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HELPLESSNESS PREDICTS THE DEVELOPMENT OF HYPERTENSION IN OLDER MEXICAN AND EUROPEAN AMERICANS

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Abstract

Objective—The mechanisms by which depression is associated with an elevated risk of cardiovascular disease remain unclear. It is possible that depressive symptoms could increase the risk of hypertension, which in turn could predispose to cardiovascular disease. The goal of this study was to explore whether individual depressive symptoms might predict the incidence of hypertension in a cohort of 240 initially normotensive Mexican-American and European-American elders.

Methods—Subjects were 65–78 years old on entering the San Antonio Longitudinal Study of Aging, an epidemiologic survey, at which time they completed the 30-item Geriatric Depression Scale in English or Spanish. Their blood pressure was reassessed a mean of 7.0 years later. Responses to 6 key Scale items (depressed mood, decreased interest, worthlessness, hopelessness, helplessness, and fatigue) were evaluated for the ability to predict incident hypertension.

Results—In univariate analyses, only helplessness significantly predicted incident hypertension (chi-square 13.5, df=1, $p=0.0003$). In a Cox proportional hazards model adjusted for sex, education, number of comorbid diseases, current drinking, social well-being, and marital status, helplessness remained a very strong predictor (hazard ratio 4.99, 95% confidence interval 1.90–13.12, $p=0.0011$). Total depression score also predicted incident hypertension, but less strongly (HR 1.08, CI 1.00–1.17, $p=0.0339$).

Conclusion—Helplessness may predict the development of hypertension in the elderly. Further research into this relationship might lead to interventions to reduce the risk of cardiovascular disease.

Keywords

depression; elderly; ethnicity; helplessness; hypertension

Introduction

Growing evidence suggests that both older and younger individuals with significant depressive symptoms are at greater risk of developing cardiovascular disease (1,2). The mechanisms for

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this link, however, remain unclear. In light of the strong link between hypertension and the risk of cardiovascular disease (3), one plausible hypothesis is that depressive symptoms could increase the likelihood of a person's developing hypertension, which in turn could raise the risk for cardiovascular disease.

Four large prospective studies have evaluated depressive symptoms at baseline and monitored subjects' blood pressure over time (4–7). Although the findings varied, in the aggregate they suggested that the presence of depressive symptoms might put some individuals at increased risk for the subsequent development of hypertension, particularly African Americans. One study of middle-aged women did not find baseline depression to predict incident hypertension, but did note that subjects who experienced new-onset depression over the course of the study were more likely to develop hypertension (7). These studies included few subjects other than African Americans or non-Hispanic whites and few who were older than 65.

Rather than look at the full syndrome of depression, Everson et al (8) used a two-item scale to study a single depressive symptom – hopelessness – in a cohort of 616 middle-aged men from Eastern Finland who were normotensive at baseline. A subject was considered to meet criteria for hypertension if he had a SBP ≥ 165 mm Hg or a DBP ≥ 95 mm Hg or was currently taking antihypertensive medication. After controlling for other hypertension risk factors, the authors found that persons with a baseline score in the highest range of hopelessness were three times more likely to become hypertensive over the course of a 4-year follow-up (odds ratio 3.22; 95% CI 1.56–6.67). Depressive symptoms did not significantly predict the development of hypertension.

Other than the report by Everson et al. (8), the above studies did not look at individual depressive symptoms. In an effort to further explore the relationship between depressive symptoms and hypertension and to extend this area of research to subjects who have not previously been adequately studied, we evaluated whether six key depressive symptoms could predict incident hypertension in a cohort of Mexican-American (MA) and European-American (EA) elders. This population is of particular interest because of the high incidence of hypertension in the elderly (9) and the low rates of hypertensive control in MAs (9). Moreover, MAs comprise the most rapidly growing segment of U.S. elderly (10).

