Depressive symptoms are independently associated with pain perception in Colombians with rheumatoid arthritis

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ABSTRACT

Aims: To examine the relationships between psychosocial factors and reported pain in Colombians with Rheumatoid Arthritis (RA).

Methods: One hundred and three RA patients [85% from the lowest socio-economic strata (SES) in the country] recruited from outpatient centers in Neiva, Colombia were administered the Disease Activity Scare-28 (DAS28), which included a Visual Analog Scale (VAS) arthritis pain/activity rating, Zung Depression Scale, State-Trait Anxiety Inventory (STAI), Interpersonal Support Evaluation List-12 (ISEL-12), and Symptom Checklist-90 Revised (SCL-90R).

Major Results: VAS pain was not associated with the age of socio-demographic or medical factors, but was negatively associated with ISEL tangible subscale ($r=-0.22$, $p< 0.01$; $r=0.28$, $p<0.01$). VAS pain was positively associated with Zung Depression Scale score ($r=0.38$, $p<0.001$), STAI-State and STAI-Trait Anxiety ($r=0.23$ and $r=0.25$ respectively, p's<0.01), SCL-90R Global Severity Index (GSI) and Positive Symptom Total (PST) ($r=0.23$, $p<0.05$ and $r=0.29$, $p<0.01$ respectively), and SCL-90R Somatization, Depression, and Anxiety subscales ($r=0.30$, $p< 0.01$; $r=0.28$, $p<0.01$; and $r=0.20$, $p<0.05$ respectively). A linear regression model showed that socio-demographic characteristics theoretically associated with pain perception (gender, age, and SES) explained only 2.4% of the variance of VAS scores (R-squared=0.02, p=0.49). The full model, including psychosocial factors significantly associated with VAS scores explained 18.9% of the variance in VAS pain perception scores (R-squared=0.19, p=0.02). The Zung Depression Scale score was the only factor independently associated with VAS pain, such that higher depression scores were associated with higher VAS ratings ($\beta=0.13$, $p<0.01$), controlling for gender, age, SES, STAI-State, STAI-Trait, ISEL tangible, SCL-90R GSI, and SCL-90R PST.

Conclusions: Depressive symptoms, anxiety, social support, and psychopathological symptom distress were associated with pain ratings, but only depressive symptoms were found to be uniquely associated with higher pain perception, taking into account socio-demographic characteristics and other psychosocial factors. These findings provide evidence for the need to assess and treat pain in RA in Colombia from a bio-psycho-social perspective. Future research is needed to determine effective depression screening and evidence-based interventions for depressive symptoms in RA patients in this socio-cultural context, as intervening in depression may decrease pain perception.

Keywords: Depression; Pain perception; Rheumatoid arthritis.

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic, systemic, autoimmune disease that affects approximately 1% of the world population. RA can occur in people of all ages, but is more common as individuals age, increasing in prevalence and incidence until the age of 70 and then slowly declining. RA is two to three times more common in women than men[1]. Genetic vulnerability also plays a role in the development of RA, with a higher prevalence among monozygotic twins compared to dizygotic twins (12-15% vs. 2-4%)[2]. The public health impact of RA is high, generating significant morbidity, lost productivity, and work disability. This leads to increased utilization of health and social resources, and ultimately impacts the economy in both developed and

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developing countries[3,4]. RA is characterized by the presence of heterogeneous and ubiquitous pain and early detection is paramount to optimal prognosis[5]. Pain is the most common complaint in patients with RA[6] and there are complex interactions among socio-demographic, sensory, motivational, cognitive, psychological, cultural and social components influencing pain perception[7].

With respect to socio-demographics, women with RA report more severe levels of pain, with pain occurring at greater frequency and duration than men in both experimental and clinical settings[8]. A recent meta-analysis of 27 RA studies with gender-stratified samples, reported increased pain perception in females compared to males both at baseline and longitudinally[9]. In older patients with arthritis, a literature review reported a positive linear relationship between age and pain[10]. This is in line with other research in both mouse models and human studies that have established increased pain perception with age[11]. Other studies of arthritis patients indicate a relationship between low socioeconomic status (SES) and/or lower education levels and heightened pain perception. One recent study of RA patients found increased pain perception among those with less than 12 years of formal education[12]. In another large Latin American study, patients in the early stages of RA from lower SES strata reported worse pain intensity at baseline[13]. A longitudinal study of women with osteoarthritis complemented these results, with women with greater financial worry reporting higher levels of pain[14].

