Research Articles

A MULTIRISK APPROACH TO PREDICTING CHRONICITY OF POSTPARTUM DEPRESSION SYMPTOMS

Claudia M. Klier, M.D.,[1]* Katherine L. Rosenblum, Ph.D.,[2] Maria Zeller, M.D.,[3] Kornelia Steinhardt, Ph.D.,[4] Niels Bergemann, M.D. Ph.D.,[5] and Maria Muzik, M.D.[2,6]

***Background:** Persistence of postpartum depression (PPD) carries potential adverse implications for the emerging mother–child relationship and for child development. **Methods:** This study was designed to investigate factors related to the onset and persistence of PPD; in particular, we examined the cumulative effect of a range of psychosocial risk factors in predicting chronic PPD symptoms. One hundred and five women were interviewed at three assessment periods: within the first days after childbirth, at 6 months, and at 18 months postpartum. **Results:** Depressive symptoms at 6 months predicted 18 months depressive symptoms, even when controlling for the contribution of maternal depression at birth. Psychosocial risk had a moderating influence on the stability of depressive symptomatology. Women with two or more risk factors at birth were more likely to have stable depressive symptomatology across the infants' first 18 months of life. **Conclusion:** To prevent a chronic course of PPD it may be necessary to identify both depressive symptoms and relevant psychosocial risk factors. Depression and Anxiety 25:718–724, 2008.*

Key words: *postpartum depression; screening; psychosocial risk; chronic depression*

INTRODUCTION

Although postpartum depression (PPD) often remits after several months, in a substantial minority of cases, up to 24% by some estimates, PPD may be more chronic and persist beyond 12 months postpartum.[1] This condition carries potential adverse implications for the mother–child relationship and for child development.[2]

Earlier research has identified a number of psychosocial risk factors, including low socioeconomic status, problems in the marital relationship, stressful life events, or absence of social support, for the onset of PPD,[3,4] recently researchers start to evaluate psychosocial risk during pregnancy as early as at the first contact with the obstetric team.[5,6] The American College of Obstetricians and Gynecologist published a recommendation to include assessment of psychosocial risk factors at each trimester of pregnancy to routine prenatal care. Screening should include assessment of barriers to care, unstable housing, unintended pregnancy, communication barriers, nutrition, tobacco use,

[1]Department of Child and Adolescent Neuropsychiatry, Medical University of Vienna, Vienna, Austria
[2]Center for Human Growth and Development, University of Michigan, Ann Arbor, Michigan
[3]Department of Gynecology and Obstetrics, Medical University of Vienna, Vienna, Austria
[4]Institute of Education Science, University of Vienna, Vienna, Austria
[5]Department of Psychiatry, Ruprecht-Karls-University of Heidelberg, Heidelberg, Germany
[6]Department of Psychiatry, University of Michigan, Ann Arbor, Michigan

*Correspondence to: Dr. Claudia M. Klier, Department of Psychiatry, University of Vienna. Vienna General Hospital, Waehringerguertel 18-20, A-1090 Vienna, Austria.
E-mail: claudia.klier@meduniwien.ac.at

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substance use, depression, safety, intimate partner violence, and stress.[7] Furthermore, persistence of PPD beyond 12 months postpartum has been related to a lack of spousal support[1] and to depression in the ante and early postpartum period.[8] Although earlier work has shown the cumulative effect of psychosocial risk factors to be predictive of chronic depressive episodes in a population of workingclass mothers,[9] there continues to be a need for research investigating these associations for postpartum, or birth-related depression.

This present study aims to examine the cumulative effects of a number of psychosocial risk factors at birth in predicting chronic PPD at 18 months postpartum.

METHODS

PARTICIPANTS

Participants in this present study were 105 women who had recently given birth at the Vienna University Hospital. The sample was drawn from a larger study designed to examine the link between gonadal hormones and mood states during the early postpartum days.[10,11] Of the initial 192 women, 87 (45%) left the hospital before they could be invited to participate in the psychiatric assessment; the remaining subsample of 105 women underwent a structured psychiatric interview within 5 days after delivery, and an Edinburgh Postnatal Depression Scale (EPDS) at 6 months and 18 months. There was a tendency to miss women discharged either very early after delivery or during weekends or holidays. The sample comprised a Caucasian, metropolitan population, ranging from lower to upper middleclass with approximately onethird of the mothers having undertaken education beyond the age of 16. Most women (93%) were working full-time before their pregnancy, and more than half were primiparous. 92% of the participants stated that they were married or living with a partner. Approximately one-third of the mothers reported that they perceived their financial situation to be poor. The age range was 16–39 with a mean of 27 years, 14% women had a cesarean section and 11% ventouse delivery.

