



Intimate partner violence and incidence of hypertension in women

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ABSTRACT

Purpose: Intimate partner violence, a prevalent stressor for women, may influence the risk of cardiovascular disease. We estimated the association between intimate partner violence and the development of hypertension, an important risk factor for cardiovascular disease, in the Nurses' Health Study II cohort. **Methods:** Intimate partner violence measures included adult lifetime physical and sexual partner violence and the Women's Experiences with Battering Scale, which ascertained women's subjective experience of recent emotional abuse. Physician-diagnosed hypertension was self-reported on biennial questionnaires. We used Cox proportional hazards models to estimate the association between report of intimate partner violence in 2001 and incidence of hypertension from 2001 through 2007. **Results:** Of 51,434 included respondents, 22% reported being physically hurt, and 10% reported being forced into sexual activities at some point in adulthood by an intimate partner. After adjustment for confounders, physical and sexual abuse were not associated with hypertension. However, women reporting the most severe emotional abuse had a 24% increased rate of hypertension (hazard ratio 1.24; 95% confidence interval: 1.02–1.53) compared with women unexposed to emotional abuse. **Conclusions:** The risk of hypertension appears to be increased in the small number of women recently exposed to severe emotional abuse.

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Introduction

Cardiovascular disease (CVD) is the leading cause of death for women in the United States [1]. Behavioral risk factors for CVD, such as smoking, have been extensively investigated [2,3], but the role of psychosocial factors is less well understood. A growing body of literature suggests that psychosocial stress, depression, and social isolation contribute to the risk of CVD [4–9]. However, few authors have investigated the role of interpersonal violence, a prevalent psychosocial stressor for American women, on the risk of CVD. In the 2010 National Intimate Partner and Sexual Violence Survey [10], 24% of women reported physical intimate partner violence (IPV), while 40% of women reported childhood physical

abuse by a caretaker in The National Violence Against Women Survey [11]. Child abuse has been linked to poor adult mental health in numerous studies [12–17]. In a small number of studies, investigators have examined child abuse associations with adult physical health outcomes and generally have found that women who were abused in childhood to have poorer health as adults [18–21], including greater body mass index (BMI) [22], and greater rates of hypertension [23] and type 2 diabetes [24].

Exposure to abuse in adulthood has received little attention in the epidemiologic literature. In a handful of studies, authors have linked IPV in adulthood with women's risk of depression [25–27], suicide and suicidal ideation [17], posttraumatic stress disorder and traumatic symptoms [28,29], and poor self-rated health [25,26,30]. Only a small number of studies, all cross-sectional, have investigated associations of IPV with hypertension [31–33]. Thus, little is known about how IPV is related to women's risk of CVD. To address these gaps in the literature, we estimate the influence of IPV on incidence of hypertension, an important marker of CVD risk, in the longitudinal Nurses' Health Study II.

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Methods

Data sources

The Nurses' Health Study II (NHSII) follows a cohort of 116,430 female registered nurses recruited in 1989 when they were between the ages of 25 and 42. Participants are sent biennial questionnaires that gather sociodemographic, behavioral, and medical data. In 2001, 91,297 NHSII participants were mailed a supplemental questionnaire asking about their experiences of interpersonal violence in childhood, adolescence, and adulthood. NHSII participants who requested only short-form questionnaires or who had not responded to previous NHSII questionnaires within three mailings were not included in this mailing. Questionnaires were returned by 68,376 (75%) of the Violence Questionnaire recipients. We compared the incidence of hypertension in the 6 years after the return of the Violence Questionnaire (2001–2007) in women with and without 2001 reports of adult IPV. We excluded 12,674 women who reported a hypertension diagnosis in or before 2001, when the Violence Questionnaires were returned, and an additional 4261 women who reported taking antihypertensive medications in or before 2001. We also excluded seven women who completed the supplemental Violence Questionnaire but died before completing the biennial questionnaire on which baseline hypertension status was ascertained. Our analysis included 51,434 women free from hypertension and the use of antihypertensive medication at baseline.

