Sexual Quality of Life in Patients with Axial Spondyloarthritis in the Biologic Treatment Era

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ABSTRACT. ***Objective.*** To examine the relationship between demographics, disease-related variables, treatment, and sexual quality of life (SQOL) in men and women with axial spondyloarthritis (axSpA).

Methods. AxSpA patients were consecutively recruited from 2 rheumatology outpatient clinics in southern Norway. A broad spectrum of demographics, disease, treatment, and QOL data were systematically collected. SQOL was assessed using the SQOL-Female (SQOL-F) questionnaire (score range 18–108). Appropriate statistical tests were applied for group comparison, and the association between independent variables and SQOL-F was examined using multiple linear regression analysis.

Results. A total of 360 (240 men, 120 women) axSpA patients with mean age 45.5 years and disease duration 13.9 years were included. Seventy-eight percent were married/cohabiting, 26.7% were current smokers, 71.0% were employed, 86.0% performed > 1-h exercise per week, and 88.0% were HLA-B27–positive. Mean (SD) values for disease measures were C-reactive protein (CRP) 8.5 (12.1) mg/l, Bath Ankylosing Spondylitis Disease Activity Index 3.1 (2.1), Bath Ankylosing Spondylitis Global Score (BAS-G) 3.8 (2.5), Bath Ankylosing Spondylitis Functional Index 2.7 (2.2), and Health Assessment Questionnaire 0.6 (0.5). The proportion of patients using nonsteroidal antiinflammatory drugs was 44.0%, synthetic disease-modifying antirheumatic drugs (DMARD) 5.0%, and biologic DMARD 24.0%. Mean (SD) total sum score for SQOL was 76.6 (11.3). In multivariate analysis, female sex, increased body mass index, measures reflecting disease activity (BAS-G and CRP), and current biologic treatment were independently associated with a lower SQOL.

Conclusion. Our data suggest that inflammation in patients with axSpA even in the biologic treatment era reduces SQOL. (J Rheumatol First Release April 1 2019; doi:10.3899/jrheum.180413)

Key Indexing Terms:
AXIAL SPONDYLOARTHRITIS
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Axial spondyloarthritis (axSpA) is a chronic, systemic inflammatory rheumatic disease affecting the axial skeleton[1]. AxSpA most often has its onset in early adulthood, which is an important time in life when most people start relationships and prepare for and start their career[2]. The characteristics of the disease may affect quality of life (QOL)[3]. QOL is a broad concept that is both subjective and multidimensional, and has psychological, social, and spiritual dimensions[4]. The physical and psychological consequences of a chronic disease such as axSpA may influence all dimensions of QOL, including sexual function and sexual perception, in a lifelong perspective. Sexual QOL (SQOL) is not clearly defined in the literature; however, it includes the relationship between sexual dysfunction and QOL[3,5]. Sexual activity and enjoyment are components of the physical and psychological dimensions of QOL. Further, sexual activity as part of reproduction is considered one of the key functions of human beings, with its effect on QOL. According to the World Health Organization, sexual health is defined as a state of physical, emotional, mental, and social well-being in relation to sexuality[6].

The literature has focused mainly on dysfunction or sexual problems[7,8,9]. In the present study, we aimed to focus on the quality and patients' perception of SQOL, investi-

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gating the relationship between SQOL and demographics, disease-related variables, and treatment in men and women with axSpA.

MATERIALS AND METHODS

Patient recruitment. The patients with axSpA included in this cross-sectional study were consecutively recruited when visiting the outpatient rheumatology clinics at Martina Hansens Hospital (MHH) and Sorlandet Hospital (SSHF), Norway. To be included, the patients had to be 18 years or older and fulfill the Assessment of Spondyloarthritis international Society (ASAS) criteria for axSpA[10]. Patients had to be in a physical and mental condition in which they were capable to give confirmed consent, and understand written and vocal Norwegian language.

Data collection. A broad range of demographic characteristics, disease, treatment, and QOL data were systematically collected, partly by using patient questionnaires, direct interviews, physical examination, and laboratory tests. Demographic data included age, sex, body mass index (BMI), smoking status (current smoker, previous smoker, and nonsmoker), alcohol consumption (never, 1–6 glasses, ≥ 7 glasses/week), education (education < 10 yrs, 11–13 yrs, and > 13 yrs), work status (employed and unemployed), and physical exercise (< 1 h/week and > 1 h/week). Previous smokers were considered as nonsmokers. Disease duration was defined as the time between the date fulfilling the ASAS criteria for axSpA and the date for inclusion in the study. HLA-B27 status was registered. Data on comorbidities were recorded by nurse interview and by reviewing medical records and included the following: cardiovascular diseases, pulmonary diseases, neurological disorders, endocrine disorders, hematological disorders, gastrointestinal disorders, urogenital disorders, peripheral arthritis, cancer, and mental disorders; these data were integrated into a sum score to reflect comorbidity.

Disease activity was assessed by the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), 68 tender and 66 swollen joint counts, Maastricht Ankylosing Spondylitis Enthesitis Score (MASES), and C-reactive protein (CRP). Physical function was assessed by Bath Ankylosing Spondylitis Functional Index (BASFI) and the Health Assessment Questionnaire (HAQ). To measure damage, the Bath Ankylosing Spondylitis Metrology Index (BASMI) was used. Data on Bath Ankylosing Spondylitis Global Score (BAS-G) and morning stiffness were also collected. Current medication was registered, including nonsteroidal antiinflammatory drugs (NSAID), synthetic disease-modifying antirheumatic drugs (sDMARD), and biologic DMARD (bDMARD).

