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Childhood family psychosocial environment and carotid intima media thickness: The CARDIA study

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ABSTRACT

Little is known about whether the childhood family psychosocial environment (characterized by cold, unaffectionate interactions, conflict, aggression, neglect and/or low nurturance) affects coronary heart disease (CHD) risk. Objectives were to evaluate associations of childhood family psychosocial environment with carotid intima media thickness (IMT), a subclinical measure of atherosclerosis. The study population included 2659 CARDIA study participants, aged 37–52 years. Childhood family psychosocial environment was measured using a risky family questionnaire via self-report. Carotid IMT was calculated using the average of 20 measurements of mean common carotid, bulb and internal carotid IMT, assessed using high-resolution B-mode ultrasound images. Utilizing linear regression analyses adjusted for age, a 1-unit (range 0–21) increase in risky family score was associated with 0.0036 (95% CI: 0.0006,0.0066 mm) and 0.0020 (95% CI: 0.0002,0.0038) mm increase in mean IMT in white males and females, respectively. Formal mediation analyses and covariate adjustments suggested childhood socioeconomic position and smoking may be important mechanisms in white males and females, as well as education and depressive symptomatology in white males. No associations were found in black participants. Formal statistical tests for interaction between risky family score and sex, and between risky family score and race/ethnicity, demonstrated borderline evidence of interactions for both sex ($p = 0.12$) and race/ethnicity ($p = 0.14$) with risky family score for associations with mean IMT. In conclusion, childhood family psychosocial environment was positively associated with IMT in white participants, with little evidence of association in black participants. Mechanisms in white participants may include potential negative impacts of socioeconomic constraints on parenting quality, potentially influencing offspring's cardiovascular risk factors (e.g. smoking), socioeconomic position (e.g. education), and/or psychosocial functioning (e.g. depression), which may in turn lead to atherosclerotic processes. Borderline racial/ethnic differences in findings should be replicated, but add to literature exploring race/ethnicity-specific associations of parenting approaches with health outcomes.

Introduction

Coronary heart disease (CHD) remains a major cause of mortality world-wide (Mendis, Puska, & Norrving, 2011). There is increasing evidence that early life factors may contribute to the development of CHD, such as findings of early atherosclerotic lesions in adolescents and young adults (Berenson et al., 1998), development of CHD risk factors such as obesity, blood pressure and cholesterol in infants and children (Lynch & Smith, 2005), and evidence that early life markers such as birth weight and parental socioeconomic position may be risk markers for CHD (Lynch & Smith, 2005). An early life potential determinant of CHD that has been minimally explored is the childhood family psychosocial environment. "Risky families" is a term proposed and developed by Taylor et al. which is defined as a childhood family environment composed of cold, unaffectionate interactions, conflict, aggression,

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neglect and/or low nurturance (Taylor, Lerner, Sage, Lehman, & Seeman, 2004). The risky family questionnaire measures the family psychosocial environment including levels of family conflict, harsh restrictive parenting styles, and chaotic or neglectful parenting (Repetti, Taylor, & Seeman, 2002). This is distinct from other measures of the family psychosocial environment such as the Adverse Childhood Experiences (ACE) questionnaire that measures only exposure to more extreme parenting styles including abuse and neglect (Dong et al., 2004), and the Parental Bonding Instrument (PBI) which focuses on measuring the degree of parental care and overprotection (Parker, Tupling, & Brown, 1979). The risky family questionnaire allows for the measurement of family psychosocial environment along a continuum from caring and organized to harsh, disorganized, neglectful and abusive (Repetti et al., 2002). Early evidence suggests that risky families, or other measures of the childhood family psychosocial environment, may be associated with CHD (Dong et al., 2004; Felitti et al., 1998). Furthermore, a small number of studies suggest that the childhood family psychosocial environment may be associated with CHD risk factors/risk markers such as smoking, blood pressure and metabolic syndrome (Almeida et al., 2010; Dong et al., 2004; Lehman, Taylor, Kiefe, & Seeman, 2005, 2009; Loucks, Almeida, Taylor, & Matthews, 2011; Taylor, Lehman, Kiefe, & Seeman, 2006). However, associations of childhood family psychosocial environment with subclinical estimates of atherosclerosis, such as carotid intima media thickness (IMT), to our knowledge have not been explored.