PROCEDURES

The women were approached by a trained psychiatrist in the maternity hospital after childbirth and invited to participate in the study. All were given information regarding the study, and these who agreed to participate gave informed written consent. The study was approved by the local ethics committee. None of the women refused to participate; but there was a tendency to miss women discharged very early after delivery, or during weekends or holidays. All 192 women had filled out the Zung self-rating depression scale [SDS][12] at week 38 of pregnancy and day 1 postpartum, so we could check selection bias by comparing the 105 participants with the 87 who were not approached.

ASSESSMENTS

Before study entry (week 38 of pregnancy), symptoms of depression were assessed by self-rating: The SDS Zung self-rating depression scale (SDS-German version;[13]), which is a standard measure of depression (cut-off score of 40/raw score or 50/index score). The actual study started within the first postpartum days, while in hospital, all participants completed a psychiatric interview and the Experience of Pregnancy Questionnaire. A trained psychiatrist (MM) conducted all the Structured Clinical Interviews -German version [SCID; [14]] for DSM-III-R [APA].[15] A diagnosis of DSM-III-R Major Depressive Episode (MDD) current or lifetime and family history was derived from the interview.

Any woman who met the criteria for a disorder was encouraged to obtain treatment and was referred to the psychiatric department. In addition, all women were provided with a flyer describing depressive symptoms that may occur during the postpartum period, and were offered free treatment options at the psychiatric department in case they experienced such symptoms. Only one woman contacted our service after the 6 months assessment and received counseling sessions.

The follow-up assessments at 6 and 18 months postpartum consisted of the EPDS-German version, a 10 item self-rating scale with a sensitivity of 87% and a specificity of 87% for a score above 11[16] and were conducted by telephone. The EPDS has been validated for use as a phone-interview assessment device[17] and these interviews were conducted by a graduate research assistant.

During the initial assessment all participants were checked for psychosocial risk factors such as maternal age, parity, mode of delivery (cesarean section, ventouse or vaginal delivery), perinatal complications (based on the participants subjective report of the severity of complication), marital status, education and occupation.

The Experience of Pregnancy Questionnaire was designed to assess a variety of possible psychosocial risk factors related to the experience of pregnancy: dissatisfaction with support from family and friends, occurrence of somatic and emotional problems during pregnancy, insufficient weight gain during pregnancy, perception of insufficient financial resources, household crowding, and reports that the child was not wanted by the mother or father. Items regarding satisfaction with current social support, financial resources, and household crowding were scored on a scale from 1 to 4, with lower numbers indicating low levels of satisfaction. Somatic and emotional problems during pregnancy were scored as present (1) or absent (0); these questions included items regarding somatic, sleep, and mood disturbance, as well as hyperemesis. Weight gain was reported in total kilograms gained across the pregnancy.

We derived a composite variable, the risk index (RI). The RI was created by summing across seven individual dichotomized risk variables, including: household crowding (consistent with Samer-off[18] this was defined as at least four children in household), maternal age (20 years or younger), problems during pregnancy (respondent indicating the presence of somatic, sleep, or mood problems), or weight gain less than 9 kg across pregnancy, dissatisfaction with social support, financial resources, and reports at birth that the child was unwanted by mother or father.

DATA ANALYSIS

The assessments produced diagnosis of maternal depression immediately after birth and EPDS scores at 6 and 18 months postpartum. Although a score of 9/10 has been recommended as an appropriate cut-off for screening PPD,[19] based on current evidence for the German-speaking version a cut-off of 10/11 is used to maximize sensitivity and specificity.[16] To assess the stability of maternal depressive symptomatology across the infant's first 18 months of life, we conducted zero-order correlations among the depression scores at the three assessment periods. Next, we used zero-order correlations and χ^2 analyses to examine the relation between the psychosocial risk composite variable (i.e., maternal RI scores) and maternal depression at each time-point. Finally, to examine the stability of maternal depressive symptomatology across the three time points, as well as to examine whether psychosocial risk contributed independent variance to mothers' depressive symptomatology at the 18-month follow-up, a hierarchical multiple regression analysis was conducted. The dependent variable was maternal EPDS

scores at 18 months. The predictor variables were entered in the following sequence: at the first step— mothers' depression at birth, at the second step mothers' depressive symptomatology at 6 months, at the third step— the psychosocial RI score, and at the fourth step— the interaction term between mothers' RI scores and depression at birth. This final step in the regression analysis was included to examine the possibility that environmental risk might moderate the persistence of maternal depressive symptomatology across the three time-points.[19]