Method

All participants in this study had completed a home-based assessment (HBA) as part of the baseline examinations in the San Antonio Longitudinal Study of Aging (SALSA), a community-based study of disablement in a bi-ethnic cohort (11). The SALSA sample consisted of older persons who had previously participated in the San Antonio Heart Study (SAHS). The reader is directed elsewhere for a more detailed description of the SAHS and SALSA samples and methods (12–14).

From April 1992 to June 1996, we attempted to contact all SAHS subjects who were currently or would soon be between 65 and 79 years of age and ask them to participate in SALSA. Of the 1247 subjects from the SAHS cohort who would have met these age criteria during the study period, 1063 were still alive during the SALSA baseline enrollment period and 749 completed the baseline examination, for a response rate of 70.5% (749/1063). Of the 749 participants, 720 completed the 30-item Geriatric Depression Scale (GDS) (15) and had their blood pressure measured using a random-zero sphygmomanometer. Three readings were taken in the right arm after a five-minute rest, with the subject seated and their right arm resting on a table; the first reading was discarded, and the mean of the second and third readings used as the subject's blood pressure. Cuff size (adult small, regular or large) was based on measurement of the subject's arm circumference. Examiners were trained by an experienced clinical

investigator using standardized training tapes and methods developed for the Hypertension Detection and Follow-up Study (HDFS) (16). Subjects were considered to have met JNC6 (17) criteria for hypertension if their mean systolic BP was ≥ 140 or their mean diastolic BP was ≥ 90 or they had been prescribed antihypertensive medication by their physician. Three hundred sixty-two subjects (50.3%) were classified as hypertensive and 358 (49.7%) as normotensive.

A SALSA follow-up examination was completed from July 2000 to December 2001 and provides the incidence data for the present study. At the time of this follow-up, 62 of the initially normotensive subjects had died and two had moved out of the area. Fifty-four of the remaining subjects declined to participate, leaving 240 subjects who were normotensive at baseline and whose blood pressure was re-evaluated in 2000–2001. The age range for this group at SALSA baseline in 1992–1996 was 65–78 years (mean 68.6) and the mean length of follow-up was 7.0 years (range: 4.4 – 9.7).

Demographic Characteristics of the Study Population

Of the 240 initially normotensive subjects re-evaluated in 2000–2001, 73 (30.0%) were Mexican-American (MA) women, 53 (22.1%) were MA men, 62 (25.8%) were European-American (EA) women, and 52 (21.7%) were EA men.

Data Analysis

The relationship between incident hypertension and six key GDS items -- depressed mood (“Do you often feel downhearted and blue?”), decreased interest (“Have you dropped many of your activities and interests?”), worthlessness (Do you feel pretty worthless the way you are now?”), hopelessness (“Are you hopeful about the future?”), helplessness (“Do you often feel helpless?”), and fatigue (“Do you feel full of energy?”) -- was explored in univariate analyses using chi-square. For symptoms significantly associated with incident hypertension, a Cox proportional hazards model was used to determine whether this association was independent of demographic characteristics (age, sex, ethnic group, education, and household income), number of co-morbid diseases (constructed as the sum of: diabetes, myocardial infarction, angina, stroke, arthritis, and cancer, excluding skin cancer), lifestyle factors (current drinker, current smoker, and body mass index), and factors related to social support (married, living alone, number of social contacts, and sense of social well-being [satisfaction with social contacts]). Time to event in the Cox model was time elapsed between the baseline and follow-up examinations. Given the number of predictor variables examined relative to the sample size, the Cox proportional hazards model was run using backwards elimination.

Results

Eighty-one (33.8%) of the 240 initially normotensive subjects developed hypertension over the course of follow-up. The baseline prevalence of the six depressive symptoms among the 240 subjects was: decreased interest (n=47, 19.6%), fatigue (n=45, 18.8%), depressed mood (n=36, 15%), helplessness (n=26, 10.8%), worthlessness (n=15, 6.2%) and hopelessness (n=15, 6.2%). Table I lists the proportion of subjects with each depressive symptom who developed incident hypertension over the course of follow-up. Only helplessness significantly predicted hypertension in this univariate analysis; depressed mood was of borderline significance. Additional univariate analyses run separately by ethnic group showed that helplessness was a significant predictor of incident hypertension both for Mexican Americans (chi-square 4.85, df=1, p=0.0277) and European Americans (chi-square 4.89, df=1, p=0.0269). Separate univariate analyses in men and women suggested that helplessness may have a greater impact on incident hypertension in women than in men (data not shown). A comparison of the subjects' baseline demographic characteristics (see Table II), reveals that the 26 individuals who

