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Maternal Adverse and Protective Childhood Experiences and Prenatal Smoking

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Keywords

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Abstract

Prenatal smoking is associated with adverse pregnancy and birth outcomes as well as health problems in early childhood. Recent research determined that maternal adverse childhood experiences (ACEs) increase the odds of smoking during pregnancy. We consider the role of protective and compensatory childhood experiences (PACEs) in an effort to examine the extent to which positive childhood experiences are protective factors for maternal smoking behaviors. Between 2015-2018, 309 pregnant women in Oklahoma recruited from high-risk prenatal clinics, childbirth education classes, and social media were surveyed about their childhood experiences and smoking behaviors during pregnancy. Ordinal regression analysis was used to examine the association between ACEs, PACEs, and prenatal smoking frequency. Similar to prior studies, we found women with more ACEs reported smoking more frequently during pregnancy. Women with more PACEs reported significantly less frequent prenatal smoking. With both ACEs and PACEs in the model, however, ACEs was no longer a significant predictor of maternal prenatal smoking. Our findings suggest that protective and compensatory childhood experiences may be more salient for prenatal smoking behaviors than adverse childhood experiences. Identifying protective factors for pregnancy health risk behaviors such as smoking can offer a target for intervention and prevention.

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Introduction

More than one in fifteen women in the United States reported smoking during pregnancy in 2016 (Kondracki, 2019). Despite significant declines in the rates of smoking during pregnancy over the past 50 years, nicotine is still the most common substance exposure during pregnancy (Li et al., 2018). Smoking is highly correlated with preterm birth, stillbirth, infant mortality, including sudden infant death syndrome (SIDS), among other pregnancy complications and developmental issues in infancy and early childhood (Cnattingius, 2004).

Predictors of smoking during pregnancy include age, marital status, and childhood adversity (Harville et al., 2010). Adverse childhood experiences (ACEs) are traumatic events, including physical and emotional abuse, neglect, and household dysfunction. When exposed to ACEs during childhood, the risk of poor health and early mortality is substantially increased in adulthood (Felitti et al., 1998). These adverse experiences often have a dose-response relationship with the likelihood of adverse outcomes. Maternal ACEs can also have intergenerational consequences for infant development due to poorer physiological and behavioral risks during pregnancy (Racine et al., 2018).

While the consequences of childhood adversity can be substantial and long-lasting, it is possible that protective factors can ameliorate these negative effects. Grounded in attachment theory (Bowlby, 1969; 1988), protective and compensatory experiences (PACEs; Hays-Grudo & Morris, 2020) include experiences or circumstances during childhood that are associated with positive developmental outcomes (e.g., feeling loved unconditionally by a caregiver, having opportunities to learn, and living in a clean, safe home with adequate food available). Attachment theory refers to the relationship bond between caregivers and infants; infants who can trust the availability, responsiveness, and helpfulness of their caregivers form secure attachments in close relationships that are protective in the face of adversity. Attachment theory posits that substance abuse is a form of "self-medication" to cope with stress and the lack of close relationships (Schindler, 2019). There is growing evidence to suggest that positive childhood experiences counteract the impact of adverse childhood experiences for a variety of psychological and developmental outcomes (Narayan et al., 2021), though we have not found that this question has been examined previously for substance use outcomes.

In this brief report, we examine the role of ACEs and PACEs in maternal smoking frequency during pregnancy among women in Oklahoma, a state that ranks in the top third in prenatal smoking rates, and highest in the nation in rates of adverse childhood experiences (America's Health Rankings, 2020). By including both protective as well as adverse childhood experiences in this study, we aim to better understand the salience of both for a substantial health risk behavior—maternal prenatal smoking—and to identify a new target for smoking prevention and intervention.

