Lupus (2011) 20, 80–84
http://lup.sagepub.com

CONCISE REPORT

Depression predicts self-reported disease activity in systemic lupus erythematosus

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Systemic lupus erythematosus (SLE) is an autoimmune disease that can significantly impact both physiological and psychological functioning. In order to examine the relationship between psychological functioning and disease activity in SLE, we administered instruments that collected sociodemographic information and measured indices of disease activity and psychosocial functioning from 125 adult Hispanic and White patients with SLE. Patients were recruited from four healthcare settings in the greater Southern California area. Both cross-sectional and longitudinal relationships between depression and disease activity were evaluated. Cross-sectional findings revealed that depression and ethnicity were independently correlated with self-reported disease activity. Longitudinally, depression alone predicted self-reported disease activity. These data suggest that depression may play a significant role in the health status of SLE patients and serve as an important target for clinical intervention. *Lupus* (2011) **20,** 80–84.

Key words: depression; disease activity; systemic lupus erythematosus

Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease primarily found in women that can have life-threatening consequences and interfere significantly with quality of life.[1] Previous studies have shown that levels of emotional disturbance are higher in patients with SLE[2,3] than in healthy controls. In particular, more than 20% of SLE patients have been found to report a current major depressive episode.[4] Depression in patients, especially when combined with physiological symptoms such as pain, has been shown to interfere with daily functioning and may be a risk factor for atherosclerosis.[5,6] Little is known, however, about the relationship between SLE disease activity and depression over time. The purpose of this study was to determine whether depression, in combination with other psychological variables, would predict self-reported disease activity in a sample comprised of White and Hispanic SLE patients. We examined both cross-sectional and longitudinal relationships between psychosocial variables and disease activity.

Participants

One hundred and twenty-five adult Hispanic and White patients meeting the revised American College of Rheumatology (ACR) criteria for SLE[7] were recruited from four medical centers in the greater Southern California area: Los Angeles County/USC Medical Center, Loma Linda University Medical Center, Harbor-UCLA Medical Center, and Cedars-Sinai Medical Center. The sample included 119 women and six men whose average age was 44.2 years (SD = 13.20). Forty-five of the patients were Hispanic/Mexican, 15 were Hispanic/non-Mexican, and 65 were White.

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Received 28 April 2010; accepted 17 June 2010

10.1177/0961203310378672

Hispanic patients were younger and reported lower incomes than White patients.

Methods

The study employed a longitudinal design in which patients completed disease activity and psychosocial evaluations at an initial clinic visit and again at 3-month follow-up. Project coordinators administered self-report measures in either Spanish or English during a regularly scheduled clinic visit, while Systemic Lupus Erythematosus Disease Activity Index (SLEDAI) scores were obtained from the medical chart during each patient's most recent visit. The Systemic Lupus Activity Questionnaire (SLAQ) was used to evaluate patient-reported disease activity.[8] The SLAQ was derived from the Systemic Lupus Activity Measure (SLAM)[9] and was developed to monitor the disease activity of large groups of patients with SLE for clinical studies. The SLEDAI assesses lupus activity based on clinician ratings of nine organ systems and laboratory data.[10] Psychological measures included the helplessness and internality subscales of the Rheumatology Attitudes Index (RAI),[11] and the 9-item Patient Health Questionnaire (PHQ-9), a measure of depression based on the Diagnostic and Statistical Manual [of Mental Disorders], 4th Edition (DSM-IV) criteria.[12] The PHQ-9 assesses symptoms associated with depression and functional impairment and provides a severity score useful for monitoring patient symptoms over time. A score of 10 or greater indicates the prevalence of depressive disorder in the general population. Data on all measures were obtained at baseline, while only the SLAQ was readministered 3 months later (SLAQ2) (see Table 1).

Hierarchical multiple regression analyses were conducted on both cross-sectional and longitudinal data using the same approach. In both analyses, SLEDAI scores were entered on the first step, followed by ethnicity on step 2, sociodemographic factors on step 3, and psychological variables on step 4. In this manner, the role of psychological functioning was examined after removing the effects of other variables.