endorsed helplessness were significantly more likely to be female and to have less education and a lower household income than the 214 who did not. In the final Cox proportional hazards model (see Table III), which also included sex, education, number of co-morbid diseases, current drinking, social well-being, and marital status, helplessness remained a highly significant predictor of incident hypertension for the entire cohort. Total GDS score analyzed as a continuous variable was also a significant, though less strong, predictor of incident hypertension using the same Cox model (hazard ratio 1.08, 95% confidence interval 1.00–1.17, $p=0.0339$). There was no significant relationship between a GDS score of ≥ 11 , the usual cut-point for a major depressive syndrome (15), and risk of incident hypertension.

Discussion

Relationship with other studies

To our knowledge this is the first study to find a significant relationship between helplessness and the development of incident hypertension. Unlike Everson et al (8), we did not find the closely-related construct of hopelessness to predict hypertension risk. Our findings confirm the results of some (4,5), but not all (6,7), previous studies that total depressive symptoms at baseline can predict the development of incident hypertension, and extend this finding to a new ethnic group – Mexican Americans – and a new age range – the elderly. Our findings are consistent with the reports of Engel, Schmale and their colleagues about the role of helplessness and hopelessness in the “giving up-given up” complex, which the authors proposed was highly conducive to the development of illness (18), as well as with Seligman’s hypothesis on the relationship between both of these constructs and health (19). These results are consistent with our findings in the same cohort of older Mexican and European Americans, of which the current sample is a subset, that helplessness as well as hopelessness was a significant predictor of subsequent mortality (14,20).

The disparity between our findings and those of some other investigators could reflect differences in the instruments used to measure depressive symptomatology, as well as variability in the age or ethnicity of the samples. Differences in the genetic make-up of study populations could also account for some of the disparate findings. In this regard, Grewen et al (21) found a correlation between depression ratings and 24-hour ambulatory blood pressure in subjects with a positive family history of hypertension, but not in those without such a history.

Why might helplessness be a predictor and not other depressive symptoms?

Our findings could be related to the fact that helplessness is not only a key symptom of depression but is also present in many persons who are not currently clinically depressed. The construct of helplessness overlaps with that of a diminished sense of control over one’s environment, which has been reported to be associated with an increased risk of hypertension and coronary artery disease (22) and which may help to explain the inverse gradient between socioeconomic status and the risk of these diseases (22). It is possible that older individuals may be particularly vulnerable to the effects of helplessness as a result of the increased infirmity and reduced lifestyle choices (e.g. in diet) that often accompany aging. The reduction in life choices could well contribute to an increased sense of helplessness in some elders.

Mechanisms

Both biological and behavioral mechanisms could help to explain a link between helplessness, depression, and hypertension. Gold and colleagues (23) found that patients with severe melancholic depression had significant increases in mean CSF norepinephrine (NE), plasma NE, and plasma epinephrine. The authors also found both systolic and diastolic blood pressure to be significantly greater in patients with melancholic depression (mean 128/80) than in controls (mean 117/71). Depression has also been reported to be associated with abnormalities

in the hypothalamic-pituitary-adrenal axis (24) and in levels of pro-inflammatory cytokines (25). Depressed individuals are also less likely to engage in positive health behaviors, such as exercise and eating a healthy diet (26). Persons who feel helpless may be similarly unlikely to feel that they can make a difference in their own health or to engage in positive health behaviors. Helplessness and hypertension could also be manifestations of another underlying factor that predisposes to the development of both phenomena.

