapy ^a			-0.264 (0.001)	
Glucocorticoid treatment	-0.141 (0.201)	-	-	-0.116 (0.329)
NSAID treatment ^b	-	-0.098 (0.356)	-	-
Antidepressant therapy	-0.164 (0.214)	-	-0.093 (0.282)	-
<i>Psychological characteristics</i>				
Depression (HADS-D > 10)	-	-0.131 (0.207)	-0.119 (0.139)	-0.112 (0.394)
Anxiety (HADS-A > 10)	-	-0.101 (0.389)	-0.390 (< 0.001)	-0.319 (0.026)
Stress (PSS ≥ 20)	0.013 (0.934)	-	-0.189 (0.049)	-0.071 (0.564)
Fatigue (CFQ ≥ 4)	-0.306 (0.034)	-0.148 (0.954)	-0.237 (0.014)	-0.097 (0.466)
Disability (HAQ-DI ≥ 1)	-0.210 (0.122)	-0.006 (0.187)	-	-
Pain (VAS)	-0.474 (0.004)	0.045 (0.821)	-0.017 (0.865)	-0.066 (0.604)
COPE Dysfunctional	-	0.033 (0.765)	-0.016 (0.865)	-0.081 (0.529)
% Variance explained (Adj-R^b)	54.5%	54.3%	81.6%	27.4%

SF-36 Short Form health survey, ASDAS-CRP Ankylosing spondylitis disease activity score with c-reactive protein, NSAID treatment non-steroidal anti-inflammatory drug treatment, HADS-D Hospital anxiety and depression scale – depression, HADS-A Hospital anxiety and depression scale – anxiety, PSS Perceived stress scale, CFQ Chalder fatigue questionnaire, HAQ-DI Health assessment questionnaire – disability index, VAS Visual analogue scale, COPE Coping orientation to the problems experiences

^a anti-IL6/bDMARDs/tsDMARDs with or without csDMARDs

^b used in the last ten days

and pain, while high levels of fatigue, anxiety and stress explain the poor mental quality of life.

The first main finding is that female patients with axSpA and PsA have significantly higher scores on fatigue, pain, and perceived stress and have more severe anxiety symptoms, as numerous studies have previously shown [1–3, 7, 9, 11, 13, 19, 61]. Recent reviews concluded that the impact of axSpA and PsA might be experienced differently for men and women [2, 7]. The relation between gender and fatigue in arthritis could be mediated and explained by the number of daily roles [62], daily positive events or pain level [63]. Additionally, women with axSpA have a higher density of pain

receptors in the skin and report pain in more body parts [2]. Moreover, women reported more chronic and cumulative stress, which could be explained by their greater reactivity to stressful life events or higher demands in their social roles [64]. Psychological distress leads to poorer disease outcomes by enhancing symptom burden, decreasing treatment adherence, and increasing disability [1, 65]. Differently than expected [1, 7], in the present study, gender differences concerning depressive symptoms did not appear. It might be because of the low overall number of depressed patients (about 8%) or the effectiveness of psychotropic therapy (females with axSpA were more frequently under antidepressants).

Table 3 Multivariate linear regression models by sex in psoriatic arthritis [each cell contains Beta coefficient (*p*-value)]

Dependent variable	SF36 Physical		SF36 Mental	
	F	M	F	M
<i>Socio-demographic characteristics</i>				
Employed	-	-	-	-0.209 (0.010)
Age	-	-0.175 (0.026)	-	-
<i>Clinical characteristics</i>				
Comorbidity	-	-0.114 (0.122)	-	-
BMI	-0.105 (0.098)	-	-	-
DAPSA	-0.167 (0.069)	-0.042 (0.668)	0.157 (0.137)	-0.059 (0.594)
Erosions	-0.114 (0.096)	-	-	-
Radiographic progression	0.035 (0.610)	-0.125 (0.106)	-	-
<i>Treatment characteristics</i>				
Rheumatological treatment	-	-	-	-
Second line therapy ^a	-0.072 (0.280)	-	-	-
Glucocorticoid treatment	-	-0.156 (0.036)	-	-0.091 (0.265)
NSAID treatment ^b	-0.135 (0.040)	-0.226 (0.003)	-	-
Antidepressant therapy	-0.049 (0.447)	-	-	-
<i>Psychological characteristics</i>				
Depression (HADS-D > 10)	-0.011 (0.863)	0.065 (0.401)	-0.197 (0.016)	-0.075 (0.400)
Anxiety (HADS-A > 10)	-	-0.121 (0.125)	-0.180 (0.034)	-0.235 (0.011)
Stress (PSS ≥ 20)	-	-	-0.254 (0.001)	-0.118 (0.193)
Fatigue (CFQ ≥ 4)	-0.176 (0.011)	-0.172 (0.028)	-0.207 (0.013)	-0.401 (< 0.001)
Disability (HAQ-DI ≥ 1)	-0.104 (0.146)	-0.100 (0.184)	-0.125 (0.150)	-
Pain (VAS)	-0.391 (< 0.001)	-0.416 (< 0.001)	-0.210 (0.054)	-0.088 (0.460)
COPE Dysfunctional	-	-0.035 (0.641)	0.039 (0.624)	-0.145 (0.114)
% Variance explained (Adj-R^b)	55.0%	68.2%	34%	56.8%