Variable definitions

Exposures

We examined three IPV exposure variables: physical IPV in adulthood (age 18+), sexual IPV in adulthood, and the Women's Experience with Battering Scale [34] for intimate relationships that were ongoing in 2001. Women were considered to have been physically abused in adulthood if they answered "Yes, this happened once" or "Yes, this happened more than once" to the question "Have you ever been hit, slapped, kicked, or otherwise physically hurt by your spouse/significant other?" Likewise, women who answered "Yes, this happened once" or "Yes, this happened more than once" to the question "Has your spouse/significant other ever forced you to have sexual activities?" were defined as having been sexually abused in adulthood. Women were instructed to consider only relationships at age 18 or older when answering these questions. Preliminary analyses indicated that abuse experienced once and abuse experienced more than once did not differ importantly in their associations with hypertension, so these categories were combined into a single exposure level.

To assess emotional IPV, the Violence Questionnaire included the Women's Experiences with Battering (WEB) Scale, which assesses the extent to which women experience disempowerment, entrapment, loss of identity, and threat in their intimate relationships [34]. We examined WEB scores reported for intimate relationships that were ongoing at the time of the 2001 Violence Questionnaire. This scale ranges from 10 to 60, with 60 corresponding to the most severely abusive relationships. For the main analyses we categorized women into three levels of the WEB: 10–19, 20–39, and 40–60. We also assessed the linearity of the WEB–hypertension association by using likelihood ratio tests to compare a model with a linear WEB term to a model with the linear term plus cubic splines [35].

Physical IPV and sexual IPV were missing for 1038 and 1044 women, respectively, leaving 50,396 women for physical IPV analyses and 50,390 for sexual IPV analyses. For WEB analyses, we included those women in a relationship at the time of the 2001 Violence Questionnaire, a total of 42,602 women with nonmissing 2001 WEB scores.

Outcome

Physician diagnosis of hypertension was self-reported by the NHSII participants on each biennial questionnaire. A recent validation of this variable in a random sample of NHSII participants indicated good agreement with medical records data (sensitivity, 94%, and specificity, 85%) [36].

Interactions

We had previously observed an association of child abuse (abuse before age 18) with adult hypertension in this cohort [23]. Stressful early life experiences may lead to life-long stress response impairments [37–39], making abused populations uniquely susceptible to later stress. We investigated the hypothesis that a history of child abuse influences the health impact of adult abuse by examining interaction terms between adult and child abuse. The ascertainment of child physical and sexual abuse in the NHSII is described in detail elsewhere [23,24]. To summarize in brief, respondents reported physical child abuse by indicating the frequency with which an adult caregiver pushed, grabbed, or shoved them; kicked, bit, or punched them; hit them with an object; choked or burned them; or otherwise physically attacked them. Regarding sexual abuse, respondents were asked the frequency with which an adult or older child touched them in a sexual way or forced/attempted to force them into sexual activities.

We tested interaction terms between a dichotomized child abuse variable (no child physical or sexual abuse versus any child physical or sexual abuse) and physical, sexual, and emotional adult IPV exposure variables. In addition, a previous analysis indicated that the risk of hypertension became significantly increased among women with a history of severe sexual abuse or severe physical abuse before the age of 18 [23]. We therefore investigated the possibility that IPV effects differ depending on exposure specifically to severe child abuse by using interaction terms between IPV exposures and child abuse dichotomized into "severe" (forced sexual activities or kicked, bitten, punched, choked, burned, or physically attacked) [23] versus none, mild, or moderate abuse.

Covariates

We considered as potential confounders those risk factors for hypertension not thought to be on the pathway between IPV and hypertension incidence. Main adjusted models included age in months, race (indicators for white, African-American, Hispanic, Asian, and "other"), mother's and father's educational attainment (indicators for <9 years, 9–11 years, 12 years, 13–15 years, and 16+ years), continuous somatogram score at age 5 (the participant could choose one of nine female figures ranging from very lean, a score of 1, to very obese, a score of 9, that best represented her body type at age 5 years), and continuous BMI at age 18. Covariates were missing for fewer than 2% of observations, with the exception of mother's education and father's education, which were missing for 11% and 12% of observations, respectively. Missing variables were handled with missing indicators; a complete case analysis produced similar results. The following potential confounders were not included in final models because their inclusion had little influence on the abuse–hypertension effect estimates: parental occupations; parental home ownership; parental history of early (<age 60) myocardial infarction or stroke; spouse's educational attainment; and 2001 self-rated health, smoking status, alcohol intake, physical activity, and BMI.

Data analysis

We used Cox proportional hazards regression to model the association between IPV and hypertension, with study time beginning with ascertainment of exposure (IPV) status in 2001 and ending at time of incident physician-diagnosed hypertension, at

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