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Towards a Better Understanding of PTSD/Hypertension Associations: Examining Sociodemographic Aspects

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Simple Summary: Posttraumatic stress, stemming from psychological trauma, has been associated with risk for elevated blood pressure and hypertension diagnosis. Although social factors such as employment, income, marital support, and living environment (urban, suburban, or rural) appear to influence the risk of posttraumatic stress, there has been only limited research on how these social factors interact to influence high blood pressure. In the present paper, we examine the associations of these social factors with both posttraumatic stress and hypertension, and also assess which social variables and/or posttraumatic stress are associated with hypertension above and beyond their overlapping associations with the other factors. Although higher income and being married were protective in terms of both posttraumatic stress and hypertension, only employment status and posttraumatic stress were associated with hypertension above and beyond their associations with other factors. It is concluded that several social factors play interactive roles in the relationship between posttraumatic stress and high blood pressure; employment status appears to play an especially key role, with higher unemployment rates among those with posttraumatic stress, and higher hypertension rates among those who are unemployed.

Abstract: The present study is an examination of sociodemographic and environmental correlates of hypertension and post-traumatic stress disorder (PTSD), with the goal of better understanding previously identified PTSD and hypertension associations. Data from 5877 adults up to age 54 were analyzed to examine racial and ethnic differences in hypertension, and relationships of socioeconomic status (SES; total family income), employment status, and marital status, and urbanicity (urban, suburban, or rural habitation) with hypertension and PTSD. Next, a total model was tested to determine which sociodemographic and environmental variables, and/or PTSD were significant independent correlates of hypertension. Higher rates of hypertension were evident among African Americans (13.8%), relative to Caucasian (7.7%) or Hispanic (6.7%) participants ($p < 0.001$). Low SES (family income under USD 19,000) and unemployment were associated with significantly greater likelihood ($p < 0.001$) of hypertension (9.8% vs. 7.6% for low SES; 14.3% vs. 8.3% for unemployment) and PTSD (16.6% vs. 8.7% for low SES; 21.3% vs. 9.6% for unemployment). Participants who were married versus those separated or divorced were significantly less likely ($p < 0.001$) to have hypertension (9.0% vs. 11.9%) or PTSD (10.8% vs. 18.3%). Urbanicity was not significantly associated with hypertension or PTSD. Unemployment and PTSD were the only significant independent factors associated with hypertension.

Keywords: sociodemographic; socioeconomic; hypertension; posttraumatic stress; PTSD

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1. Introduction

Previous studies identified a relationship between hypertension and post-traumatic stress disorder (PTSD), suggesting a condition of sympathetic-nervous-system overdrive in PTSD that partially explains this effect [1–3]. However, additional research is needed to better understand sociodemographic factors that underlie the hypertension–PTSD association,

particularly among those who are disadvantaged and at elevated risk for cardiovascular illnesses and PTSD. Health disparities in the prevalence of hypertension, and PTSD risk are thought to be related to sociodemographic and environmental factors [4,5]. In a broader context, there are various psychological, behavioral, and environmental variables that may coincide with both hypertension and PTSD, such as stress coping, depression, diet, and smoking [6–9]. However, for the present paper, we focus on four sociodemographic constructs that are related to hypertension and PTSD outcomes (socioeconomic status (SES), employment status, marital status, and neighborhood environment) [4,5,10–20].

SES is implicated as a risk for several chronic illnesses, including hypertension [5,11]. Epidemiological analysis of data from 9830 individuals indicated significant increases in hypertension rates for those in the lowest segment of SES [5]. A related factor, unemployment, is associated with increased risk for hypertension; longer duration of unemployment, along with consequences such as limited resources, is associated with increased unhealthy behaviors and a greater prevalence of hypertension [8]. As with other chronic illnesses, being married is a demographic status that appears to be protective in terms of both the development and management of hypertension [9]. Urban living (as opposed to rural or suburban neighborhood environments) was used as an index of urbanicity in some studies, and it is one approach to studying neighborhood risks associated with illness [14,15]. Studies in multiple countries associated the urban environment with greater hypertension risk [14,15].

Given the association of hypertension with PTSD, sociodemographic factors implicated in hypertension were also identified as PTSD correlates. In a study with 988 residents of New York City following the September 11 terrorist attacks, lower income was significantly associated with elevated rates of PTSD [6]. These findings are consistent with those of other studies that demonstrated the main effects for social disadvantage in relation to elevated risk for PTSD [16]. Urban environments also confer a greater risk for traumatic events and PTSD, with estimates of lifetime PTSD as high as 24% in residents of urban environments [17,18]. Bidirectional relationships are apparent between PTSD and both unemployment and marriage; unemployment can be both a risk and consequence of PTSD, whereas marriage is protective against developing PTSD, but is also negatively affected by the course of PTSD [19,20].

