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Maternal depression and rapid subsequent pregnancy among first-time mothers

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Abstract

Purpose: To examine differences in prenatal depression among first-time mothers who had a subsequent pregnancy within six months of first birth and those who did not. Mothers with depression symptoms were expected to have a greater likelihood of rapid subsequent pregnancy.

Study Design: The Parenting for the First Time (PFT) study is a longitudinal multi-site prospective descriptive study designed to identify and understand the dynamics of sub-threshold neglectful parenting behaviors among first-time mothers. Data were collected from the prenatal period through the child's first 3 years of life. The PFT sample consisted of 684 first-time mothers between 15 and 36 years. Data were available on prenatal depression and subsequent pregnancy at six months for 279 participants (n=279).

Methods: Multiple logistic regression analysis was conducted to determine the odds of subsequent pregnancy within six months of first birth.

Results: Twelve mothers (5.9%) became pregnant within six months of first birth. The odds of subsequent pregnancy were 7.24 greater (95% CI: 2.18 – 24.04) among mothers with moderate to severe depression. White versus non-white race did not influence subsequent pregnancy (0.91, 95% CI: 0.18 – 4.49). Pregnancy was not significantly different between teen and adult mothers (OR: 0.92, 95% CI: 0.24 – 3.68).

Clinical Implications—In this sample of first time mothers, moderate to severe depression symptoms were associated with subsequent pregnancy within six months of first birth. Routine depression screening by nurses during the prenatal period offers opportunities for intensive contraceptive counseling and may help mothers achieve optimal birth spacing.

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Conflicts of Interest :Authors have no conflicts of interest to declare.

Keywords

Pregnancy; Depression; Contraception; Interpregnancy Interval

A short interpregnancy interval is generally defined as a pregnancy occurring within 18 months of a prior pregnancy, and many experts recommend at least 18 months between pregnancies to promote optimal perinatal outcomes (United States Department of Health and Human Services, 2012; World Health Organization, 2005). In its technical report, the World Health Organization (WHO, 2005) discusses the wide range of terminology used to describe the interpregnancy interval. The report suggests that birth to pregnancy interval is the optimal terminology to report spacing.

Data on outcomes of pregnancies that occur within less than six months of a previous birth are limited. Conde-Agudelo and Belizán (2000) conducted a cross-sectional study of over 450,000 participants and reported that women with interpregnancy intervals of five months or less were at increased risk of third trimester bleeding, premature rupture of membranes, endometritis, and anemia. Further, their results suggested the risk of maternal death may be more than twice as high when compared to mothers with an interpregnancy interval of 18–23 months (odds ratio 2.54; 95% confidence interval 1.22 to 5.38) (Conde-Agudelo & Belizán, 2000). In a subsequent meta-analysis of 130 studies, Conde-Agudelo and colleagues found an increased risk of preterm birth, low birthweight, and small for gestational age associated with interpregnancy intervals less than 6 months as compared to intervals of 18 to 23 months (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006). Other data also support the finding that interpregnancy intervals less than six months may be associated with increased poor maternal and fetal outcomes (DaVanzo, Hale, Razzaque, & Rahman, 2007).

Consequences of short birth to pregnancy intervals on maternal and infant outcomes are well-documented (Shachar & Lyell, 2012; WHO, 2005; Zhu, Rolfs, Nangle & Horan, 1999). Less is known about the relationship between maternal mental health and short birth to pregnancy intervals. An early study of depression and perinatal outcomes found that depressed mood in the early postpartum period was significantly associated with grand multiparity, education less than five years, and interpregnancy intervals less than 24 months (Gurel & Gurel, 2000). The role of educational status, mental health, and unintended pregnancy also was studied by Bennett and colleagues (2005). They considered the association of depression and pregnancy within one year of last birth among a sample of over 500 adult mothers. Findings suggested education less than high school was significantly associated with a birth to pregnancy interval less than one year. Depression did not appear to mediate the association between education and birth to pregnancy interval (Bennett, Culhane, McCollum, & Elo, 2005). A study of adolescent mothers in a health care setting found that depressed maternal mood and short interpregnancy intervals may co-occur (Patchen, Caruso, & Lanzi, 2009). Evidence regarding the relationship of prenatal depression and birth to pregnancy interval is limited.