Potential limitations

We evaluated helplessness and other individual depressive symptoms by single yes-no items, which prevented us from being able to determine whether there was any dose-response relationship with the risk of incident hypertension. The use of a single item could also have increased the possibility of a measurement artifact. We might have been able to ascertain other significant relationships had the size of the sample been larger. For example, since there were only 15 subjects with hopelessness among the 240 initially normotensive subjects, our negative finding for that symptom could have been a Type II error. We did not assess depression by clinical interview, though the GDS has been reported to correlate highly with clinicians' diagnoses (27). Finally, we measured blood pressure at rest, a technique that substantially underestimates the number of persons who are found to be hypertensive when 24-hour ambulatory blood pressure monitoring is used (28). It is very likely that the proportion of patients with hypertension would have been greater both at baseline and follow-up had we used ambulatory monitoring.

Future research

It would be useful to determine whether helplessness, a diminished sense of control, hopelessness, and a major depressive syndrome have similar, different or overlapping roles in the pathogenesis of hypertension. Everson's (8) and our data both suggest that helplessness and/or hopelessness may be more likely than the overall depressive syndrome to be associated with the development of hypertension. Future research should employ 24-hour ambulatory blood pressure monitoring. It would also be helpful, in a similar sample, to assess helplessness by means of a scale instead of a single item and to consider using a different measure of depression, such as the Patient Health Questionnaire-9 (PHQ-9) (29), which yields DSM-IV diagnoses (30) as well as a severity score.

It would be important in future research to explore further the relationship between helplessness and other proposed psychosocial risk factors for cardiovascular disease, such as lack of social support, anger and hostility, anxiety, vital exhaustion (31), and type D personality (32). Helplessness might also be related to the relative absence of certain potentially beneficial factors, such as spirituality, resilience, and optimism. It would be worth exploring what life experiences might contribute to the development of helplessness and whether women, men, MA's, EA's, and other ethnic and racial groups might differ in the extent to which different etiologic factors play a role in the development of helplessness, as well as in the extent to which helplessness is associated with incident hypertension. If future research confirms our findings, prospective studies to evaluate the effects of treating helplessness on the development of hypertension would be worthwhile.

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TABLE I

Proportion of patients with and without each depressive symptom who developed incident hypertension

	Syptom Present	Symptom Absent	Chi- Square	P
Depressed Mood * (n=36)	47.2	31.4	3.4	0.0637
Decreased Interest * (n=47)	38.3	32.6	0.5	0.4622
Worthlessness * (n=15)	46.7	32.9	1.2	0.2745
Hopelessness * (n=15)	33.3	33.8	0.0	0.9719
Helplessness * (n=26)	65.4	29.9	13.1	0.0003
Fatigue * (n=45)	37.8	32.8	0.4	0.5261

* n = number of subjects in the sample of 240 who endorsed this symptom; all chi-square tests are based on 1 degree of freedom

TABLE II

Demographic characteristics for total sample and separately by helplessness category

	Total Sample (N = 240)	Often feel helpless?		P-value Helplessness Difference
		Yes (N = 26)	No (N = 214)	
Variable *				
Age (years)	69.3 (3.4)	69.2 (3.7)	69.3 (3.4)	.9657
Female (%)	55.5	80.8	52.3	.0059
Mexican American (%)	52.1	69.2	50.0	.0638
Education (years)	11.5 (3.9)	9.9 (4.5)	11.7 (3.8)	.0248
Household income (category: 1–15)	11.9 (3.1)	10.6 (3.1)	12.0 (3.1)	.0264

* For continuous variables, the number shown is the mean and standard deviation (SD).

TABLE III

Final cox proportional hazards model for incident hypertension

Variable	Hazard Ratio	95 % CI	P
Sex	0.60	0.32–1.15	0.1266
Education	0.95	0.88–1.03	0.2198
Comorbid Diseases	1.52	1.02–2.28	0.0408
Current Drinking	1.55	0.82–2.91	0.1749
Social Well-Being	1.09	1.00–1.18	0.0410
Marital Status	1.52	0.76–3.04	0.2322
Helplessness	4.99	1.90–13.12	0.0011