The present project is an examination of sociodemographic and environmental factors associated with hypertension and post-traumatic stress with the goal to better understand previously identified relationships between hypertension and post-traumatic stress disorder (PTSD). Further, conducting stepwise analysis of a single total model was to determine which of the intercorrelated correlates of hypertension were independent of other predictors. The National Comorbidity Study (NCS), a large epidemiological study sample utilized for the present analysis, was designed to be representative of the U.S. population. However, the NCS utilized a sampling approach that limited respondent ages to 15–54. This strategy resulted in the assessment of hypertension diagnosed at a relatively early age (the exact age of onset for each participant was not assessed in this survey). This artificial restriction of age may contribute to an improved understanding of how sociodemographic factors and PTSD are associated with early hypertensive risk.

2. Materials and Methods

2.1. Participants

Approval from the University Institutional Review Board of Nova Southeastern University was waived for the present analysis due to the exclusive use of an existing deidentified dataset. As such, consent was not applicable. The study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki and its later amendments. The NCS involved the administration of a structured psychiatric interview to determine the prevalence of psychiatric disorders, and comorbid conditions and symptoms. This survey was conducted with a nationally representative sample of 8098 participants aged 15–54 in the noninstitutionalized U.S. civilian population. A second set of assessments

for evaluating psychosocial and health variables in relation to psychiatric disorders was administered to a subsample of 5877 participants [21]. Each part took just over 1 hour to complete; Part 2 included more detailed diagnostic information, including PTSD criteria not included in the core interview. Budgetary requirements limited the Part 2 subsample to 5877 respondents.

Participants had a mean age of 34 years (SD = 10.8). The sample consisted of both men (45%) and women (55%). The racial breakdown of the sample was 73.6% Caucasian, 13.0% African American, 9.8% Hispanic, and 3.6% other races. The marital status of married or cohabitating was reported by 60.2% of participants; 11.2% were separated, divorced, or widowed; and 28.6% reported never having been married. Family income of less than USD 20,000 was reported by 25.4% of the sample, 24.5% reported USD 20,000–35,000, 35.8% reported USD 35,000–70,000, and 14.2% reported family income over USD 70,000. Full- or part-time employment was reported by 76.3% of participants, 5.6% were unemployed, 11.8% reported student status, and 6.4% identified as homemakers.

2.2. Sampling and Weighting

The NCS utilized stratified multistage area probability sampling for participant selection in an effort to recruit a nationally representative study sample. The overall response rate was 82.6%. A small percentage of nonrespondents were offered a small financial incentive to participate—the rates of psychiatric disorders in this population were found to be higher. Data were weighted to account for this difference in prevalence. To reflect differences in selection from within and between households, a second weight was used. A third weight was also applied to modify the data to the national population distribution.

2.3. General Study Procedures

The NCS was administered by field staff from the Survey Research Center at the University of Michigan. Interviewers were 158 individuals who had completed a 7 day training course. The interviewers had an average of 5 years of experience interviewing at the Survey Research Center, and were supervised by the Survey Research Center throughout data collection for the NCS.

2.4. Measures

2.4.1. Psychiatric Interviews

Participants were interviewed in their homes after informed consent had been obtained. To assess the diagnoses of psychiatric disorders, a modified version of the Composite International Diagnostic Interview (CIDI) was used [21]. The CIDI was designed to be used by trained interviewers who are not clinicians to assess the lifetime prevalence of psychiatric disorders (alcohol and drug abuse and/or dependence, major depression, bipolar disorder, dysthymia, panic disorder, agoraphobia, social phobia, simple phobia, general anxiety disorder, and PTSD).

2.4.2. Sociodemographic Data and Health Conditions

Participants completed a series of surveys related to their demographic backgrounds and environment (as well as numerous other assessments that were not a focus of the present paper), and responded to a list of serious health problems by indicating which problems, if any, were experienced in the past 12 months. Fourteen physical health conditions were listed, including high blood pressure or hypertension, which was the health outcome of interest for the present study. On the basis of the participant's responses, health conditions were coded as 0 (no) or 1 (yes).

2.5. Data Analyses

Descriptive analyses were used to characterize the rates of hypertension and PTSD, and chi-squared tests were utilized to test for racial and ethnic differences in hypertension and PTSD rates. Logistic-regression analyses were used to test the relationships of

socioeconomic status (SES; total family income), employment status, marital status, and urbanicity (urban, suburban, or rural habitation) with hypertension and PTSD. Next, stepwise hierarchical logistic-regression analysis was conducted to examine which variables (sociodemographic or environment variables and/or PTSD) were significant correlates of hypertensive status above and beyond the other factors.

3. Results

Because our study sample was relatively young, the rate of hypertension was modest (7.8%), and 7.3% reported a history of PTSD (4.6% of men and 10.0% of women). Significantly higher rates of hypertension were evident among African Americans (13.8%) relative to Caucasian (7.7%) or Hispanic (6.7%) participants ($p < 0.001$). The rate of hypertension was similar for men and women (7.8%–7.9%), while the rate of PTSD was higher for women (10.0%) than that for men (4.6%).

Low SES (family income under USD 19,000) and unemployment were associated with a significantly greater likelihood ($p < 0.001$) of both hypertension (9.8% vs. 7.6% for low SES; 14.3% vs. 8.3% for unemployment) and PTSD (16.6% vs. 8.7% for low SES; 21.3% vs. 9.6% for unemployment). Participants who were married versus those separated or divorced were significantly less likely ($p < 0.001$) to have hypertension (9.0% vs. 11.9%) or PTSD (10.8% vs. 18.3%); the category of "never married" was not included due to the confound with age. Urbanicity was not significantly associated with hypertension or PTSD.