Affective and psychological factors are also associated with pain perception. A systematic review of recent research in various medical conditions, including RA, concluded that negative emotional states and pain-centered emotions are associated with higher levels of pain[7]. The review indicates that the cyclical relationship between emotion and pain can cause, maintain, and/or exaggerate it[7]. Fluctuations and duration of positive or negative emotional states in patients with RA have been found to predict future pain ratings[15]. Psychological symptoms and disorders such as depression, anxiety, and anger, all relatively common in RA patients, can also modulate and predict pain[16]. RA patients with a history of multiple episodes of depression report higher levels of chronic pain[17]. RA patients who have higher levels of depressive symptoms report higher levels of pain, taking into account disease activity and disability[18]. In patients with inflammatory arthritis, depressive symptoms predict pain and pain predicts depressive symptoms, controlling for baseline characteristics[19]. In women with RA, state anxiety was found to have a greater impact than depression on the prediction of weekly pain scores[20]. Another longitudinal study reported that state anxiety, but not depression, predicts pain[21].

Regarding psychopathological symptoms beyond depression and anxiety, there is little research describing their influence on pain in RA patients. It is known that individuals with schizophrenia are less likely to have RA than a control group, and individuals with RA have been found to have less paranoid ideation than a control group with other medical problems, including psoriatic arthritis[22].

There is a bi-directional relationship between pain perception and social support. People who experience acute pain tend to avoid contact with other people[23] and low levels of social support at the time of RA diagnosis predicts pain and functional disability three to five years later[24]. Marital support, in particular, influences reported pain severity in arthritic patients[25]. However, individuals vary in the amount and type of social support they need and social support is not always helpful. For example, in chronic pain, dissatisfaction with social support is associated with heightened pain intensity[26].

There is a paucity of studies in RA among low SES individuals[27]. In 2011, 28.8% of the population of the Latin American region lived in poverty[28] and poverty rates in Colombia specifically were 34%[29]. It is not known the extent to which current research, conducted primarily in the United States and Europe[30], generalize to this region and its inhabitants with low SES. Thus, the present study examines the relationship between psychosocial factors and pain perception in Colombian RA patients. Based on prior literature, we hypothesized that more depressive symptoms, more anxiety, and less social support would be associated with pain ratings, but that psychopathological symptoms or symptom severity in general would not. We expected that increased depressive symptoms and/or state anxiety would be the only factors to be independently associated with increased pain ratings above and beyond social support and general psychopathology.

PATIENTS AND METHODS

PATIENTS

One hundred and three participants diagnosed with

RA were recruited from outpatient centers in Neiva, Colombia. The patients were aged between 18 and 79, had been evaluated by a rheumatologist or internal medicine specialist to meet criteria according to the American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) Collaborative Initiative 2010 Rheumatoid Arthritis Classification Criteria[31], and were cognitively able to complete the evaluation protocol. Patients currently hospitalized or with a comorbid terminal illness, individuals determined via court proceedings to be unable to make autonomous decisions (e.g., due to cognitive impairment or psychiatric problem), and/or a history of alcoholism or drug abuse were excluded from the study.

PROCEDURE

All participants were recruited between December 2012 and June 2013 from ambulatory centers in Neiva, Colombia. Participants were evaluated by a rheumatologist or an internal medicine specialist and signed an informed consent. The Disease Activity Scale[32] was administered, and then trained research assistants collected socio-demographic and psychosocial information. This study received local Ethics Committee approval.