We present data to identify possible pathways between prenatal maternal mental health, previous abuse, and pregnancy within six months of previous birth among a sample of first-

time teen and adult low-resource mothers. Our sample matched teens and adult mothers for education and economic level in order to isolate the effect of age. We considered the birth to pregnancy interval of six months, as studies have found this interval to be associated with both increased morbidity and mortality (WHO, 2005).

STUDY DESIGN AND METHODS

Participants

The Parenting for the First Time (PFT) study is a longitudinal multi-site prospective descriptive study designed to identify and better understand the dynamics of sub-threshold neglectful parenting behaviors among first-time adolescent and adult mothers. Data were collected from the prenatal period through the child's first three years of life. Assessments included in-person interviews, cell phone interviews, home visits, lab visits, standardized developmental assessments, and observations of mother-child interactions every 2–6 months. The first interview occurred during the prenatal period. Subsequent data collection occurred when the child was 4, 6, 8, 12, 18, 24, 30 and 36 months.

Participants were enrolled from four diverse communities, including Birmingham, Alabama; South Bend, Indiana; Kansas City, Kansas/Missouri; and the District of Columbia. The sample consists of 684 first-time mothers between 15 and 36 years at the time of her child's birth. Three groups of participants were recruited: teens, ages 15–18 at the time of enrollment ($n = 389$); low-education adults, ages 19–36 with no more than two years of postsecondary education ($n = 168$); and high-education adults, ages 19–36 with greater than two years of secondary education ($n = 127$). In order to more directly understand the effect of age among a low resource sample of first-time mothers, the current analysis excluded high-education adults. Excluding high-education adults (as indexed by education and economic background) resulted in a sample of 557 teens and low-education adults eligible for analysis. Of these participants, data on prenatal depressive symptoms and subsequent pregnancy at six months were available for 279 participants (See Figure 1 for study sample). Approval to conduct the study was obtained from the Institutional Review Board (IRB) of each participating site. Study investigators excluded teen mothers 14 years and younger due. Parenting for the First Time study investigators were concerned that it would be difficult to obtain informed consent and assent for these very young mothers. Investigators also were concerned teens 14 and younger may encounter increased challenges to their ability to fully participate in the study as a result of their very young age. Further, investigators at one site (Kansas) did not ask questions about depression and pregnancy of participants less than 16 years.

Measures

Maternal depression was measured during the prenatal period using the Depression Inventory II (BDI-II). The BDI-II consists of 21 items and indicates depressive symptoms, assigning ratings ranging from minimal to severe (Beck, Steer, & Brown, 1996). Mothers complete the questionnaire by selecting an answer that most closely matches their feelings during the prior two weeks. Each response within the questionnaire receives a score from 0 to 3, which are totaled to determine a composite score ranging from 0 to 63. The BDI-II

assesses an individual's symptoms and should not be confused with clinical diagnosis (Beck, Steer, & Brown, 1996). For the purposes of this analysis, participants were coded as having either (1) none, minimal, mild or (2) moderate or severe depressive symptoms.

The primary outcome variable of this analysis is pregnancy within six months of the index birth. Pregnancy was determined by self-report at each assessment point, along with outcome of the pregnancy. At each interval, the participant was asked if she had experienced a pregnancy since the birth of her first child. Asking about pregnancy at each assessment allowed for data consistency checks across self-reported pregnancy and accurate determination of the timing of conception. If the pregnancy continued, birth outcomes (date of the birth and gestational age) were recorded. Pregnancy was coded as yes or no if the mother was pregnant six months after the birth date of the index pregnancy, regardless of gestational age of the subsequent pregnancy.

Maternal race was recorded as Black, White, and Other. Hispanic ethnicity also was reported. Maternal age (during pregnancy) was recorded as a continuous variable. Descriptive variables were coded as dichotomous parameters. Race was coded as white and nonwhite. Age at time of pregnancy was coded as teen (15 to 21 years) and adult (22–36 years).

