Arthritis Care & Research
Vol. 64, No. 9, September 2012, pp 1274–1281
DOI 10.1002/acr.21689

ORIGINAL ARTICLE

Correlates and Predictors of Disability in Vulnerable US Hispanics With Rheumatoid Arthritis

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Objective. **US Hispanics with rheumatoid arthritis experience worse functional outcomes compared to whites. The determinants of disability, however, are not well established in large Hispanic cohorts. In the present report, we identified factors associated with disability in a cross-sectional design, and evaluated their individual contributions to disability over time.**

Methods. **Two hundred fifty-one Hispanic subjects from a single center were evaluated. Disease activity, serologies, radiographs, treatments, irreversible articular damage (defined as subluxation, arthrodesis, fusion, or prosthesis), and joint replacement surgeries were recorded. Self-reported disability (Health Assessment Questionnaire disability index), patient pain by a visual analog scale, and depression assessments were collected. Cross-sectional factors associated with disability were identified, and their effects on future disability were evaluated in a subgroup of 114 patients assessed 6 months later.**

Results. **Six parameters were independently related to disability cross-sectionally: pain was the strongest ($P < 0.0001$), followed by irreversible articular damage, disease activity, depression, age, and fibromyalgia ($P < 0.03$ for all). Baseline parameters predicting disability 6 months later included, in decreasing significance, irreversible articular damage ($P = 0.004$), depression, disease activity, age, and pain (all $P < 0.04$).**

Conclusion. **In cross-sectional analysis, self-reported pain had the strongest relationship with disability; however, factors such as irreversible articular damage, depression, and disease activity were more important in predicting future disability. Most of these factors are amenable to targeted interventions and should be addressed in an effort to improve functional outcomes.**

INTRODUCTION

Recent research has called attention to the unique clinical features of rheumatoid arthritis (RA) and self-reported outcomes in Hispanic minorities, especially in low socioeconomic status, uninsured, and immigrant populations collectively described as "vulnerable patients" (1–4). Furthermore, the generalizability and applicability of the results from clinical trials to this population are questionable, since the majority of published studies have included predominantly whites (5–9). Given the evolving ethnic landscape in the US, with Hispanics accounting for the most robustly expanding part of the population, it is important to identify and address unique clinical features of their RA, including self-reported outcomes to therapy, as well as predictors of these outcomes.

Hispanics accounted for 16% of the total US population in 2010, and they are expected to reach 24.4% of the total population by 2050 (10). There was 43% growth in the US Hispanic population between 2000 and 2010 compared to a 4.9% growth in non-Hispanics (11). In Los Angeles County, California, where this research was conducted, 38% of residents are of Hispanic origin and there was 28% growth in the Hispanic population between 2000 and 2010 compared to 1.5% growth in non-Hispanic residents (12).

The objective of this research was to evaluate the magnitude of self-reported disability in a cohort of vulnerable US Hispanics and to identify the independent factors related to such disability at baseline as well as over time. Several studies in RA, predominantly involving white Eu-

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Submitted for publication October 28, 2011; accepted in revised form March 26, 2012.

ropeans and some Northern Americans, have confirmed the important contribution of disease activity, duration, seropositivity, and the presence of radiographic damage (erosions) to disability (13–16). In similar populations, the presence of secondary fibromyalgia averages 15% and may inflate self-reported disability (17–20). These factors and their contributions to functional disability in large cohorts of US Hispanics have not been adequately reported. Understanding quantitative and qualitative differences compared to literature reports on non-Hispanic whites could provide a foundation for designing meaningful and culturally sensitive interventions that optimize functional outcomes and quality of life in Hispanics.

