A Pilot Study to Determine Whether Disability and Disease Activity Are Different in African-American and Caucasian Patients with Rheumatoid Arthritis in St. Louis, Missouri, USA

ULKER TOK IREN, MARK S. WALKER, ERIC HOCHMAN, and RICHARD BRASINGTON

ABSTRACT. ***Objective.*** To compare the levels of disability and disease activity in African-Americans and Caucasians with rheumatoid arthritis (RA) in an academic medical center practice, and to determine whether the differences are independently associated with ethnicity.

Methods. Data on socioeconomic, disease related, psychological, and behavioral variables were obtained from 100 outpatients (67 Caucasians, 33 African-Americans) with RA. Functional status was assessed with the Health Assessment Questionnaire (HAQ) and Disease Activity Score (DAS-28). Chi-square and Student t tests were used to test for differences between groups. Multiple regression analysis was used to determine whether ethnicity was associated with these differences independent of other factors known to influence disease outcome.

Results. African-Americans and Caucasians did not differ with respect to age, sex, disease duration, rheumatoid factor positivity, and medication compliance. African-Americans had higher scores than Caucasians for HAQ (1.5 ± 0.8 vs 0.9 ± 0.7; $p < 0.001$) and DAS-28 (5.5 ± 1.3 vs 4.3 ± 1.4; $p < 0.001$). Regression models showed that ethnicity was not independently associated with the higher HAQ and DAS-28 scores when controlled for demographic, socioeconomic, psychological, and behavioral factors. Arthritis self-efficacy approaches significance in the regression model.

Conclusion. HAQ disability and RA disease activity were higher in African-Americans than Caucasians in this sample from an academic medical center practice. However, ethnicity was not independently associated with these outcomes when socioeconomic and psychological factors were taken into account. Improvement in self-efficacy has the potential to improve outcome in African-Americans with RA. (J Rheumatol 2005;32:602–8)

Key Indexing Terms:
RHEUMATOID ARTHRITIS HEALTH ASSESSMENT QUESTIONNAIRE
DISEASE ACTIVITY SCORE SELF-EFFICACY PAIN AFRICAN-AMERICANS

Ethnicity has been examined as a factor in differences in the outcome of several musculoskeletal disorders. Studies on systemic lupus erythematosus (SLE) have shown that African-Americans have increased disease activity, morbidity, and mortality[1-3]. In scleroderma, diffuse disease is more common in African-Americans and Hispanics than Caucasians[4,5]. Jordan, *et al* have reported that African-American men and women were more likely than Caucasians to have severe and bilateral radiographic osteoarthritis of the knee[6].

From the Division of Rheumatology, Washington University School of Medicine, St. Louis, Missouri, USA.

Supported by a grant from the Eastern Missouri Chapter of the Arthritis Foundation.

U.T. Iren, MD, Rheumatologist in Private Practice; M.S. Walker, PhD, Instructor of Medicine; E. Hochman, MD, Rheumatologist in Private Practice; R. Brasington, MD, Associate Professor of Medicine.

Address reprint requests to Dr. R. Brasington, Division of Rheumatology, Washington University School of Medicine, 660 S. Euclid Ave., Campus Box 8045, St. Louis, MO 63110. E-mail: brasingr@msnotes.wustl.edu

Submitted January 22, 2004; revision accepted November 12, 2004.

There have been few studies comparing the effect of ethnic differences on the severity and outcome of rheumatoid arthritis (RA)[7,8]. Lopez-Mendez, *et al* found that African-Americans with seropositive RA had disease characteristics and disability that were similar to that observed in Caucasians[8]. However, the study was performed before the adoption of contemporary methods of outcome assessment in RA. Jordan, *et al* have shown that African-Americans had reduced physical activity, negative affect, and increased disease activity as measured by tender joint count and grip strength[9], and Lambert and Lambert showed greater self-reported mobility limitations in African-Americans[10].

Our hypothesis was that the outcome of RA, like lupus and scleroderma, would be worse in African-Americans than Caucasians, and that these differences might be independently attributable to ethnicity.

We performed a pilot study to determine whether disease activity and disability differ in patients from these 2 ethnic groups in the same academic rheumatology practice, and to assess whether such differences were attributable to ethnic-

ity, or rather due to sociodemographic factors known to affect the outcome of RA.

