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Maternal history of adoption or foster care placement in childhood: A risk factor for preterm birth

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Abstract

Objectives—To assess the impact of maternal history of adoption or foster care placement in childhood on risk for preterm birth (PTB), controlling for other known risk factors for PTB.

Study Design—Participants were 302 pregnant women from a low-income, diverse sample drawn from two intensive prospective studies of maternal mood and behavior and fetal and infant development. Gestational age was determined by best obstetric estimate. Maternal history of adoption or foster care placement prior to age 18 was determined by maternal report. Other maternal characteristics, including maternal medical conditions, psychosocial characteristics, and health behaviors, were measured during second and third trimesters of pregnancy.

Results—The odds of delivering preterm (GA<37 weeks) were approximately four times greater among women with a history of childhood adoption or foster care placement compared to women who were never placed out of the home during childhood. This association remained significant after adjusting for other known risk factors for PTB including maternal medical conditions, psychosocial characteristics, and negative health behaviors in pregnancy.

Conclusions—Findings suggest that history of adoption/foster care placement is an important risk factor for PTB and may be comparable to other established risk factors for PTB including prior history of PTB, body mass index, African-American race, and advanced maternal age. More studies are needed to understand why women with placement histories may be at increased risk to deliver preterm.

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Increased risk of preterm birth in pregnant women with a history of adoption or foster care.

Keywords

adoption; foster care; preterm birth; early life stress; pregnancy

Introduction

Preterm birth (PTB) is a major public health problem. Twelve to eighteen percent of births in the US are categorized as preterm (1). PTB is the leading cause of infant morbidity and mortality in the US (2); 25% of neonatal deaths result from PTB (3). Further, preterm infants are at increased risk for numerous adverse outcomes in adulthood, including neurological problems, cardiovascular disease, respiratory problems, metabolic disorders, and infection (4). Care for preterm infants costs the U.S. \$26 billion annually (5).

The etiology of PTB remains poorly understood (6) and rates of PTBs are rising in many industrialized countries (3). In the US, rates of PTB have increased from 9.5% in 1981 to 12.7% in 2007 (7) despite advancing knowledge regarding the risk factors for PTB and medical interventions designed to prevent PTB. Some risk factors for PTB that have been identified in past research include younger and advanced maternal age, minority race (rates of PTB in African-American women in the US are 16-18% compared to 5-9% for Caucasian women (8)), single marital status, low socioeconomic status, prenatal stress, maternal depression and anxiety, interpersonal violence, low and high body mass index, and cigarette smoking in pregnancy (3, 9-11). While the causal mechanisms linking maternal characteristics and PTB are largely unknown, previous researchers have proposed that as women experience a greater number of risk factors, the balance from uterine quiescence to preterm labor is “tipped,” perhaps due to the influence of stressful experiences on inflammatory processes in the maternal-fetal-placental unit, leading to early labor onset (12).

Emerging research has also shown increased rates of PTB in women with histories of stressful experiences (e.g., child physical and sexual abuse) in their childhood (13,14). For example, women with a history of child sexual abuse were approximately three times more likely to deliver preterm compared to women without histories of child sexual abuse (13). Childhood out-of-home placement (i.e., adoption or foster care) represents an extreme form of early life stress due to caregiver separation and instability (15) and is associated with a constellation of psychosocial and behavioral risk factors for PTB including lower socioeconomic position, emotional and behavioral difficulties, depression, and cigarette smoking (16-18). Therefore, there is reason to believe that childhood placement history may represent a risk factor for PTB. Furthermore, placement history could be assessed during preconception counseling and prenatal care appointments in order to improve risk profiles for PTB. However, no studies to date have investigated childhood adoption or foster care placement as a risk factor for PTB. In this study we aimed to 1) examine the association between maternal history of childhood placement and PTB in a low-income, racially/ethnically diverse sample of pregnant women, and 2) examine this association within the context of other maternal psychosocial and behavioral characteristics known to increase risk for PTB.

Materials and Methods

Participants

Participants were 302 women pooled from two prospective perinatal studies of maternal mood and behavior and fetal and infant development. Participants were excluded from participating in the larger studies if their pregnancies were complicated by multiple gestations or maternal age <18 or >40 years old. The primary aim of one study was to examine effects of maternal smoking on fetal and infant development (R01 DA019558) and thus oversampled for maternal smoking during pregnancy. The aim of the second study was to examine effects of maternal depression on fetal and infant development (R01 MH079153) and thus oversampled for depression during and prior to the current pregnancy. Maternal smoking and depression were examined as predictors of PTB in subsequent models. These studies were approved by Women and Infants and Lifespan Hospitals' Institutional Review Boards. All women provided written consent prior to their participation. Study activities were conducted in the greater Providence Rhode Island region.