PATIENTS AND METHODS

Patients. Two hundred fifty-one Hispanic patients meeting the 1987 American College of Rheumatology (ACR) criteria for RA (21) from a single center with complete data for sociodemographic, clinical, laboratory, serologic, radiographic, and therapeutic parameters at baseline were included. Our site, the adult rheumatology clinic at Harbor-UCLA Medical Center in Los Angeles, California, provides comprehensive health care to mainly low socioeconomic status, immigrant, indigent minority patients, most of whom (>80%) are Hispanic. Subjects self-identified race and ethnicity by completing a hospital registration demographics cover sheet. Two hundred six subjects (82%) self-identified as white Hispanic, 1 (0.4%) as black Hispanic, and the remaining 44 (17.6%) as "other" Hispanic (including Asian Hispanic, Filipino Hispanic, Hawaiian Hispanic, and Indian American Hispanic). The majority further identified themselves as first-generation immigrants from Mexico and Central America. Only 10% had Medicaid coverage; the remaining patients were uninsured.

In general, subjects with RA are followed quarterly at the outpatient rheumatology clinic. Physician measurements of disease activity (3-variable Disease Activity Score in 28 joints using the erythrocyte sedimentation rate [DAS28-ESR]) are collected on all subjects as part of routine care. Self-reported outcomes questionnaires assessing disability (Health Assessment Questionnaire [HAQ] disability index [DI]), depression (Patient Health Questionnaire-9 [PHQ-9]), and pain are offered to all subjects upon check-in at each followup visit. Self-reported outcomes questionnaires have been approved by the Harbor-UCLA Institutional Review Board and are administered as part of a standing protocol for quality improvement of patient care delivery. For the present study, demographic, serologic, and radiographic parameters as well as therapeutic assignments were electronically captured. Disease activity scores, disability evaluation, patient assessment of pain with a visual analog scale (VAS), evaluation for fibromyalgia (defined below), and depression assessments were collected. Irreversible articular damage, defined as ankylosis, subluxation, arthrodesis, or prosthesis, and joint replacement surgeries were tracked. Achievement of a DAS28-ESR score of <3.2 defined response to therapy.

Description of disease measures and scales. *HAQ DI.* In this study we used the 2-page Spanish version of the Stanford University HAQ DI to measure disability. Translated HAQ DIs have been validated using methods such as test–retest reliability, item-total correlations, convergent validity, interviewer- versus self-administered formats, and factor analyses (22). Culturally adapted Spanish-translated HAQ DI instruments have been proven as equally reliable and valid as the parent instrument (23). The HAQ DI includes 20 questions across 8 separate domains of function and is scored from 0–3. Scores of 0–1 generally represent mild to moderate disability, 1–2 represent moderate to severe disability, and 2–3 indicate severe to very severe disability (24).

Patient assessment of pain: the HAQ pain VAS. Self-reported pain was assessed using the HAQ double-anchored VAS. The VAS line is standardized to 15 cm in length. The scale is labeled from 0 (no pain) at the left anchor point to 100 (severe pain) at the right anchor point. Patients are instructed to place a vertical mark on the line to indicate the severity of their pain. Pain severity is scored using a clear gauge graded from 0–3 by 0.1-grade increments that is aligned with the patient's mark on the pain scale. The value indicated below the shaded area that aligns with the patient's mark represents the pain scale score. The pain VAS has undergone extensive testing and validation and has been used widely in experimental, observational, and clinical settings (25).

Assessment of depression with the PHQ-9. The PHQ-9 is a brief measure specifically designed and validated to screen and evaluate depressive symptoms in patients seen in primary care settings (26). Additionally, it is in widespread use for a range of acute and chronic medical conditions, was developed to closely parallel the diagnostic symptoms of major depressive disorder (27–29), and has established reliability and validity in white, African American, Asian, and Hispanic populations (4,5,29,30). The PHQ-9 consists of 9 items that parallel the 9 diagnostic criteria for major depression in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Each item measures symptoms that have occurred over the past 2 weeks and is scored from 0 (absence of symptoms) to 3 (presence of symptoms nearly every day). Commonly used cutoff scores include 5–9 (mild depressive symptoms), 10–14 (moderate depressive symptoms), and 15–19 (moderate to severe depressive symptoms); a score of ≥10 has high sensitivity for detecting depressive disorder in patients with medical problems.