MATERIALS AND METHODS

Patients and data collection. Roughly 90% of the African-American population of St. Louis, Missouri, lives within a short distance of the Washington University School of Medicine (WUSM), and many live in poverty. The majority of rheumatology referrals come to our urban academic medical center. We also provide care for patients from the surrounding geographic area with a more diverse distribution of income and insurance status. Caucasian or African-American patients older than 18 years attending the WUSM outpatient rheumatology clinic were eligible to participate if they fulfilled the American College of Rheumatology (formerly the American Rheumatism Association) classification criteria for RA[11]. The sole exclusion criterion was the concurrent presence of another rheumatic or musculoskeletal disease that might have confounded the assessment of outcome, except for fibromyalgia. This patient population was chosen because it was readily accessible to the investigators at WUSM. Ethnicity (African-American vs Caucasian) was self-identified by the patients[12] ("Please circle one option that describes the ethnic group that you consider yourself in"). Other ethnic groups (Hispanic, Native American, Asian-Pacific, etc.) were not included in our sample because of insufficient numbers in our outpatient population. The WUSM Human Studies Committee approved the study, and consent was obtained from all participants before data were collected.

A brief interview was conducted for demographic information and medical history. Each patient was given a questionnaire to mail back in a stamped, preaddressed envelope. Medical record review was performed to determine rheumatoid factor (RF) status. A 28-joint count was performed for tender and swollen joints[13] by one of 2 investigators who had received formal training in performing a joint count. Concordance of results between the 2 investigators was established prior to the study.

Measures. Data for age, sex, duration of disease, height, weight, symptom duration before seeking medical attention for RA, symptom duration before starting disease modifying antirheumatic drug (DMARD) therapy, current and past use of DMARD, and reasons for stopping DMARD use were determined by interview. Subjects completed a questionnaire to collect information on ethnicity, marital status, smoking, alcohol consumption, occupation[14], work status, health insurance (some private insurance vs all other including Medicare, Medicaid, and no insurance), years of formal education, total yearly household income, satisfaction with health care, and whether receiving disability payments ("Currently, which of the following applies to you?" one option of which was "Disabled, receiving disability"). In the same questionnaire, patients were asked to select items from a list of other illnesses, thus identifying comorbidities.

The European League Against Rheumatism (EULAR) Disease Activity Score (DAS-28) was calculated for each patient using the number of tender and swollen joints from the 28-joint count, the erythrocyte sedimentation rate (ESR), and the visual analog scale (VAS) for overall health (assessed by the patient)[13]. The DAS-28 is a continuous variable that provides an absolute value for disease activity at a given point in time. Patients completed a separate 10 cm VAS for pain (VAS-pain). Patients completed the Health Assessment Questionnaire (HAQ)[15] as a self-reported measure of disability. We administered the Rheumatology Arthritis Index (RAI; formerly known as the Arthritis Helplessness Index, AHI) to assess patients' perceptions of helplessness in coping with arthritis[16]. The Arthritis Self-Efficacy Scale (ASES) was administered to measure a patient's beliefs that he/she could perform specific tasks or behaviors to cope with arthritis[16]. Finally, we used the Compliance Questionnaire Rheumatology (CQR)[17] to assess potential differences between the 2 groups in attitudes toward taking medication and compliance with prescribed medications.

Statistical analysis. Data were stored and analyzed using SPSS statistical software, v. 10.0 (SPSS Inc., Chicago, IL, USA). Initial assessments of group differences were conducted using independent samples t-tests for continuous variables, chi-square tests for frequency data, and Mann-Whitney U test for non-normal and rank order data. Simple Pearson correlations were computed among independent and dependent variables.

For each of the outcome variables, HAQ and DAS-28, sequential multiple linear regression models were developed to evaluate the effect of ethnicity and other predictors on the outcome of interest. The first step included only ethnicity, and served as a baseline against which to evaluate the effects of other variables. At the second step, demographic variables were added (age, sex, education, marital status). Demographic and socioeconomic factors have been shown to have a profound influence on health outcome[18-20]. At the third step, indicators of socioeconomic status (health insurance status, income above poverty level) were added. At the fourth step, psychological/behavioral variables (overall self-efficacy, helplessness) were added. At the fifth step, clinical variables were added. For analysis of the HAQ, these included number of comorbidities, disease duration, number of DMARD, DAS-28, and VAS-pain. For analysis of the DAS-28, these included number of comorbidities, disease duration, and number of DMARD, as these clinical variables would plausibly precede disease activity.

