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Childhood adversity, social support, and telomere length among perinatal women

Amanda M. Mitchell[a,b], Jennifer M. Kowalsky[a,b], Elissa S. Epel[c], Jue Lin[c], Lisa M. Christian[a,b,d,e,*]

[a] Department of Psychiatry and Behavioral Health, The Ohio State University Wexner Medical Center, Columbus, OH, USA
[b] The Institute for Behavioral Medicine Research, The Ohio State University Wexner Medical Center, Columbus, OH, USA
[c] Department of Psychiatry, University of California – San Francisco, San Francisco, CA, USA
[d] Department of Psychology, The Ohio State University, Columbus, OH, USA
[e] Department of Obstetrics and Gynecology, The Ohio State University Wexner Medical Center, Columbus, OH USA

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ABSTRACT

Adverse perinatal health outcomes are heightened among women with psychosocial risk factors, including childhood adversity and a lack of social support. Biological aging could be one pathway by which such outcomes occur. However, data examining links between psychosocial factors and indicators of biological aging among perinatal women are limited. The current study examined the associations of childhood socioeconomic status (SES), childhood trauma, and current social support with telomere length in peripheral blood mononuclear cells (PBMCs) in a sample of 81 women assessed in early, mid, and late pregnancy as well as 7–11 weeks postpartum. Childhood SES was defined as perceived childhood social class and parental educational attainment. Measures included the Childhood Trauma Questionnaire, Center for Epidemiologic Studies-Depression Scale, Multidimensional Scale of Perceived Social Support, and average telomere length in PBMCs. Per a linear mixed model, telomere length did not change across pregnancy and postpartum visits; thus, subsequent analyses defined telomere length as the average across all available timepoints. ANCOVAs showed group differences by perceived childhood social class, maternal and paternal educational attainment, and current family social support, with lower values corresponding with shorter telomeres, after adjustment for possible confounds. No effects of childhood trauma or social support from significant others or friends on telomere length were observed. Findings demonstrate that while current SES was not related to telomeres, low childhood SES, independent of current SES, and low family social support were distinct risk factors for cellular aging in women. These data have relevance for understanding potential mechanisms by which early life deprivation of socioeconomic and relationship resources affect maternal health. In turn, this has potential significance for intergenerational transmission of telomere length. The predictive value of markers of biological versus chronological age on birth outcomes warrants investigation.

1. Introduction

Risk for pregnancy complications (e.g., preeclampsia) and adverse birth outcomes (e.g., preterm birth, low birth weight) are enhanced among women with psychosocial risk factors, including low socioeconomic status, history of childhood trauma, and a lack of social support (e.g., Blumenshine et al., 2010; Dunkel Schetter, 2011). For example, among pregnant women, each adverse childhood experience has been associated with a 16.33 g reduction in infant birth weight and a 0.063 week decrease in gestational age at delivery (Smith et al., 2016). In addition, evidence has shown that social support may have direct and/or indirect effects on perinatal outcomes, such as birth weight, small for gestational age, and postpartum depression, (Dunkel Schetter, 2011; Yim et al., 2015). Although data have indicated that poorer health behaviors, such as cigarette use, play a role in the association between psychosocial stress and perinatal health outcomes (e.g., Lobel et al., 2008), they do not fully account for these effects. The role of biological pathways requires explication.

In relation to biology, indicators of aging may be of particular relevance for women of childbearing age. Advancing maternal age is a strong predictor of risk for adverse perinatal health outcomes; these risks are observed as early as age 30 but advance considerably at 35 years (e.g., Cavazos-Rehg et al., 2015). Of importance, individuals of similar chronological age can vary considerably in indicators of aging at

* Corresponding author at: Institute for Behavioral Medicine Research Room 112, 460 Medical Center Drive, The Ohio State University Medical Center, Columbus, Ohio 43210, USA.
E-mail address: Lisa.Christian@osumc.edu (L.M. Christian).

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the cellular level (Müezzinler et al., 2013). Thus, it is plausible that psychosocial factors may increase risk for adverse perinatal health outcomes in part by promoting biological aging.

Telomere length is a key indicator of biological aging. Defined as DNA-protein complexes found at the end of chromosomes, telomeres play a crucial role in the protection of genetic stability (Blackburn, 2005). Telomere length shortens with each replication of the cell, and is further reduced by oxidative stress. When telomeres shorten to a critical length, genomic instability ensues, cellular replication ceases, and cell senescence occurs (von Zglinicki, 2002). As a sensitive indicator of cellular aging, shorter telomere length has been linked with various health outcomes, such as myocardial infarctions, strokes, and type 2 diabetes mellitus (D'Mello et al., 2015).

Importantly, a growing literature links psychosocial exposures with telomere length. For example, a lack of social support has been associated with shorter telomeres in non-pregnant adults (Barger and Cribbet, 2016; Carroll et al., 2013; Uchino et al., 2012). However, effects of unique sources of social support remain to be elucidated. In addition, experiences of childhood trauma have been associated with shorter telomeres in adulthood in multiple studies (for meta-analyses, see Hanssen et al., 2017; Li et al., 2017). Given the large literature on early childhood maltreatment and telomere length, data on effects of childhood socioeconomic disadvantage are notably lacking. In addition, studies examining psychosocial factors and telomere length have largely focused on older adults (Schutte and Malouff, 2015; Starkweather et al., 2014), with less data specific to women of childbearing age.