Fibromyalgia. Fibromyalgia was defined according to the ACR criteria (31) as the presence of widespread pain in both sides of the body, above and below the waist, lasting for >3 months; the presence of at least 11 of 18 tender points; and/or the use of medications prescribed for fibromyalgia without alternate identifiable secondary causes.

Statistical analysis. Categorical variables are reported as percentages and continuous variables are reported as the mean ± SD unless otherwise specified. Associations between continuous variables were explored using Spearman's correlations, and linear regression analyses were

conducted to analyze their independent contribution to disability. Individual groups were compared using nonparametric tests; the Kruskal-Wallis test with Dunn's posttest for multiple group comparisons or Mann-Whitney U test was used for comparisons of continuous variables. Contingency tables were constructed for categorical variables and groups were compared with Fisher's exact tests.

To identify factors contributing to disability cross-sectionally (time 1), exploratory multivariable linear regression analyses were performed in the manner of a forward selection based on observed significance level. Specifically, to select a variable for inclusion, a candidate variable was added to the current model and its significance level was recorded. This was done for every candidate variable in turn. The variable with the highest significance level (smallest *P* value) was permanently added to the model for the next iteration. This procedure was stopped when no candidate variable showed a significance level below *P* values of 0.05. Similar multivariable linear regression analysis was carried out to predict the HAQ DI score measured at a subsequent visit (time 2; the median time interval is 6 months), using factors recorded at the first time point. Important predictors were selected using a forward variable selection procedure. All tests were 2-sided. A *P* value less than 0.05 was required for statistical significance. Analyses were performed using SAS software, version 9.2 (SAS Institute).

Table 1. Cross-sectional patient characteristics*

	Value
No. of patients	251
Women/men	216 (86)/35 (14)
Age, mean ± SD years	51.5 ± 11
Disease duration, mean ± SD years	10.2 ± 8.3
RF	232 (92)
Anti-CCP	213 (85)
Erosions	154 (61)
ESR, mean ± SD mm/hour	31 ± 20
CRP level, mean ± SD mg/dl	1.1 ± 1.7
Prednisone	83 (33)
DMARDs	224 (89)
No. of DMARDs, mean ± SD	2.1 ± 0.9
Biologic agents	117 (47)
Anti-TNFα inhibitors	107 (91)
Rituximab	10 (9)
DAS28-ESR, mean ± SD	3.3 ± 1.2
HAQ DI score, mean ± SD	1.24 ± 0.9
Pain VAS (range 0–3), mean ± SD	1.4 ± 0.8
PHQ-9 score, mean ± SD	7.1 ± 6.7
Joint replacement surgery	20 (8)
Irreversible articular damage	85 (34)

* Values are the number (percentage) unless otherwise indicated. RF = rheumatoid factor; anti-CCP = anti–cyclic citrullinated peptide antibodies; ESR = erythrocyte sedimentation rate; CRP = C-reactive protein; DMARDs = disease-modifying antirheumatic drugs; anti-TNFα = anti–tumor necrosis factor α; DAS28-ESR = 3-variable Disease Activity Score in 28 joints using the ESR; HAQ = Health Assessment Questionnaire; DI = disability index; VAS = visual analog scale; PHQ-9 = Physician Health Questionnaire-9.