At each step, variables were entered into the model as a block, and the significance of the block, of ethnicity, and of the overall model were examined. Normal distribution of residuals was also verified for each model. The criterion of significance for all statistical tests was set at $p < 0.05$, 2-tailed.

RESULTS

A total of 118 patients were approached for the study (79 Caucasian, 39 African-American). One hundred and three agreed to participate (69 Caucasian, 34 African-American), and provided data through interview, medical record review, joint examination, and blood collection for ESR. However, 16 patients failed to complete at least one of the study outcome measures, leaving 92 available for analysis of the HAQ (63 Caucasian, 29 African-American), and 91 available for analysis of the DAS-28 (58 Caucasian, 33 African-American). Descriptive statistics are reported for the 100 patients who provided data for at least one of the outcome measures (67 Caucasian, 33 African-American).

Descriptive results and simple group comparisons. The majority of patients were female (82%) nonsmokers (80%) who did not work fulltime (69.1%). African-Americans had higher body mass indexes, were more likely to be receiving disability and to have income under the poverty level, and were less likely to be married or to have private insurance. Other demographic and socioeconomic characteristics of the sample, as well as means, standard deviations, and significance of group differences, are reported in Table 1.

Patients had experienced symptoms for an average of 22.3 months prior to diagnosis, and 33.1 months before initiation of DMARD therapy, with no difference between Caucasian and African-American patients on these variables. Caucasian and African-American patients also did not differ in the proportion with positive RF, or in the proportion currently using nonsteroidal antiinflammatory drugs, prednisone, methotrexate, or biologic agents. However, African-American patients had a greater number of comorbidities, were taking fewer current DMARD, and had taken fewer DMARD in the past, compared to Caucasian patients. Details of the clinical characteristics of patients, and signif-

Table 1. Demographic and clinical characteristics of the sample.

Characteristic	Total N[a]	African-American	Caucasian	Total	p[b]
Age, yrs, mean ± SD	98	52.3 ± 10.7	55.5 ± 12.8	54.5 ± 12.2	0.232
Female, n (%)	100	29 (87.9)[c]	53 (79.1)	82 (82)	0.215
Body mass index	81	33.1 ± 9.5	29.2 ± 7.2	30.1 ± 8.3	0.039
Has a primary care provider	95	27 (90.0)	59 (90.8)	86 (90.5)	0.586
Smoker	95	9 (30)	10 (15.4)	19 (20.0)	0.086
Working fulltime	94	6 (20.7)	23 (35.4)	29 (30.9)	0.117
Receiving disability payments	94	19 (65.5)	9 (13.8)	28 (29.8)	< 0.001
Married	95	9 (30.0)	47 (72.3)	56 (58.9)	< 0.001
Income under poverty level	92	16 (57.1)	1 (1.6)	17 (18.5)	< 0.001
Private insurance[d]	92	14 (48.3)	61 (96.8)	75 (81.5)	< 0.001
Education, yrs	93	11.9 ± 2.9	13.7 ± 2.9	13.1 ± 3.0	0.006
Symptom duration before diagnosis, mo	89	26.7 ± 41.9	20.1 ± 27.7	22.3 ± 33.1	0.537*
Symptom duration before DMARD therapy, mo	72	39.8 ± 57.6	30.1 ± 35.0	33.1 ± 43.0	0.573*
No. of comorbidities	95	2.4 ± 1.54	1.9 ± 2.4	2.07 ± 2.2	0.016*
No. of current DMARD	94	1.1 ± 0.74	1.5 ± 0.68	1.4 ± 0.72	0.016
No. of past DMARD	90	0.7 ± 1.4	1.4 ± 1.5	1.2 ± 1.5	0.005*
Currently taking NSAID	93	19 (67.9)	37 (56.9)	56 (60.2)	0.225
Currently taking prednisone	94	10 (34.5)	26 (40.0)	36 (38.3)	0.393
Currently taking methotrexate	94	18 (62.1)	46 (70.8)	64 (68.1)	0.273
Currently taking a biologic agent	94	4 (13.8)	18 (27.7)	22 (23.4)	0.112
Positive rheumatoid factor	74	17 (73.9)[c]	37 (72.5)	54 (73.0)	0.570
Disease duration, yrs, mean ± SD	96	12.4 ± 11	11.0 ± 9.0	11.5 ± 9.8	0.998*

[a] Number of cases for which data on each characteristic were available. [b] Student's t test to compare means; Mann-Whitney U test to compare groups on non-normally distributed data (denoted *). Chi-square tests of independence were used to compare distribution of categorical variables. [c] Count (% within ethnicity). [d] Private insurance versus no insurance, Medicare, and Medicaid.

icance of group differences on these variables, are reported in Table 1.