Finally, pregnancy is a time of considerable physiological changes including marked increases in serum and salivary cortisol, serum proinflammatory cytokines (e.g., IL-6, TNF-α), and ex vivo LPS-stimulated proinflammatory cytokine production (e.g., Christian and Porter, 2014; Gillespie et al., 2016). Notably, elevations in cortisol and serum inflammatory markers have been linked with telomere shortening in non-pregnant adults (Révész et al., 2014; Wong et al., 2014). Given that these inflammatory and neuroendocrine adaptations represent typical pregnancy-related physiology (e.g., Christian and Porter, 2014; Glynn et al., 2007) and are important for critical processes in pregnancy, such as parturition (McLean et al., 1995; Mor et al., 2011), it is unknown if similar effects on telomere biology occur in context of pregnancy.

To address gaps in the literature, the current study examined the associations of childhood socioeconomic status, childhood trauma, and current social support with telomere length in PBMCs in a racially diverse sample of 81 pregnant women who were assessed during each trimester of pregnancy and at 7–11 weeks postpartum. In the current study, it was hypothesized that a) lower childhood socioeconomic status (per perceived childhood social class and parental educational attainment), b) exposure to childhood trauma (per self-reported abuse and neglect) and c) lower perceived social support would be associated with shorter telomere length of PBMCs. The predictive value of perceived support from different sources (friends, family, significant other) was determined. Finally, stability in telomere length across the course of pregnancy and postpartum visits was examined.

2. Materials and methods

2.1. Study design and participants

This study included 84 women recruited from the Ohio State University Wexner Medical Center (OSUWMC) Prenatal Clinic and the community of Columbus, Ohio. Data collection occurred from 2011 to 2014. Blood samples and psychosocial data were collected in early, mid, and late pregnancy as well as 7–11 weeks postpartum. The broader study consisted of 144 women with data collected from 2009 to 2011; blood for telomere assays was only available for women from the second wave of the study (n = 84). Exclusion criteria included multifetal gestation, known fetal anomaly, medications or health conditions with a major immunological or endocrine component (e.g., rheumatoid arthritis, hypothyroidism). No women self-reported alcohol consumption after pregnancy was known. Women who used illicit drug use other than marijuana during or in the six months prior to the current pregnancy were excluded. The current analyses included women who participated in at least two study visits; two women were excluded because they did not meet these criteria. Fourteen women were missing data on childhood SES (n = 1, maternal education level; n = 13, paternal education level) and five were missing data on childhood trauma; thus, these women were excluded from respective analyses. Written informed consent was obtained at the first study visit, and participants received modest financial compensation at the completion of each study visit, for a total of $230 if all study visits were completed. The study was approved by the OSU Biomedical Institutional Review Board.

2.2. Measures

2.2.1. Demographics

Race/ethnicity, age, marital status, annual household income, education level, and number of prior births (parity) were collected by self-report at the first study visit. Pre-pregnancy BMI (kg/m^2) was calculated utilizing self-reported pre-pregnancy weight and measured height at the first visit. Pregnancy complications (i.e., gestational hypertension, preeclampsia, and gestational diabetes) were obtained per medical record review.

2.2.2. Health behaviors

At the first study visit, smoking status and exercise were assessed via self-report. Smoking was categorized as current or not current. In terms of exercise, participants responded to an item assessing the frequency with which they engaged in vigorous activity long enough to build up a sweat: less than once per month, once per month, 2–3 times per month, once per week, or more than once per week. Prenatal vitamin use was defined as never, 1–3 days/week, 4–6 days/week, or 7 days/week.

2.2.3. Childhood socioeconomic status (SES) indicators

Childhood SES was assessed at the first study visit using three different indicators: perceived childhood social class, maternal educational attainment, and paternal educational attainment. Women responded to perceived childhood social class on a 5-point scale: lower class, working class, lower middle class, upper middle class, and higher class. Maternal and paternal educational attainment were categorized as less than high school, high school graduate/some college, or college graduate, based on participant report.

2.2.4. Childhood trauma

The 28-item Childhood Trauma Questionnaire (CTQ) is comprised of 5 subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect (Bernstein et al., 2003). Each item is responded to on a 5-point scale, from "Never true" to "Very often true." This scale has shown good criterion, convergent, and discriminant validity in adults (Bernstein et al., 2003). The CTQ was administered at the third study visit to reduce respondent burden in earlier visits and increase opportunities to build rapport with participants. In the current study, women were categorized on each subscale as reporting prior abuse or neglect below versus above the clinical cutoff. The clinical cutoff was defined using the moderate to severe cutoff on each CTQ subscale (emotional abuse ≥ 13, physical abuse ≥ 10, sexual abuse ≥ 8, emotional neglect ≥ 15, physical neglect ≥ 10); these cutoffs have been used in prior studies (e.g., Heim et al., 2009). Total trauma exposure was defined as the number of times above the moderate to severe cutoff across all subscales: none, one type of trauma, two or more types of trauma.

2.2.5. Depressive symptoms

Given the evidence supporting a link between depression and telomere length (e.g., Schutte and Malouff, 2015), childhood SES and social