ASSOCIATIONS OF STRESS AND DEPRESSIVE SYMPTOMS WITH CANCER IN OLDER MEXICAN AMERICANS

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Objectives: Cancer outcomes vary by ethnicity and socioeconomic status, particularly among the elderly. Although not well understood, there is increasing evidence that psychosocial issues, including depression, may be particularly influential among older minority groups. The objective of this study was to explore associations of stress and depressive symptoms with prevalent cancer in older Mexican Americans.

Methods: Conditional logistic regression analyses were performed on baseline data from the Hispanic EPESE (collected in 1993, 1994) to explore associations of stress and depressive symptoms with prevalent cancer.

Results: Higher education, income, and acculturation were associated with cancer. In general, people with more education and greater income, men, and those evidencing greater acculturation were more likely to have cancer. People with cancer had also experienced more adverse life events: specific discrete life events, especially losses, were found to be more important than total number of life events. There was evidence of a J curve in the relationship of depressive symptoms with cancer, particularly for women. The presence of between three and seven symptoms was inversely associated with cancer for women, while clinical depression was positively associated with the disease. In addition, depression was positively associated with cancer in men who felt hopeless.

Conclusions: In the fastest growing segment of those aged ≥65 in the United States, Mexican Americans, our findings suggest that some psychosocial factors are associated with cancer and have implications for treatment. Consistent with other research, factors associated with cancer generally reflect greater assimilation. Further exploration of subclinical depression in this older group is needed. (*Ethn Dis.* 2005;15:698–704)

Key Words: Depression, Elderly, Mexican Americans, Neoplasms, Psychological Stress

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INTRODUCTION

Depression has been proposed as a predisposing factor for diseases whose origins are associated with increased surveillance activity of the immune system, like cancer.[1] Prevalence of depression has been found to vary across ethnocultural groups.[2] Although available evidence is somewhat mixed, in general, Mexican Americans report more symptoms of depression than do non-Hispanic Whites. For example, Black[3] found the risk of cancer, as well as that of some other chronic diseases, to be higher in the presence of concomitant depressive symptoms in a group of Mexican Americans. Similarly, Black and Markides[4] found high levels of depressive symptoms concomitant with major medical conditions to elevate the risk of death for older Mexican Americans, including death from cancer, heart disease, hypertension, and stroke. In this same group, Black et al[5] also found excess risk of depression among women and immigrants. As a means of exploring these issues, we investigated the associations of several psychosocial risk factors, including stress and depressive symptoms, with self-reported cancer among older Mexican Americans.

METHODS

Data Collection

The Hispanic Established Populations for Epidemiologic Study of the

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Although available evidence is somewhat mixed, in general, Mexican Americans report more symptoms of depression than do non-Hispanic Whites.

Elderly (EPESE) study was designed to assess the mental health, physical health, and functional status of older community-dwelling Mexican-American adults. When weighted for the actual number in the five-state area, the sample represents slightly less than 500,000 Mexican Americans aged ≥65. Data were collected in four waves between 1993 and 2001. Home interviews lasted approximately 90 minutes, including 15 minutes for medical assessments (blood pressure, weight, height, vision testing, and performance-based tests of physical function). A Spanish version of the interview schedule was used in ≈75% of the interviews, and all interviewers were bilingual. Response rate at baseline was 83%.

Measures

Demographic Characteristics

Age, gender, years of education, marital status, living arrangements, employment status, personal and household income, and type of health insurance were included.

Medical Conditions

An estimate of lifetime prevalence was established by asking respondents whether they had ever been told by a physician that they had cancer. One hundred seventy-two people reported

they had been diagnosed with cancer, including 67 men and 105 women. Types of cancer in the sample included breast (30), uterine/gynecologic (40), colon (27), prostate (26), skin (13), and 36 designated as other. For this study, cases of cancer were obtained from the first sampling wave. Smoking and drinking, and body mass index were included as control variables in one statistical model.