SF-36 Short Form health survey, BMI Body mass index, DAPSA Disease activity in psoriatic arthritis, NSAID treatment non-steroidal anti-inflammatory drug treatment, HADS-D Hospital anxiety and depression scale – depression, HADS-A Hospital anxiety and depression scale – anxiety, PSS Perceived stress scale, CFQ Chalder fatigue questionnaire, HAQ-DI Health assessment questionnaire – disability index, VAS Visual analogue scale, COPE Coping orientation to the problems experiences

^a anti-IL6/bDMARDs/tsDMARDs with or without csDMARDs

^b used in the last ten days

A plausible explanation for gender differences in arthritis is that it represents a complex interplay of biological and social factors [61, 66]. It is well-established that genetic differences between men and women underlie the variations in disease prevalence, manifestation, and treatment responses [66]. Conversely, social role theory suggests that females are encouraged from youth to express their distress and discomfort more openly, while males are foster to embody masculinity by suppressing any signs of weakness [30]. Therefore, it cannot be one-sidedly interpreted that a woman's experience of more pain, distress, and functional deterioration reflects only an inherent gender difference in the biology of the disease or that it only represents a different impact of social and cultural aspects toward disease [5, 63]. Consequently, patient-reported outcomes must be interpreted cautiously [2].

Women's poorer psychological outcomes in the current study could further decrease everyday functioning and produce frustration, so the expected result was that quality of life is more severely compromised for the females [30]. In details, women with axSpA and PsA had impaired physical quality of life, while only female patients with PsA had worse mental quality of life. Considering axSpA, these results align with previous findings where male patients had a better quality of life over time and PCS was more affected than MCS in both sexes [18, 27]. Regarding PsA, a previous study found that only PCS was decreased in female patients [19]. Other studies did not find significant gender differences in quality of life in axSpA and PsA [20, 21].

Previous research has indicated that coping strategies significantly affect psychological well-being in chronic patients [65, 67]. In the present study, axSpA and PsA

female patients predominantly and more frequently than males use emotion-focused and dysfunctional coping strategies. This aligns with sex role theory, which suggests that men tend to be task-oriented, while women are more expressive and focused on feelings and relationships [32]. While a dysfunctional strategy unambiguously negatively impacts the patient's life, the result of an emotion-focused strategy needs to be considered carefully since this strategy may have divergent implications for a person's success in coping [68]. The second main finding of the present study is a clear pattern of psychological variables that explain physical and mental quality of life, primarily in female patients. Physical quality of life is mainly explained by fatigue and pain in female patients with axSpA and male and female patients with PsA. Previously, it was shown that fatigue and pain significantly negatively impact the quality of life [15], while only fatigue was positively associated with the female gender in multivariate analysis [69]. The relationship between physical quality of life and pain could be explained by the fact that pain undermines a patient's ability to perform everyday activities [15], especially if painful arthritis symptoms remain untreated [14]. In the present study, disease activity was higher in women with axSpA and PsA, while in men with axSpA, disease activity was associated with physical quality of life, as previous studies found [27, 28]. Additionally, the analyses of the current study revealed that in PsA, PCS is related to NSAID treatment in women and age, glucocorticoid and NSAID treatment in men.