African-American patients had greater disease activity, greater pain, and greater disability compared to Caucasian patients. There was no difference between Caucasian and African-American patients on measures of helplessness or compliance, but African-American patients scored as having significantly lower self-efficacy for dealing with functioning, pain, and other symptoms of arthritis. Other details of disease activity and its effects, and significance of group differences, are reported in Tables 2 and 3.

The variable ethnicity, and the same sets of demographic predictors (age, sex, education, marital status), socioeconomic indicators (health insurance status, income below poverty level), and psychological/behavioral predictors (overall self-efficacy, helplessness) were used in regression modeling of HAQ and DAS-28. Clinical indicators differed, in that models for both outcomes included number of comorbidities, disease duration, and number of DMARD, but the regression model of the HAQ also included DAS-28 and VAS-pain. Except for age and number of current DMARD, each of the predictors was significantly correlat-

Table 2. Disease activity, damage, and health status measures among African-Americans and Caucasians.

Measure	Total N[a]	African-American	Caucasian	Total	p[b]
HAQ (0–3)	92	1.5 ± 0.8	0.9 ± 0.7	1.07 ± 0.78	< 0.001
DAS-28	91	5.5 ± 1.3	4.3 ± 1.4	4.7 ± 1.5	< 0.001
VAS-disease activity (0–100), mean ± SD	88	44.7 ± 27.4	32.9 ± 24.3	36.5 ± 25.7	0.046
VAS-pain (0–100)	88	52.8 ± 30.7	32.1 ± 23.6	38.4 ± 27.5	0.001
ESR, mm/h	91	54.0 ± 27.5	29.5 ± 22.3	38.4 ± 26.9	< 0.001
Swollen joint count (28-joint)	97	7.3 ± 5.5	6.9 ± 6.7	7.0 ± 6.3	0.76
Tender joint count (28-joint)	97	10.1 ± 8.8	5.6 ± 5.7	7.1 ± 7.2	0.003

[a] Number of cases for which data on each characteristic were available. [b] Student's t test was used to compare group means. HAQ: Health Assessment Questionnaire, DAS: Disease Activity Score, VAS: visual analog scale.

Table 3. Helplessness, compliance, and self-efficacy among African-Americans and Caucasians with RA.

Measure	Total N[a]	African-American	Caucasian	Total	p[b]
RAI, mean ± SD	86	35.2 ± 5.6	33.3 ± 5.1	33.8 ± 5.3	0.129
CQR	87	58.6 ± 5.0	59.2 ± 8.0	59.0 ± 7.2	0.661
Self-efficacy					
Function	91	39.2 ± 28.3	73.1 ± 23.8	63.0 ± 29.1	< 0.001
Pain	91	37.8 ± 24.3	56.2 ± 19.7	50.5 ± 22.7	< 0.001
Other symptoms	91	46.5 ± 27.5	68.5 ± 21.2	61.7 ± 25.3	< 0.001
Overall[c]	89	41.5 ± 24.8	66.0 ± 18.6	58.6 ± 23.5	< 0.001

[a] Number of cases for which data on each characteristic were available. [b] Student t test. [c] Computed as the mean of the 3 self-efficacy subscales. RAI: Rheumatology Attitudes Index, CQR: Compliance Questionnaire Rheumatology.

ed with at least one of the outcomes. Age and number of current DMARD were included in the regression models despite their nonsignificant simple relation with HAQ and DAS-28 because of their clinical relevance, and because of the potential for significant higher order correlations.