Depressive Symptoms

A translation developed for the Hispanic Health and Nutrition Examination Survey (HHANES) was used for the 20-item Center for Epidemiologic Studies Depression scale (CES-D). Alpha coefficient was .83 at baseline. Items were summed (0–60) for use as a continuous measure, and a dichotomous measure created for ''caseness'' (standard cutoff score of 16). In addition, a cutoff score of 20 was tested, as this number may be more appropriate for older groups. A four-level categorical variable that approximated quartiles was created to test for levels of depressive symptoms. In addition, hopelessness (one item on the CES-D scale) was tested as a separate construct.

Stress

Stress was assessed by life events, chronic financial stress, social stress, and level of acculturation (Chiriboga et al[6] have suggested that lower levels of acculturation create conditions of chronic strain).

Life Events Stress. Nine items within the past year measured stress exposure. Some were derived from the 10-item Life Event Inventory (Duke EPESE study), others from scales developed for older populations.[7,8] Items included: death of close other, illness of close other, deteriorating finances, hospitalization of a spouse, becoming victim of a crime, becoming a caregiver, family wedding, birth of grandchild, and family graduation. Events were summed into an index of stressors, as well as entered separately to assess the independent effect of each.

Financial Strain. Four items from the Index of Chronic Economic Strain[9] included: insufficient money for food, medical care, and at the end of the month and difficulty meeting monthly bills. Although internal reliability was satisfactory (coefficient $\alpha=0.73$), items were entered separately because of missing data and to investigate the independent effect of each. Other measures included low income (<\$10,000), lack of insurance coverage, and perception of deteriorating finances (from life events scale).

Social Stress. Social stress was measured by social isolation for this study. Based upon social functioning indicators in the Duke EPESE, support was assessed by marital status (married vs not married), number of sons, number of daughters, quality of relationships (assessed by whether the respondent perceived they could count on family/ friends and whether they perceived they had someone in whom they could confide) and by participation in social groups.

Acculturation Stress. Acculturation is generally assessed in terms of the individual's knowledge of factors that allow unproblematic activity in the host culture. The ability to read, write, and speak the host language is the most common component of most acculturation measures. Other factors used to measure acculturation stress include migration history (self-reports of place of birth, age, and recency of immigration), and knowledge about such things as how to dress or appropriate and acceptable behavior at work or school. Six acculturation items were included in the present study, drawing on scales by Cuellar and Hazuda that were used in the parent investigation.[10,11] Combined, the items assess whether the participant was US born, age at migration, years in the United States, ability to speak English, and whether neighbors and co-workers were primarily Anglo, mixed, or Mexican-American.

Data Analysis Procedures

Univariate and bivariate statistics were generated to describe sociodemographic characteristics of the study sample. For the multivariate analyses, a correction for multi-colinearity for the two measures of relationship quality (whether one perceived they could count on others, whether one perceived they had someone in whom they would confide) was included. Since these were highly correlated, residual orthogonalization was performed, allowing assessment of their unique characteristics.[12] Analyses were conducted separately for men and women, as women in general have higher levels of depressive symptoms. Age and education were entered as covariates in each sex-specific model. In addition to a series of conditional logistic regression analyses that investigated correlates of cancer (conditional for age and educational status), two logistic regression models were estimated for levels of depressive symptoms: a partial model, and a full model controlling for all other cancer risk factors.[13] Odds-ratios (OR) and 95% confidence intervals are presented. All analyses were weighted to adjust for differential probability of sampling. Results were determined significant at the .05 probability level. All analyses used the SAS statistical software package (SAS Institute, Cary, NC, USA).

RESULTS

As seen in Table 1, people with cancer were more highly educated than people without cancer. Men with cancer also had higher personal and household incomes than men without cancer. Women with and without cancer did not differ in income. Men with cancer

Table 1. Characteristics of study sample (N=3050)