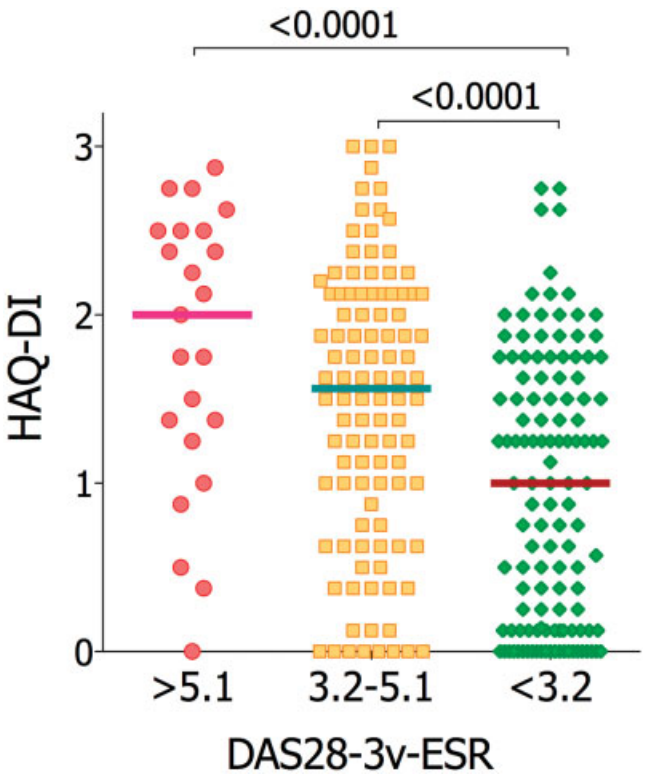

Figure 1. High self-reported disability in vulnerable US-based Hispanic patients with rheumatoid arthritis. The Health Assessment Questionnaire (HAQ) disability index (DI) score is high at all levels of disease severity. Bars show the median for each group. The median HAQ DI score for the high disease activity group (3-variable Disease Activity Score in 28 joints using the erythrocyte sedimentation rate [DAS28-3v-ESR] >5.1) is 2, for the moderate disease activity group (3.2 ≤ DAS28-3v-ESR ≤5.1) is 1.56, and for the low disease activity group (DAS28-3v-ESR <3.2) is 1. One-way analysis of variance using the Kruskal-Wallis test with Dunn's posttest for multiple comparisons between all groups yields significant differences in disability between high and low, as well as between moderate and low, disease activity groups, as shown ($P < 0.0001$ for both).

RESULTS

Patient characteristics. Baseline characteristics for the 251 Hispanic RA patients are shown in Table 1. The majority were middle-aged women with chronic established RA. Patients were highly seropositive; 92% had a rheumatoid factor (RF) with a median titer of 1:1,280 (interquartile range [IQR] 1:640–1:5,120) and 85% had anti–cyclic citrullinated peptide antibodies (anti-CCPs) with a median titer of 176 units/ml (IQR 118–250). Erosions were present in 61% of subjects. Thirty-three percent were receiving prednisone and 89% were receiving disease-modifying antirheumatic drugs (DMARDs). The mean ± SD number of DMARDs was 2.1 ± 0.9, and methotrexate was used in 79% of patients at a median dose of 20 mg every week. Biologic agents were used in 117 subjects (47%); 107 (91%) of 117 were receiving tumor necrosis factor α inhibitors and the remaining 10 (9%) were receiving rituximab. Twenty patients (8%) had at least 1 joint replacement surgery, and irreversible articular damage was present in 85 patients (34%). Mean ± SD disease activity

Table 2. Cross-sectional factors associated with disability in Hispanics with rheumatoid arthritis (n = 251)*

	Univariate				Multivariable		
	b	95% CI	*P*	R^2	b	95% CI	*P*
Categorical variables							
RF	0.16	−0.25, 0.56	0.44	0.002			
Anti-CCP	0.04	−0.26, 0.34	0.80	0.0003			
Erosions	−0.03	−0.25, 0.19	0.79	0.0003			
Fibromyalgia	0.53	0.24, 0.81	0.0004	0.050	0.27	0.03, 0.51	0.0265
Prednisone	0.23	0.006, 0.46	0.04	0.016			
Female sex	0.32	0.01, 0.62	0.04	0.017			
Biologic agents	0.02	−0.19, 0.24	0.82	0.0002			
Irreversible articular damage	0.38	0.16, 0.60	0.0008	0.044	0.48	0.31, 0.66	< 0.0001
Continuous variables							
Age	0.01	0.004, 0.02	0.0073	0.029	0.01	0.004, 0.02	0.0034
No. of DMARDs	0.01	−0.09, 0.11	0.84	0.0002			
DAS28-ESR	0.26	0.17, 0.34	< 0.0001	0.131	0.14	0.06, 0.21	0.0003
Pain VAS	0.54	0.43, 0.65	< 0.0001	0.277	0.36	0.23, 0.48	< 0.0001
Disease duration	0.01	−0.001, 0.02	0.0765	0.013			
PHQ-9	0.06	0.04, 0.07	< 0.0001	0.202	0.02	0.01, 0.04	0.0009