Regression analysis. Multiple regression analysis of the HAQ showed that, at the first step, ethnicity was a significant predictor of functional status, and explained 12.9% of the variance of functional status (Table 4). The block of demographic predictors entered at the second step was significant, and explained an additional 10.1% of the variance of functional status. After entry of this block, ethnicity remained a significant predictor ($p = 0.02$). The block of socioeconomic predictors entered at the third step did not achieve significance ($p = 0.096$), but the variance explained by this block (4.2%) was enough to show ethnicity as nonsignificant in the model ($p = 0.083$). The insertion of psychological/behavioral variables at the fourth step was highly significant ($p < 0.001$), and explained an additional 33.9% of the variance of functional status. Entry of this block left ethnicity unambiguously nonsignificant ($p = 0.905$). Entry of clinical characteristics on the final step was also significant ($p < 0.001$), and explained an additional 10.7% of HAQ variance. Ethnicity remained nonsignificant after the final step ($p = 0.551$). The final model explained 71.7% of the variance of functional status. Further details of the analysis are shown in Table 4.

Despite the significance of 4 of 5 blocks to enter this model, most of the individual variables entered were nonsignificant in the final model. Table 5 shows the standardized partial regression coefficients for each of the variables in the final model. As indicated in Table 5, arthritis self-efficacy was significantly related to functional status, such that those with lower self-efficacy had greater functional impairment. In addition, those with more comorbidities and greater pain also had greater functional impairment.

As in the analysis of the HAQ, multiple regression analysis of the DAS-28 showed that, at the first step, ethnicity was a significant predictor of disease activity (Table 6). Ethnicity explained 15.3% of the variance of disease activity, and was significant at $p < 0.001$. The block of demographic predictors entered at the second step just missed significance ($p = 0.058$), but explained an additional 8.5% of the variance of disease activity. After entry of this block, ethnicity remained a significant predictor ($p = 0.001$). The block of socioeconomic predictors entered at the third step also just missed significance at $p = 0.063$, but explained an additional 4.9% of the variance of disease activity. Unlike under analysis of the HAQ, ethnicity remained a significant predictor of disease activity even after addition of the socioeconomic indicators ($p = 0.02$). Insertion of psychological/behavioral variables at the fourth step also missed significance by a narrow margin ($p = 0.085$), although inclusion of this block explained an additional 4.2% of the variance of disease activity. Entry of this block left ethnicity marginally nonsignificant at $p = 0.097$. Entry of clinical

Table 4. Multiple regression analysis of HAQ disability.

Block	ΔR^2*	p for Block	p for Ethnicity**	R^2 Model†	p for Model††
Ethnicity	0.129	< 0.001	< 0.001	0.129	< 0.001
Demographic Characteristics	0.101	0.030	0.002	0.230	< 0.001
Socioeconomic Status	0.042	0.096	0.083	0.271	< 0.001
Psychological/Behavioral Characteristics	0.339	< 0.001	0.905	0.611	< 0.001
Clinical Characteristics	0.107	< 0.001	0.551	0.717	< 0.001

* Change in R^2 after entry of block of variables. ** Significance of ethnicity after entry of block. † R^2 for model after entry of this block of variables. †† Significance of overall model.

Table 5. Regression model of Health Assessment Questionnaire (HAQ) and Disease Activity Score (DAS-28).

Predictor	HAQ ß	HAQ p	DAS-28 ß	DAS-28 p
Ethnicity (0: Caucasian, 1: African-American)	–0.057	0.551	0.179	0.195
Sex (0:male, 1:female)	0.095	0.152	0.240	0.015*
Marital status (0: not married, 1: married)	0.045	0.513	–0.046	0.657
Age	–0.020	0.788	0.109	0.335
Education, yrs	–0.058	0.396	0.031	0.764
Insurance status (0: other, 1: private insurance)	–0.067	0.528	–0.234	0.139
Income below poverty level (0: below, 1: above)	0.008	0.943	0.086	0.610
Arthritis self-efficacy (overall score)	–0.557	0.000***	–0.213	0.097
Rheumatology Attitudes Index	–0.150	0.065	0.017	0.883
No. of comorbidities	0.169	0.021*	0.126	0.226
Disease duration, yrs	0.099	0.142	–0.051	0.604
No. of current DMARD	0.008	0.906	–0.050	0.623
VAS-pain	0.255	0.004**		
DAS-28	0.097	0.200		

* Significant at $p < 0.05$. ** Significant at $p < 0.01$. *** Significant at $p < 0.001$.

Table 6. Multiple regression analysis of DAS-28.

