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The Effect of Stressful Life Events on Postpartum Depression

Results from the 1997-1998 North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS)

by

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ABSTRACT

Objective: Among mothers with recent births, we identify the effects of self-reported stressful life events in the year before delivery on the risk of postpartum depression (PPD).

Methods: Survey data (1997-1998) from the North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS) were used to evaluate the impact of both the quantity of stress and individual stressors on the risk of PPD. In the analyses, we controlled for several important risk characteristics known to elevate a mother's chances of having PPD, i.e., young maternal age, low socioeconomic status, physical abuse during pregnancy, and very low birth weight. The stressful life event items were those occurring during the 12 months before delivery.

Results: Based on the PRAMS Survey, an estimated 7.5 percent of North Carolina mothers had PPD. This group included mothers who reported being either "very depressed" or "very depressed and had to get help." The occurrence of six or more potentially stressful events during the 12 months before delivery proved to be a strong independent risk factor for PPD. Furthermore, mothers who reported losing their job (even though they wanted to continue working) *or* reported being overwhelmed with bills to pay had a two-fold risk of PPD, compared to mothers who did not experience these economic adversities.

Conclusion: A significant proportion of mothers experienced PPD. Moreover, mothers with the highest levels of prenatal stress had the highest risk for PPD. To promote awareness and treatment of PPD, pregnant women should be routinely advised of the signs and symptoms of postpartum depression.

Introduction

Postpartum depression is a substantial problem affecting mothers and their families. It is estimated that one out of ten new mothers experience depression in the first few months after delivery; many of these mothers present with depressive symptoms that warrant assessment and treatment.[1-3] Among cases where the depression is not resolved within the infant's first year of life, research shows that recurrent maternal depression can damage infant attachment and development, and the mother's relationship with other family members.[4] Moreover, it is known that the great majority of mothers who become depressed in the first few months after childbirth do not seek mental health intervention.

Much of the experience of depression in adult life is triggered by the occurrence of stressful life events, such as losing one's job or having a loved one die unexpectedly.[5] The research on postpartum depression (PPD) shows that the occurrence of stressful events in the prenatal period often leads to the onset of PPD.[6-8] Studies also demonstrate that at least half of all cases of depression in the postpartum period are 'new' cases, i.e., mothers who were not depressed while pregnant or did not have a history of depression.[9]

In this study, we examined the effect of reported stressful events, occurring in the year before delivery, on postpartum depression. The 13 stressful events referred to in this study (see Table 1 on page 4) were adapted from previous research, which has linked them to the risk of delivery of low birth weight infants.[10] The majority of these selected stressful events are objective events, rather than feelings, e.g., a close family member becomes sick and has to go to the hospital. This study examines the following questions:

- What is the prevalence of PPD in a statewide sample of mothers with recent delivieries?
- To what extent do the number of potentially stressful life events, experienced during the 12 months before delivery, impact on postpartum depression occurring 2-5 months after delivery?
- Are there certain potentially stressful events that are more strongly associated with postpartum depression?

Methods

The sample

The sample for this study was obtained from the North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS), which is an on-going mail/telephone survey of North Carolina resident mothers contacted 2 to 5 months after delivery. Each month approximately 200 new mothers are randomly selected from birth certificates to participate in the survey. PRAMS is based on a stratified sample, using birthweight to define the strata. The annual completion rate for this survey is approximately 75 percent. The survey is a state/federal partnership of the North Carolina Center for Health Statistics and the Centers for Disease Control and Prevention (CDC) in Atlanta.

The study period covers the first 18 consecutive months of data collected through North Carolina PRAMS: July 1, 1997 through December 31, 1998. There were 2,648 surveys completed and available for analysis. From this number, we eliminated mothers whose infants had died by the survey date. We did so to avoid the overwhelming (and confounding) effect of infant loss on postpartum depression. We would expect most mothers to be highly depressed after losing a newborn, regardless of any previous stressful event that occurred. After eliminating 146 reported infant deaths, the sample consisted of 2,502 respondents.

The assessment of PPD

The study definition for PPD was based on the mother's opinion of her emotional state. In North Carolina PRAMS, depression is measured on a five point scale, ranging from "not depressed at all" to "very depressed and had to get help." Mothers who reported being either "very depressed" or in need of help for their depression were included in the PPD group; all others were included in the non-depressed group.

The analysis

Two logistic regression models were developed for analysis of the study questions related to prenatal stress. For Model I, which measures the effect of the quantity of stress on the risk of PPD, the total number of reported stressful events was divided into four groups:

(1) mothers who reported no events during the year before delivery;
(2) those reporting 1-2 events;
(3) those reporting 3-5 events; and
(4) those, in the highest stress category, reporting 6 to 13 events.