Procedure

As part of the larger studies, women were interviewed twice during second and third trimesters of pregnancy (at approximately 27 (SD=3.5) and 35 (SD=1) weeks gestation). At the first interview, women reported adverse childhood experiences, socioeconomic characteristics, health and pregnancy history, pre-pregnancy height and weight, cigarette smoking and alcohol use, symptoms of depression and anxiety, perceived stress, and sleep quality. At the second interview, women were again interviewed about substance use, symptoms of depression and anxiety, perceived stress, and sleep quality. Socioeconomic status was assessed by maternal education (1 = "less than 7th grade" to 7 = "graduate training with degree") and annual household income (approximately \$10,000 increments from 1 = "<\$5,000" to 8 = "\$100,000"). Participants reported pre-pregnancy weight and height to compute body mass index (BMI). Maternal medical conditions were assessed through medical chart review and maternal report and summed for analyses.

Measures

Preterm Birth—Gestational age at birth was defined as the number of days between the last menstrual period (collected by maternal self-report) or ultrasound (confirmed by medical chart review) and date of delivery. If gestational age as measured by ultrasound after 14 weeks gestation differed from the last menstrual period by +/- 10 days, gestational age at birth was computed according to ultrasound calculations (19). Births were then categorized into those occurring prior to 37 weeks gestation to indicate PTB status (3). One preterm birth resulted in fetal death.

Maternal history of adoption/foster care—At the first study session participants were asked two questions to determine maternal history of adoption ("Were you adopted?" yes/no) or foster care placement ("Were you ever in foster care or an institution because your parents were unable to take care of you?" yes/no). Participants were considered to have a childhood placement history if they were ever adopted and/or in foster care prior to age 18.

Maternal History of Childhood Sexual and Physical Abuse—was determined from items from the Adverse Childhood Experiences Scale (20). Specifically, participants were asked how often, before the age of 18, they experienced child sexual abuse (4 items; e.g. “How often did an adult person at least 5 years older than you touch or fondle your body in a sexual way?”) or physical abuse (4 items; e.g., “How often did a parent, stepparent or adult living in your home push, grab, slap, or throw something at you?”). Response options ranged from 0 (never) to 4 (very often). We then created dichotomous childhood sexual abuse and childhood physical abuse variables based on whether participants endorsed a score of 1 or higher (e.g. “once or twice”) on relevant maltreatment items.

Psychosocial Depression, Anxiety, and Stress—Symptoms of depression in the previous week was assessed using the Quick Inventory of Depressive Symptomatology (QIDS) (21). QIDS scores range from 0-27; scores above 21 indicate severe depressive symptoms. Symptoms of anxiety over the past week were assessed by the Hamilton Anxiety Rating Scale (22) (HAM A) administered at each study session. HAM-A scores range from 0 to 56; scores above 25 indicate moderate to severe anxiety. Perceived stress over the last month was assessed at each study session using the Perceived Stress Scale (10 items) (23), a measure of daily hassles, low perceived control over challenges, and low perceived ability to cope with challenges over the previous month. Perceived Stress scores range from 0 to 40, with higher scores indicating greater stress. Summary depression, anxiety, and stress scores were computed by averaging scores for each measure across study sessions.

Health Behaviors—Participants were interviewed regarding the number of cigarettes smoked and alcoholic drinks consumed throughout pregnancy using the Timeline Follow Back Interview (24). Total number of cigarettes and drinks in pregnancy were examined as continuous substance exposure variables. In addition, we included biochemically-verified smoking status (smoker vs. non) by classifying women as ‘smokers’ if they reported smoking > 40 cigarettes in pregnancy. Sleep quality over the previous month was assessed via the Pittsburgh Sleep Quality Index (PSQI) (25). Scores on the PSQI range from 0 to 21; scores greater than 5 indicate poor sleep quality. The sum score of global sleep quality over pregnancy, averaged across the two study sessions, was examined in analyses.

Data Analysis: All statistical analyses were performed using SPSS (version 20) software. The primary outcome of interest was preterm birth (PTB), binary variable (1=preterm). As a preliminary step, we examined associations among predictor variables using a regression analysis in order to rule out multicollinearity. All variance inflation factor (VIF) scores were < 3 indicating that multicollinearity was not evident in these analyses. Given the binary nature of our outcome variable, a stepwise multiple logistic regression analysis was performed to assess the association between maternal placement history and PTB (step 1), and the association between maternal placement history and PTB adjusting for child maltreatment history, psychosocial distress, negative health behaviors in pregnancy, and maternal demographic and medical conditions in pregnancy (step 2).

Results

Sample characteristics

Maternal and infant characteristics are presented in Table 1. Thirty-nine women in the sample (13%) reported a history of out-of-home placement in childhood. Twenty-six women in the sample (9%) delivered preterm, slightly lower than PTB rates in the US (12%) (1), which was consistent with aims of the larger studies to select samples of pregnant women at low-risk for adverse neonatal outcomes. 24% of women experienced any infection and/or were prescribed antibiotics during pregnancy, and 6% of the sample experienced preterm labor.