Methods

Sample

Data for the current study come from a study of 341 pregnant women (aged 16-38) recruited from two obstetrics clinics and community baby showers, and through social media in Oklahoma between 2015-2018. The participating clinics serve a racially diverse, socioeconomically disadvantaged, and medically underserved patient population in an urban area. Recruitment from childbirth education classes, community baby showers, and social media (e.g., Facebook pregnancy/birth local groups) primarily targeted participants from rural communities in Oklahoma. The sample for the current study was restricted to the 309 participants who responded to all questions about adverse and protective childhood experiences and smoking behaviors during pregnancy. The majority of the participants in this study (N = 177) were recruited from obstetrics clinics.

Measures

Smoking during pregnancy is an ordinal variable measured by a question asking participants, "Since getting pregnant/finding out that you were pregnant, how often have you been smoking cigarettes or other tobacco products?" Responses were coded from never = 0 through daily = 6. *Adverse Childhood Experiences (ACE) score* was coded as a sum of 10 items of childhood adversity that include questions about physical and emotional abuse and neglect, as well as household dysfunction, with scores ranging from 0 (no adverse childhood experiences) to 10 (Felitti et al., 1998). *Protective and Compensatory Experiences (PACE) score* was coded as a sum of 10 items reflecting protective experiences including being loved unconditionally, having a safe and clean home, having enough food to eat, and having

prosocial relationships with peers and adults (Hays-Grudo & Morris, 2020). *Sociodemographic variables* associated with childhood adversity and smoking behaviors included age, race/ethnicity, and educational status.

Analytical Strategy

In our first model, we ran an ordered logit model in SPSS (version 27) to examine the association between adverse childhood experiences and smoking during pregnancy, while controlling for sociodemographic variables. In our second model, we ran an ordered logit model to examine the addition of protective and compensatory childhood experiences to the analysis. Ordinal regression is a method used when the dependent variable is categorical and not metric, response categories are not equidistant, and the distribution of responses is non-normal (Liddell & Kruschke, 2018) and is therefore appropriate for many studies of substance use with a categorical dependent variable, including tobacco use in pregnancy (e.g., Cheng et al., 2009; Kennedy-Hendricks et al., 2016).

Results

Notably, more than 1 in 7 participants (14.28%, *n* = 44) reported smoking at some point in pregnancy. The average ACE score is 2.28, and the average PACE score is 7.74. Approximately 56% of the sample reported a high school diploma or less education, 18% reported some college, and 26% reported at least a college degree. Although this is not a representative sample of pregnant women in Oklahoma, the demographics of participants in this study are similar to statewide demographics, though more participants in our sample reported "black" or "American Indian" racial identity (NICHQ, 2020). Most (53%) participants reported non-Hispanic

white as their race/ethnicity, followed by 19% American Indian, 18% black, and 9% Hispanic, respectively. The average age of participants was 25.

Table 1 presents the results of the ordinal regression analyses. Model 1 includes the model with ACE score adjusted for covariates, and Model 2 adds PACE score. Model 1 results indicate a significant positive association between ACE score and smoking during pregnancy (B = .10; Wald = 3.9, p = .038), suggesting that women who experienced more adversity during childhood reported smoking more during pregnancy. The results suggest that the odds of a woman smoking during pregnancy is 13% higher with a one-point increase in ACE score. In Model 2, when PACE score is included, ACE score is no longer significant, but PACE score has a significant and negative association with smoking during pregnancy (B = -.14; Wald = 8.04, p = .009). The results suggest that the odds of a woman smoking during pregnancy is 16% lower with a one-point increase in PACE score. This indicates that women with more protective and compensatory experiences during childhood reported lower smoking rates during pregnancy, in spite of adverse childhood experiences.

Discussion

National samples indicate that as many as 14% of women use combustible cigarettes in the 3 months prior to known pregnancy (Wang et al., 2020), which is similar to the rate reported by our participants during pregnancy. Our results were aligned with prior research indicating women who experienced more adversity during childhood reported higher rates of smoking during pregnancy. Yet we also contribute a new finding; when PACEs were added to the model, the association of ACEs for prenatal smoking behavior was no longer significant.