Statistical Analyses

Data were analyzed using STATA statistical software Stata 10 (College Station, Texas). Characteristics of participants with available and missing data were compared using Chi-square analysis. Background characteristics of mothers who were pregnant by six months after their first birth were compared to those who did not become pregnant within six months using logistic regression. Multiple logistic regression analysis was conducted to determine the odds of subsequent pregnancy within six months of first birth. Since age category (teen or adult) and race (white or nonwhite) were not associated with the primary outcome, the analysis was repeated using the chi-square distribution to examine moderate to severe depression during the prenatal period and subsequent pregnancy at six months after first birth alone. Hosmer-Lemeshow and Pearson's goodness of fit tests were performed. Both tests failed to present evidence of lack of fit (Pearson's $p=0.5084$, Hosmer-Lemeshow $p=0.7235$).

RESULTS

Comparison of Participants by Missing Data

Maternal characteristics were comparable between participants with missing ($n=278$) and available data ($n=279$). No significant differences between groups were identified for parameters of interest. Missing data occurred with 47.6% of white ($n=39$) and 50.2% ($n=239$) of nonwhite participants ($p=0.732$). About fifty percent of data was missing for adult and teen participants, 50.5% ($n=84$) and 49.9% ($n=194$) ($p=0.978$), and for minimal to mild and moderate to severe depression, 49.9% ($n=228$) and 48.5% ($n=47$) respectively ($p=0.797$). Table 1 summarizes maternal characteristics by missing data.

Comparison of Participants by Rapid Repeat Pregnancy at Six Months

Race and age were comparable between mothers who experienced rapid subsequent pregnancy ($n=12$) and those who did not ($n=267$). Overall, 15% of the sample was white and 85% was nonwhite. Race was not significantly different between mothers that experienced rapid subsequent pregnancy and those that did not ($p=0.87$, 95% CI: $-1.68 - 1.43$). Maternal age was similar between groups as well ($p=0.69$, 95% CI: $-1.60 - 1.07$). Approximately one-third of the sample was adults (30.9%). Contraceptive use prior to the index pregnancy and intentionality of index pregnancy also were similar among mothers that experienced a rapid subsequent pregnancy and mothers that did not, $p=0.42$ (95% CI: $-1.64 - 0.68$) and $p=0.14$ (95% CI: $-2.19 - 0.30$) respectively. Although nearly two-thirds (61.3%) of mothers reported that they did not use contraception prior to their first pregnancy, 83% reported their pregnancy was planned. History of child abuse was similar among mothers that experienced a rapid subsequent pregnancy and mothers that did not become pregnant again during the first six months after delivery ($p=0.12$, 95% CI: $-3.73 - 0.42$). One-third (33.3%) of the sample reported a history of abuse as a child. Abuse during the prenatal period also was similar ($p=0.44$, 95% CI: $-2.90 - 1.26$). Nearly one-fifth (18.1%) reported abuse during the prenatal period of their first pregnancy. In contrast, reported moderate to severe depression symptoms during the prenatal period were significantly different between mothers that became pregnant again within six months and mothers that did not ($p=0.001$, 95% CI: $0.79 - 3.18$). Overall, nearly one-fifth (17.9) of the sample reported moderate to severe depression symptoms during the prenatal period. Table 2 presents maternal characteristics by pregnancy status at six months after first birth.

Maternal Prenatal Depression Symptoms and Rapid Repeat Pregnancy at Six Months

The odds of becoming pregnant within 6 months of having a baby were 7.24 greater (95% CI: $2.18 - 24.04$, $p<0.001$) among first-time mothers with moderate to severe depression symptoms. The wide confidence interval reflects the small number of participants who became pregnant ($n=12$). Adjusting for age and race in the multiple logistic model, being a teen mother and nonwhite race did not provide evidence of increased odds of rapid subsequent pregnancy (OR: 0.92, 95% CI: $0.24 - 3.68$ and OR: 0.91, 95% CI: $0.18 - 4.49$, respectively). These analyses were based on a small number of mothers with subsequent pregnancies within six months of first birth ($n=12$). Findings must be interpreted with caution as estimates may not be stable. Table 3 presents risks estimates for depression symptoms during the prenatal period, race, and maternal age group.