* The coefficient of determination (R^2) in the multivariable analysis is 0.45. The most important predictor is pain, followed by irreversible articular damage, DAS28-ESR, PHQ-9, age, and fibromyalgia. b = estimate of beta coefficient; 95% CI = 95% confidence interval; RF = rheumatoid factor; anti-CCP = anti–cyclic citrullinated peptide antibodies; DMARDs = disease-modifying antirheumatic drugs; DAS28-ESR = 3-variable Disease Activity Score in 28 joints using the erythrocyte sedimentation rate; VAS = visual analog scale; PHQ-9 = Physician Health Questionnaire-9.

for the entire group was 3.3 ± 1.2; 124 patients (49%) had low disease activity (DAS28-ESR <3.2), 104 (42%) had moderate disease activity (3.2 ≤ DAS28-ESR ≤5.1), and 23 (9%) had high disease activity (DAS28-ESR >5.1).

Poor functional outcomes in Hispanics with RA. Cumulative self-reported disability was significant for the entire group (Figure 1); the mean ± SD HAQ DI score was 1.24 ± 0.9 and 147 individuals (59%) had HAQ DI scores of ≥1, consistent with moderate to severe disability. In patients with high and moderate disease activity, the mean ± SD HAQ DI scores were 1.8 ± 0.83 and 1.5 ± 0.82, respectively. More importantly, disability remained high in the group with low disease activity (Figure 1); 58 (47%) of 124 patients in this group had HAQ DI scores of ≥1 and the mean ± SD HAQ DI score was 0.95 ± 0.8. Disability and disease activity were significantly correlated (Spearman's $\rho = 0.37$, $P < 0.0001$; data not shown). Patient-reported pain was high for the entire cohort despite the apparently good overall clinical disease control; the mean ± SD pain VAS score was 1.37 ± 0.83 and exhibited a statistically significant correlation with disease activity (Spearman's $\rho = 0.4$, $P < 0.0001$; data not shown). More importantly, pain was significantly correlated with disability (Spearman's $\rho = 0.53$, $P < 0.0001$; data not shown).

Depression was highly prevalent in our cohort; 32% of all patients and 24% of patients with low disease activity had a PHQ-9 score of ≥10, indicative of moderate depression requiring treatment according to the DSM-IV. Disease activity was correlated with depression (Spearman's $\rho = 0.26$, $P < 0.0001$; data not shown).

Cross-sectional analyses. A total of 14 categorical and continuous baseline variables (time 1) were evaluated and their contribution to disability at baseline is shown in Table 2. ESR and C-reactive protein level were significantly correlated with each other ($\rho = 0.52$, $P < 0.0001$; data not shown), and since ESR was included in the calculation of the DAS28, these parameters were omitted from the analysis as independent contributors in order to avoid redundancy. Similarly, irreversible articular damage and joint replacement surgeries were significantly correlated ($P < 0.0001$; data not shown); therefore, only irreversible articular damage was included in the regression analysis. The univariate analysis established 8 of 14 parameters as statistically significant predictors of HAQ DI, with self-reported pain being the strongest (Table 2). The presence of RF, anti-CCP, and erosions; biologic agent use; and the number of DMARDs used did not predict disability.

