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Original Article

Influence of psychological status on back pain and clinical assessments in Chinese ankylosing spondylitis patients: a cross-sectional study

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Abstract: Objective: To evaluate the influence of psychological status on back pain and clinical assessments in ankylosing spondylitis (AS) patients. Methods: Three hundreds and Fourteen AS patients were enrolled into the study. Self-rating anxiety Scale (SAS), Self-Rating Depression Scale (SDS), pain-visual analogue scale (VAS), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), and Functional Index (BASFI), and Metrology Index (BASMI), fingertip-to-floor distance, were used to assess psychological and clinical characteristics respectively. Results: SAS and SDS scores were significantly higher than normative values of Chinese population (P=0.000). Back pain, BASDAI and BASFI were positive correlated with anxiety and depression (P<0.05), while BASMI and fingertip-to-floor distance were not correlated with them (P>0.05). Anxious and depressed patient subgroups had significantly higher levels of back pain, BASDAI and BASFI than non-anxious and non-depressed subgroup (P<0.05). No statistical difference was found with BASMI and fingertip-to-floor distance (P>0.05). In hierarchical multiple regression analysis, the psychological variables contributed significantly to the variance in back pain scores, adding an additional 8.7% to the overall R-square beyond that accounted by demographic variables (R-square 6.3%), resulting in a final R-square of 19.4%. Multiple stepwise regression analysis revealed that anxiety was the second statistical contributor to C-reaction protein in predicting back pain (standardized coefficients of 0.018). Conclusion: Anxiety and depression have a considerable effect on back pain and self-reported clinical assessments in Chinese AS patients.

Keywords: Ankylosing spondylitis, anxiety, depression, pain, disease activity

Introduction

Ankylosing spondylitis (AS) is a chronic systemic inflammatory disease, affecting mainly the sacroiliac joints, spine, peripheral joints, and entheses [1]. Although non-steroidal anti-inflammatory drugs (NSAIDs) and tumor necrosis factor (TNF)-blocking agents therapy are effective for inflammatory remission, some AS patients continue to rate pain. This situation may be due to in part by physicians who care more about somatic complaints of AS patients, while ignoring psychological symptoms, such as anxiety and depression [2].

Substantial literatures indicated the relationship between pain and psychological disorders, in particular, depression and anxiety [3, 4]. McWilliams et al. [5] surveyed 3032 adults from nationally representative sample, the Midlife Development in the United States Survey, found that those with back pain had more frequently reported depression (21.0% vs 12.4%), generalized anxiety disorder (6.2% vs 2.5%), than those without back pain. Data of a survey [6] in Korean showed that the scores from the Beck Depression Inventory and Beck Anxiety Inventory were significantly higher in group chronic low back pain than in group controls. The incidence of depression and anxiety was significantly higher in group chronic low back pain than in group controls. Gerrits et al. [7] followed up a total of 614 participants with no previous history and no current depression or anxiety at baseline for 4 years. Onset of depressive or anxious disorder occurred in 15.5% of participants, which was associated with increasing number of pain

locations and higher severity of pain. Another study suggested that pain was associated with increased depression and anxiety recurrence, its association with aggravated subthreshold depressive symptoms [8]. Wasilewski et al. [9] suggested a cause-and-effect relationship between psychological effects and pain symptoms, the patients with a long history of pain disorders also had an increase in depression and anxiety symptoms. Patients with more severe depression and anxiety symptoms also had an increase of pain problems.

Likely, patients with AS are more prone to be anxious and depressed than healthy counterparts according to published data. Meesters et al. [10] completed the Hospital Anxiety and Depression Scale measured anxiety and depression questionnaire with 2,167 patients with spondyloarthritis (SpA). In total, 683 (32%) cases were classified as "possible anxiety" and 305 (14%) as "possible depression" cases. Martindale et al. [11] reported that anxiety was found in 25% and depression in 15% among patients with AS. The result in study of Günaydin et al. [12] showed that 27.4% AS patients had high depression scores. In addition, our previous study showed that combined regimen of antidepressants (duloxetine) and conventional therapies were significantly effective for AS patients with depression and anxiety [13].

Although psychological complaints are commonly reported in other rheumatic diseases, little is known in persons with AS [14-16]. Moreover, it is unclear whether the severity of back pain of AS is directly related to poor psychological status. Specifically, given the considerable adverse effects of anxiety and depression on clinical outcomes, identifying the factors associated with back pain is an important goal. Studies addressing this issue have had some limitations: small sample size, inclusion of patients with SpA, postal questionnaire to assess mental functioning, and lack of comprehensive assessment of psychological status and back pain. The objective of this study were (1) to determine the prevalence of psychological status and their association with demographic variables, disease-specific variables, and other variables that can have an impact on back pain; and (2) to evaluate the statistical contribution in predicting back pain in AS patients.