In the present study, mental quality of life is explained by fatigue, anxiety and stress in female patients with axSpA and PsA. At the same time, in male patients, MCS is determined by anxiety and fatigue or only anxiety (in PsA and axSpA, respectively). Thus, anxiety was a steady factor associated with poor MCS in both genders in axSpA and PsA, as demonstrated in previous studies [7, 70]. This relationship may be partly attributed to anxiety's tendency to increase patients' complaints related to their condition [30]. Depression was related to MCS in females with PsA in the present study. In rheumatoid arthritis, depression and anxiety both correlate with impaired quality of life [71]. Interestingly, in this study, stress negatively affects mental quality of life, primarily among female patients both in axSpA and PsA. Since women perceived higher stress, it was expected to be found that stress decreases mental well-being in females. In studies with rheumatoid arthritis, considering male and female patients together, lower perceived stress contributed to higher general well-being and increased mental quality of life [64, 72]. In the current study, fatigue also decreases mental quality of life in both genders with PsA and female patients with axSpA. This result is expected since

fatigue is a phenomenon experienced both physically and mentally and is driven by physiological, psychological, behavioural, and sociocultural factors [73]. Stressing the importance of psychological factors, optimal clinical care in rheumatology should involve treating psychological symptoms related to the disease [71]. The findings of the current study indicate that women exhibit lower scores on psychological symptoms and, according to social support theory, more actively seek medical assistance, suggesting that a proactive response from medical practitioners could lead to improved health outcomes [30]. Still, rheumatologists underestimate patient reports of psychological state probably because their evaluation of the patient's health status severity differs from that of the patients [74]. Also, patients rarely discuss their symptoms of depression during their rheumatologist visits [71]. Therefore, considering the severity of psychiatric comorbidities is essential and more likely to be achieved if holistic approaches to patient care are adopted [75].

Employment contributes to overall well-being, self-esteem, and financial independence in patients with arthritis [75]. In the current study, employment was significantly positively related to mental quality of life in female patients with axSpA, while previously, it was found only in men with axSpA [28]. The surprising finding of a negative correlation between employment and MCS in male patients with PsA in the present study needs further investigation. In the current study, the pain was not related to mental quality of life; that was unexpected since pain is the critical determinant of long-term quality of life, where its cognitive interpretation can have significant implications for the patient's mental health [71].

Male and female patients with axial spondyloarthritis and psoriatic arthritis experience distinct differences in clinical and psychological symptoms and quality of life, which may have important practical implications. Screening for and monitoring anxiety, depression and general psychological distress that impairs daily functioning beyond the limits imposed by the disease should be part of rheumatologic practice. The preferred first-line psychological treatment for anxiety disorder and mild depression is cognitive-behavioural therapy employing a variety of techniques, including cognitive restructuring, exposure and behavioural experiments. Based on the findings of this study, psychological interventions should be gender-sensitive, addressing the distinct ways in which male and female patients experience chronic illness. Another implication of the present study is that medical research should systematically integrate gender differences into clinical trials, with the ultimate aim of developing comprehensive gender-adapted clinical guidelines.

There are some strengths and limitations to the present study. The study's main strength is the numerosity of the sample of patients with axial spondyloarthritis and psoriatic arthritis, with longer disease duration, minimizing the effect of possible acute stress reaction provoked by a diagnosis of arthritis. The second strength is the consideration of the broad scope of self-reported psychological and physical disease outcomes, providing a more comprehensive picture of the current disease state and the impact of the disease on daily life. The study's main limitation is a cross-sectional design that does not allow inferences on the temporal relationship between the analyzed variables, and, consequently, diminishes the strength of the study's conclusions. Further, since there was no follow-up of the patients, we cannot understand whether the difference in the explained variance reflects the difference between genders and diagnoses or the effect of an unrecognized confounding variable. The second limitation is the use of general questionnaires instead of specific instruments constructed for axial spondyloarthritis and psoriatic arthritis, such as the quality of life measures. The third limitation is that, even though comorbidity was included as a variable, a more subtle measure utilizing a comorbidity index (such as the Rheumatoid Arthritis Comorbidity Index) would enhance the overall analysis. Given that gender differences are commonly observed in the prevalence of various diseases [66], a thorough examination of the impact of comorbidities on gender disparities and quality of life would be beneficial. Future research should address our findings and limitations by conducting a longitudinal study with follow-up assessments and more specific instruments to draw more robust conclusions. The fourth limitation is that the study was conducted at a single center, limiting the results' external validity. Future research on this topic should be international and multicenter in order to draw more global conclusions from diverse populations, gain cross-cultural insights and enhance external validity.

