



Child maltreatment and blood pressure in young adulthood[☆]



Holly C. Gooding^{a,b,*}, Carly Milliren^c, Katie A. McLaughlin^d,
Tracy K. Richmond^{a,b}, Sabra L. Katz-Wise^{a,b},
Janet Rich-Edwards^{e,f}, S. Bryn Austin^{a,b,g}

^a Boston Children's Hospital Division of Adolescent and Young Adult Medicine, 300 Longwood Avenue, Boston, MA 02115, USA

^b Harvard Medical School, 25 Shattuck Street, Boston, MA 02115, USA

^c Clinical Research Center, Boston Children's Hospital, 300 Longwood Avenue, Boston, MA 02115, USA

^d Department of Psychology, University of Washington, 119A Guthrie Hall, UW Box 351525, Seattle, WA, USA

^e Department of Medicine, Harvard Medical School, 25 Shattuck Street, Boston, MA 02115, USA

^f Department of Epidemiology, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, USA

^g Department of Social and Behavioral Sciences, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, USA

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ABSTRACT

Adverse childhood experiences are associated with hypertension in older adults. This study assessed whether an association between child maltreatment and blood pressure is detectable in young adults and whether any association differs by sex or is modified by genetic polymorphisms known to be involved in stress sensitivity. We examined these patterns in a sample of 12,420 young adults ages 24–32 years who participated in Wave IV of the National Longitudinal Study of Adolescent Health. Participants retrospectively reported history of physical, emotional, or sexual abuse before age 18 years. Participants with a systolic blood pressure (SBP) ≥ 140 mmHg or a diastolic blood pressure (DBP) ≥ 90 mmHg were classified as hypertensive. We used sex-stratified linear and logistic regression models to assess associations between each type of childhood maltreatment and SBP, DBP, and hypertension. We created interaction terms to assess for effect modification of any relationship between maltreatment and blood pressure by sex or SLC64A genotype. Fifteen percent of females and 31.5% of males were hypertensive. Frequent physical abuse in childhood was reported by 5%, frequent emotional abuse by 12%, and any sexual abuse by 5%. No association was observed between abuse history and blood pressure in either males or females, nor was effect modification present by SLC64A genotype. Child maltreatment exposure was not associated with blood pressure or hypertension in young adults in this study. Future studies should investigate additional critical windows for the effect of child maltreatment on cardiovascular health.

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Abbreviations: SBP, systolic blood pressure; DBP, diastolic blood pressure; CVD, cardiovascular disease; DNA, deoxyribonucleic acid; BMI, body mass index; OR, odds ratio; CI, confidence interval.

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* Corresponding author at: Boston Children's Hospital, Division of Adolescent and Young Adult Medicine, 300 Longwood Avenue, Boston, MA 02115, USA.

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Introduction

Hypertension is a well-documented risk factor for the development of cardiovascular disease (CVD), the leading cause of death in U.S. adults (Hoyert & Xu, 2012) and is also linked to morbidity related to stroke, chronic kidney disease, and heart failure (Cushman, 2003). Recent research has identified an association between adverse childhood experiences – including child abuse – and hypertension in middle-aged adults (Afifi, Mota, Macmillan, & Sareen, 2013; Danese et al., 2009; Lehman, Taylor, Kiefe, & Seeman, 2009; Riley, Wright, Jun, Hibert, & Rich-Edwards, 2010; Stein et al., 2010). The mechanisms for this association remain unclear and may represent a higher co-morbidity of risk factors for hypertension among those who experienced child abuse (e.g., obesity (Midei & Matthews, 2011; Vamosi, Heitmann, & Kyvik, 2009), smoking (Jun et al., 2008), or alcohol use (Widom, White, Czaja, & Marmorstein, 2007)). In addition, those with an abuse history may have increased physiologic and/or emotional response to stressors (Miller, Chen, & Parker, 2011). Some studies have found a stronger relationship between child maltreatment and various CVD risk factors in women compared to men (Afifi et al., 2013; Batten, Aslan, Maciejewski, & Mazure, 2004). This finding raises the question of whether women respond differently to child maltreatment or are simply more likely to be exposed to certain forms of maltreatment, such as sexual abuse, that may have more direct effects on blood pressure.