Patients and methods

For long-term follow-up, patients were recruited from rheumatology clinics and department at Fujian Provincial Hospital between March 2011 and May 2015. All patients met the modified New York classification criteria for AS [17]. The Erythrocyte sedimentation rate (ESR) (normal ≤20 mm/h) was determined by Westergren method. The CRP value (normal ≤0.8 mg/dl) was evaluated by nephelometry. Demographic characteristics were documented for each patient. Patients with other comorbid disorders, such as serious infections or systemic diseases (respiratory, cardiac, gastrointestinal, neurological, endocrine, etc), and with those could influence disease activity, functional and psychological status and those with a history of anxiety or depression before the onset of AS were also excluded. The study was approved by Chinese PLA General Hospital ethics committee, and all participants gave their written informed consent according to the Declaration of Helsinki.

Assessment scales for back pain and clinical characteristics

The back pain (last week/spine/due to AS) score was determined from a visual analogue scale (VAS), recording from 0 cm (no pain) to 10 cm (severe pain). The clinical characteristics were evaluated by BASDAI [18], BASFI [19], BASMI [20], fingertip-to-floor distance.

Measurements of psychological status

Anxious symptoms were assessed by SAS; the revised SAS was used to evaluate the level of anxiety related symptoms during the last week before the survey. This self administered test has 20 questions, with 15 items worded toward increasing anxiety levels and five questions worded toward decreasing anxiety levels. Each question was scored on a scale of 1-4 (rarely, sometimes, frequently, and always). The scores ranged between 20 and 80. Higher scores reflected more severe anxiety.

Depressive symptoms were assessed by SDS. The SDS was used to evaluate the level of anxiety related symptoms during the last week before the survey. This scale consists of 20 questions that examine the somatic, affective, and psychological symptoms associ-

Table 1. Demographic, medical and psychological characteristics of patients with AS (n=314)

Variables	Mean ± SD
Age, years	27.6 ± 8.3
Disease duration, years	6.1 ± 4.9
Morning stiffness, minute	11.9 ± 27.8
BASDAI (VAS)	3.6 ± 2.1
BASFI (VAS)	1.6 ± 2.2
BASMI	1.4 ± 1.9
Fingertip-to-floor distance, cm	9.8 ± 13.7
Total back pain (VAS)	3.9 ± 2.7
ESR	16.8 ± 18.9
CRP	1.6 ± 3.5
SAS	48.4 ± 8.1
SDS	47.3 ± 10.5

VAS: visual analog scale; BASDAI: bath ankylosing spondylitis disease activity index; BASFI: bathankylosing spondylitis functional index; BASMI: bath ankylosing spondylitis metrology index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; SAS: Self-rating anxiety scale; SDS: Self-ratingdepression scale.

ated with depression. Each question is scored between 1 and 4. The total score varies between 20 and 80.

A score of >50 shows the existence of anxiety and depression [21, 22]. Patients were dichotomized into anxious subgroup (SAS>50) and non-anxious subgroup (SAS≤50), depressed subgroup (SDS>50) and non-depressed subgroup (SDS≤50).

Statistical analysis

The data were expressed as the mean (SD) and percentage (%) for categorical variables. Descriptive analyses were performed to investigate patient characteristics. Mann-Whitney u test and t test was used in independent groups for parametric variables, whereas the Spearman correlation analysis was used to assess correlation between parametric variables. Comparison of SAS and SDS scores in AS patients and normative values of Chinese population was carried out by t test. Hierarchical multiple regression analysis was chose to analyze the contribution of demographic, physiological, medical and psychological variables to back pain. Stepwise multiple regression analysis was designed to find the most powerful predictor of back pain. Statistical analysis was performed by using SPSS 17.0 and level of significance was set as $P<0.05$.

Results

Demographic and disease parameters and pain

Among the 318 AS patients who participated in this study, 314 (98.7%) returned their completed questionnaires, 4 patients withdrew their consent. The 314 consecutive patients with AS (234 men, 80 women) were included in the study. The mean age of patients was 27.6 ± 8.3 years, and the mean disease duration was 6.1 ± 4.9 years. The mean SAS and SDS scores of patients were 48.4 ± 8.1 and 47.3 ± 10.5, respectively. Other demographic, physiological and medical variables of the patients were shown in **Table 1**.