Health-related QOL (HRQOL) was assessed by the Medical Outcomes Study Short Form-36 (SF-36), a self-reported and generic questionnaire assessing 8 domains: general health, bodily pain, physical function, role limitations (physical), mental health, vitality, social function, and role limitations (emotional). The 8 domains can be combined into a physical and mental sum scale that reflects physical and mental health. The physical component summary (PCS) and the mental component summary (MCS) scales were used in this study[11].

SQOL was assessed using the generic SQOL-Female (SQOL-F) questionnaire developed to study the relationship between female patients and SQOL[5]. A modified version of SQOL-F was also used for men[12]. SQOL-F can also be used on partners, with minor modifications[5]. In our study, we changed the fourth question to "When I think about my sex life, I feel less of a woman/man." The questionnaire was translated into Norwegian by Mapi Research Trust in 2006. SQOL consists of 18 items, rated on a 6-point response scale: completely agree, moderately agree, slightly agree, slightly disagree, moderately disagree, completely disagree. The response categories are scored 1–6, giving a total score range of 18–108. A higher score indicates better SQOL[5]. In this paper we also have used subscores, identified and validated by Maasoumi, *et al*[3] based on the Symonds SQOL-F questionnaire, which reflects various aspects or dimensions of SQOL as shown in Table 1. All data were collected on the same day for each patient.

Statistical analyses. Statistical analyses were performed using IBM SPSS Statistics (version 24; IBM). Continuous variables are presented as the mean with SD and categorical variables as numbers and percentages. For group comparison we used chi-square for categorical variables, and independent t test and Pearson correlation for continuous variables.

Linear regression analysis (general linear model) in SPSS was used to examine the univariate/unadjusted and adjusted association between demographic- and disease-related variables, and for SQOL (SQOL-F) total score and subscores. The independent variables in the multiple analyses were chosen based on $p < 0.1$ in the univariate analyses (demographic, comorbidity, disease activity measures, health status, and current treatment in Table 2), and also adjusted for age and sex. Analyses were also performed with and without the HRQOL SF-36 measures in the model.

In the final multivariate model, we included demographic variables, disease activity (assessed by BASDAI and MASES scores), health status (assessed by HAQ, BASFI, and BAS-G scores), damage (assessed by BASMI score), comorbidity, and treatment center. For robustness, we also tested the multiple regression models by using forward and backward procedure. Cronbach's alpha test was used to examine the reliability of the SQOL-F questionnaire with its total score and its subscores. The level of significance was set at $p < 0.05$.

Ethical and legal aspects. The study was approved by the Regional Committee for Medical Research Ethics in Norway (REK no.: 4.2007.2152). All patients gave written informed consent before inclusion.

RESULTS

Demographic and disease-related characteristics. A total of 389 patients with axSpA were consecutively recruited at the 2 participating rheumatology outpatient clinics. Among them, 29 patients (MHH 10 and SSHF 19 patients) did not answer the SQOL-F questionnaire. The significant differences between responders and nonresponders on SQOL were that responders had a higher consumption of alcohol ($p = 0.033$), were more often employed ($p = 0.003$), exercised more ($p = 0.038$), and were more often cohabitant ($p < 0.001$).

Cronbach's alphas in our study expressing reliability of the test were 0.75 for the SQOL-F total score, 0.91 (excellent) for psychosexual feelings, 0.82 (good) for sexual and relationship satisfaction, 0.82 (good) for self-worthlessness, and 0.60 (questionable) for sexual repression.

Statistically significant differences for mean (SD) between patients at MHH (n = 246) and SSHF (n = 114) were found for BASDAI [2.9 (2.0) vs 3.6 (2.0), $p = 0.02$], BAS-G [3.6 (2.5) vs 4.3 (2.6), $p = 0.015$], MASES [2.4 (2.9) vs 4.9 (4.76), $p < 0.001$], and the sum score of comorbidities [0.8 (1.0) vs 0.4 (0.7), $p < 0.001$]. Further, more MHH patients than SSHF patients were treated with bDMARD (29.7% vs 9.0%, $p < 0.001$). For HRQOL, measured by SF-36, a statistically significant better PCS was found among MHH patients compared to SSHF patients [40.7 (9.1) vs 37.9 (9.8), $p = 0.011$]. For the other variables listed in Table 2, no significant differences were seen between the 2 centers. For the present analysis, the results are presented as pooled data from both hospitals and adjusted for center in multivariable analyses.

In Table 2, data are shown for all patients with axSpA (n = 360) included in the SQOL analyses and for men (n = 240) and women (n = 120) separately. The mean age for

Table 1. Subcategories in the Sexual Quality of Life–Female (SQOL-F) questionnaire[3].

Category	SQOL-F Questions (Question No.)	Range	High Score Indicates Positive/Negative Direction
Psychosexual feelings	Frustrated (2) Depressed (3) Anxious (7) Angry (8) Worry (10) Worry of partner's hurt or rejection (16) Feeling like losing something (17)	7–42	Positive
Sexual and relationship satisfaction	Enjoy (1) Good feeling about oneself (5) Closeness to partner (9) Talk to partner about sexual matters (13) Satisfaction with frequency of sexual activity (18)	5–30	Negative
Self-worthlessness	Feeling like less of a woman/man (4) Losing confidence (6) Feeling of guilt (15)	3–18	Positive
Sexual repression	Loss of pleasure (11) Embarrassed (12) Avoiding (14)	3–18	Positive

all patients was 45.5 years (11.9); 67.0% were men and 33.0% women, 78.0% were married or cohabiting, and 86.0% reported exercising > 1 h per week. Mean (SD) values for disease measures were as follows: BASDAI 3.1 (2.06), MASES 3.2 (3.67), BASFI 2.7 (2.21), BAS-G 3.8 (2.53), and HAQ 0.6 (0.49). Among patients, 88.0% were HLA-B27–positive; current users of NSAID were 44.0%, of sDMARD 5.0%, and of bDMARD 24.0%. Only 3 patients treated were concomitantly treated with bDMARD and sDMARD. When comparing men and women with axSpA (Table 2), women had a significantly lower BMI [25.4 (4.4) vs 27.5 (4.5) kg/m^2, $p < 0.001$]. Women had higher MASES scores [4.5 (3.8) vs 2.5 (3.4), $p < 0.001$], lower BASMI [2.0 (1.6) vs 2.6 (2.2), $p = 0.005$], and higher HAQ [0.6 (0.5) vs 0.5 (0.5), $p = 0.025$]. For the other variables listed in Table 2, no statistically significant differences were found between men and women, including HRQOL measures.