In the total model, controlling for correlations among predictors in the model, unemployment and PTSD were the only significant independent factors associated with hypertension (above and beyond their shared variance with SES and marital status). The significant results for this total logistic-regression model are depicted in Table 1.

Table 1. Total logistic-regression model for prediction of hypertension incidence.

Step	B	Std. Error	Wald	Exp(B)	Sig.
1. Employment	−1.695	0.383	19.618	0.184	0.000
2. PTSD Status	0.809	0.209	14.929	2.245	0.000
3. Low SES	0.302	0.169	3.209	1.353	0.142
4. Marital Status	−0.178	0.142	1.577	0.837	0.209

PTSD = post-traumatic stress disorder; SES = socioeconomic status; Sig = p value for evaluation of significance.

4. Discussion

The results of the present study support the hypothesis that certain sociodemographic factors are significantly associated with greater rates of hypertension and PTSD. These findings are consistent with studies that identified greater rates of hypertension in the lowest segments of SES and among those who are unemployed and single [5,8,9]. The findings also support the notion that low SES is associated with increased risk for PTSD [6,16]. It may be beneficial to consider the ways in which economic resources provide a buffer for coping with traumas, or the ways in which economic hardship may increase risk for PTSD. Perhaps one way in which finances have a psychological effect is due in part to cognitive appraisals about safety, threat, or justness in the world. Several studies illustrated the key roles of appraisals in the development and maintenance of PTSD [22,23].

There was no significant relationship between urbanicity and either hypertension or PTSD in the present study. Thus, the hypothesis that exposure to stress from urban environments is a contributor to hypertension and increases risk for PTSD, through greater trauma exposure, was not supported by our results. Further research on this construct that explores the assessment of urbanicity and the impact of environmental stress by operationally defining urban risks in different ways would likely help to further evaluate the veracity of this hypothesis.

In the model that tested for independent correlates of hypertension, unlike PTSD and unemployment, SES was not an independent predictor. In other words, SES did not

explain a significant amount of variance in hypertension prevalence above and beyond this variable's shared variance with PTSD and unemployment. This finding diverges from the findings of other studies that indicated that commonly reported traumatic events are indirectly related to health risks through PTSD and adult SES factors [24,25]. Our findings suggest that, although there is a relationship between lower SES and greater PTSD prevalence, direct association between hypertension and PTSD does not always depend on SES.

The onset of hypertension in PTSD may represent an early premorbid risk factor for cardiovascular disease (CVD). Traditional cardiovascular risk factors such as hypertension may partially explain relationships between PTSD and CVD [26,27]. Along with previous research on hypertension and PTSD, the present findings suggest that there are common sociodemographic factors that contribute to this relationship. Taken together with prior research, the present findings suggest that demographic profiles may assist in identifying those who are most at risk of, and those who may have some protective factors from, developing PTSD and hypertension.

The primary limitation to the present study is the nonexperimental design. Although the design was not prospective, and elevated blood pressure (BP) could have developed at any time in relation to the sociodemographic factors and PTSD, there are several indications that suggest that sociodemographic factors and PTSD generally preceded hypertension in our study sample. Because hypertension is an age-related chronic illness that tends to impact adults in their mid to late years, it is likely that the hypertension evidenced in our study sample (aged 54 and under) was relatively recent in the majority of cases. In contrast, sociodemographic factors are often present early in life, and PTSD occurs across the age range, often affecting children, adolescents, and young adults. In addition, the average age of PTSD onset in the present study was 17 (SD = 9.0), which was considerably lower than the average age of 34 years in our sample and the typical age of onset for hypertension. Nonetheless, the actual age of onset for hypertension was not assessed, and it must be considered that the proximal relationship of PTSD to hypertension for our sample is not known. Thus, the relationship of PTSD and hypertension to unemployment is best conceptualized as bidirectional. An additional limitation is the self-reporting of hypertension, as actual physiological measurements of blood pressure would have provided a more valid index.

Despite its limitations, the present study provides corroborating evidence for the role of sociodemographic factors in the hypertension–PTSD relationship. Our findings expanded on previous research of these topics by including comparable numbers of men and women, and civilian trauma cases. The artificially restricted age sampling in the NCS may also be viewed as a strength, in that it resulted in a study of early-onset hypertension. Clinicians and researchers should consider the implications of these findings, and others relating sociodemographic factors and PTSD to health outcomes, for an early intervention focusing on health promotion among at-risk groups. For example, cognitive-behavioral stress management and relaxation techniques may assist in managing stress-related arousal and BP for young adults with PTSD. In addition, these findings may be useful from a public-health intervention standpoint. Individuals with PTSD who also exhibit unemployment, lack of marital support, or low income may by at greater risk for hypertension and may require more intensive treatment or greater social resources.

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Data Availability Statement: The data presented in this study are openly available https:/www.hcp.med.harvard.edu/ncs/.

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