Block	ΔR^2*	p for Block	p for Ethnicity**	R^2 Model†	p for Model††
Ethnicity	0.153	< 0.001	< 0.001	0.153	< 0.001
Demographic Characteristics	0.085	0.058	0.001	0.238	< 0.001
Socioeconomic Status	0.049	0.063	0.02	0.287	< 0.001
Psychological/Behavioral Characteristics	0.042	0.085	0.097	0.329	< 0.001
Clinical Characteristics	0.017	0.574	0.195	0.346	< 0.001

* Change in R^2 after entry of block of variables. ** Significance of ethnicity after entry of block. † R^2 for model after entry of this block of variables. †† Significance of overall model.

characteristics on the final step was clearly nonsignificant, and explained only 1.7% additional variance. Ethnicity remained nonsignificant at $p = 0.195$. The final model explained 34.6% of the variance of disease activity. Further details of the analysis are shown in Table 6.

Ethnicity, when entered on the first step, was the only block of variables that was significant to enter this regression model of disease activity. However, demographic characteristics, socioeconomic indicators, and psychological/behavioral variables narrowly missed significance to enter, and may have been significant with a somewhat larger sample. Despite this, only one of the variables in the final model was a significant predictor of disease activity. Table 5 shows the standardized partial regression coefficients for each of the variables in the final model. As indicated in the table, sex was the lone significant predictor, with female sex predicting greater disease activity. Arthritis self-efficacy approaches significance in this model, however ($p = 0.097$), suggesting that greater self-efficacy is associated with lower disease activity. Other predictors, including clinical indicators such as disease duration and number of current DMARD, were nonsignificant.

DISCUSSION

Increasingly there is concern about differences in disease severity, treatment, and outcome between different ethnic groups. The National Institutes of Health (NIH) has established a new National Center on Minority Health and Health Disparities, and conducted in December 2000 an unprecedented conference to address health disparities in arthritis, musculoskeletal, and skin diseases[12]. The elimination of health disparities has been identified as a priority by the US Department of Health and Human Services in their plan, Healthy People 2010[21]. Further, current efforts to better understand RA in African-Americans include the Consortium for the Longitudinal Evaluation of African-Americans with RA (CLEAR), which will enroll several hundred patients with early RA to study genetic and non-genetic factors associated with disease severity[22].

The study published by Lopez-Mendez, *et al* in 1989 directly compared characteristics of African-Americans and Caucasian RA patients and found no significant differences in outcome between the 2 groups[8]. However, many of the currently standard outcome measures were not in use at that time, and detailed demographic and socioeconomic data

were not collected. As well, the approach to the treatment of RA has changed dramatically in the interval since that study was published.

Our goal in performing this pilot study was to explore the possibility that the outcome of RA by current outcome measures might be worse in African-Americans than in Caucasians. Our intent was to look for a "signal" that outcome differences might exist, reasoning that if such differences were seen in such a small sample, a subsequent prospective study with a larger sample size might be undertaken.

In our small sample, we found that the DAS-28 results were significantly higher for the African-American group. Although swollen joint counts did not differ between the 2 groups, the tender joint count and ESR were significantly worse for African-Americans. Further, VAS-pain was also worse in the African-American group. Pain experience has been shown to be influenced by sociocultural environment[23-26]. The possibility that the perception of joint tenderness and pain in general might be different between these 2 ethnic groups would have significant implications for data obtained during clinical trials of investigative agents. This issue deserves further investigation in a prospective study.

HAQ scores were also significantly higher in the African-American group, and correlated positively with female sex and number of comorbidities and negatively with years of education and income level, consistent with previous studies[27,28]. It is well established that African-American ethnicity is associated with lower socioeconomic status, which is also a risk factor for poor health outcome[22].

In addition, we were not surprised to find that the African-American RA patients had lower incomes and fewer years of education than the Caucasian patients, and were less likely to have private medical insurance. This is consistent with the observation that differences in socioeconomic factors such as social class and formal education adversely influence longterm outcomes in RA[18-20]. However, the 2 groups did not differ with respect to (1) the number of patients taking methotrexate, prednisone, and biologic agents, or (2) the duration of symptoms before diagnosis of RA, and before starting DMARD therapy. Moreover, there were no differences in self-reported medication compliance practices. Since Caucasians were currently receiving a higher mean number of DMARD and had been taking a higher number of DMARD in the past, treatment practices of healthcare providers might have differed between the 2 ethnic groups. Although we cannot exclude this possibility, we believe that this is not likely to be the case, since all patients were treated by the same physicians in the same location.