Bivariate correlation between demographic and clinical background variables showed a strong correlation ($r = > 0.5$) between age and disease duration ($p < 0.001$), morning stiffness and BASDAI ($p < 0.001$), morning stiffness and MASES ($p = 0.045$), BASFI and BASDAI ($p < 0.001$), BASDAI and BAS-G, HAQ, PCS, and MCS ($p < 0.001$), BASFI and BAS-G, HAQ, PCS, and MCS ($p < 0.001$), BAS-G and MASES ($p < 0.001$), and HAQ and MASES ($p < 0.001$).

Further, we identified moderate correlation ($r = 0.3$–0.5) between age and sum comorbidity ($p < 0.001$), work and sum comorbidity ($p < 0.001$), work and BASFI ($p < 0.001$), HAQ and PCS ($p < 0.001$), work and sum comorbidity ($p < 0.001$), work and BASFI ($p < 0.001$), BASMI and disease duration ($p < 0.001$), BASMI and BASFI ($p < 0.001$), BASFI and morning stiffness ($p < 0.001$), and BASDAI and MCS ($p < 0.001$). Weak and negligible correlations are not shown.

SQOL data. Total SQOL score and subscores for domains for all patients and for men and women separately are shown in Table 3. When comparing SQOL between MHH and SSHF, patients from MHH reported lower subscores for psychosexual feelings [32.6 (8.7) vs 34.7 (7.4), $p = 0.019$], self-worthlessness [15.3 (3.6) vs 16.2 (2.8), $p = 0.005$], and sexual repression [14.9 (3.8) vs 16.0 (3.3), $p = 0.004$], and higher scores for sexual and relationship satisfaction [13.4 (6.2) vs 10.8 (4.4), $p < 0.001$].

As shown in Table 3, compared to men, women reported a significantly lower SQOL sum score [74.7 (11.9) vs 77.6 (10.9), $p = 0.026$] and a lower score for sexual repression [14.4 (4.1) vs 15.6 (3.4), $p = 0.005$; higher score is positive], whereas for the other sub-domains in SQOL, no significant differences were found between sexes.

Unadjusted association between demographic- and disease-related variables and SQOL. In Table 4 univariate/unadjusted associations are shown for SQOL-F sum score and for SQOL-F subscores. As shown, employment status, increased comorbidity score, BASDAI, BASMI, morning stiffness, BASFI, BAS-G, HAQ, CRP, and bDMARD were associated with a reduced SQOL-F score, whereas male sex and the SF-36 PCS and MCS were associated with a higher SQOL score.

Adjusted associations between demographic- and disease-related variables and SQOL. In the multivariate analyses presented in Table 5 (without SF-36 measure in the model), these were independently associated with a higher SQOL total score: male sex (B = 4.2, $p = 0.014$), low BMI

Table 2. Demographic data, disease markers, disease activity measures, damage, health status, treatment, and comorbidity in 360 patients with axial spondyloarthritis.

Characteristics	All, n = 360	Women, n = 120	Men, n = 240	p
Demographics				
Age, yrs	45.5 (11.9)	45.0 (12.0)	46.0 (12.0)	0.797
Living alone, n (%)	282 (78)	91 (76)	191 (80)	0.374
BMI, kg/m^2	26.9 (4.6)	25.4 (4.4)	27.5 (4.5)	< 0.001
Current smoker, yrs, n (%)	96 (27)	32 (27)	64 (27)	0.966
Alcohol, n (%)				0.051
Never	64 (18)	29 (24)	35 (15)	
1–6 glasses	254 (71)	81 (68)	173 (73)	
≥ 7 glasses	38 (11)	9 (8)	29 (12)	
Education, yrs, n (%)				0.644
< 10	38 (11)	13 (11)	25 (11)	
11–13	116 (32)	35 (29)	81 (34)	
> 13	204 (57)	72 (60)	132 (56)	
Employed/self-employed, n (%)	256 (71)	78 (68)	178 (77)	0.090
Exercise > 1 h/week, n (%)	309 (86)	105 (88)	204 (86)	0.510
Disease duration, yrs	14.0 (11.3)	12.6 (11.0)	14.8 (11.0)	0.082
Comorbidity, total score (range 0–10)	0.7 (0.9)	0.8 (0.9)	0.7 (0.9)	0.525
Disease marker				
HLA-B27–positive (n = 349), n (%)	316 (88)	100 (86)	216 (93)	0.051
Disease activity measures				
CRP, mg/l	8.5 (12.1)	7.7 (13.0)	8.9 (11.0)	0.424
68 tender joint count	0.39 (1.7)	0.33 (1.0)	0.22 (2.0)	0.398
66 swollen joint count	0.10 (0.6)	0.06 (0.3)	0.12 (0.7)	0.254
BASDAI (0–10)	3.1 (2.1)	3.4 (2.0)	3.0 (2.0)	0.080
MASES enthesitis score	3.2 (3.7)	4.5 (3.8)	2.5 (3.4)	< 0.001
Damage				
BASMI (0–10)	2.4 (2.0)	2.0 (1.6)	2.6 (2.2)	0.005
Health status				
Morning stiffness, min, n (%)				
< 30	215 (61)	69 (60)	146 (62)	0.667
> 31	137 (39)	47 (40)	90 (38)	
BASFI (0–10)	2.7 (2.2)	2.7 (2.2)	2.7 (2.2)	0.754
BAS-G (0–10)	3.8 (2.5)	4.0 (2.4)	3.8 (2.6)	0.539
HAQ (0–3)	0.6 (0.5)	0.6 (0.5)	0.5 (0.5)	0.025
Health-related QOL				
SF-36 PCS	39.8 (9.4)	38.8 (9.1)	40.3 (9.6)	0.163
SF-36 MCS	48.4 (10.4)	47.9 (10.3)	48.6 (10.4)	0.569
Current treatment, n (%)				
NSAID	159 (44)	57 (48)	102 (43)	0.368
Synthetic DMARD	17 (5)	7 (6)	10 (4)	0.482
Biologic DMARD	85 (24)	22 (18)	63 (26)	0.095