Variables	Men (1291)				Women (1759)			
	With Cancer (67)		Without Cancer (1224)		With Cancer (105)		Without Cancer (1654)	
Age (mean)	M=75‖	SD=8.85	M=73*,‖	SD=6.80	M=72	SD=8.61	M=73	SD=6.54
Education (mean)	M=6.70‖	SD=5.76	M=4.98‡,‖	SD=4.09	M=6.03	SD=4.49	M=4.96†,‖	SD=3.80
Income								
Annual personal	M=2.95	SD=2.24	M=2.19‡,‖	SD=1.05	M=1.67	SD=0.74	M=1.72	SD=0.86
Annual household	M=3.65	SD=2.26	M=2.89‡,‖	SD=1.30	M=2.72	SD=1.69	M=2.64	SD=1.32
Health insurance (% yes)	94%		94%		93%		91%	
Migration history								
Age at migration (mean)	M=22‖	SD=22.54	M=34‡,‖	SD=20.05	M=35	SD=20.39	M=34	SD=21.30
Time in the US (mean years)	M=55	SD=27.55	M=40‡,‖	SD=21.00	M=43	SD=26.18	M=39	SD=22.03
US born (%)	60%		53%		67%		52%‡,§	
Marital status								
Married (%)	76%		74%		35%		41%	
Separated	1%		3%		7%		3%*,§	
Divorced	7%		4%		9%		5%*,§	
Widowed	16%		15%		40%		45%	
Never married	1%		5%		10%		6%	
CES-D (mean)	M=8.13	SD=9.01	M=8.23	SD=8.81	M=18.45	SD=16.07	M=11.68‡,‖	SD=10.07
(1) Age 65–74	M=6.87	SD=9.10	M=7.84	SD=8.85	M=17.25	SD=16.03	M=11.41‡,‖	SD=10.07
(2) Age 75–84	M=10.21	SD=9.04	M=8.98	SD=8.41	M=18.14	SD=13.89	M=12.04‡,‖	SD=9.99
(3) Age 80+	M=11.24	SD=7.16	M=9.57	SD=9.75	M=31.69	SD=20.42	M=13.07‡,‖	SD=10.45
(1) Grades 0–5	M=11.42	SD=9.52	M=8.79	SD=9.06	M=23.42	SD=17.39	M=12.14‡,‖	SD=10.02
(2) Grades 6–11	M=6.28	SD=6.47	M=8.01	SD=8.93	M=14.44	SD=13.91	M=11.63	SD=10.27
(3) Grades 12+	M=4.03	SD=8.24	M=5.78	SD=6.27	M=16.41	SD=13.09	M=9.02‡,‖	SD=9.39
Life events (mean)	M=0.71	SD=0.96	[b]M=0.48*	SD=0.85	M=0.89	SD=1.09	M=0.55‡,‖	SD=0.87

Note: Differences between men with and without cancer and between women with and without cancer.

* P<.05; † P<.01; ‡ P<.001.

§ Chi square test (weighted); ‖ T-test (weighted).

migrated to the United States at earlier ages than men without cancer, but no difference was found for women for age at migration. Both men and women with cancer had been in the United States longer than those without the disease, but again the results were only significant for men. More women with cancer were separated or divorced; marital status was not significantly associated with cancer for men.

Overall, women had a higher mean number of depressive symptoms than men, and results indicated that depression and cancer were associated for women and not for men. Those women with self-reported cancer had significantly higher mean CES-D scores than women without cancer, and this difference was found for each of the three age categories used in the analyses. The most substantial differences were found for those of the oldest age group: women older than age 80 with cancer

had almost three times the mean number of depressive symptoms as women >80 without cancer. In contrast, men with and without cancer did not differ on a number of depressive symptoms at any age.

Education showed a similar pattern to that of age, with results for men demonstrating no association of education and depression in the context of cancer, but clear differences were found for women. Specifically, at each level of education, women with cancer had significantly more depressive symptoms than women without cancer, and the results were particularly pronounced at the highest and lowest levels of education. In other words, women with cancer and either less than five years of education or >12 years had the highest mean CES-D scores. Also of note: both men and women with cancer reported having experienced significantly more life events during the past year; this

pattern was especially pronounced in women.