INSTRUMENTS

Disease Activity Scale-28

The instrument Disease Activity Scale-28 (DAS28) assesses RA disease activity[32]. It consists of physical, emotional and serologic assessment, including: (a) the number of 28 joints of the hands, wrists, elbows, shoulders, and knees that are tender and/or swollen (b) the erythrocyte sedimentation rate (ESR) as a measure of inflammation, and (c) the score on a 10 cm Visual Analog Scale (VAS) indicating the extent of pain/disease activity over the prior week from 0 (no pain/no disease activity) to 10 (very bad pain / high levels of disease activity). The total score is calculated and higher scores indicate more disease activity. The established cut-off points are as follows: less than 2.6 indicates disease remission, 2.6 to 3.2 indicates low disease activity, 3.2 to 5.1 indicates moderate disease activity, and higher than 5.1 indicates severe disease activity[32]. The DAS28 has been used in rheumatoid populations with good reliability (Cronbach's alpha = 0.73)[33].

Zung Depression Scale

The Zung Depression Scale is a short, self-rating scale assessing the affective, psychological, and somatic symptoms associated with depression[34]. The scale consists of 20 items – 10 affirmatively worded items and 10 negatively worded items. Each item question is assessed on a scale of 1 (a little of the time) to 4 (most of the time). Higher scores indicate more depressive symptoms. The Zung Depression Scale has been translated and validated for use with clinical population and general population research in Colombia with good reliability (Cronbach's alpha=0.85)[35].

State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) has two subscales[36]. One, consisting of 20 items describing how an individual generally feels, measures trait (stable) anxiety, and the other, consisting of 20 items describing how an individual feels at any given moment, measures state (or transient) anxiety. The items are scored on a Likert scale of 1 (not at all) to 4 (very much so) with reverse coding for certain items. Higher scores indicate greater anxiety. Both sub-scales of the Spanish version have excellent to good reliability (Cronbach's alpha=0.86 for STAI-Trait and 0.91 for STAI--State)[37].

Interpersonal Support Evaluation List-12

The Interpersonal Support Evaluation List-12 (ISEL--12) is a shortened version of the 40-item Interpersonal Support Evaluation List and consists of 12 items that assess the perceived availability of social support and interaction[38]. Half of the items are positive affirmations about the social support/relationships and the other half are negative statements. The scale has three subscales of four items each. The "tangible" subscale measures the perceived availability of material assistance; the "appraisal" subscale assesses the perceived availability of someone with whom one can confide in; and the "belonging" subscale measures the perceived availability of people to do things with. Options for each item range from "definitely false" to "definitely true" scored from 1 to 4. Higher scores indicate higher levels of perceived social support. The ISEL-12 was recently validated in a sample of Spanish speakers with good reliability (Cronbach's alpha=0.70)[39].

Symptom Checklist 90-Revised (SCL-90R)

The Symptom Checklist 90-Revised (SCL-90R) assesses symptoms of psychopathology[40]. The scale consists of 90 items that are rated by the patient on a five-point Likert scale of distress from 0 (none) to 4 (extreme). The items are grouped in the following nine di-

mensions of symptomatology: Somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, psychoticism, and paranoid ideation. In addition to the nine dimensions, the scale includes a Global Severity Index (GSI) to indicate the average distress caused by the symptoms evaluated, a Positive Symptom Distress Index (PSDI) to measure the intensity of symptoms experienced, and a Positive Symptom Total (PST) to represent the total number of symptoms experienced[40]. The original SCL-90R has good reliability with Cronbach's alphas between 0.77 and 0.90. The Spanish language version has similar reliability with Cronbach's alphas between 0.76 and 0.85[41].

STATISTICAL ANALYSIS

The data were analyzed using IBM SPSS for Windows, version 20.0 (IBM Corporation, 2011). Frequencies and descriptive statistics were conducted on socio-demographic and medical characteristics. To examine the bivariate relationships between socio-demographic, medical characteristics, psychosocial factors and VAS pain perception, Pearson correlations or t-tests were run. A stepwise linear regression was then performed, with socio-demographic characteristics theoretically known to be associated with pain perception entered in Step 1. In Step 2, the psychosocial factors found to be significantly associated with VAS pain perception in bivariate analyses were entered.

RESULTS

One hundred and forty one patients were screened for the present study. Of these, 24 (17%) did not meet inclusion criteria. Of the 117 who met inclusion criteria, 14 (12%) refused to participate. The socio-demographic characteristics of the final sample of 103 patients are displayed in Table I. The sample was composed mainly of individuals in lower socio-economic levels, with 85.4% coming from lowest income strata 1 and 2 neighborhoods. Most were women (85.4%), married (63.1%), with a mean age of 54 years. Table II describes the medical characteristics of the sample. The RA patients had been living with the disease for an average of 13.0 years (11.6) and approximately 85% of the sample had a moderate-to-severe disease activity according to their DAS28 at the time of the evaluation[32]. Patients reported higher-than-average VAS pain scores of 6.29 (2.68) over the past week on a scale from 0 to 10.