Continuous variables are presented as mean (SD) and categorical variables as n (%). Chi-square was used to compare categorical data and independent t tests for continuous variables. BMI: body mass index; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; MASES: Maastricht Ankylosing Spondylitis Enthesitis Score; CRP: C-reactive protein; BASFI: Bath Ankylosing Spondylitis Functional Index; BASMI: Bath Ankylosing Spondylitis Metrology Index; HAQ: Health Assessment Questionnaire; QOL: quality of life; BAS-G: Bath Ankylosing Spondylitis Global Score; SF-36 PCS: Medical Outcomes Study Short Form-36 physical component summary; MCS: mental component summary; NSAID: nonsteroidal antiinflammatory drugs; DMARD: disease-modifying antirheumatic drugs.

(B = –0.4, p = 0.034), low CRP (B = –0.15, p = 0.026), low BAS-G (B = –1.7, p = 0.002), and nonuse of bDMARD (B = 6.4 , p < 0.001). Male sex (B = 2.44, p = 0.045), low BMI (B = –0.29, p = 0.015), low BAS-G (B = –1.36, p < 0.001), and nonuse of bDMARD (B = 3.91, p = 0.003) were independently associated with high scores in psychosexual feelings. Living alone (B = 3.11, p = 0.001) and high BAS-G (B = 0.65, p = 0.016) were independently associated with high scores in sexual relationship satisfaction. Male sex (B = 1.11, p = 0.027), low BMI (B = –0.11, p = 0.021), low CRP (B = –0.05, p = 0.015), low BAS-G (B = –0.49, p = 0.002), and non-use of bDMARD (B = 1.89, p < 0.001) were independently associated with a high score on self-worthlessness. These variables were independently associated with high sexual repression: young age (B = –0.05, p = 0.014), male sex (B = 1.37, p = 0.012), low CRP (B = –0.05, p = 0.017), low BAS-G (B = –0.42, p = 0.013), and nonuse of bDMARD (B = 1.17, p = 0.044). The

Table 3. Sexual quality of life (SQOL) assessed by the SQOL questionnaire in 360 patients with axial spondyloarthritis.

Variables	All, n = 360	Women, n = 120	Men, n = 240	p
SQOL sum score (range 18–108)	76.6 (11.3)	74.7 (11.9)	77.6 (10.9)	0.026
Psychosexual feelings (range 7–42)	33.3 (8.3)	32.2 (8.9)	33.8 (8.0)	0.087
Sexual and relationship satisfaction(range 5–30)	12.5 (5.8)	12.9 (6.2)	12.3 (5.6)	0.361
Self-worthlessness (range 3–18)	15.6 (3.4)	15.1 (3.5)	15.7 (3.3)	0.112
Sexual repression (range 3–18)	15.2 (3.7)	14.4 (4.1)	15.6 (3.4)	0.005

Data presented as SQOL sum score and SQOL subscores, for all and for men and women separately. Independent t tests were used when comparing the groups. Continuous variables are expressed as mean (SD).

demographic- and disease-related variables included in the multiple analyses explained 16.5% of the variance in SQOL-F sum, 16.7% in psychosexual feelings, 9.7% in sexual relationship satisfaction, 16.9% in self-worthlessness, and 16.3% in sexual repression. The same pattern of associations was seen when the multivariate model was performed with the forward and backward procedure (data not shown). Further, only minor differences in the results were seen when SF-36 measures were included in the model (data not shown).

DISCUSSION

The main finding of our study is that SQOL is impaired in patients with active axSpA, as indicated by association with elevated BAS-G and CRP. Further use of bDMARD was also associated with impaired SQOL. Among demographic variables, we found that female sex and increased BMI were independently associated with impaired SQOL.

Minor differences between sexes were identified, with men reporting about a 3% higher total score on SQOL than women. Except for a higher score for sexual repression in men, no significant differences between the sexes were found for the other subcategories. As in other studies, men are more likely to report feeling positive about their sexual life, self-confidence in their ability to perform well in a sexual relationship, and having value as a sexual partner[3,5].

Depression analysis was not performed in our study, but the SF-36 summary scales (MCS and PCS) show no significant differences in MCS between men and women. Several factors may contribute to lower SQOL in women, one being lower self-confidence. An increased BMI can lead to low self-confidence[13]; women experience increased BMI more often than men[14]. Differences between the sexes in the clinical presentation of axSpA, such as more fatigue and enthesitis in women, may also account for SQOL differences[15,16]. In our study, women reported more enthesitis than men and may have had more pain from enthesitis, resulting in reduced SQOL. Studies in patients with SpA[17] and RA have also found a greater effect of disease symptoms on sexual activity in female patients[16]. Further, women and men are different in how they present their health status and communicate their health problems[18]. This may influence the way they answer questionnaires. In contrast to our results, van Berlo, *et al* observed in a study with rheumatoid arthritis patients a stronger correlation between sexual problems, physical health, and disease activity in men than in women, but there were no sex differences regarding sexual satisfaction[19]. Differences observed between studies may partly be explained by various levels of disease activity, which in general were low in our study.