Analysis of HAQ results indicated that after controlling for demographic and socioeconomic variables, ethnicity fell just short of statistical significance in predicting disability. However, the addition of the block of psychological/behavioral variables rendered ethnicity clearly nonsignificant as a predictor of HAQ oucome. This suggests that ethnicity differences in disability as measured by HAQ are explained by ethnicity differences in other variables, and that ethnicity is not independently associated with HAQ.

Analysis of the DAS-28 results showed that African-Americans scored as more disabled even when controlling for demographic and socioeconomic variables. However, ethnicity became nonsignificant once psychological/behavioral and clinical behavioral variables were added to the regression model.

We were particularly interested that measures of self-efficacy were significantly worse in the African-American group. Self-efficacy describes the concept whereby a patient believes that he/she can act in a way to modify the outcome of disease in a favorable fashion. Although it is exceedingly difficult to change socioeconomic and demographic differences, patients' attitudes toward their disease can be modified. Increasing self-efficacy can improve health outcomes in a variety of conditions, particularly arthritis. Lorig and others have shown that the Arthritis Self-Help Course has been effective in improving self-efficacy in patients with RA. Scores for self-efficacy have been shown to improve during an arthritis self-management course, and measures of pain decreased[29]. If further study verifies that self-efficacy is decreased in African-Americans with RA, a strategy for intervention to enhance self-efficacy would be worth investigation.

Our study had several very significant limitations. First, the design was cross-sectional, rather than prospective. This allowed us to collect data over a relatively short timeframe to assess whether further study might be justified. Based on these preliminary results, we plan to develop an inception cohort of RA patients of both ethnic groups and follow the groups prospectively. Second, the sample size was modest, providing roughly a 7:1 case to variable ratio for the regression models. Although this might have led to overfitting of the models, we felt it was important to examine plausible correlates of disease activity and perceived disability in a multivariable model. We note also that most variables in the final models were indeed nonsignificant, suggesting that overfitting did not occur. Third, the small sample size limits the application of our statistical analysis. However, the fact that this small sample showed significant differences in several important measures suggests that it is likely the outcome of RA in African-Americans is worse than for Caucasians. Finally, our sample is clearly subject to the referral bias of an academic medical center. In particular, our patient population is enriched with patients who lack private medical insurance.

In summary, we found that HAQ and DAS-28 results were worse in the African-American patients in our clinic. However, ethnicity was not independently associated with either outcome when controlling for sociodemographic vari-

ables, socioeconomic status, psychological/behavioral variables, and clinical variables in a regression analysis. In analysis of both HAQ and DAS-28 results, lower arthritis self-efficacy appeared to be associated with poorer outcome. Thus, the outcome of African-American patients with RA might be improved through interventions that address patients' level of self-efficacy for dealing with RA.

ACKNOWLEDGMENT

We thank Seth Eisen, MD, for his critical review of the study proposal and Robert Groszewski for assistance in preparing the manuscript.