CLINICAL IMPLICATIONS

Subsequent pregnancy within five to six months of birth is associated with both increased maternal and infant risks, including maternal, fetal, and early neonatal death (WHO, 2005). Preterm birth, low birth weight, and small for gestational age also are more common when the pregnancy interval is six months or less (Conde-Agudelo & Belizán, 2000). Poor outcomes associated with rapid subsequent pregnancy makes identification of mothers who may be at risk for short birth to pregnancy intervals a priority. This analysis of 204 primigravidas found an association between moderate to severe depression during the prenatal period and subsequent pregnancy by six months after the birth of their first child.

Screening pregnant women for depression during the prenatal period may help identify mothers and infants at increased risk of adverse perinatal outcomes.

This analysis suggests that moderate to severe depressive symptoms may be associated with rapid subsequent pregnancy within six months. Findings have immediate clinical relevance, since screening for depressive symptoms during the prenatal period may help identify mothers who will benefit from referral for mental health evaluation, intensive contraceptive counseling during the prenatal period, and careful follow-up after delivery. Long-acting reversible contraceptive (LARC) methods may offer particular benefits for mothers with moderate to severe depressive symptoms during the prenatal period, as they are highly effective and do not require maintenance activities from the user (Stoddard, McNicholas, & Peipert, 2011). Focused efforts to provide information about LARC options may prove helpful.

Risk estimates were similar for adults and teens, as well as white and nonwhite mothers. While analyses were based on a limited number of subsequent pregnancies, results indicate that moderate to severe depressive symptoms may be associated with rapid subsequent pregnancy after first birth. Analyses were based on twelve subsequent pregnancies within six months and should therefore not be viewed as predictive evidence of risk. Maternal characteristics were similar among participants experiencing a rapid subsequent pregnancy and those that did not. Mothers with missing data also were similar to those included in the analysis. Nonetheless, the lack of significant differences between groups on selected characteristics does not indicate that the sample is free from selection bias. Data for the present analysis was available for only 29.8% of the sample, which may have introduced surveillance bias.

Findings that age group was not related to rapid subsequent pregnancy within six months of first birth were unexpected. Other studies suggest that early childbearing and maternal mental health also may be related. Kessler and colleagues (1997) conducted one of the largest studies to examine this association. They presented retrospective data from a sample of nearly 6000 respondents that suggested onset of a psychiatric disorder prior to or during adolescence may be associated with an increased likelihood of becoming a teen parent (Kessler, Berglund, Foster, Saunders, Stang, & Walters, 1997). This finding was true for both adolescent females and males, and the association was strongest for addictive disorders. The Kessler study did not consider the effect of psychiatric disorders upon higher order births and birth to pregnancy interval. An interdisciplinary program for teen mothers that worked to prevent multiple pregnancies during adolescence found that suicidal behaviors and a history of psychiatric treatment were more common among participants who experienced a subsequent pregnancy (Pfitzner, Hoff, & McElligott, 2003). These results suggest that the severity of mental health symptoms may be important in the context of reproductive health behaviors. This study did not find a significant difference in reported histories of abuse between teen mothers that experienced a subsequent pregnancy and those who did not. Other studies have found that abuse may be related to short birth to pregnancy intervals among adolescent mothers (Raneri & Wiemann, 2007). Studies to evaluate the relationship between maternal abuse and trauma history are needed.