An increased level of CRP reflecting inflammatory activity was negatively associated with total SQOL and with 2 of 4 subscales: self-worthlessness and sexual repression. BAS-G was the only self-reported disease variable significantly associated with SQOL, indicating that axSpA may markedly reduce well-being and SQOL. High disease activity may make the patient lose confidence as a sexual partner and feel less attractive as a woman or man. Grief and shame over being disabled may raise feelings of guilt or resentment, which could also strain the relationship[5,16]. However, in our study, BASMI, mainly reflecting damage to the spine, was significantly higher in men than in women (2.6 vs 2.0, respectively), indicating a higher damage score in men compared with women.

In our study, current use of bDMARD was independently associated with a negative total SQOL-F score and the SQOL-F subscale scores, except in sexual relationship satisfaction. Good disease control achieved by bDMARD has been reported to improve physical and psychological outcomes in both ankylosing spondylitis (AS) and axSpA patients[20,21,22]. In our study, bDMARD were used by 24% of the patients but only by 11.6% in the study by Healey, *et al*[20]. In our study, fewer female than male patients used bDMARD (18% in women and 26% in men). One explanation may be that the indication for prescribing anti-tumor necrosis factor (anti-TNF) treatment was first approved for patients with radiological axSpA and AS, diseases with male predominance. Later on, the indication for anti-TNF treatment also included patients diagnosed with nonradiographic axSpA, which has a more equal sex distribution than AS[23,24]. In our study, current use of bDMARD was independently associated with a negative total SQOL-F and the SQOL-F subscales, except for sexual relationship satisfaction. This is most likely explained by the cross-sectional study design, which did not allow for drawing conclusions about causality. In the present study, the use of bDMARD might be a marker of disease activity that does not reflect a causal negative effect of bDMARD on SQOL.

Table 4. Univariate associations between demographic data, disease markers, disease activity measures, damage, health status, treatment, comorbidity, and SQOL (measured by SQOL questionnaire) total score and subscores examined in 360 patients with axial spondyloarthritis.