Participants reported average levels of depressive and anxiety symptoms [Zung=44.14(7.40), STAI-State=35.26(10.21), STAI-Trait=38.39(9.72), possible range 0-80]. Mean social support scores were high [ISEL total=41.66(6.08), possible range 12-48] and psychopathology scores were low [23.13(14.75) out of 90 symptoms, SCL-90R PST] with slightly below average severities [1.51(0.44), possible range 0-4, SCL-90R PSDI] and low overall severities [0.42(0.35), possible range 0-4 across 90 symptoms, SCL-90R GSI]. Table III indicates that none of the socio-demographic or medical characteristics were significantly associated with VAS pain rating. Table IV shows the relationships between psychological factors and VAS pain perception. The Zung Depression Scale score was positively associated with VAS scores ($r=0.38$, $p<0.001$), as were measures of STAI-State and STAI-Trait Anxiety ($r=0.23$ and $r=0.25$ respectively, p's<0.01). The ISEL Tangible sub-scale was negatively associated with VAS pain ratings ($r=-0.22$, $p<0.01$). The SCL-90R GSI and PST were positively associated with VAS scores ($r=0.23$, $p<0.05$ and $r=0.29$, $p<0.01$ respectively). SCL-90R Somatization, Depression, and Anxiety sub-scales were positively associated with VAS ($r=0.30$, $p< 0.01$; $r=0.28$, $p<0.01$; and $r=0.20$, $p<0.05$ respectively).

Step 1 of the stepwise linear regression model revealed that socio-demographic characteristics theoretically associated with increased pain perception (gender, age, and SES) explained only 2.4% of the variance of VAS scores (R-squared=0.024, p=0.49). The full model, presented in Table V, was significant and explained 18.9% of the variance in perception of pain (VAS) (R-squared=0.189, p=0.017). The Zung Depression Scale score was the only factor independently associated with VAS, such that higher depression scores were associated with higher VAS ratings ($\beta=0.13$, $p<0.01$), controlling for gender, age, SES, STAI-State, STAI-Trait, ISEL Tangible, SCL-90R GSI, and SCL-90R PST.

DISCUSSION

Depressive symptoms were found to be independently associated with higher pain perception, taking into account socio-demographic characteristics theoretically known to be associated with enhanced pain (gender[10], age[11] and SES[14,15]) as well as all other psychosocial factors related to pain in this sample. Although not independently associated with pain ratings, state an-

TABLE I. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION

Patients with RA	n=103
Age, years, mean (SD)	53.8 (12.7)
Gender (female)	85.4% (n=88)
Marital Status	
Single	12.6% (n=13)
Married	63.1% (n=65)
Divorced/Separated	12.6% (n=13)
Widowed	11.7% (n=12)
Education	
Primary/elementary school or less	39.9% (n=41)
High school	42.7% (n=44)
Technical studies or degree	10.6% (n=11)
University studies or degree	6.8% (n=7)
Socio-economic level	
1	17.4% (n=18)
2	68.0% (n=70)
3	12.6% (n=13)
4	1.0% (n=1)
5	1.0% (n=1)
6	0.0% (n=0)
Gainfully employed	36.9% (n=38)