Bivariate associations

As shown in **Table 2**, Pearson coefficients were computed to identify correlates of SAS and SDS score in our sample of AS patients. SAS and SDS score were associated with back pain BASDAI, BASFI ($P<0.05$), and not associated with BASMI and fingertip-to-floor distance ($P>0.05$).

Mann-Whitney u test and t test

The mean SAS and SDS score of our patients were higher than the normative values for SAS (37.2 ± 12.6) and SDS (41.9 ± 10.6) in the general Chinese population respectively [23]. There was significant difference between SAS score and normative values (t=9.934, $P=0.000$), the same situation was seen in SDS score and normative values (t=4.691, $P=0.000$).

As shown in **Tables 3** and **4**, Mann-Whitney u test and t test were performed between patients who were anxious subgroup (SAS>50) and non-anxious subgroup (SAS≤50); depressed subgroup (SDS>50) and non-depressed subgroup (SDS≤50); anxious and depressed subgroups had significantly higher levels of back pain, BASDAI, BASFI than non-anxious and non-depressed subgroups ($P<0.05$). With regard to BASMI and fingertip-to-floor distance score, there was no statistically difference between the anxious and non-anxious subgroups, depressed and non-depressed subgroup ($P>0.05$).

Table 2. Comparison between depression and non-depression subgroups

	Depression	Non-depression	z/t	*P*
	n=111 (35.4%)	n=203 (64.6%)		
Age (years)	29.6 ± 8.6	26.9 ± 8.1	-2.8	0.006
Disease duration	6.6 ± 5.1	5.8 ± 4.8	-1.76	0.078
Morning stiffness (minute)	14.8 ± 27.9	10.3 ± 27.7	-2.6	0.01
Gender (male)	76	158	3.3	0.069
HLA-B27 (+)	89	154	0.77	0.382
Total back pain (VAS)	5.0 ± 2.7	3.2 ± 2.5	-5.5	<0.0001
BASDAI	4.6 ± 2.1	3.0 ± 1.9	-7.1	<0.0001
BASFI	2.5 ± 2.5	1.2 ± 1.8	-6.2	<0.0001
BASMI	1.7 ± 1.9	1.3 ± 1.9	-2.6	0.009
Fingertip-to-floor distance (cm)	11.1 ± 14.6	9.1 ± 13.1	-1.19	0.235
ESR	20.8 ± 21.5	14.6 ± 16.8	-2.25	0.025
CRP	2.3 ± 5.4	1.2 ± 1.5	-2.6	0.009

HLA: human leukocyte antigen; VAS: visual analog scale; BASDAI: bath ankylosing spondylitis disease activity index; BASFI: bath ankylosing spondylitis functional index; BASMI: bath ankylosing spondylitis metrology index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

Table 3. Comparison between anxiety and non-anxiety subgroups

	Anxious subgroups	Non-anxious subgroups	z/t	*P*
	n=118 (37.6%)	n=196 (62.4%)		
Age (years)	28.9±8.9	27.2±8.0	-1.7	0.091
Disease duration	6.6±5.3	5.7±4.6		-1.36
Morning stiffness (minute)	16±33.8	9.4±21.2	-3.4	0.001
Gender (male)	78	156		7.1
HLA-B27 (+)	90	153		0.14
Total back pain (VAS)	5.0±2.8	3.1±2.4		-5.92
BASDAI	4.7±2.0	2.9±1.8		-8.1
BASFI	2.4±2.4	1.2±1.9		-5.77
BASMI	1.6±2.0	1.3±1.8		-1.5
Fingertip-to-floor distance (cm)	10.3±13.4	9.5±13.9	-0.9	0.367
ESR	21.4±22.4	14.0±15.6	-2.83	0.005
CRP	2.1±5.2	1.3±1.7		-2.12

HLA: human leukocyte antigen; VAS: visual analog scale; BASDAI: bath ankylosing spondylitis disease activity index; BASFI: bath ankylosing spondylitis functional index; BASMI: bath ankylosing spondylitis metrology index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