Variables	SQOL-F Sum, range 18–108, B (95% CI)	p	Psychosexual, range 7–42, B (95% CI)	p	Sexual and Relationship Satisfaction, range 5–30, B (95% CI)	p	Self–worthlessness, range 3–18, B (95% CI)	p	Sexual Repression, range 3–18, B (95% CI)	p
Age, yrs	–0.49 (–0.15 to 0.05)	0.328	–0.01 (–0.08 to 0.06)	0.795	0.038 (–0.01 to 0.09)	0.142	–0.02 (–0.05 to 0.01)	0.148	–0.06 (–0.09 to –0.02)	< 0.001
Male	3.04 (0.56–5.51)	0.017	1.76 (–0.07 to 3.59)	0.059	–0.66 (–1.95 to 0.62)	0.310	0.64 (–0.10 to 1.39)	0.088	0.128 (0.48–2.08)	0.002
Living alone	0.49 (–2.38 to 3.36)	0.736	–1.18 (–3.28 to 0.93)	0.273	2.77 (1.32–4.21)	< 0.001	–0.57 (–1.42 to 0.28)	0.188	–0.52 (–1.45 to 0.42)	0.275
BMI, kg/m^2	–0.27 (–0.57 to 0.02)	0.071	–0.17 (–0.38 to 0.04)	0.108	0.06 (–0.09 to 0.20)	0.443	–0.09 (–0.18–0.01)	0.035	–0.06 (–0.16 to 0.03)	0.207
Nonsmoker	–0.12 (–2.79 to 2.55)	0.929	–0.38 (–2.34 to 1.59)	0.706	–0.46 (–1.82 to 0.90)	0.505	0.47 (–0.33 to 1.26)	0.249	–0.25 (–0.62 to 1.11)	0.580
Alcohol, per week										
Never	–0.58 (–5.13 to 3.98)	0.803	0.95 (–2.40 to 5.95)	0.576	–1.25 (–3.58 to 1.07)	0.290	0.36 (–0.98 to 1.70)	0.599	–0.53 (–2.00 to 0.94)	0.480
1–6 glasses	2.46 (–1.41 to 6.33)	0.212	3.10 (0.26–5.95)	0.033	–2.69 (–4.67 to –0.72)	0.008	1.43 (0.29–2.57)	0.014	0.62 (–0.63 to 1.87)	0.329
≥ 7 glasses	Ref.		Ref.		Ref.		Ref.		Ref.	
Education, yrs										
< 10	–2.51 (6.45–1.43)	0.211	–0.31 (–3.22 to 2.59)	0.832	0.21 (–1.82 to 2.24)	0.840	–1.25 (–2.42 to –0.08)	0.037	–1.15 (–2.42 to 0.13)	0.079
11–13	0.52 (–2.08 to 3.11)	0.696	0.86 (1.05–2.77)	0.377	–0.16 (–1.50 to 1.17)	0.811	–0.15 (–0.92 to 0.62)	0.710	–0.02 (–0.87 to 0.82)	0.956
> 13	Ref.		Ref.		Ref.		Ref.		Ref.	
Unemployed/self-employed	–3.64 (–6.4 to 9.4)	0.008	–3.64 (–6.34 to –0.94)	0.008	0.98 (–0.40 to 2.36)	0.162	–0.80 (–1.62 to 0.01)	0.053	–1.41 (–2.29 to –0.54)	0.002
Exercise < 1 h/week	–3.12 (–6.58 to 0.33)	0.076	–1.90 (–4.44 to 0.64)	0.143	0.63 (1.15–2.41)	0.487	–0.66 (–1.69 to 0.37)	0.209	–1.19 (–2.31 to –0.06)	0.038
Disease duration, yrs	–0.01 (–0.11 to 0.10)	0.918	0.02 (–0.06 to 0.10)	0.612	0.04 (–0.02 to 0.09)	0.161	–0.02 (–0.05 to 0.01)	0.160	–0.04 (–0.08 to –0.01)	0.019
Comorbidity, total score (range 0–10)	–1.96 (–3.12 to –0.70)	0.002	–1.29 (–2.22 to –0.36)	0.007	0.85 (0.21–1.50)	0.010	–0.59 (–0.96 to –0.22)	0.002	–0.92 (–1.32 to –0.52)	< 0.001
Disease marker										
HLA-B27–positive, n = 349	2.15 (–1.96 to 6.27)	0.304	1.93 (–1.09 to 4.96)	0.210	–0.22 (–2.31 to 1.88)	0.839	–0.04 (–1.24 to 1.17)	0.953	0.54 (–0.78 to 1.86)	0.423
Disease activity measures										
CRP (mg/l)	–0.06 (–0.16 to 0.04)	0.264	–0.05 (–0.12 to 0.03)	0.201	0.05 (–0.01 to 0.10)	0.077	–0.03 (–0.06 to 0.00)	0.091	–0.03 (–0.06 to 0.00)	0.069
68 tender joint count	–3.2 (–1.01 to 0.36)	0.354	–0.14 (–0.64 to 0.37)	0.596	–0.94 (–0.55 to 0.16)	0.279	–0.02 (–0.23 to 0.18)	0.829	0.03 (–0.19 to 0.25)	0.791
66 swollen joint count	–1.65 (–3.58 to 0.29)	0.095	–0.59 (–2.02 to 0.84)	0.418	–0.43 (–1.43 to 0.56)	0.392	–0.38 (–0.96 to 0.20)	0.198	–0.24 (–0.88 to 0.39)	0.450
BASDAI (0–10)	–1.36 (–1.92 to –0.80)	< 0.001	–1.08 (–1.48 to –0.67)	< 0.001	0.37 (0.08–0.66)	0.012	–0.31 (–0.47 to –0.14)	< 0.001	–0.35 (–0.54 to –0.17)	< 0.001
MASES enthesitis score	–0.27 (–0.59 to 0.05)	0.100	–0.183 (–0.42 to 0.05)	< 0.001	–0.06 (–0.23 to 0.10)	0.443	–0.03 (–0.13 to 0.07)	0.550	0.01 (–0.10 to 0.11)	0.889
Damage										
BASMI (0–10)	–0.76 (–1.34 to –0.17)	0.011	–0.42 (–0.85 to 0.01)	0.058	0.19 (–0.11 to 0.49)	0.223	–0.27 (–0.44 to –0.10)	0.002	–0.26 (–0.45 to –0.07)	0.009
Health status										
Morning stiffness, min										
< 30	3.01 (0.57–5.45)	0.016	2.46 (0.66–4.25)	0.007	–0.62 (–1.87 to 0.64)	0.335	0.46 (0.27–1.16)	0.219	0.73 (–0.06 to 1.53)	0.071
> 31	Ref.		Ref.		Ref.		Ref.		Ref.	
BASFI (0–10)	–1.27 (–1.79 to –0.76)	< 0.001	–0.91 (–1.29 to –0.53)	< 0.001	0.36 (0.09–0.63)	0.010	–0.36 (–0.52 to –0.21)	< 0.001	–0.36 (–0.53 to –0.19)	< 0.001
BAS-G (0–10)	–1.28 (–1.73 to –0.03)	< 0.001	–1.00 (–1.33 to –0.67)	< 0.001	0.38 (0.14–0.61)	0.002	–0.32 (–0.45 to –0.18)	< 0.001	–0.34 (–0.49 to –0.20)	< 0.001
HAQ (0–3)	–4.32 (–6.69 to –1.95)	< 0.001	–3.42 (–5.26 to –1.68)	< 0.001	1.67 (0.44–2.90)	0.008	–1.14 (–1.85 to –0.43)	0.002	–1.44 (–2.22 to –0.67)	< 0.001
Health-related QOL										
SF-36 PCS	0.20 (0.07–0.32)	0.002	0.16 (0.07– 0.25)	0.001	–0.05 (–0.11 to 0.02)	0.164	0.04 (0.00–0.08)	0.035	0.05 (0.00–0.09)	0.030
SF-36 MCS	0.34 (0.23–0.45)	< 0.001	0.29 (0.21–0.37)	< 0.001	–0.17 (–0.23 to –0.11)	< 0.001	0.10 (0.07–0.14)	< 0.001	0.12 (0.08–0.15)	< 0.002
Current treatment										
NSAID last 10 days	0.23 (–2.16 to 2.60)	0.847	0.09 (–1.65 to 1.84)	0.916	0.15 (–1.06 to 1.37)	0.804	0.06 (–0.64 to 0.77)	0.859	–0.09 (–0.86 to 0.68)	0.817
Synthetic DMARD	2.18 (–3.35 to 7.72)	0.438	1.58 (–2.50 to 5.65)	0.448	–0.99 (–3.83 to 1.86)	0.497	1.02 (–0.62 to 2.67)	0.223	0.56 (–1.24 to 2.37)	0.539
Biologic DMARD	3.46 (0.72–6.20)	0.014	2.19 (0.16– 4.22)	0.034	–0.77 (–2.19 to 0.65)	0.289	1.35 (0.54–2.16)	0.001	0.68 (–0.22 to 1.58)	0.139

Univariate associations were performed using general linear model B (95% CI). SQOL: sexual quality of life; SQOL-F: SQOL-Female questionnaire; BMI: body mass index; CRP: C-reactive protein; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; MASES: Maastricht Ankylosing Spondylitis Enthesitis Score; BASFI: Bath Ankylosing Spondylitis Functional Index; BAS-G: Bath Ankylosing Spondylitis Global Score; BASMI: Bath Ankylosing Spondylitis Metrology Index; HAQ: Health Assessment Questionnaire; SF-36 PCS: Medical Outcomes Study Short Form-36 physical component summary; MCS: mental component summary; NSAID: nonsteroidal antiinflammatory drugs; DMARD: disease-modifying antirheumatic drugs.