In addition to potential sex differences in the response to child maltreatment, genes that influence changes in blood pressure, heart rate, and vascular endothelial function in response to psychological stress may also play a role. Individuals with a long promoter region for the serotonin transporter gene SLC6A4 have greater transcription of this gene and therefore greater serotonin uptake in platelets compared to those with a short promoter region for SLC6A4 (Greenberg et al., 1999). Experimental studies have generally found greater cardiovascular reactivity in response to acute stressors in those with the short promoter region (McCaffery, Bleil, Pogue-Geile, Ferrell, & Manuck, 2003; Way & Taylor, 2011). However, studies of the moderating effect of SLC6A4 polymorphisms on the relationship between child maltreatment and adult health outcomes such as depression have shown mixed results (Banny, Cicchetti, Rogosch, Oshri, & Crick, 2013; Brown et al., 2012; Klauke et al., 2011; Uher et al., 2011). Whether any increased cardiovascular reactivity associated with SLC6A4 polymorphisms results in chronic hypertension due to frequent stressful exposures in those with a history of child maltreatment or conversely, lower blood pressures in those who experienced supportive environments, is unknown. The latter may be true if certain SLC6A4 alleles confer a differential susceptibility to both positive and negative environments (Belsky & Pluess, 2009). We are unaware of previous studies examining the effect of the SLC6A4 gene on the relationship between child maltreatment and blood pressure.

Early identification and treatment of hypertension is a cornerstone of CVD prevention (Chobanian et al., 2003), and clarifying any association between child maltreatment and blood pressure in young adults could assist with screening and prevention programs before end-organ effects occur. As the majority of the studies of child maltreatment and hypertension have looked at this outcome in mid-life, we aimed to assess for relationships between physical, sexual, and emotional abuse and elevated blood pressure in young adults aged 24–32 years in the National Longitudinal Study of Adolescent Health (Add Health). We hypothesized that any association found would be stronger for females compared to males and in those with a short compared to a long promoter region for SLC6A4.

Methods

We used data from the fourth wave of Add Health ($n = 15,701$), a nationally representative school-based study of adolescents enrolled in grades 7–12 at initial recruitment (Wave I) in 1994–1995. Wave IV data were collected in 2007–2008 when the participants were ages 24–32 years. Informed consent was obtained at Wave I and the study was approved by the Institutional Review Board at the University of North Carolina at Chapel Hill (Harris et al., 2009); additional analyses were approved by the Boston Children's Hospital Office of Clinical Investigation.

The sample for this study contained 12,420 young adults (79% of Wave IV participants). We excluded participants with missing data for sample weights or region ($n = 904$) because it was not possible to take into account the complex survey design for these individuals. We excluded those currently pregnant ($n = 487$) because of concern that their blood pressure might be influenced by factors different than the non-pregnant population. We also excluded those with systolic blood pressure (SBP) < 80 mmHg or > 200 mmHg ($n = 9$) and diastolic blood pressure (DBP) < 40 mmHg or > 120 mmHg ($n = 15$) because of concerns about measurement error. We excluded those currently on blood pressure lowering medications in the past four weeks as inventoried in the home by the Add Health field interviewer ($n = 528$) but also performed a sensitivity analysis with the included individuals. In addition, we excluded those who had missing data for either the outcome variable or for any key independent variables ($n = 1,361$). Because there was a high non-response rate for household income ($\sim 7\%$), we imputed income by Gaussian normal regression to avoid selection bias.

Measures

Outcome variables

Blood pressure was measured by trained Add Health field interviewers using an appropriately sized arm cuff and an automatic oscillometric monitor approved by the British Hypertension Society (BP 3MCI-PC-IB; MicroLife USA, Inc., Dunedin,

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