To explore the relationship of depressive symptoms and cancer in more detail, we examined the distribution of scores. There was evidence of a J-curve in the relationship between number of depressive symptoms and cancer: those with no symptoms or those with low levels (0–2 symptoms), and those with more than seven symptoms were more likely to have cancer, in addition to those with clinical depression (≥16 symptoms). Between three and seven symptoms were inversely associated with cancer for both genders, particularly for women in the full model, who were half as likely to have cancer. Women whose score was indicative of clinical depression on the CES-D were almost twice as likely to have cancer as those without such an indication. Changing the cutoff point for probable clinical depression from 16 to 20 symptoms

Table 2. Odds ratios (95% confidence intervals) adjusted for age and education and multivariate odds ratios for levels of depressive symptoms and cancer

CES-D Scale	Men		Women	
	OR	95% CI	OR	95% CI
Number of depressive symptoms on 20-itemCES-D scale				
0–2 symptoms	1.34	0.87–2.06	0.92	0.59–1.41
full model	same		0.71	0.46–1.10
3–7 symptoms	0.66	0.43–1.01	0.45	0.29–0.69
full model	same		same	
8–15 symptoms	0.84	0.55–1.30	0.88	0.57–1.36
full model	0.88	0.57–1.36	0.93	0.60–1.14
16–54 symptoms	1.28	0.83–1.98	1.90	1.23–2.93
full model	same		1.72	1.36–3.23
Sub-threshold vs clinical depression				
(0–15 vs 16–60)	1.38	0.89–2.13	2.10	1.36–3.24
full model	same		2.08	1.34–3.20
Sub-threshold vs clinical depression				
(0–20 vs 21–60)	1.13	0.73–1.74	2.37	1.53–3.65
full model	1.05	0.68–1.62	2.76	1.74–4.15
Hopelessness	1.70	1.10–2.62	1.08	0.70–1.67
full model	1.45	0.94–2.23	1.06	0.69–1.64

Note: Partial model controls for age and education; full model controls for age, education, smoking, drinking, and body mass index.
OR=odds ratio; CI=confidence interval.

(recommended for older age groups) increased the odds ratio for women, but only slightly. Therefore, based upon these results, for women, having three to seven symptoms of depression was inversely associated with cancer. The observed relationships also held in the model that simultaneously adjusted for all measured risk factors.

Similar to other studies, hopelessness was a stronger predictor of cancer for men than number of depressive symptoms. Hopelessness in men was positively associated with cancer, particularly when controlling only for age and education. Results were in the same direction for women, but were not significant. See Table 2 for results of these analyses.

People who reported having experienced major life events or changes were more likely to have cancer (Table 3). The nature of the event was more important than the total number. For example, people who had experienced the illness of a significant other, had been the victim of a crime, had been involved in a family wedding, and/or the birth of a grandchild were significantly more likely to have cancer than those who had not experienced those events. As can be seen in Table 3, some events were too rare for meaningful interpretation (evidenced by large odds ratio and wide confidence intervals), such as death of significant other for men. However, results do suggest a trend that would have held with more power. Therefore, for men, having experienced the death of a significant other was positively associated with cancer, and for women, having assumed care-taking responsibility was positively associated with cancer in these analyses.

Financial strain provided interesting contrasts between genders in the context of cancer. For men, higher income was positively associated with cancer, while a disadvantaged financial situation, including insufficient money for food, was inversely associated with cancer. On the other hand, for women, lacking sufficient medical insurance coverage and having difficulty meeting monthly bills were positively associated with cancer.

Educational attainment was associated with cancer in the multivariate analyses, similar to results of analyses presented in Table 1. Findings from age-adjusted models suggested a dose-response relationship in that moderate-to-high levels of educational attainment were positively associated with cancer (approximately two to three times the odds as those without these levels), while low educational attainment was inversely associated with cancer, particularly for men. Men with the fewest years of education were half as likely as the most highly educated to have cancer.

Social stress, measured by indicators of social isolation, was a moderately important predictor of cancer. Men with more sons were >1.5 times as likely to have cancer as those with fewer sons. Women were half as likely to have cancer if they had someone with whom to share confidences and more than twice as likely to have cancer if they participated in social groups (this finding did not seem to be a function of involvement with cancer-related self-help groups). Being less acculturated, measured by inability to speak English and living in Mexican-American neighborhoods, was inversely associated with cancer. Women born in the United States were more than twice as likely to have cancer as those not born in the United States. Having co-workers who were a mixture of both Mexican Americans and non-Hispanic Whites was positively associated with cancer, particularly for women. Because the number of women who worked was small, as was the possibility that they might constitute a special subgroup, findings regarding co-workers for women should be viewed with caution.