A few strengths and limitations of this analysis merit discussion. The cohort had a 36 month follow-up period. This period allowed for data consistency checks for self-reported pregnancy between assessment periods, making it possible to identify rapid subsequent pregnancy that may not have been known at the time of study assessments completed at four and six months. It is likely that underreporting still occurred, since early pregnancy losses, miscarriages and abortions may not have been identified. IRB exclusions regarding pregnancy for minors introduced selection bias. The small number of participants that experienced rapid subsequent pregnancy and the amount of missing data for subsequent pregnancy at six months also are limitations. Concerns regarding sample size and missing data are not unique to this analysis. Behavioral studies of low-income women and youth with a focus on reproductive health have sample sizes that range from a few hundred to several thousand participants and they often suffer from high rates of study attrition and incomplete data (Oringanje, Meremikwu, Eko, Esu, Meremikwu, & Ehiri, 2009). There is a need to improve retention strategies in order to optimize study design and analyses. Using vital record data to measure birth interval may offer advantages.

Routine depression screening during the prenatal period offers several opportunities. Nurses may identify mothers who will benefit from immediate mental health evaluation. Depression screening also may help to identify mothers who are more likely to have a rapid subsequent pregnancy within six months of birth, providing an opportunity for intensive contraceptive counseling and follow-up by nursing staff during the early postpartum period.

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CLINICAL IMPLICATIONS

- Screening women for depression during the prenatal period offers the opportunity to refer mothers for mental health supports. It also identifies women that are likely to benefit from intensive nursing follow-up after birth in order to achieve optimal birth spacing.
- To extend the interval between pregnancies, it is important to discuss contraception during the prenatal period and help women initiate family planning during the immediate postpartum period.
- Completing a nursing visit with mothers two weeks after they give birth, rather than the standard six week postpartum visit, offers an opportunity to reassess mental health status and address family planning needs.

Figure 1:

Approximately one-third of the original sample was retained in the present analysis. The majority of participants were excluded from analysis due to missing data regarding pregnancy status at six months. One site did not ask questions about pregnancy status and depression screens for 127 participants (due to maternal age less than 16 years).

Table 1

Key Variables by Missing Data

	No Missing Data n (%)	Missing Data n (%)	<i>P</i> value
Race	n=280	n=278	0.73
White	43 (15.4)	39 (14.0)	
Nonwhite	237 (84.6)	239 (86.0)	
Maternal Age	n=279	n=278	0.98
Adult	84 (30.1)	84 (30.2)	
Teen	195 (69.9)	194 (69.8)	
Prenatal Depression Screen	n=279	n=275	0.80
Minimal to Mild	229 (65.6)	228 (82.9)	
Moderate to Severe	50 (14.3)	47 (17.1)	

Table 2

Baseline Characteristics by Pregnancy Group

	Not Pregnant at 6 months n	Pregnant at 6 months n	Total n (%)	P Value (95% CI)
Race				
White	40	2	42 (15.0)	0.87 (−1.68 – 1.43)
Nonwhite	227	10	237 (85.0)	
Maternal Age Group				
Adult	81	3	84 (30.9)	0.69 (−1.60 – 1.07)
Teen	186	9	195 (69.1)	
Using Contraception Prior to Index Pregnancy				
Yes	102	6	108 (38.7)	0.42 (−1.64 – 0.68)
No	165	6	171 (61.3)	
Index Pregnancy Unplanned				
Yes	222	8	230 (83.0)	0.14 (−2.19 – 0.30)
No	43	4	47 (17.0)	
History Abuse as Child				
Yes	86	1	87 (33.3)	0.12 (−3.73 – 0.42)
No	164	10	174 (66.7)	
Reported Abuse during Prenatal Period of Index Pregnancy				
Yes	46	1	47 (18.1)	0.44 (−2.90 – 1.26)
No	202	10	212 (81.9)	
Moderate or Severe Depression Symptoms				
Yes	43	7	50 (17.9)	0.001 (0.79 – 3.18)
No	224	5	229 (82.1)	

Table 3

Odds of Subsequent Pregnancy within Six Months

(n=279)	Odds Ratio	P value	95% Confidence Interval
Minimal to Mild versus Moderate to Severe Depression	7.24	0.001	2.18 – 24.04
White versus Nonwhite Race	0.91	0.905	0.18 – 4.49
Teen versus Adult Age Group	0.93	0.922	0.24 – 3.68