Association between childhood placement history and preterm birth

Multiple logistic regression analysis revealed that, prior to adjusting for maternal characteristics, women with placement histories were significantly more likely to deliver preterm compared to women without childhood placement histories ($\beta=1.34$, $SE=.51$, $p=.008$, Odds Ratio=3.82; 95% CI: 1.30-8.92). In other words, eighteen percent of women with histories of childhood placement delivered preterm versus 6% of women without histories of childhood placement. See Figure 1. The odds of delivering preterm were approximately four times greater among women with a history of out-of-home placement compared to women who were never placed out of the home during childhood.

Association between placement history and PTB adjusting for maternal characteristics

Next, using multiple logistic regression analysis, we explored whether the association between maternal placement history and PTB was significantly diminished after adjusting for maternal demographic characteristics, history of child maltreatment, psychosocial distress in pregnancy, or health behaviors. Results are presented in Table 2. The association between placement history and PTB remained significant ($\beta=1.44$, $SE=.66$, $p=.02$, Odds Ratio=4.22; 95% CI: 1.17-15.29), indicating that the association between placement history and PTB was not significantly accounted for by maternal characteristics or experiences in the perinatal period. Maternal race was also significantly associated with PTB ($\beta=1.09$, $SE=.56$, $p=.05$, Odds Ratio=2.98; 95% CI: 1.0-8.92), such that odds of delivering preterm was approximately three times greater among women from a minority race compared to Non-Hispanic white women. In addition, there was a marginally significant effect of maternal age on PTB ($\beta=.09$, $SE=.06$, $p=.10$, Odds Ratio=1.10; 95% CI: .99-1.23), such that advanced maternal age was associated with PTB. No other maternal characteristics or behaviors were significantly associated with PTB (β values $<.62$, p values $>.19$).

Comment

This study was the first, to our knowledge, to examine maternal history of adoption or foster care placement in childhood as a risk factor for PTB. Results revealed that the odds of delivering preterm were approximately four times greater among women with a history of childhood placement compared to women who were never placed out of the home during childhood. Adjusting for known risk factors for PTB, including maternal characteristics, health behaviors in pregnancy, and other childhood stressful experiences did not alter the

results. Relative to other known risk factors for PTB that have been presented in previous research, placement history poses a comparable risk for PTB as chronic hypertension (odds ratio of 4.06 in prior studies (26), versus odds of 4.34 among women with histories of adoption or foster care) and a greater risk than history of previous indicated PTB (odds ratio 2.79 in prior studies) or spontaneous preterm birth (odds ratio: 2.45 (26)), pelvic inflammatory disease (odds ratio: 2.07) (28), low body mass index (odds ratio: 2.03 (27)), advanced maternal age (odds ratio: 2.42) (26), and African-American race (odds ratio: 1.56) (26-27). In addition, results from this study indicate that, in this sample of women, maternal placement history may be a more powerful predictor of PTB than psychosocial distress, negative health behaviors, and maternal medical conditions in pregnancy. These findings suggest that childhood experiences may have long-term consequences for neonatal outcomes. Further investigation is needed regarding whether screening tests or treatments to prevent PTB are effective for this unique group of women.

In contrast to findings from previous research, we did not find maternal psychosocial stress, depression, or anxiety to be significant predictors of PTB in this sample. Recent evidence suggests that daily, momentary measures of psychosocial stress and negative mood (“state” measures) may be more predictive of PTB compared to more traditional “trait” measures of distress (6,7). Thus, future studies are needed that include momentary measures of stress and mood in pregnancy as potential mechanisms linking childhood placement history and PTB.

In addition to the stress of caregiver separation and/or instability, children who are placed out of the home often experience extreme stress *prior to* placement, including poverty, neglect, and abuse (31). The cumulative impact of these experiences may have had long-term consequences on biopsychosocial regulation. Specifically, previous evidence suggests that individuals who were exposed to early life stress display altered activation of biological stress systems including the hypothalamic-pituitary adrenal (HPA) axis. Children who were placed out of the home display blunted cortisol rhythms (32-35) and greater cortisol output (8,9). Furthermore, a growing body of research suggests maternal hypothalamic-pituitary adrenal (HPA) production of cortisol predicts PTB and may play a causal role in labor onset (36-40). However, the effect of childhood placement history on cortisol production in pregnancy is unknown. Future research is needed to investigate HPA activity as a mechanism linking stressful childhood experiences to PTB.