TABLE II. MEDICAL CHARACTERISTICS OF THE POPULATION

DAS28, mean (SD)	4.87 (1.46)
Severe (> 5.1)	45.6% (n=47)
Moderate (3.2-5.1)	38.8% (n=40)
Low (2.6-3.2)	8.7% (n=9)
Remission (< 2.6)	6.8% (n=7)
VAS Pain / Disease Activity Rating	6.29 (2.68)
Number of years with disease	12.97 (11.63)
Early AR (≤ 3 years)	20.4% (n=21)
Total medications	3.03 (0.88)
NSAIDs	91.3% (n=94)
DMARDS	77.7% (n=80)
Steroids	76.7% (n=79)
Biologic Therapy	44.7% (n=46)
Opioids	4.9% (n=5)
Other	5.8% (n=6)
Total comorbidities	0.84 (1.02)
Hypertension	28.2% (n=29)
Cardiac disease	14.6% (n=15)
Diabetes (Type II)	8.7% (n=9)
Pulmonary disease	4.9% (n=5)
None	23.7% (n=51)
Other	21.4% (n=22)

xiety, trait anxiety, number of psychopathological symptoms, and psychopathological symptom severities were related to higher pain, while perception of material aid (tangible social support) appears to be a protective factor associated with lower pain perception. Almost all published studies on pain perception in RA have been conducted in the United States or Europe[30]. The current study highlights the importance of psychosocial factors on pain perception in Colombians with RA. The findings are also unique because most of the sample represented the lowest socio-economic strata in the country, making them representative of many rural Latin American populations.

The results confirmed our hypothesis and replicated previous research supporting the relationship between depressive symptoms and pain perception in RA and other chronic pain conditions. This relationship holds true despite various measures of depression used. RA patients with more self-reported depressive symptoms on the Center for Epidemiological Studies Depression Scale (CES-D) reported more intense pain across a 75-day recording period, accounting for levels of disease activity and disability[18]. Higher levels of depressive symptoms on the CES-D in patients with inflammatory arthritis were also found to independently predict pain[19]. However, a study of one of the largest samples of RA patients reported that pain and fatigue are the best predictors of depression[42], indicating the bidirectional nature of the relationship between pain and depression. One of the main limitations of the present study is that the cross-sectional design does not provide insight into the causal nature of this relationship, but depression and pain are clearly intertwined.

Depression may influence pain perception in RA through numerous bio-behavioral mechanisms. Depression and autoimmune diseases such as RA share similar biological pathways. Dysregulation of the hypothalamic pituitary adrenal axis (HPA) and hypothalamic corticotropin-releasing hormone responsiveness (CRH), as well as increased amounts of pro-inflammatory cytokines, are common in both depression and RA[43]. Cytokines (including Tumor Necrosis Factor--Alpha, Interleukin-6, and Interleukin-1), can result in cartilage destruction, which causes pain, and can disrupt the HPA axis, resulting in fatigue and depres-

TABLE III. BIVARIATE RELATIONSHIPS BETWEEN SOCIO-DEMOGRAPHIC AND MEDICAL CHARACTERISTICS AND VAS PAIN RATING

Socio-demographic and medical characteristics	r or t value	p value
Age	0.08	0.44
Gender	0.59	0.56
Marital status	0.07	0.94
Education	-0.12	0.25
SES	-0.12	0.22
Gainfully employed	1.07	0.29
Early RA	1.46	0.15
Number of years with RA	-0.14	0.16
Total medications	-0.05	0.62
NSAIDs	1.66	0.10
DMARDS	-1.00	0.32
Steroids	0.69	0.49
Biological therapy	-1.98	0.05
Others	-0.59	0.56
Opioids	1.65	0.10
Total comorbidities	0.08	0.45
No comorbidities	-0.80	0.43
Hypertension	1.03	0.31
None	0.80	0.43
Other	0.32	0.75
Cardiac disease	0.80	0.43
Diabetes (Type II)	-0.34	0.73
Pulmonary disease	-0.25	0.80

TABLE IV. BIVARIATE RELATIONSHIPS BETWEEN PSYCHOSOCIAL FACTORS AND VAS PAIN RATING

Psychosocial Factors	R	p value
Zung Depression***	0.38	<0.001
STAI-State*	0.23	0.02
STAI-Trait*	0.25	0.01
ISEL Total	-0.16	0.10
ISEL Appraisal	-0.14	0.16
ISEL Belonging	-0.06	0.53
ISEL Tangible*	-0.22	0.02
SCL-90R Global Severity Index*	0.23	0.02
SCL-90R Positive Symptom Total**	0.29	0.003
SCL-90R Positive Symptom Distress Index	0.17	0.09
SCL-90R Somatization**	0.30	0.002
SCL-90R Obsessive-Compulsive	0.18	0.07
SCL-90R Interpersonal Sensitivity	0.01	0.99
SCL-90R Depression**	0.28	0.004
SCL-90R Anxiety*	0.20	0.04
SCL-90R Hostility	0.18	0.08
SCL-90R Phobic Anxiety	0.19	0.05
SCL-90R Paranoid Ideation	-0.02	0.83
SCL-90R Psychoticism	0.08	0.45