Hierarchical multiple regression analysis

The results of the hierarchical multiple regression analyses were shown in **Table 5**. Model 1 (demographic model) tested the contribution of demographic variables to back pain. Model 2 (medical model) tested the contributions of medical and Physiological variables to back pain after controlling for the demographic variables. Model 3 (psychological model) described the extent to which psychological variables contributed to back pain after controlling for the demographic variables. Models 1-3 were the results of hierarchical regression analyses, which are usually done in research to determine the importance of predictor variables once other predictor variables have already been entered into the equation [24]. Model 4 was the standard regression analysis where all of the variables have been entered simultaneously into the model to assess the relative contributions of these variables to back pain. This model took into account the interrelations between predictor variables as well as the effects of predictor variables on the outcome variable (back pain). The first model testing the contributions of demographic variables to back pain was found to be statistically significant (R^2=0.063). In this model, age (*P*=0.036) and disease duration (*P*=0.05) contributed significantly to total back pain. The addition of medical variables (model 2) resulted in a significant increase in the R^2 value (R^2=0.13). In this model, CRP (*P*=0.015) contributed significantly to back pain. Inclusion of psychological variables also significantly added to the demographic set (R^2=0.15). This also explained an additional 8.7% of the variance in back pain. In the final full model (standard multiple regression analysis) in which all of the vari-

Table 4. Correlation coefficients between psychological disorders and clinical assessments in patients with AS

	SAS		SDS	
	r	*P*	r	*P*
Age (years)	0.146	0.01	0.154	0.06
Disease duration	0.106	0.061	0.13	0.021
Morning stiffness (minute)	0.248	<0.0001	0.163	0.004
Total back pain (VAS)	0.389	<0.0001	0.322	<0.0001
BASDAI	0.512	<0.0001	0.437	<0.0001
BASFI	0.403	<0.0001	0.444	<0.0001
BASMI	0.094	0.085	0.167	0.003
Fingertip-to-floor distance (cm)	0.056	0.319	0.133	0.018
ESR	0.147	0.009	0.161	0.004
CRP	0.132	0.02	0.167	0.003

VAS: visual analog scale; BASDAI: bath ankylosing spondylitis disease activity index; BASFI: bath ankylosing spondylitis functional index; BASMI: bath ankylosing spondylitis metrology index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; SDS: Self-rating depression scale; SAS: Self-rating anxiety scale; SDS: Self-rating depression scale.

ables were entered simultaneously, only SAS (*P*=0.002) and age (*P*=0.03) remained as significant determinant of back pain. The full model could explain 19.4% of the total variance in back pain.

Multiple stepwise regression analysis

The results of the stepwise multiple regression analyses were shown in **Table 6**. CRP (B=0.295, *P*=0.001), The SAS score (B=0.087, *P*<0.0001) and age (B=0.051, *P*=0.002), were found to have significantly associated with back pain. The R-square=0.24 indicated that 24% variation of back pain could be explained by CRP, anxiety and age. The stepwise multiple regression analyses revealed that anxiety was second only to CRP statistical contribution in predicting back pain (Standardized Coefficients of 0.291).

Discussion

The current study is, to our knowledge, the largest to evaluate the influence of psychological status on back pain and clinical assessments in AS patients. The relationship between psychological symptoms and back pain and clinical assessments were described by the following six aspects.

Levels and prevalence rates of anxiety and depression

In this study, the mean SAS and SDS scores of our patients were significantly higher than normative values for SAS and SDS in the general Chinese population respectively [23]. The prevalence rates of anxiety (37.6%) and depression (35.4%) are also higher than results of most studies in AS patients [11, 25]. We speculated that anxiety and depression might be derived partly from other psychosocial factors, including worry about of deformities, workforce decline and social discrimination caused by AS, but not derived completely from activity inflammation.

Psychological status and back pain

Psychological status and back pain have close relationships in AS patients. In the current study, we found that back pain scores correlated significantly with anxiety and depression, anxious subgroups and/or depressed subgroups had consistently worse back pain than non-anxious or non-depressed subgroups. Baysal et al. [26] reported similar results among anxiety, depression and pain in AS patients. The association between psychological variables and back pain imply a common underlying biological process or the impact of the AS disease itself. There are two possible reasons for back pain. On one hand, some of the patients may have active inflammation. On the other hand, psychological status and back pain have close and reciprocal relationship. Psychological symptoms usually contribute to pain, and in turn, chronic pain causes psychological symptoms such as anxiety and depression. Anxious and depressive symptoms have been found to reduce the pain threshold, increase the severity of pain, amplify dysphoric physical sensations (including pain), and impair the person's capacity to adapt to severe pain [27-29], and have a substantial effect on treatment response in those with chronic pain [3, 30, 31]. Moreover, AS patients with depression and anxiety may over-report their pain symptoms. Our findings raise a challenge that how to deal with the role of psychological disorders in self-reported back pain in AS. If physician can not handle this properly, more aggressive anti-inflammatory treatment may be applied to patients. Therefore, this issue is deemed more important. We suggest that inactive AS patients with high back pain (VAS) scores should