Groups 1-4 were included in Model I, with Group 1 serving as the reference group. This provides a measure of the effect which a low number, moderate number, or high number of reported stressful events has on the risk of PPD, in comparison to mothers who did not report an event (Group 1).

For Model II, designed to assess the impact of individual life stressors, we first tested (through logistic regression) the effect of all 13 events on the risk of PPD among the group of mothers with 6 or more reported events, the high stress group (n=212). From the results of this subgroup analysis, we then selected those individual events that achieved a moderate degree of statistical significance ($p<0.15$) for inclusion in Model II, which contained the full study sample. From the results of Model II, we present the adjusted odds ratios for those predictors of PPD that achieved statistical significance ($p<0.05$). For each of these significant risk factors, we also calculated the population attributable risk percent (PAR%) associated with each risk factor. The PAR% is an epidemiological measure of the maximum change that could be expected in the outcome (e.g., PPD), if the exposure or risk factor was *both* directly causal and could be completely eliminated from the population.[11]

To better isolate and define the effect of stressful events on the risk of PPD, we controlled for several important risk factors. All of these characteristics have been previously identified in the research as being associated with an elevated risk for PPD. The study control variables include young maternal age (ages 13 to 17),[12] low socioeconomic status*,[13], physical abuse during pregnancy (as reported in PRAMS),[14] and very low birth weight (less than 1,500 grams).[15]

All study variables were treated as dichotomous (0,1) and the data were analyzed with the SUDAAN[17] software, developed for the analysis of complex sample designs.

Results

Description of study factors

We begin with a description of mothers' responses to the stressful life events question and their perception of the severity of their depression. Additional descriptive statistics are presented on the rate of PPD among the four stress groups. For the control groups, we also show the rate of PPD and high number of reported stressful events (6-13 events).

Table 1 depicts the percentage of mothers who responded affirmatively to each stressful life event. Table 1 also shows the percentages of total reported events for each of the four Model I groups, ranging from none to 6-13 events. Among the most commonly reported events in the year before delivery, 38 percent of mothers reported that they had moved to a new address, while 31 percent reported that they argued more than usual with their partner (a subjective event). Among the least frequent occurrences, four percent of mothers reported they were homeless, five percent reported that they or their partners were incarcerated, and six percent reported they were involved in a physical fight.

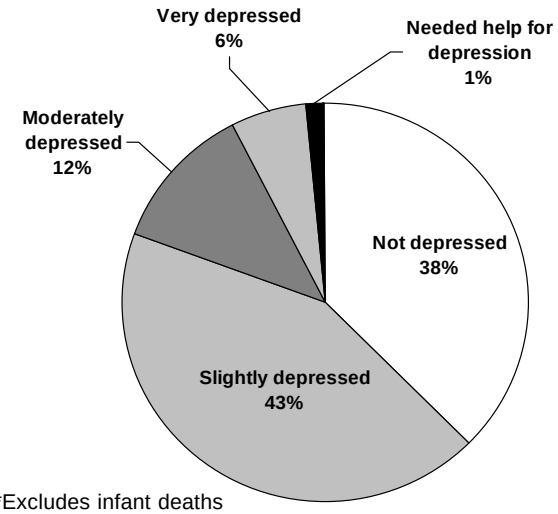
*Due to the large number of missing values (n=191) associated with the PRAMS household income question, we elected not to use income in the formulation of low socioeconomic status. As adapted from previous PPD research[16], low maternal socioeconomic status for this study was defined as less than a 12th grade education **and** Medicaid payment for prenatal care **and** 18 years of age or older (not overlapping with teen risk).

Table 1
Reported stressful life events during the year before delivery
North Carolina PRAMS, 1997-1998

	Percent* Yes
1. You moved to a new address	38%
2. You and your husband or partner argued more than usual	31%
3. A close family member was very sick and had to go into the hospital	29%
4. You had a lot of bills you couldn't pay	26%
5. Someone very close to you died	21%
6. Someone very close to you had a bad problem with drinking or drugs	15%
7. You lost your job even though you wanted to go on working	11%
8. Your husband or partner said he did not want you to be pregnant	11%
9. You got separated or divorced from your husband or partner	11%
10. Your husband or partner lost his job	10%
11. You were involved in a physical fight	6%
12. You or your husband or partner went to jail	5%
13. You were homeless	4%
No reported event	23%
1 - 2 events	43%
3 - 5 events	27%
6 - 13 events	7%

*Weighted

Figure 1
Reported Severity of Depression*
North Carolina PRAMS, 1997-1998



*Excludes infant deaths

Figure 2
Percentage* of Mothers with Postpartum Depression by Total Number of Reported Stressful Events
North Carolina PRAMS, 1997-1998