To further identify variables that contributed independently to disability (HAQ DI) at time 1, exploratory multivariable linear regression analyses were performed as mentioned earlier. The final model highlighted the following 6 baseline variables as independent predictors of disability in decreasing order of significance: pain, irreversible articular damage, disease activity, depression, age, and fibromyalgia. While each was jointly significantly related to disability ($P < 0.0001$, $R^2 = 0.5$) (Table 2), pain emerged as the strongest independent factor contributing to disability at time 1. It is known that fibromyalgia commonly coexists in individuals with RA and can be a source of significant pain in this population (18). Since 39 (16%) of 251 patients in our cohort fulfilled the criteria for fibromyalgia, we wanted to clarify whether the presence of this condition might have influenced the observed significance of self-reported pain on disability. We therefore repeated our multivariable regression analysis excluding those 39 patients with fibromyalgia (total n = 212; data not shown). In this secondary analysis, the same aforementioned parameters emerged as significant contributors to disability; pain was again the most significant predictor,

Table 3. Time 1 predictors of time 2 disability in vulnerable US Hispanics with rheumatoid arthritis (n = 114)*

	Univariate				Multivariable		
	b	95% CI	*P*	R^2	b	95% CI	*P*
Categorical							
RF	0.11	−0.49, 0.71	0.72	0.001			
Anti-CCP	0.01	−0.47, 0.5	0.95	< 0.001			
Erosions	−0.07	−0.3, 0.42	0.7	0.001			
Fibromyalgia	0.57	0.13, 1.0	0.01	0.057			
Prednisone	0.29	−0.06, 0.64	0.1	0.024			
Female sex	0.56	0.06, 1.07	0.03	0.04			
Biologic agents	0.11	−0.25, 0.45	0.53	0.004			
Irreversible articular damage	0.38	0.03, 0.73	0.03	0.04	0.47	0.16, 0.79	0.0037
Continuous							
Age	0.02	0.001, 0.03	0.037	0.038	0.01	0.001, 0.03	0.03
No. of DMARDs	0.02	−0.14, 0.18	0.8	0.001			
DAS28-ESR	0.23	0.08, 0.37	0.0026	0.078	0.16	0.02, 0.29	0.026
Pain VAS	0.37	0.19, 0.55	< 0.0001	0.13	0.21	0.01, 0.41	0.036
Disease duration	0.01	−0.02, 0.03	0.49	0.004			
PHQ-9	0.05	0.03, 0.07	< 0.0001	0.15	0.03	0.01, 0.06	0.008

* The most important predictor is irreversible articular damage, followed by PHQ-9, DAS28-ESR, age, and pain. b = estimate of beta coefficient; 95% CI = 95% confidence interval; R^2 = coefficient of determination; RF = rheumatoid factor; anti-CCP = anti–cyclic citrullinated peptide antibodies; DMARDs = disease-modifying antirheumatic drugs; DAS28-ESR = 3-variable Disease Activity Score in 28 joints using the erythrocyte sedimentation rate; VAS = visual analog scale; PHQ-9 = Physician Health Questionnaire-9.

followed by irreversible articular damage, depression, age, and prednisone use. This suggests that the contribution of self-reported pain was distinct and independent from having fibromyalgia.

Predicting disability over time. We subsequently examined what baseline (time 1) parameters would predict disability over time. One hundred fourteen patients from the original 251 subjects had high-quality complete data on all 14 parameters of interest collected on a followup visit a median of 6 months later (time 2). Of the remaining 137 patients, the majority had not yet returned for the intended 6-month visit, whereas others had either incomplete data points, partially completed questionnaires, or did not turn in or refused to complete the surveys. The 114 patients were highly representative of the cross-sectional cohort (n = 251) described in Table 1; the subjects did not differ in any of the baseline disease-associated parameters, including demographics; disease activity; serologic, inflammatory, or radiographic parameters; treatments; and self-reported outcomes measures ($P > 0.5$ for all comparisons; data not shown). We therefore explored in this subset which of the 14 baseline (time 1) parameters would predict disability at time 2. Interestingly, this analysis identified a very similar group of parameters as predictors of disability to those highlighted in the cross-sectional evaluation, albeit in a different order of significance (Table 3); irreversible articular damage was now the primary determinant of disability, followed by depression, disease activity, age, and finally, pain. This suggests that time 1 parameters less prone to significant change within the observational timeframe, such as irreversible damage, depression, and disease activity, are more likely to shape future disability at time 2; pain, on the other hand, which may fluctuate more frequently on a daily basis and be subject to other influences, is less significant. This is further corroborated by the high degree of correlation exhibited by measurements of disability, disease activity, and depression between times 1 and 2 (ρ = 0.6, 0.61, and 0.48, respectively, $P < 0.0001$ for all; data not shown). By contrast, correlations of pain between time 1 and time 2 were much weaker, although still statistically significant ($\rho = 0.33$, $P < 0.0001$).