*p<0.05, ** p <0.01, *** p<0.001

sion[44]. A second pathway linking depression and pain perception is cognitive. A study of Mexican patients with chronic pain emphasizes how catastrophizing enhances pain ratings[45]. Hyper-vigilance and/or misinterpretation or misattribution of symptoms are other cognitive mechanisms that may explain the relationship between depression and pain[46]. Somatization, which is common in depression[47] is another cognitive factor that may explain this relationship and the SCL-90R somatization sub-scale was significantly associated with pain ratings in this study. However, a follow-up multivariate regression analysis indicated that, even though depressive symptoms were moderately correlated with SCL-90R somatization (r=0.42, p<0.001), they were independently associated with pain perception after taking into account somatization. Thus depressive symptoms are likely impacting pain perception via the other mechanisms described previously, or via other behavioral mechanisms such as coping strategies.

Both state and trait anxiety were associated with increased pain perception in bivariate analyses. Clinically significant state anxiety is a common co-morbidity in RA[48] and anxiety levels have been shown to predict pain severity and pain behavior in chronic pain patients. In a cross-sectional study, the Arthritis Impact Measurement Scale (AIMS) anxiety sub-scale was associated with increased pain[49] and a longitudinal study utilizing the same sub-scale found that anxiety is a better predictor of pain than depression[21]. Anxiety and depression commonly occur together and follow-up analyses showed that trait and state anxiety were highly correlated with depressive symptoms in this sample (r=0.68 and r=0.51, respectively, p's<0.001). However, in the multivariate analysis, anxiety did not explain any unique variance above and beyond depressive symptoms. The results suggest that, although anxiety plays a role in heightened pain perception, depressive symptoms are the driving factor behind pain ratings in this sample of Colombian RA patients. This contrast with prior research may be explained by this study's use of the STAI to measure anxiety and/or characteris-

TABLE V. LINEAR REGRESSION MODEL TO PREDICT VAS PAIN RATING

Psychosocial Factor	B	p value
Gender (Reference Group: Male)	-0.67	0.37
Age	0.01	0.81
SES	-0.15	0.70
Zung Depression	0.13	0.009**
STAI–State	0.02	0.67
STAI–Trait	-0.04	0.47
ISEL Tangible	-0.16	0.26
SCL-90R Global Severity Index	-0.68	0.71
SCL-90R Positive Symptom Total	0.04	0.39

**p<0.01

tics specific to the socio-cultural context of this sample. Additional research is warranted. Although the sample had low rates of psychopathology, SCL90-R positive symptom counts and severity were also associated with pain perception in bivariate analyses. Thus, even low levels of psychopathology in RA patients may increase pain intensity and disability, serving to perpetuate pain-related dysfunction[46]. Other types of psychopathology, with the exception of schizophrenia, are rarely measured in research with RA patients and this may be another area of future research.

Tangible social support was associated with lower pain perception in bivariate analyses, but not in the multivariate analysis. Patients who felt that they had more access to material aid reported less pain. Perhaps in this sample of low SES participants, those with lower levels of tangible support had more financial worry, which was associated with more pain in women with osteoarthritis[14]. Follow-up analyses confirmed that tangible social support was significantly associated with decreased levels of anxiety, depression, and psychopathology (e.g., depression r=-0.24, GSI r=-0.31, PST r=-0.41, trait anxiety r=-0.36, state anxiety r=-0.30, p's<0.05), suggesting that the perception of more material aid decreases financial stressors or enhances internal coping with stress, which may, in turn, play a role in decreasing depressive and anxiety symptoms, as well as other psychopathology. The weakened psychological symptoms may then result in decreased pain. This hypothesis (that tangible social support decreases emotional distress and therefore pain) is supported in this study's multivariate model, in which tangible social support did not explain any unique variance in pain perception above and beyond depressive symptoms. It is also possible that those lacking in material aid may have had more needs for medications, however, in follow-up analyses, there was no significant association between number of medications and SES, nor was there a relationship between medication usage and tangible social support scores. It is plausible that the perceived availability of tangible social support, which was rated highly in this sample (mean of 13.9 out of 16 maximum), equates to increased satisfaction. Satisfaction with support has been linked to decreased pain perception in prior research[26]. Studies associating tangible social support and pain perception in RA are not well represented in the literature and additional research is warranted.