Table 5. Independent associations between demographic data, disease markers, disease activity measures, damage, health status, treatment, comorbidity, and sexual quality of life (measured by SQOL questionnaire) explored in 360 patients with axial spondyloarthritis.

Variables	SQOL-F Sum, range 18–108, Adj B (95% CI)	p	Psychosexual, range 7–42, Adj B (95% CI)	p	Sexual and Relationship Satisfaction, range 5–30, Adj B (95% CI)	p	Self–worthlessness, range 3–18, Adj B (95% CI)	p	Sexual Repression, range 3–18, Adj B (95% CI)	p
Demographics										
Age, yrs	–0.04 (–0.18 to 0.09)	0.521	0.02 (–0.12 to 0.08)	0.689	0.06 (0.01–0.13)	0.099	–0.03 (0.07–0.01)	0.189	–0.05 (–0.10 to 0.01)	0.014
Male	4.22 (0.85–7.59)	0.014	2.44 (0.06–4.83)	0.045	–0.86 (–2.57 to 0.84)	0.319	1.11 (0.13–2.10)	0.027	1.37 (0.30–2.43)	0.012
Living alone	1.47 (–2.18 to 5.13)	0.428	–0.95 (–3.54 to 1.64)	0.471	3.11 (1.26–4.95)	0.001	–0.19 (–1.25 to 0.087)	0.722	–0.23 (–1.37 to 0.92)	0.694
Employed/ self-employed	–0.45 (–4.04 to 3.15)	0.807	–0.01 (–2.55 to 2.54)	0.997	–0.81 (–2.63 to 1.01)	0.379	0.16 (0.89–1.22	0.764	–0.04 (–1.18 to 1.10)	0.946
Education, yrs										
< 10	–2.51 (–7.61 to 2.60)	0.334	–1.23 (–4.84 to 2.39)	0.054	1.01 (–1.57 to 3.59)	0.440	–1.06 (–2.53 to 0.042)	0.160	–0.86 (–2.47 to 0.34)	0.289
11–13	1.21 (–1.99 to 4.42)	0.458	0.97 (–1.31 to 3.24)	0.403	–0.08 (–1.70 to 1.54)	0.926	–0 to 42 (–0.98 to 0.90)	0.930	0.34 (–0.68 to 1.36)	0.511
> 13	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Exercise < 1 h/week	–3.79 (–7.93 to 0.35)	0.072	–1.93 (–4.86 to 1.00)	0.196	0.05 (–2.02 to 2.14)	0.961	–0.54 (–1.75 to 0.07)	0.377	–1.17 (–2.48 to 0.14)	0.080
Current smoker	–1 to 33 (–4.63 to 1.97)	0.427	–1.48 (–3.81 to 0.87)	0.218	0.11 (–1.57 to 1.78)	0.901	–0.05 (–1.01 to 0.92)	0.924	0.12 (–0.93 to 1.17)	0.821
Alcohol, per week										
Never	–0.34 (–6.15 to 5.47)	0.908	–1.02 (–5.13 to 3.10)	0.626	1.54 (–1.39 to 4.48)	0.302	–0.31 (–2.01 to 1 to 38)	0.717	–0.40 (–2.24 to 1.44)	0.667
1–6 glasses	2.23 (–2.64 to 7.11)	0.367	1.24 (–2.21 to 4.69)	0.480	–0.51 (–2.97 to 1.95)	0.683	0.93 (–0.51 to 2.36)	0.204	0.60 (–0.96 to 2.15)	0.451
≥ 7 glasses	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
BMI (kg/m^2)	–0.36 (–0.69 to –0.03)	0.034	–0.29 (–0.52 to 0.06)	0.015	0.15 (–0.2 to 0.32)	0.075	–0.11 (–0.21 to 0.02)	0.021	–0.09 (–0.20 to 0.01)	0.088
Disease activity measures										
BASDAI (range 0–10)	–0.14 (–1.42 to 1.14)	0.829	–0.35 (–1.25 to 0.56)	0.455	0.17 (–0.48 to 0.82)	0.601	0.04 (–0.34 to 0.42)	0.840	0.02 (–0.40 to 0.42)	0.967
MASES (range 0–13)	0.11 (–0.34 to 0.55)	0.639	0.03 (–0.29 to 0.34)	0.863	–0.10 (–0.33 to 0.12)	0.367	0.07 (–0.06 to 0.20)	0.291	0.10 (–0.06 to 0.24)	0.182
CRP, mg/dl	–0.15 (–0.29 to –0.02)	0.026	–0.9 (–0.19 to 0.003)	0.059	0.04 (–0.03 to 0.11)	0.224	–0.05 (–0.09 to –0.01)	0.015	–0.05 (–0.19 to –0.01)	0.017
Health status										
BASFI (range 0–10)	0.14 (–1.41 to 1.69)	0.857	0.52 (–0.57 to 1.62)	0.348	–0.56 (–1.34 to 0.23)	0.162	0.07 (–0.38 to 0.53)	0.748	0.02 (–0.47 to 0.52)	0.924
BAS-G (range 0–10)	–1.70 (–2.74 to –0.66)	0.002	–1.36 (–2.10 to 0.63)	< 0.001	0.65 (0.12–1.18)	0.016	–0.49 (–0.80 to 0.19)	0.002	–0.42 (–0.75 to 0.09)	0.013
HAQ (range 0–3)	2.45 (–2.72 to 7.62)	0.351	0.55 (–3.11 to 4.21)	0.766	0.89 (–1.72 to 3.50)	0.503	0.59 (–0.93 to 2.11)	0.443	0.25 (–1.40 to 1.90)	0.767
Damage										
BASMI (range 0–10)	0.18 (–6.69 to 1.05)	0.667	0.21 (0.41–0.82)	0.507	–0.18 (–0.62 to 0.26)	0.412	0.04 (–0.21 to 0.30)	0.752	0.10 (–0.17 to 0.38)	0.463
Comorbidity, mean total score range 0–10	–1.65 (–3.55 to 0.25)	0.088	–0.75 (–2.10 to 0.60)	0.275	0.30 (–0.66 to 1.26)	0.542	–0.55 (–1.11 to 0.00)	0.052	–0.56 (–1.16 to 0.46)	0.070
Current treatment										
NSAID	–0.002 (–3.03 to 3.03)	0.999	–0.37 (–2.52 to 1.77)	0.733	0.31 (–1.23 to 1.83)	0.695	0.23 (–0.66 to 1.12)	0.616	–0.01 (–0.97 to 0.96)	0.986
Synthetic DMARD	2.61 (–4.23 to 9.47)	0.454	1.00 (–2.86 to 6.86)	0.419	–1.02 (–4.49 to 2.45)	0.564	0.92 (–1.10 to 2.94)	0.373	0.69 (–1.51 to 2.88)	0.538
Biologic DMARD	6.43 (2.85–10.01)	< 0.001	3.91 (1.38–6.45)	0.003	–0.68 (–2.49 to 1.13)	0.459	1.89 (0.84–2.93)	< 0.001	1.17 (0.03–2.30)	0.044
Center, SSHF (N/Y)	1.66 (–1.88 to 5.22)	0.357	2.31 (–0.21 to 4.82)	0.072	–2.18 (–3.97 to 0.38)	0.018	0.65 (–0.40 to 1.69)	0.224	0.80 (–0.33 to 1.04)	0.165
R^2, %	16.5		16.7		9.7		16.9		16.3	