Table 5. Hierarchical multiple regression analysis of demographic, medical and psychological variables in relation to back pain

	Model 1				Model 2				Model 3				Model 4			
	B	P	OR	95% CI	B	P	OR	95% CI	B	P	OR	95% CI	B	P	OR	95%CI
Age	0.036	0.038	1.04	1.00~1.07	0.046	0.011	1.05	1.01~1.08	0.031	0.093	1.03	1.00~1.07	0.041	0.03	1.04	1.00~1.08
Gender	-0.345	0.217	0.71	0.41~1.22	-0.329	0.27	0.72	0.40~1.29	0.037	0.902	1.04	0.57~1.88	0.016	0.961	1.02	0.54~1.90
Disease duration	0.05	0.119	1.05	0.99~1.11	0.041	0.194	1.04	0.98~1.11	0.039	0.209	1.04	0.98~1.11	0.036	0.26	1.04	0.97~1.11
Years of education,		0.431				0.425				0.769				0.791		
Primary school	0.791	0.364	2.21	0.40~12.16	0.704	0.447	2.02	0.32~12.43	0.645	0.469	1.91	0.33~10.91	0.604	0.514	1.83	0.30~11.20
High school	0.252	0.309	1.29	0.79~2.09	0.293	0.255	1.34	0.81~2.22	0.031	0.907	1.03	0.61~1.74	0.076	0.782	1.08	0.63~1.84
Parental relationship		0.483				0.752				0.725				0.856		
Harmony	0.347	0.647	1.41	0.32~6.25	0.149	0.852	1.16	0.24~5.51	0.632	0.433	1.88	0.39~9.12	0.448	0.584	1.56	0.32~7.78
ordinary	0.747	0.364	2.11	0.42~10.57	0.429	0.62	1.54	0.28~8.36	0.679	0.438	1.97	0.35~10.98	0.385	0.666	1.47	0.26~8.46
HLA-B27					0.344	0.255	1.41	0.78~2.55					0.327	0.299	1.39	0.75~2.57
ESR					0.015	0.151	1.02	1.00~1.04					1.013	0.22	1.013	0.99~1.03
CRP					0.224	0.051	1.25	1.00~1.57					0.193	0.093	1.21	0.97~1.52
SDS									0.021	0.198	1.02	0.99~1.05	0.015	0.388	1.02	0.98~1.05
SAS									0.072	0.001	1.08	1.03~1.12	0.072	0.002	1.06	1.03~1.13
R^2 (%)	6.3				13				15				19.4			
Adjusted R^2 (%)	8.4				17.3				20				25.9			

ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; SDS: Self-rating depression scale; SAS: Self-rating anxiety scale.

Table 6. Stepwise multiple regression analysis of demographic, medical and psychological variables in relation to back pain

Independent	B	Standardized coefficient	OR	*P*	95.0% CI. for OR	R^2 (%)
						24.0
Age	0.051	0.0161	1.05	0.002	1.025~1.092	
SAS	0.087	0.018	1.09	<0.0001	1.056~1.132	
CRP	0.295	0.087	1.34	0.001	1.126~1.566	

SAS: Self-rating anxiety scale; CRP: C-reactive protein.

also be screened for anxiety and depression. Early identification and treatment of co-occurring depression and anxiety may facilitate patients to adapt to severe back pain and result in a more favorable treatment response.

Relationship between psychological status and BASDAI & BASFI

BASDAI and BASFI scores are derived from self-completion questionnaires. Psychological status of patients might affect perceptions of their functional abilities and their reporting. Based on the results of the current study, we have found that BASDAI and BASFI scores correlated significantly with anxiety and depression, but not correlated with BASMI and fingertip-to-floor distance. Our data are similar to those of Hakkou et al. [32] who found that the correlations were with BASDAI, BASFI, but not ESR and CRP. The results demonstrated clearly that anxiety, depression and BASDAI, BASFI were closely linked in AS. The results in previous research done by Brionez et al. [33] argued that the total explained variation of the BASFI increased from 32% to 56% when adding various psychological variables to the demographic and clinical variables. Another study suggested that psychological variables contributed significantly to the variance in BASDAI scores, adding an additional 33% to the overall R-square beyond that accounted for by demographic and medical variables (combined R-square 18%) in the final model of Hierarchical multivariate regression analysis [34]. Thus, in the light of our findings, interpretation of clinical assessments, as measured by the BASDAI and BASFI, might need to occur in the context of evaluating the patient's psychological status.