Results

Ethnic differences

Hispanic patients reported less disease activity and depression at SLAQ time 1 than White patients. No other differences were found on study variables (see Table 1).

Cross-sectional findings

The entry of SLEDAI on step 1 was not significant, while the contribution of ethnicity on step 2 explained significant variance in SLAQ

Table 1 Descriptive data on study measures

Variable	*White*	*Hispanic*	*Range*	t-*test*
Age	46.68 (SD = 14.31)	41.422 (SD = 11.43)	19–81	2.26[a]
SLEDAI	3.71 (SD = 3.49)	3.18 (SD = 3.61)	0–18	.821
SLAQ	27.41 (SD = 13.99)	11.16 (SD = 8.86)	0–59	7.56[c]
SLAQ2	13.38 (SD = 8.53)	11.20 (SD = 7.07)	0–40	1.51
Internality	23.18 (SD = 5.69)	24.45 (SD = 6.25)	0–35	−1.19
Helplessness	15.25 (SD = 4.07)	15.22 (SD = 4.31)	0–25	.04
PHQ-9 sum	9.43 (SD = 6.81)	6.55 (SD = 5.29)	0–24	2.62[b]
Yearly family income (US$)	***n***	***N***		
<5 k	6	16		
5–9 k	3	10		
10–14 k	2	7		
15–19 k	3	7		
20–29 k	4	5		
30–49 k	6	4		
50–99 k	20	1		
>100 k	15	0		

[a] $p \leq .05$; [b] $p \leq .01$; [c] $p \leq .001$.
Abbreviations: PHQ-9: (9-item) Patient Health Questionnaire; SLAQ: Systemic.
Lupus Activity Questionnaire; SLAQ2: Systemic Lupus Activity Questionnaire.
readministered 3 months later (at time 2); SLEDAI: Systemic Lupus Erythematosus.
Disease Activity Index.

Table 2 Cross-sectional multiple regression model

Model	R	R^2	R^2 *change*	F *change*	*d.f.*	*beta*	t	sr^2	*Final beta*	*Final* sr^2
Step 1: SLEDAI	.01	.00	.00	.01	1,123	.01	.07	.00	−.06	.00
Step 2: Ethnicity	.56	.32	.32	56.33[a]	1,122	−.56[a]	−7.51	.32	−.45[a]	.13
Step 3:	.57	.32	.01	.66	2,120					
Age						−.01	−.18	.00	−.04	.00
Annual Income						.10	1.14	.01	.10	.01
Step 4:	.65	.42	.10	6.39[a]	3,117					
Helplessness						.00	−.05	.00	.00	.00
Internality						−.08	−1.02	.01	−.08	.01
PHQ-9						.30[a]	3.58	.06	.30[a]	.06

[a]$p < .001$.
Beta: standardized regression coefficient of the variable at each step; sr^2: unique variance explained; Final beta: standardized regression coefficient after all variables entered the model; Final sr^2: unique variance explained after all variables entered the model.
Abbreviations: PHQ-9: (9-item) Patient Health Questionnaire; SLEDAI: Systemic Lupus Erythematosus Disease Activity Index.

Table 3 Longitudinal multiple regression model

Model	R	R^2	R^2 *change*	F *change*	*d.f.*	*beta*	t	sr^2	*Final beta*	*Final* sr^2
Step 1: SLEDAI	.06	.00	.00	.37	1,123	.06	.61	.00	.04	.00
Step 2: Ethnicity	.14	.02	.02	1.95	1,122	−.13	−1.40	.02	−.04	.00
Step 3:	.17	.03	.01	.67	2,120					
Age						.10	1.04	.01	.06	.00
Annual Income						−.06	−.57	.00	−.06	.00
Step 4:	.55	.31	.28	15.45[a]	3,117					
Helplessness						.13	1.33	.01	.13	.01
Internality						−.13	−1.42	.01	−.13	.01
PHQ-9						.46[a]	5.04	.20	.46[a]	.20

[a]$p < .001$.
Beta: standardized regression coefficient of the variable at each step; sr^2: unique variance explained; Final beta: standardized regression coefficient after all variables entered the model; Final sr^2: unique variance explained after all variables entered the model.
Abbreviations: PHQ-9: (9-item) Patient Health Questionnaire; SLEDAI: Systemic Lupus Erythematosus Disease Activity Index.