Finally, women with placement histories may be at greater risk to deliver preterm due to insults in their own prenatal environment. Mothers of participants may have received inadequate prenatal care, may have abused substances during their pregnancy, or may have experienced increased levels of prenatal stress resulting in shorter gestational length. Evidence suggests that gestational length is heritable (41), therefore women who were born preterm are at increased risk to have shorter gestational lengths in their own pregnancies. Unfortunately we do not know whether participants in this sample were born preterm and we do not have information about their own prenatal environment. Thus, future studies are needed that examine the intergenerational transmission of PTB risk among women with childhood placement histories.

This study has a number of notable strengths. Participants in these studies were from diverse backgrounds and reported high levels of childhood maltreatment. We measured multiple aspects of childhood maltreatment and were able to adjust for childhood maltreatment experiences that have been associated with PTB in past research (13). In addition, we prospectively observed participants over second and third trimesters of pregnancy in order to collect information about psychological processes at multiple gestational time points. In terms of limitations, the studies were designed to recruit women at low medical risk and did not include women who were <18 or > 40 years old; therefore the proportion of preterm births was relatively small (7% in this sample versus 12% in the U.S.(1)). The low-risk nature of the sample may have artificially elevated the odds of delivering preterm among women with placement histories. Thus, replications are needed in larger samples including high and low-risk mothers to confirm the current findings. Given the low-risk nature of the sample, results, if replicated, suggest that effects might be stronger in samples including high-risk women. We also did not collect information on the number of placements that women experienced or the length of each placement during childhood. Future research in this area should investigate these factors. Future research is also needed in order to determine the relative risk for PTB among women who were adopted versus women who were in foster care placement; the current study lacked adequate power to perform this analysis.

Conclusions

Findings from this study suggest that childhood placement history may be an important risk factor for PTB. Odds of delivering preterm were approximately four times greater among women with a history of childhood placement compared to women who were never placed out of the home during childhood. This association was not better explained by psychosocial, behavioral, or medical conditions in pregnancy known to increase risk for PTB. More studies are needed that investigate the plausible mechanisms that may underlie this association including daily experiences of maternal distress and altered maternal neuroendocrine functioning in pregnancy.

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Figure 1.

Percentage of preterm births by maternal history of adoption or foster care placement.

Note: Preterm birth was defined as births that occurred prior to 37 weeks gestation.

Table 1**Maternal and Infant Characteristics**

Maternal Characteristics		
	<i>Mean or %</i>	<i>SD</i>
Age	26	5
Gravida	3	2
Planned Pregnant (% yes)	41%	
Adopted or in Foster Care	13%	
Childhood Physical Abuse (% yes)	41%	
Childhood Sexual Abuse (% yes)	23%	
Race (% Non-Hispanic white)	50%	
Annual Income (% < \$10K)	11%	
Marital Status (% married)	36%	
Cigarette smoking (%) ^I	30%	
Infant Characteristics		
	<i>Mean or %</i>	<i>SD</i>
PTB (<37 weeks GA)	9%	
PTL (<37 weeks GA)	6%	
Gestational Age at Birth (Weeks)	39	2
Birth Weight Percentile	48	25
APGAR score at 5 minutes	9	.7

^I Note: Cigarette smoking was defined as smoking > 40 cigarettes in pregnancy.

Table 2

Stepwise multiple logistic regression analyses predicting preterm birth

	B	SE B	Odds Ratio	95% C.I. for Odds Ratio	p
Childhood Placement History (yes/no)	1.44	.66	4.22	1.17-15.29	.02
Childhood Physical Abuse (yes/no)	.02	.07	1.02	.89-1.16	.74
Childhood Sexual Abuse (yes/no)	.03	.08	1.03	.88-1.19	.73
Body Mass Index	-.04	.04	.96	.88-1.04	.29
Smoking Status (yes/no)	.44	.34	1.55	.23-1.52	.20
Number of Cigarettes in Pregnancy	.00	.00	1.00	.99-1.00	.77
Number of Alcoholic Drinks in Pregnancy	-.02	.02	.98	.94-1.03	.41
Sleep Quality (PSQI)	-.11	.10	.90	.27-.89	.27
QIDS score	-.06	.06	.94	.85-1.05	.29
Anxiety Symptoms (HAM-A)	-.009	.07	.99	.86-1.14	.90
Perceived Stress (PSS)	.25	1.04	1.26	.16-10.12	.81
Maternal Age	.09	.06	1.10	.99-1.23	.10
Gravida	-.07	.17	.93	.67-1.29	.68
Marital Status	.04	.12	1.04	.83-1.3	.75
Family Income	-.03	.14	.97	.74-1.28	.82
Maternal Education	.04	.27	1.04	.61-1.77	.88
Medical Conditions in Pregnancy (yes/no)	.40	.47	1.49	.60-3.73	.39
Maternal Race (white vs. non-white)	1.09	.56	2.98	1.0-8.92	.05

Note: Preterm birth was defined as births that occurred prior to 37 weeks gestation.