Conclusions

The current study demonstrates that female patients with axial spondyloarthritis and psoriatic arthritis have worse scores in most psychological variables than men, representing worse health disease status. Furthermore, reduced physical and mental quality of life is mainly associated with fatigue, stress, pain, and anxiety. Based on these findings, therapeutic strategies for routine clinical practice should be adapted in order to improve patient well-being. By taking into account the clinical and psychological variables that reflect each patient's unique sex and gender differences, effective and individualized care can be provided.

Abbreviations

anti-TNF	Drugs anti-tumor necrosis factor drugs
ASAS	Assessment of spondyloarthritis international society
ASDAS-CRP	Ankylosing spondylitis disease activity score with c-reactive protein
axSpA	Axial spondyloarthritis
bDMARDs	Drugs biological disease-modifying antirheumatic drugs
BMI	Body mass index
CASPAR	Classification for psoriatic arthritis
CFQ	Chalder fatigue questionnaire
COPE-NVI	Coping orientation to the problems experiences-new Italian version
csDMARDs	Conventional synthetic disease-modifying antirheumatic drugs
DAPSA	Disease activity in psoriatic arthritis
HADS-A	Hospital anxiety and depression scale – anxiety
HADS-D	Hospital anxiety and depression scale – depression
HAQ-DI	Health assessment questionnaire – disability index
HRQoL	Health-related quality of life
MCS	Mental component score
NSAID	Treatment non-steroidal anti-inflammatory drug treatment
PSS	Perceived stress scale
PsA	Psoriatic arthritis
SF-3	6 Short Form health survey
tsDMARDs	Drugs targeted synthetic disease-modifying antirheumatic drugs
VAS	Visual analogue scale

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40359-025-02889-5>.

Additional file 1: Table 1: "Socio-demographic characteristics of the patients with spondyloarthritis and psoriatic arthritis, stratified and compared by gender". Description of the study sample. Table 2: "Clinical and treatment characteristics of patients with axial spondyloarthritis and psoriatic arthritis, stratified and compared by gender". Clinical variables such as disease activity, disease duration, comorbidity, family history of rheumatologic diseases, body mass index, erosions, radiographic progression and disability, and treatment variables such as rheumatological treatment, glucocorticoid treatment, NSAID treatment, and antidepressant therapy are presented. Table 3: "Univariate linear regression models by sex in spondyloarthritis [each cell contains % explained variance (only if the variable is significant at $p < 0.05$), Beta coefficient (p -value)]". Univariate linear regression models by sex in spondyloarthritis with each SF36 summary measure as the dependent variable and socio-demographic characteristics, clinical characteristics, treatment characteristics, and psychological characteristics as independent variables. Table 4: "Univariate linear regression models by sex in psoriatic arthritis [each cell contains % explained variance (only if the variable is significant at $p < 0.05$), Beta coefficient (p -value)]". Univariate linear regression models by sex in psoriatic arthritis with each SF36 summary measure as the dependent variable and socio-demographic characteristics, clinical characteristics, treatment characteristics, and psychological characteristics as independent variables. Table 5: "Checks for model assumptions referring to multivariate linear regression models in axial spondyloarthritis (Table 2 in the paper): Shapiro-Wilk test, Breusch-Pagan test, and Variance Inflation Factor (VIF)". Results checking the assumptions of multivariate linear regression models for males and females with axial spondyloarthritis. Table 6: "Checks for model assumptions referring to multivariate linear regression models in psoriatic arthritis (Table 3 in the paper): Shapiro-Wilk test, Breusch-Pagan test, and Variance Inflation Factor (VIF)". Results checking the assumptions of multivariate linear regression models for males and females with psoriatic arthritis.

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Authors' contributions

B.R., S.T., and C.B. conceptualized and designed the study. C.B. performed statistical analyses. B.R., S.T., and C.B. interpreted the data. B.R. wrote the first draft of the manuscript with substantial contributions from S.T. L.M. prepared tables. D.C. checked data quality. E.F., G.S., M.R., O.V. collected data. A.C. supervised data collection. All authors approved the final version of the manuscript.

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Data availability

The dataset supporting the conclusions of this article is available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study received ethical approval from the Ethics Committee of the Provinces of Verona and Rovigo (Ref. CESC15840, 2016). The investigation was conducted in accordance with the latest version of the Declaration of Helsinki [38]. All patients signed a written informed consent before the recruitment.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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