Carotid IMT serves as a reasonable surrogate marker of atherosclerosis and biological marker of CVD risk (Lorenz, Markus, Bots, Rosvall, & Sitzer, 2007; Pignoli, Tremoli, Poli, Oreste, & Paoletti, 1986). Ultrasonic carotid IMT measurements correlate well with atherosclerotic histology (Pignoli et al., 1986). Carotid IMT is associated with cardiovascular risk factors and coronary artery disease, and serves as a strong predictor of future cardiovascular events (Lorenz et al., 2007). A meta-analysis demonstrated that for a carotid IMT difference of 0.10 mm, the future risk of myocardial infarction increased by 15% (RR = 1.15; 95% CI, 1.12,1.17); and the relative risk of stroke increased by 18% (RR = 1.18; 95% CI, 1.16,1.21) (Lorenz et al., 2007).

The primary objectives of this study were to evaluate whether the childhood family psychosocial environment, measured with a "risky family" questionnaire, is associated with carotid intima media thickness in black and white participants of a large, prospective study of United States adults, specifically the Coronary Artery Risk Development in Young Adults (CARDIA) study. Previous studies suggested possible sex differences in associations of early family adversity with cardiovascular outcomes, with evidence of stronger associations in females than males (Almeida et al., 2010; Batten, Aslan, Maciejewski, & Mazure, 2004). There has been very little exploration of racial/ethnic differences in the relation between childhood family psychosocial environment and cardiovascular disease risk. We hypothesized there would be no racial/ethnic differences in findings. It is important to understand sex- and race/ethnicity-specific associations, consequently analyses were stratified by sex and race/ethnicity.

Methods

Study sample

The CARDIA study is a multicenter, longitudinal study of CHD risk markers. At baseline assessment (1985–1986) the cohort included 5115 black and white adults aged 18–30 years, recruited from 4 metropolitan areas (Birmingham, AL, Chicago, IL, Minneapolis, MN and Oakland, CA). Participants have been regularly examined since baseline, including Examination 6 which occurred at the 15-year follow-up during the years 2000–2001 (ages 33–45 years) and Examination 7 which occurred at the 20-year follow-up during the years 2005–2006 (ages 37–52 years). Study protocols were approved by institutional review boards at each institution, and informed consent was obtained from participants.

Of the 3671 participants assessed at Examination 6, 21 participants were excluded for not having risky family score variables and 1 transgender participant was excluded, leaving 3649 participants. Of these, 490 participants did not attend Examination 7 when carotid IMT was assessed; an additional 250 attended Examination 7 but were missing carotid IMT. A further 250 participants were missing $\geq$1 covariate (171 of these were missing father and mother's education), and consequently were not included in analyses, leaving 2659 participants for complete case analyses. Due to limited availability of all required variables at each exam period, all study variables were ascertained at Examination 7, with the exception of the exposure variable (risky family questionnaire), family income, CES-D, anger expression and social support, which were obtained at Examination 6.

Independent variable

Using a risky family questionnaire adapted from Felitti et al. (Felitti et al., 1998) and further developed by Taylor et al. (Taylor et al., 2004), participants answered questions about their parents or other adults in the household during participants' childhood and adolescence (prior to age 18) using a 7-item scale, each item ranging from 0 (rarely or none of the time) to 3 (most or all of the time). The scale was created specifically in the context of the CARDIA study, for which questions were developed for a community-based sample, to assess family conflict, neglect and cold non-nurturant behavior. Items were summed (after reverse scoring where appropriate) leading to an overall scale range of 0–21, where higher values represent more adverse experiences. Questions included whether participants felt loved, supported and cared for, were verbally abused, were shown physical warmth and affection, were physically abused, lived with a substance abuser, lived in a well-organized, well-managed household, and whether their family knew what they were up to as children and adolescents (specific wording of questions shown in Appendix Table A).

In order to evaluate the discriminant validity of the risky family variable, we investigated the variable's independence from other psychosocial variables (depressive symptomatology, social support and anger-out expression) that could potentially alter the accuracy of retrospective reporting on family environment, using a confirmatory factor analysis. After evaluating a scree plot of eigenvalues, four derived factors were identified as (a) all risky family questionnaire variables, (b) all anger-out expression questionnaire variables, (c) all negative social contacts questionnaire variables, and (d) all depressive symptomatology (CES-D) questionnaire variables as well as all positive social contacts questionnaire variables, based on which variables with orthogonally rotated factor loadings (i.e. correlation coefficients) greater than 0.30 clustered together. A correlation test was performed to confirm that these four derived factors were not correlated with one another. Pearson correlation coefficients ranged from 0.00 to 0.13. Other literature has further evaluated validity and reliability of retrospective reporting for constructs including childhood SES (Krieger, Okamoto, & Selby, 1998), parental support and affection (Brewin, Andrews, & Gotlib, 1993; Parker, 1989), and childhood abuse (Dill, Chu, Grob, & Eisen, 1991).

Dependent variable

At year 20 (2005–2006), carotid ultrasounds were performed by centrally-trained technicians using standard procedures (GE Logiq