Paradoxical findings between objective and subjective scales

Objective and Subjective Scales are paradoxical under the psychological disorders circumstance. In our study, we found that anxious subgroups and/or depressed subgroups had significantly different BASDAI and BASFI scores than non-anxious or non-depressed subgroups. However, their BASMI and fingertip-to-floor distance scores were not significantly different from non-anxious or non-depressed subgroups. Firstly, the reasons for these findings may be related to the fact that self-reports of AS disease activity and function may not directly reflect underlying biological dysfunction. Secondly, it is conceivable that there is a bidirectional relation between the perceived disease activity, functional limitation and psychometric factors. Thirdly, the BASMI and fingertip-to-floor distance scores are derived from an assessment by well trained clinician or metrologist (in our case, we do it by ourselves), whereas BASDAI and BASFI scores are derived from self-completed questionnaires. Despite the anxiety and depression did not affect the objective function (BASMI and fingertip-to-floor distance scores), we could not surely make following conclusion: anxiety and depression did not cause functional disability. McFarlane et al. [35] reported that psychological factors consistently predicted more of the variance of disability than disease activity in a group of 30 patients with rheumatoid arthritis over a 3-year period. As we all known, regular exercise through the whole period of evolution of AS, is as important as pharmacological treatments. AS patients with psychological problems have decreased strength to cope with their physical disease and are negatively affected regarding voluntary participation in treatment and rehabilitation programs [35].

In additional, our findings suggested that BASDAI and BASFI scores should be valued correctly because of their subjective nature. If patients had worse self-report BASDAI and BASFI, however, BASMI and fingertip-to-floor distance scores were better, AS patients may have the possibility of coexisting anxiety or depression. It is necessary for physician to timely evaluate issue of associations between psychological symptoms and their disease characteristics. Clearly, BASMI and fingertip-to-floor distance scores would be less susceptible to such effects, and may provide a more independent indicator of clinical disease parameters than BASDAI or BASFI scores.

Relationship between anxiety and depression

There was a close relationship between anxiety and depression, depression scores correlated significantly with anxiety in all participants, at the same time, 24.5% of AS patients both had anxiety and depression. Many studies had shown that anxiety and depression frequently overlaps and coexists in the same patient and facilitates each other [36, 37], however, this was the first report that comorbidities of anxiety and depression were prevalent in patients suffering AS.

Statistical contribution in predicting back pain

A number of studies [6, 36, 37] indicated that anxiety and depression are risk factors for pain. Gerrits MM et al. [28] reported that patients with pain are more prone to a chronic course of depressive and anxiety disorders. Denkinger MD et al. [38] found that pain severity and frequency were the best predictors of late life depression. In turn, there is a lack of research on the role of depression and/or anxiety in back pain. In our hierarchical multiple regression analysis, the psychological variables contributed significantly to the variance in back pain scores, adding an additional 8.7% to the overall R-square beyond that the demographic variables (R-square 6.3%), resulting in a final R-square of 19.4%. Multiple stepwise regression analysis revealed that anxiety was the second statistical contributor to C-reaction protein in predicting back pain. It is worth mentioning that Bair MJ et al. [39] conducted a randomized clinical trial of a combined medication-behavioral intervention for primary care patients with chronic musculoskeletal pain and depression providing prospective evidence that baseline anxiety symptoms predicted both depression and pain severity at 12 months.

There were several limitations to the current study. The primary limitation of the present study was its cross-sectional study design, which provided only correlational findings, precluding an understanding of directional relations between anxiety, depression, and disease status. Other limitations included that inclusion of perceived disease activity might have masked the relation between psychological symptoms and the self-reported disease status, single center study and lack of a control group.

Conclusions

In conclusion, we found that the high levels and prevalence rates of anxiety and depression were present in patients with AS. Anxiety and depression had significant effects on back pain and self-report BASDAI and BASFI, but, had no effects on objective clinical assessments (BASMI and fingertip-to-floor distance). The psychological variables contributed significantly to the variance in back pain scores. Anxiety was the second statistical contributor to C-reaction protein in predicting back pain. These results highlighted that in AS patients with inactive inflammation, but continuing to rate back pain, anxiety and depression should be screened for further management.

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Disclosure of conflict of interest

None.

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