DISCUSSION

Our study reveals that disability is a striking feature of "vulnerable" Hispanics with RA in Los Angeles County. Self-reported measures of functional status are known to be significant predictors of adverse outcomes in RA such as work disability, joint replacement surgery, and premature death when compared to laboratory tests, joint counts, or radiographic scores (32,33). These outcomes discriminate active treatment from placebo in randomized controlled trials equally as well as, if not better than, physician-reported variables such as the ACR criteria for 20% improvement in disease activity or the DAS28 (34,35). Hispanic patients in the Arthritis, Rheumatism, and Aging Medical Information System database (2) exhibited worse functional, pain, and global assessment scores compared to whites and African Americans. Similarly, Hispanics in the Rheumatoid Arthritis DMARD Intervention and Utilization Study had significantly higher HAQ DI scores than whites (4). Likewise, in the Early Rheumatoid Arthritis Treatment Evaluation Registry cohort, 47 Hispanics with RA scored worse in all self-report measures compared to whites and African Americans, despite an absence of differences in joint counts, ESR, or physician global assessment (3).

Our goal in this study was to identify potential predictors of heightened disability and assess the individual contribution of these predictors over time in a sizeable group of well-characterized Hispanic subjects with RA.

Our results, similar to prior reports, reinforce an apparent discrepancy between physician assessment of adequate clinical disease control and patient reports of functioning. Disability in our Hispanics was high (mean ± SD HAD DI score 1.24 ± 0.9) and comparable to published experience, as well as reports from an urban multiethnic cohort from San Francisco with similar sociodemographic composition (Imboden J: unpublished observations); in the latter, the mean ± SD HAQ DI score in Hispanics was 1.4 ± 0.9 versus 0.97 ± 0.8 in whites ($P < 0.001$). Another study in non-Hispanic whites found that subjects with low disease activity had significantly lower HAQ DI scores than those seen in our Hispanic patients (median 0.125 versus 1) (36). This observation has clinical relevance; an earlier study with predominantly whites from the US reported a median HAQ DI score of 0.9 (IQR 0.5–1.3) in subjects that were work disabled compared to 0.3 (IQR 0–0.9) in those still employed (37). Another study showed that individuals with RA have a median HAQ DI score of 1.1 (IQR 0.6–1.8) at the time they reach permanent work disability, while those still working have a median HAQ DI score of 0.6 (IQR 0.3–0.9) (38).

Our cross-sectional analysis highlighted patient-reported pain as the strongest contributor to disability; this was followed by irreversible articular damage, disease activity, depression, age, and fibromyalgia, in decreasing order of significance. After removing fibromyalgia patients from the analysis, patient-reported pain remained as the main predictor of disability (b = 0.41, $P < 0.0001$), indicating that the effect of pain on disability was separate from and independent of fibromyalgia. However, the contribution of self-reported pain, while remaining significant, was attenuated across time; perhaps its more rapidly fluctuating nature and dependence on various influences, compared to the more stable irreversible articular damage and depression across time, might have accounted for its diminished ability to predict future disability relative to other factors.