REFERENCES

1. Alarcon GS, Roseman J, Bartolucci AA, et al. Systemic lupus erythematosus in three ethnic groups. II. Features predictive of disease activity early in its course. Arthritis Rheum 1998;41:1173-80.
2. Reveille JD, Moulds JM, Ahn C, Baethge B, Straaton KV, Alarcon GS. Systemic lupus erythematosus in three ethnic groups. I. The effects of HLA Class II, C4, and CR1 alleles, socioeconomic factors, and ethnicity at disease onset. Arthritis Rheum 1998;41:1161-72.
3. Petri M, Perez-Gutthann S, Longenecker G, Hochberg M. Morbidity in systemic lupus erythematosus: role of race and socioeconomic status. Am J Med 1991;91:345-53.
4. Reveille JD, Fischbach M, McNearney T, et al. Systemic sclerosis in 3 US ethnic groups: a comparison of clinical, sociodemographic, serologic, and immunogenetic determinants. Semin Arthritis Rheum 2001;30:332-46.
5. Laing GJ, Gillespie BW, Toth MB, et al. Racial differences in scleroderma among women in Michigan. Arthritis Rheum 1997;40:734-42.
6. Jordan JM. The importance of ethnicity in osteoarthritis and its consequences. Biomechanics 2001;2:25-38.
7. Anaya JM, Rosler D, Espinoza LR. Rheumatoid arthritis in black Americans [letter]. Ann Rheum Dis 1994;53:782-3.
8. Lopez-Mendez A, Paul WA, Alarcon GS. Rheumatoid arthritis in American blacks: a clinical and radiological study. J Rheumatol 1989;16:1197-1200.
9. Jordan MS, Lumley MA, Leisen JC. The relationships of cognitive coping and pain control beliefs to pain and adjustment among African-American and Caucasian women with rheumatoid arthritis. Arthritis Care Res 1998;11:80-8.
10. Lambert VA, Lambert CE. The relationship between social support and psychological well being in rheumatoid arthritic women from two ethnic groups. Health Care Women Int 1985;6:405-14.
11. Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1988;31:315-24.
12. Jordan JM, Lawrence R, Kington R, et al. Ethnic health disparities in arthritis and musculoskeletal diseases: report of a scientific conference. Arthritis Rheum 2002;46:2280-6.
13. Prevoo ML, van't Hof MA, Kuper HH, van Leeuwen MA, van de Putte LB, van Riel PL. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum 1995;38:44-8.
14. US Department of Labor. Bureau of Labor Statistics, 2004. Internet. [cited November 19, 2004]. Available from: http://www.bls.gov/
15. Fries JF, Spitz P, Kraines G, Holman H. Measurement of outcome in arthritis. Arthritis Rheum 1980;23:137-45.
16. Brady T. Measures of self-efficacy, helplessness, mastery, and control: The Arthritis Helplessness Index (AHI)/Rheumatology Attitudes Index (RAI), Arthritis Self-Efficacy Scale (ASES), Children's Arthritis Self-Efficacy Scale (CASE), Generalized Self-Efficacy Scale (GSES), Mastery Scale, Multi-Dimensional Health Locus of Control Scale (MHLC), Parent's Arthritis Self-Efficacy Scale (PASE), Rheumatoid Arthritis Self-Efficacy Scale (RASE), and Self-Efficacy Scale (SES). Arthritis Care Res 2003;49:S147-64.
17. de Klerk E, van der Heijde D, van der Tempel H, van der Linden S. Development of a questionnaire to investigate patient compliance with antirheumatic drug therapy. J Rheumatol 1999;26:2635-41.
18. Pincus T, Callahan L. Formal education as a marker for increased mortality and morbidity in rheumatoid arthritis. J Chron Dis 1985;38:973-84.
19. Wolfe F, Zwillich SH. The long-term outcomes of rheumatoid arthritis: a 23-year prospective, longitudinal study of total joint replacement and its predictors in 1600 patients with rheumatoid arthritis. Arthritis Rheum 1998;4:1072-82.
20. Callahan LF, Pincus T, Huston JW 3rd. Measures of activity and damage in rheumatoid arthritis: depiction of changes and prediction of mortality over five years. Arthritis Care Res 1997;10:381-94.
21. US Department of Health and Human Services. Healthy people 2010: understanding and improving health. 2nd ed. Washington, DC: US Government Printing Office; 2000.
22. Bridges SL, Hughes LB, Mikuls RT, et al. Early rheumatoid arthritis in African-Americans: the CLEAR Registry. Clin Exp Rheumatol 2003;21 Suppl 31:S138-45.
23. Bates MS, Edwards WT, Anderson KO. Ethnocultural influences on variation in chronic pain perception. Pain 1993;52:101-12.
24. Ektor-Andersen J, Janzon L, Sjolund B. Chronic pain and the sociodemographic environment: results from the Pain Clinic at Malmo General Hospital in Sweden. Clin J Pain 1993;9:183-8.
25. Neumann L, Buskila D. Ethnocultural and educational differences in Israeli women correlate with pain perception in fibromyalgia. J Rheumatol 1998;25:1369-73.
26. Wolfe F, Anderson J, Harkness D, et al. Health status and disease severity in fibromyalgia: results of a six-center longitudinal study. Arthritis Rheum 1997;40:1571-9.
27. Holm MB, Rogers JC, Kwoh CK. Predictors of functional disability in patients with rheumatoid arthritis. Arthritis Care Res 1998;11:346-55.
28. Jansen LMA, van Schaardenburg D, van der Horst-Bruinsma IE, Bezemer PD, Dijkmans BA. Predictors of functional status in patients with early rheumatoid arthritis. Ann Rheum Dis 2000;59:223-6.
27. Lorig K, Sobel DS, Stewart AL, et al. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. Med Care 1999:37:5-14.