DISCUSSION

One of the most notable results of the present investigation is re-affirmation of a phenomenon that has

Table 3. Odds ratios (95% confidence intervals) adjusted for age and education for associations of stress and cancer

Variables	Men		Women	
	OR	95% CI	OR	95% CI
Life events stress				
Total life events	1.40	0.91–2.17	1.47	0.96–2.28
Death of significant other	27.40	17.75–42.26	1.05	0.67–1.61
Illness of significant other	2.41	1.55–3.68	3.03	1.95–4.64
Spouse hospitalized	0.68	0.44–1.04	1.29	0.83–1.98
Assume caretaking responsibility	1.14	0.73–1.76	2.09	1.72–2.54
Victim of crime	4.29	2.79–6.64	4.68	3.02–7.20
Birth of grandchild	2.76	1.78–4.24	5.11	3.31–7.88
Family wedding	31.76	20.41–48.61	9.52	6.15–14.64
Financial strain				
Income				
Individual	1.71	1.11–2.65	0.83	0.54–1.29
Household	1.44	0.92–2.19	0.98	0.63–1.51
Financial situation worse	0.77	0.49–1.17	1.09	0.71–1.69
Lack of insurance coverage	1.46	0.95–2.26	1.88	1.22–2.90
Insufficient money for				
Food	0.61	0.39–0.94	1.37	0.88–2.10
Medical care	0.71	0.46–1.09	1.67	1.08–2.57
Difficulty meeting monthly bills	0.71	0.46–1.09	1.67	1.08–2.57
Education				
(1) Grades 0–5 vs (3)	0.41	0.27–0.63	0.58	0.37–0.89
(2) Grades 6–11 vs (3)	0.62	0.40–0.95	1.13	0.72–1.73
Social stress				
Number of daughters	1.28	0.83–1.98	1.50	0.97–2.30
Number of sons	1.66	1.08–2.57	0.94	0.61–1.45
Social groups	1.21	0.79–1.87	2.07	1.34–3.20
Count on	0.80	0.52–1.24	1.10	0.71–1.69
Talk to	1.26	0.82–1.94	0.53	0.35–0.82
Acculturation				
US born	1.09	0.71–1.69	2.11	1.37–3.27
How well speak Spanish	0.56	0.37–0.87	0.54	0.47–0.62
Neighbors Mexican American	0.49	0.32–0.76	0.42	0.27–0.64
Neighbors mixed	1.90	1.23–2.93	2.28	1.49–3.54
Co-workers Mexican American	1.05	0.68–1.62	1.25	0.81–1.92
Co-workers mixed	1.52	0.99–2.35	2.75	1.78–4.24

OR=odds ratio; CI=confidence interval.

In all three instances, more time in the United States was positively associated with self-reported cancer.

been observed across many immigrant groups: assimilation into American ways of living is associated with a greater risk of disease.[14] The present results suggest that a basic exposure model may be at work, however, rather than assimilation per se. For example, level of acculturation—a complex construct and one that can either be seen as a precursor to assimilation or as an indicator of chronic strain—was not, itself, positively related to cancer. Instead, support for what might be called the "assimilation risk" hypothesis came from variables assessing age at migration, years in America, and country of origin. In all three instances, more time in the United States was positively associated with self-reported cancer. While evidence of the exposure model was evident among both men and women, different variables were at work. Moreover, for personal and household income, greater income was positively associated with cancer, but only for men.

Another intriguing finding was the curvilinear relationship between depressive symptoms and cancer, particularly in women. Symptom levels indicative of clinical depression were positively associated with cancer; however, the presence of three to seven symptoms was inversely associated with cancer. This finding is congruent with that of Hybels et al,[15] who found sub-clinical depression associated with reduced mortality for women. What may underlie the association is that individuals with moderate levels of depression are appropriately responding to external pressures, while those with more or fewer symptoms may be either under- or overreacting.