scores [R^2 change = .32, F (1.122) = 56.33, $p < .001$, beta = −.56, $p < .001$]. White patients reported higher levels of disease activity than Hispanic patients. While sociodemographic factors were not significant on step 3, the contribution of psychological factors on step 4 was highly significant [R^2 change = .10, F (3.117) = 6.39, $p < .01$]. Depression independently predicted SLAQ scores, beta = .30, $p < .001$, while helplessness and internality did not. The mean PHQ-9 score for the sample of 8.05 (SD = 6.27) was subclinical but still high for a non-psychiatric sample. After depression entered the equation, the contribution of ethnicity remained a significant independent correlate of SLAQ, (beta = −.45, $p < .001$) (see Table 2).

Longitudinal findings

The purpose of the longitudinal regression analysis was to determine if psychological variables from time 1 would predict self-reported disease activity at time 2. On step 1, the contribution of SLEDAI was not significant [R^2 change = .00, F (1.123) = .37]. When entered on steps 2 and 3, respectively, neither ethnicity nor sociodemographic factors proved significant; however, on the final step, psychological factors had a large impact on time 2 SLAQ scores [R^2 change = .28, F (3.117) = 15.45, $p < .001$]. Depression alone predicted time 2 SLAQ, beta = .46, $p < .001$, whereas helplessness and internality did not reach significance (see Table 3).

Discussion

Statistical analyses evaluated the contribution of psychological variables to self-reported disease activity after examining the effects of objective disease activity, ethnicity, and sociodemographic variables. Importantly, the role of depression in self-reported disease activity was confirmed after

controlling for these factors. This study showed that depression was correlated with higher self-reported disease activity within time and predicted SLAQ scores over a brief time interval. It is possible, however, that since both measures rely on self-report, a self-reporting bias may have played some role in the association between depression and disease activity. Additional studies with the SLAQ are needed to examine this question.

Importantly, further research is needed to clarify the mechanisms that explain the relationship between depression and SLE disease activity. For example, depression may lead to the enactment of poor health behaviors, interfere with treatment adherence, or contribute to inflammatory mechanisms that exacerbate disease activity. The identification of such mechanisms would lead to new intervention strategies and approaches that could potentially arrest lupus disease activity and symptoms.

It is noteworthy that White patients reported more disease activity than Hispanic patients at time 1, a finding that is contrary to the literature showing that Hispanics have greater health morbidities than Whites.[13] While this result is surprising, it is possible that the disease history and clinical manifestations in this population of Hispanic patients may be different than other populations of Hispanic patients previously studied. Further research on the clinical manifestations of SLE in Central American Hispanics is needed to clarify this issue and shed light on this result. Also surprising was the finding that White patients reported reductions over time in disease activity. Their improvement could have been the result of several factors, including different treatment practices among the four study sites, regression toward the mean among Whites who had substantially higher scores at study onset, or varying sensitivity of the SLAQ in tracking disease activity between the two groups.

Although SLEDAI scores were unrelated to self-reported disease activity, discordance between patient and physician reports is not a new phenomenon in SLE research. One study, for example, found that patient and physician assessments of SLE disease diverged because the two groups used different criteria for rating disease progression.[14] Another consideration is that laboratory indicators of disease may not be correlated with symptoms.[15] Thus, certain biological indices of disease progression in SLE may not have noticeable physiological manifestations in patients' disease experience. It is also possible that low scores on the SLEDAI for the cohort as a whole may have contributed to its lack of association with the SLAQ and other study measures.

The findings from this study confirm the importance of identifying and managing depression in SLE. The data indicate that depression may exacerbate lupus disease activity and suggest that effective treatment of depression may lead to improvements in lupus disease outcomes. In addition, further research is needed to evaluate the sensitivity of the SLAQ to SLE disease manifestations and psychological variables.

Funding

This work was supported by the Divisions of Rheumatology at Cedars-Sinai, LAC/USC, and Loma Linda University, and by the Harbor-UCLA Medical Center.

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