Adjusted analyses were performed using multiple regression analyses and applying a general linear model using SPSS Statistics. Adj: adjusted unstandardized regression coefficients with 95% CI and p values. SQOL: sexual quality of life; BMI: body mass index; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; MASES: Maastricht Ankylosing Spondylitis Enthesitis Score; CRP: C-reactive protein; BASFI: Bath Ankylosing Spondylitis Functional Index; BAS-G: Bath Ankylosing Spondylitis Global Score; BASMI: Bath Ankylosing Spondylitis Metrology Index; HAQ: Health Assessment Questionnaire; NSAID: nonsteroidal antiinflammatory drugs; DMARD: disease-modifying antirheumatic drugs; SSHF: Sorlandet Hospital, Norway.

Our patient population differed from those of other studies regarding disease activity and comorbidities such as cardiovascular diseases, diabetes mellitus, osteoporosis, and depressive disorders[25]. In a previous study of the perceived effect of health status on sexual activity in our axSpA cohort, the majority of patients (82%) reported that their health status had no or insignificant effects on their sexual life[26], reflecting low disease activity and low burden of comorbidities (< 1 per patient) in our patients.

In our study, high BMI was independently associated with a low total SQOL score and with the subdomains "psychosexual feelings" and "self-worthlessness." Our study is in line with previous studies reporting higher BMI as negatively associated with several aspects of QOL in patients with AS[13]. A high BMI may induce a negative body image, reducing sexual activity and impairing SQOL, particularly in women[13,14,27]. In a recent report we found that female sex, high BMI, current smoking, and reduced HRQOL were independently associated with health status and a large negative effect on sexual activity[26]. As expected, living alone was negatively associated with sexual and relationship satisfaction. Our results indicate that both physical (e.g., BMI) and social factors (e.g., living alone) exert an influence on SQOL when combined with disease characteristics such as the presence of inflammation.

The strength of our study was the high response rate (97% of surveyed) to answering questions addressing SQOL, exceeding the rate in other studies[28]. Patients of both sexes were consecutively recruited, and there were few exclusion criteria, which indicates good internal validity of the study. At one outpatient clinic (SSHF), we have previously reported minor differences between the included and not included patients with axSpA examined for both demographics and disease measures[26].

Data were collected at 2 hospitals, which can be considered both a strength and a weakness. A strength is that both hospitals follow the treat-to-target strategy, aiming to reach low disease activity or remission[29]. Our study used a cross-sectional design and did not permit any causal interpretation; therefore, we can establish associations only between dependent and independent variables. The patients were recruited in a hospital setting and may therefore have had more severe diseases than a community-based sample. A major limitation is that the patient cohort was not compared with healthy controls. Sexual activity and enjoyment are complex phenomena, which ideally should be measured using several items to record various aspects of SQOL[30]. Further, lack of data on radiological damage, hip involvement and replacements, and standardized assessment of fibromyalgia tender points might be considered limitations.

Our study indicates that SQOL is lower in females and in axSpA patients with active disease shown by elevated BAS-G and CRP. The use of bDMARD was also independently associated with a lower SQOL score, possibly reflecting bDMARD treatment in this cross-sectional study as a marker of axSpA disease activity and not causality between bDMARD use and impaired SQOL. Thus, we believe that our data indicate that good disease control suppressing inflammation may improve SQOL in patients with axSpA. The association between increased BMI and low SQOL should encourage patients to change their lifestyle, which then may improve SQOL. It is also to be emphasized that our goal in clinical practice is not only to treat inflammation but to take care of the whole patient and address patient needs, including SQOL. Longterm observational followup studies of patients with axSpA that examine the effects of disease on SQOL are needed to investigate changes over time.

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