Our data indicate a high prevalence of significant depression in Hispanics with RA: 32% of all patients and 24% of those with low disease activity had a PHQ-9 score of ≥10. The prevalence of depression in RA is double that in the general population and our observed rates are on the high end of literature reports for RA (13–42%) (39). Consistent with our data, a recent report described at least moderate depression (PHQ-9 score of ≥10) in 40% of patients with RA in a cross-sectional evaluation of an urban multiethnic cohort from San Francisco (39). Furthermore, our analysis identified baseline depression as a durable and pivotal determinant of self-reported disability over time. Depression scores at baseline evaluation were significantly correlated with those at followup (r = 0.48), suggesting little overall change in its severity over the median 6 months of observation. This is probably of no surprise, given that such depression appears largely underrecognized; of 78 subjects with a baseline PHQ-9 score of ≥10 in our cohort, only 2 (2.6%) were receiving antidepressants (sertraline), whereas 13 (17%) were receiving amitriptyline mostly for treatment of fibromyalgia. Of 54 patients without fibromyalgia and a PHQ-9 score of ≥10, only 2 (3.7%) received antidepressants (sertraline). Therefore, appropriate testing and recognition, as well as culturally sensitive interventions targeting depression, may be an effective strategy to improve functional outcomes and quality of life in this population.

Additionally, our findings highlighted the importance of irreversible articular damage, defined as subluxation, arthrodesis, fusion, or prosthesis in self-reported disability; this was present in 34% of our patients and it emerged as the strongest predictor of disability over time. In patients with irreversible articular damage, age significantly worsened disability compared to those without, both cross-sectionally and over time (b = 0.025, $P = 0.001$ and b = 0.037, $P = 0.007$, respectively). Interestingly, the presence of erosions alone did not predict such disability at any time point. The reasons remain currently unclear.

The strengths of our study include a sizeable, well-characterized population of US Hispanics from a single center where independent predictors of disability are evaluated longitudinally in a standardized manner. This is the first study to our knowledge that addresses the prevalence of irreversible articular damage, joint replacement surgeries, and their subsequent impact on disability in a Hispanic population. Patient-reported pain at a given moment was the cardinal predictor of disability at that point in time, and is distinct and independent of fibromyalgia. Consistent with a prior report (39), we confirmed a high prevalence of depression and its significant contribution to cross-sectional disability; we further characterized and validated its stable and cardinal impact on such disability over time. In contrast, however, to published experience in predominantly white Europeans and Americans, the presence of RF, anti-CCP, and erosions in US Hispanics had no influence on disability either cross-sectionally or over time. Likewise, the presence of fibromyalgia had no contribution to future disability.

Our study has several limitations. Given the evaluation of patients at only 2 time points, we are unable to effectively explore interactions or mediation effects of all of the identified predictors on disability. Additionally, we have not accounted for factors such as literacy or acculturation that can affect coping with the disease process and impact disability. A secondary issue is the potential generalizability of our findings. The prevalence of RF and anti-CCP is high in our cohort (92% and 85%, respectively); both have been associated with worse radiographic progression and outcomes. Therefore, our findings may not be representative of other Hispanic populations with RA. However, their enrichment in our population may reflect referral practices to a public urban hospital as well as our definition of RA for entry into the study. Additionally, the majority of the Hispanics in our cohort were Mexican and Central American and have low socioeconomic status. Future studies on diverse Hispanic populations and subjects of higher socioeconomic status might address those points directly.

While this study highlighted factors associated with disability in a low-income Hispanic RA population, the dynamic interplay between disease-related and psychological factors in predicting disability over time remains to be determined. Such research should include a longer followup period and an evaluation of how psychological

factors could mediate the effects of disease activity and damage on disability in similar patient populations. Future studies could then inform the development of empirically supported intervention approaches that will promote positive adaptive health outcomes in Hispanic patients with RA.

ACKNOWLEDGMENT

The authors would like to thank Dr. Alisa Wilson for her administrative as well as editorial support and guidance.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Karpouzas had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study conception and design. Karpouzas, Nicassio, Weisman.
Acquisition of data. Karpouzas, Dolatabadi, Moran.
Analysis and interpretation of data. Karpouzas, Li, Nicassio, Weisman.

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