Table 1

Ordinal Regression Coefficients and Odds Ratios of Self-reported Smoking During Pregnancy (N = 309)

Variables	M1			M2		
	B (SE)	*OR (95% CI)*	*p*	*B (SE)*	*OR (95% CI)*	*p*
ACE Score	.10 (.05)	1.13 [1.01, 1.27]	.038	.07 (.05)	1.09 [.97, 1.23]	.134
PACE Score				-.14 (.05)	.86 [.77, .96]	.009
Controls						
Race/ethnicity						
White (ref)						
Black	.39 (.36)	1.54 [.70, 3.37]	.282	.29 (.36)	1.42 [.63, 3.16]	.398
Hispanic	.29 (.55)	1.35 [.40, 4.52]	.625	.19 (.56)	1.27 [.38, 4.33]	.698
Native	-.04 (.42)	.95 [.39, 2.36]	.918	.01 (.42)	1.01 [.41, 2.52]	.982
Age	.08 (.03)	1.10 [1.03, 1.16]	.003	.09 (.03)	1.10 [1.04, 1.17]	.002

There are some limitations to the current study. Due to the convenience recruiting of the sample participants, it is not a representative sample, which limits the generalizability of findings. Our sample was fairly racially/ethnically diverse, somewhat economically disadvantaged, and had higher ACE scores than the national average (M = 2.28 as compared to 1.56 nationally; Giano et al., 2020). The diversity of the sample lends support to the validity of the findings, but future research should investigate these associations using a nationally representative sample. Further, we did not have a large enough sample of participants using electronic cigarettes or vapes to examine whether findings are similar regardless of mechanism of nicotine consumption. Future studies should determine whether ACEs or PACEs are more likely to be associated with one type of method over another, or the amount of nicotine consumed, or if there are effects for consumption declines among women who smoke and become pregnant. Finally, because the data are self-reported only, it is likely that reports of prenatal smoking behaviors are under-reported (Gorber et al., 2009). Biochemical validation of smoking during pregnancy would strengthen confidence in our survey reports. Still, the possibility for under-reported smoking behaviors suggests that our findings are likely to be conservative estimates.

Maternal adverse childhood experiences and other adverse early life events have consistently been associated with tobacco use during pregnancy (Blalock et al., 2011). This study confirmed previous work linking maternal ACEs and prenatal smoking behaviors. Notable to this work, however, is that PACEs appear to be a salient protective factor for maternal smoking during pregnancy. These findings are critically important, because while adverse childhood experiences may not be completely preventable, protective and compensatory experiences may be valuable interventions, particularly for children who experience emotional or physical abuse, neglect, or household dysfunction.

Implications for Health Behavior Theory

It is recommended that future research examine the mechanisms or drivers of the link between (adverse and positive) childhood experiences and health behaviors in adulthood, particularly with longitudinal data. This information will provide critical understanding of the developmental processes that are impacted by childhood adversity, as well as how protective childhood experiences buffer or heal negative impacts for later life outcomes, including substance use (Shin et al., 2018). Universal prevention programs that increase PACEs in childhood may have capacity to affect a broad range of health behaviors associated with early life adversity. Moreover, these programs may be more likely to result in meaningful changes at the population level when compared to programs with small to borderline effects which rely on counseling or health education for cessation during pregnancy (Chamberlain et al., 2017). Intervention strategies focused on PACEs provide a mechanism to strengthen families by supporting protective factors that are already in place and encouraging new behaviors, activities, and programs that can make the family and other systems of care stronger (Hays-Grudo et al., 2021). In particular, interventions designed to protect children growing up in adverse environments need two essential elements: support for caregivers' psychological and emotional needs, and interventions to address specific dysfunctional parenting behaviors (Luthar & Eisenberg, 2017).

Discussion Question

How might protective and compensatory childhood experiences protect against maternal prenatal smoking behaviors despite a history of adverse childhood experiences?

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