The possibility of a role for depression, at least in cancer, may be akin to the role of "signal" anxiety, an idea certainly compatible with the thinking of Ness.[16] This evolutionary perspective regards low to low-moderate levels of depressive symptoms as increasing the ability to cope with adaptive challenges, thus increasing fitness advantage. Whether sub-threshold depression may operate in a similar way in other disease states or study groups is, of course, unknown.

Men with cancer were less likely to be depressed than women with cancer, not a surprising finding since men in general are less depressed than women. More surprising is that in general, men with cancer were not more depressed than men without cancer. However, for one symptom of interest, hopelessness, there was a difference: men who experienced a sense of hopelessness were almost twice as likely to have cancer as men who were not hopeless. This finding is in line with other studies in which hopelessness predicted mortality among Mexican Americans. Perhaps the most parsimonious explanation is that the existence of cancer leads to a sense of hopelessness in Mexican-American men, even though it does not lead to

other signs and symptoms of depression. On the other hand, these results suggest the potential value of studying not only the origins of hopelessness, but such related concepts as learned helplessness, personal control, and fatalism. Fatalism, for example, is an attribute that is significantly higher in more traditional Mexicans and Mexican Americans of all ages, and has been associated with greater mental and physical health risks for older adults in general.[17–19] In either case, the results suggest that in the CES-D array of variables, hopelessness stands out as having special significance for this group of Hispanics. The single hopelessness item may be tapping into a culture-bound set of symptoms that needs to be explored more fully, if we are to understand how depression is expressed among older Mexican-American men.

Implications for intervention are suggested by these findings. For example, extremely low scores on depression inventories may warrant a second look by health professionals. Similarly, items reflecting hope and hopelessness may be particularly important signals of depression for older Mexican-American men. Finally, when stratified by age, the oldest women (age >80) with cancer had almost three times the number of depressive symptoms as the oldest women without cancer, and compared with the oldest men. Interventions may be particularly warranted in this segment of women.

This study had significant limitations. The cross-sectional nature of the data is an obvious limitation. Temporal associations could not be determined, and causality therefore could not be ascertained. However, future longitudinal studies that may unravel the causal sequence are suggested by study results. In addition, analyses were based upon self-reports of diagnosed illness without biological verification of disease. Accuracy of self-report rests on the ability of the respondent to recall events; recall may be poorer for older than for younger people, and exposures may be recalled differently in those diagnosed than in those not diagnosed with a disease. The extent of over- or under-reporting of either disease or exposure is unknown. In addition, in medically under-served groups such as Mexican Americans, prevalence rates may be confounded with socioeconomic and cultural factors that could increase the likelihood of visiting a physician and receiving a diagnosis, thus affecting findings. Another important point is that results were obtained for a specific group of Hispanics. While this limitation is vitiated by the fact that Mexican Americans make up the largest segment of the Hispanic population in America, results may not generalize to other populations or minority groups.

A broader limitation is the general complexity of studying ethnicity and cancer. Certain kinds of cancer are more prevalent among certain racial/ethnic groups. Cancers also differ by anatomic site, prognosis, and treatments received. For these reasons, specific cancers are most effectively studied in certain groups; however, numbers were too small for such focused analyses, the reason why we combined all self-reported cancers into a single outcome score. Perhaps more serious is that when dealing with historically disadvantaged populations such as the present one, where significant health disparities exist, a critical factor underlying such disparities has been linked to under-utilization of health and human services.[20] Thus, not only was cancer most likely under-diagnosed in our sample, but this underdiagnosis was more common among the less acculturated. Such a systematic source of bias could lead to an underestimation of associations, and could also help to explain the gender differences.

Strengths of the study included the focus upon one group of Hispanics and upon one disease, thus limiting the potential confounding of multiple diseases in mixed ethnic groups, and contributing to our understanding of within-group differences in physical health. Also important was the exploration of subclinical depression, the most common form in older adults. Depression is increasingly considered a biopsychosocial phenomenon, particularly among the elderly. Further information about the "Hispanic paradox" will help determine whether Mexican Americans are indeed protected from a major chronic disease. Until then, future studies should continue to investigate risk and protective factors within and between Hispanic groups, particularly among the elderly, while working to eliminate barriers to healthcare access in this and all minority and under-served groups.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Schneider, Chiriboga
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