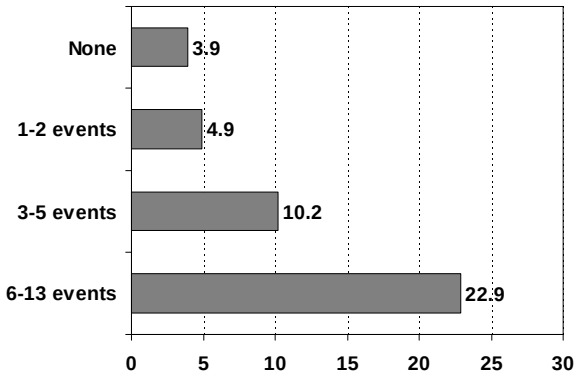


Table 2
Percentage* reporting 6-13 stressful life events and postpartum depression by maternal risk groups**
North Carolina PRAMS, 1997-1998

Maternal risk	Percent of total sample	Percent 6-13 events	Percent with PPD
1. Mothers physically abused during pregnancy	6%	37%	25%
2. Mothers of low socio-economic status	13%	15%	11%
3. Teen mothers (ages 13 to 17)	6%	17%	15%
4. Mothers who delivered very low birth weight infants	1%	11%	16%

*Weighted; **Excludes infant deaths

Figure 1 shows that a large percentage of mothers (81%) reported that, in the first few months after delivery, they were either not depressed or only slightly depressed. Those assigned to the PPD group comprised 7.5 percent of the sample: 6.1 percent were "very depressed" and 1.4 percent were "very depressed and had to get help."

Figure 2 shows that the percentage of mothers identified with PPD is about the same for those reporting no stressful events or those reporting 1-2 stressful events, four percent and five percent respectively. However, the rate of PPD doubles in the 3-5 stressful event group (10%) and more than doubles again in the 6-13 event group (23%).

Table 2 shows the percentages with 6-13 reported stressful events and with PPD among the control groups. These percentages are substantially higher among the mothers who reported being physically abused during pregnancy.

The effect of the total number of reported stress events

After controlling for the effects of physical abuse during pregnancy, low socioeconomic status, young age, and very low birth weight, the odds of PPD was significantly elevated for mothers reporting 6 or more events in the year before delivery (Table 3). The odds of these mothers having PPD was 4.5 times that for those reporting no stressful events. For lower totals of reported stressful events (1-2 events or 3-5 events), the effect was not significant.

The results of Table 3 also show that the risk of PPD was higher for the high-risk categories of the control variables. For mothers who gave birth to very low birth weight infants, the odds of PPD was more than twice that of mothers who delivered heavier babies, after adjusting for all other risk factors. The odds of PPD among mothers who were physically abused during pregnancy was almost three times

Table 3
Adjusted odds of postpartum depression* by total number of reported stress events and other factors
North Carolina PRAMS, 1997-1998

Risk factors	Odds Ratio	95% CI (lower, upper)	Referent Group
1-2 stress events	1.2	(0.4, 3.4)	No reported stress event
3-5 stress events	2.3	(0.8, 6.5)	No reported stress event
6-13 stress events	**4.5**	**(1.3, 16.0)**	No reported stress event
Physical abuse during pregnancy	**2.7[a]**	**(1.0, 7.4)**	No reported abuse during pregnancy
Low socioeconomic status	1.4	(0.6, 3.5)	Higher socioeconomic status
Young age of mother (ages 13 to 17)	1.8	(0.6, 6.0)	Older age of mother (ages 18 and older)
Very low birth weight	**2.3**	**(1.3, 4.1)**	Higher birth weight

*Excludes infant deaths; [a]Marginally significant, p=0.06
Boldface indicates statistically significant findings

that of mothers who were not abused. Teens and low socioeconomic status mothers had a somewhat higher risk of PPD than older mothers or mothers of higher socioeconomic status, although these differences were not statistically significant.

The effect of specific life stress events

When we tested the significance of all 13 stressful events on the risk of PPD within the high stress group, five items met the criterion for inclusion in Model II. These five stressful events were mothers who reported that they had lost their job (even though they wanted to continue working), they had a lot of bills they couldn't pay, their partner had lost his job, someone very close had a problem with drinking or drugs, or someone very close had died.

When testing the five selected events with the full sample, two events emerged as statistically significant: maternal job loss and difficulty paying bills. For mothers who lost their job, the adjusted odds of having PPD was 2.3; for mothers with many bills they couldn't pay, the adjusted odds ratio was 2.0 (Table 4). Furthermore, the associated population attributable risks indicate that maternal job loss (13%) and difficulty paying household bills (21%) could account for as much as one-third of postpartum depression in the study population. A large population attributable risk (15%) was also associated with being physically abused during pregnancy.