Besides the cross-sectional nature of the study, another limitation was the absence of a measure of sleep or fatigue; these variables have been found to play an important role in the cycle of pain perception and depression[50]. Future research on pain in RA in Latin America should use a longitudinal design that includes a sleep measure such as the Spanish-language Oviedo Sleep Questionnaire[51]. Such studies would allow an examination of the casual relationships between depression and pain, as well as additional potential mechanisms of action. In general, this study's findings should be replicated in other Latin American countries with patients from low SES in order to better understand the unique socio-cultural constraints that may influence the relationship between psychosocial factors and pain.

The importance of the independent relationship between depressive symptoms and pain supports the growing evidence that pain should be assessed and treated from a bio-psycho-social perspective in patients with RA and that this comprehensive care model should extend to Latin America. A 2009 Pan-American Consensus Statement by internal medicine specialists and rheumatologists documents the specific need in Latin America to increase access to better care by forming multidisciplinary treatment teams and implementing psycho-educational programs[52]. Although there are increasingly more psychosocial-focused educational opportunities for medical professionals and many countries in the region dedicate almost 5% of their healthcare budgets to mental health (similar to the US and Europe), in Colombia the allocation is less than 1%[53]. De Almeida (2010) describes a lack of mental health training of medical professionals practicing in parts of Latin America and a paucity of regular communication with psychologists[54]. However, there are a

growing number of psychologists in Colombia[55] and more are being trained in health psychology[55]. A new law, "Ley de Salud Mental 1616" in Colombia, passed in 2013, makes psychologists more available to the general population, and may offer access for RA patients suffering with psychological co-morbidities[56]. Psychological referrals from the rheumatologist or internal medicine specialist for the RA patient trying to manage depressive symptoms are critical to providing holistic care, increasing coping with pain and resulting disability, and possibly ameliorating pain.

There are numerous cognitive-behavioral and stress management techniques demonstrated to effectively assist chronic pain patients with mood and pain management. In RA patients specifically, cognitive behavioral therapy (CBT) and mindfulness meditation have been shown to be efficacious in reducing pain, and these treatments were more beneficial to participants with a history of depression compared to those without[57]. A randomized controlled trial of CBT administered to recently diagnosed RA patients found improved depressive symptoms at 18-month follow-up compared to a control group, as well as improvements in anxiety and disability[58]. Furthermore, a meta-analysis and systematic review of psychological interventions for RA by Knittle and colleagues (2010) found that therapies utilizing more self-regulation techniques were more effective at reducing depressive and anxiety symptoms in RA patients than interventions using fewer of these techniques[59]. The Arthritis Self-Management Program is another treatment with demonstrated effectiveness. This is a six-week, community-based program that provides coping, exercise, problem-solving, and communication skills training for individuals with rheumatic disease. In Spanish-speaking arthritis participants, a randomized trial demonstrated one--year improvements in depression, as well as other outcomes including pain, disability, general health, exercise, and self-efficacy[60]. An added benefit is that either a health professional or a trained lay person (e.g., a community health promoter, known as a promotora de la salud) can administer the program. However, additional intervention research is needed, as these approaches would need to be implemented and validated in the specific population of interest.

CONCLUSION

In conclusion, psychosocial factors, and depressive symptoms specifically, are associated with the amount of pain and disease activity reported by individuals with RA in Colombia. Additional research on the impact of depressive symptoms on pain in RA and how RA pain may cause depressive symptoms, especially in developing countries is warranted. One of the strengths of the present study was the low SES composition of the sample, as it is a group that is under-represented in the literature. There is a need for effective depression screening tools, multi-disciplinary care, and access to evidence-based, culturally appropriate interventions in order to better manage pain in this population.

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