Summary of Key Findings

The prevalence of postpartum depression

1. An estimated 7.5 percent of mothers reported that they had serious postpartum depression. In the total population of 1998 North Carolina live births, this translates into an estimated 7,959 mothers with serious PPD.
2. About one percent, or 1,427 of all mothers who gave birth in 1998, reported that they had to get help for their depression.

The impact of stress on postpartum depression

1. After controlling for several important risk factors, the reported occurrence of 6 or more potentially stressful life events during the 12 months before delivery proved to be a strong independent risk factor for PPD.
2. Mothers who reported losing their job (even though they wanted to continue working) or reported being overwhelmed with bills to pay had a two-fold odds of PPD, compared to mothers who did not experience these economic adversities.
3. Mothers who delivered very low birth weight infants and those who reported being physically abused during pregnancy had a significantly higher odds of PPD.

Table 4
Adjusted odds ratios (OR) and population attributable risk percent (PAR%) for significant predictors of postpartum depression*
North Carolina PRAMS, 1997-1998

Risk factors	OR	(95% CI)	Prevalence	PAR%
Maternal job loss	**2.3**	(1.1, 4.9)	11%	13%
Difficulty paying bills	**2.0**[a]	(1.0, 4.1)	26%	21%
Physical abuse during pregnancy	**3.8**	(1.4, 10.2)	6.3%	15%
Very low birth weight (<1,500 g)	**2.4**	(1.4, 4.2)	1.2%	2%

*Excludes infant deaths
[a]Marginally significant, p=0.06

Discussion

Two important limitations of this study need to be considered. First, the mother's opinion of her emotional state was the sole determinant for defining PPD. Without additional research, we do not know the extent to which mothers' subjective opinions of their depressed state correlate with the actual incidence of PPD, as obtained from clinical interviews or from self-administered measurement scales, such as the Edinburgh Postnatal Depression Scale,[18] which is widely used in survey research of PPD.

The second limitation of this study involves the possibility of recall bias. Recall bias occurs when individuals with a particular exposure or poor health outcome, such as having a very low birth weight infant, are likely to remember their experiences differently from those who are not similarly affected. In this study, mothers who were highly depressed at the time the survey was completed may have had a tendency to over-report the number of stressful events that actually occurred. On the other hand, mothers who were "not at all depressed" may have had a tendency to recall a fewer number of events than actually occurred. This bias would result in our findings overstating the effect of the amount of reported stress on the risk of PPD.

The relationship between maternal job loss (where the mother wanted to continue working) and the onset of PPD cannot be explained only by the chronic stress of being poor. In this study, we controlled for low socioeconomic status while examining the impact of stressful events. In another study it was suggested that the relationship of maternal unemployment and subsequent postnatal depression may "reflect the isolation [e.g., loss of contact with co-workers] and low self-esteem of non-working mothers, or the substantial role change for women who following childbirth have no future employment planned."[19]

Consistent with the proposed theory of unemployment and subsequent isolation, we found that unemployed mothers had less social support available to them than mothers not in this group. For example, among the study population of all unmarried mothers (n=842), 24 percent of unemployed mothers reported that there was *no one* available to help care for their new infant, compared to 13 percent for the remaining sample of unmarried mothers.

We found a significantly elevated risk for postpartum depression among mothers who reported being physically abused during pregnancy. In addition to bearing the strain of physical abuse, these mothers tend to encounter many other forms of stress during pregnancy. Abused mothers were significantly more likely than all other control groups to report six or more stressful events in the 12 months before delivery. Similarly, 16 percent of abused mothers, compared to six percent of non-abused mothers, reported losing their jobs **and** being unable to pay bills. As evident from these findings, as well as findings from other studies, the risk of depression among abused mothers is increased by the fact that many of these mothers experience many other stressors in their lives in addition to the abuse.

We also found a higher risk of PPD among mothers with very low birth weight infants. These babies are more likely to be sick and require extensive medical intervention than normal weight babies. The added strain of caring for these fragile infants may increase the risk of PPD.[20]

It is estimated that postpartum depression is treated in as few as 10 percent of affected mothers.[21] Failure to seek treatment may result, in part, from mothers dismissing or discounting their depression in view of the enormous physiological and psychological changes associated with childbirth.[22] Maternal postpartum depression is also incongruent with the usual expectations of joy surrounding the birth of a new baby.

The suffering caused from postpartum depression could be alleviated through improved health education. Pregnant women should be routinely advised of the signs and symptoms of postpartum depression, including the differences between depression and the more prevalent and benign "maternity blues." Postpartum depression is also under-diagnosed. Health care providers need to better informed of the clinical features of postpartum depression and the need for referral to appropriate mental health services.

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