RESULTS

COMPARISON OF THE SAMPLES OF WOMEN WHO WERE LOST BEFORE DAY 5 AND THOSE WHO CONTINUED THE STUDY UP TO 6 MONTHS

There were no significant differences of depressive symptoms (measured by the Zung Depression Scale) before birth ($\chi^2(193) = 0.25$, $df = 1$, $P = 0.6$, not significant), and after birth ($\chi^2(192) = 27$, $df = 1$, $P = 0.6$, ns) among the women who participated in the actual study ($n = 105$) and those who did not ($n = 87$). Furthermore, there were no differences between the two samples with respect to parity ($\chi^2(193) = 3.4$, $df = 1$, $P = 0.06$, ns), maternal age ($\chi^2(193) = 2.6$, $df = 1$, $P = 0.1$, ns), or infant birthweight ($\chi^2(191) = 0.005$, $df = 1$, $P = 0.9$, ns).

At 6 months postpartum 89 (84.7%) of the 105 women with diagnostic assessment at birth could be reached for a phone follow-up (attrition 15.3%).

DEPRESSION RATES AFTER BIRTH, AT 6 AND 18 MONTHS POSTPARTUM

Depression rates are listed in Table 1. Twelve of the 14 women depressed at birth had at least one earlier depressive episode. Of the 105 women 76.2% ($n = 80$) had no history of depression, neither current nor lifetime. A total of $n = 22$ women had a lifetime MDD and of those 11 met criteria for MDD at birth.

STABILITY OF DEPRESSIVE SYMPTOMATOLOGY FROM BIRTH TO 18 MONTHS POSTPARTUM

Zero-order correlation analyses (Pearson's r) were conducted to examine the stability of maternal depressive symptoms from birth to 18 months of age. The initial assessment of depression was based on SCID diagnoses, and women received either a score of 0 (no diagnosis) or 1 (current depressive diagnosis). Depression at 6 and 18 months was based on total EPDS scores. Results indicated significant stability in mothers' depression scores between birth and 6 months ($r = 0.23$, $P = .03$), but not between birth and 18 months ($r = 0.17$, $P = .12$). Depression symptoms between 6 and 18 months postpartum were significantly correlated ($r = 0.42$, $P < .001$) (Table 2). Although the presence of a current depressive episode at birth was highly related to the history of earlier depression ($r = 0.61$, $P < .001$), the relation between life-time depressive history and depression scores at 6 or 18 months postpartum did not exceed significance ($r = 0.15$, $P = .16$ and $r = 0.20$, $P = .06$, respectively).

PSYCHOSOCIAL RISK FACTORS AND POSTPARTUM DEPRESSION

Table 3 provides the percentage of depressed (i.e., received a SCID diagnosis) versus nondepressed women at birth who were positive for each of the psychosocial risk factors. Results indicate that most psychosocial risk factors were unrelated to depression diagnosis at birth (Table 3). In contrast, the measure of cumulative risk, the psychosocial RI was significantly associated with PPD at each of the three time points. For the combined sample the observed range of RI scores was 1–5 (possible range 0–7). Women who met criteria for depression at birth received higher scores on the RI ($M = 2.17$, $SD = 1.47$) when compared to nondepressed women ($M = 1.29$, $SD = 1.23$) $t(118) = -2.30$, $P = .026$. Pearson's r correlations between the RI and the EPDS total scores were $r = 0.40$ ($P < .001$) at 6 months and $r = 0.33$ ($P = .004$) at 18 months follow-up (see Table 2).

PSYCHOSOCIAL RISK FACTORS AND PERSISTENCE OF DEPRESSIVE SYMPTOMATOLOGY ACROSS THE POSTPARTUM PERIOD

We examined whether the chronicity of PPD was related to psychosocial risk first by computing a continuous chronicity score, which corresponded to the number of times each woman met diagnostic criteria defined by SCID diagnosis at birth or scoring above EPDS cut-off score at 6 and 18 months postpartum (possible range 0–3, observed range 0–2). The correlation between this chronicity score and the multiple was significant at $r = 0.34$ ($P = .001$) (see Table 2).

Next we conducted a series of multiple regression analyses predicting 18-month EPDS scores by earlier depression and psychosocial risk. Results are presented

TABLE 1. Depression rates at birth, at 6 months and 18 months

	Birth	6 months	18 months
SCID DSM-III-R	13.3% ($n = 14$) SCID DSM-III-R	13.5% ($n = 12$) EPDS ≥ 11	17.3% ($n = 14$) EPDS ≥ 11

EPDS, the Edinburgh Postnatal Depression Scale; SCID, structured clinical interviews.

TABLE 2. Zero-order correlations between depression variables and psychosocial risk index

	Depression at 6 months	Depression at 18 months	Psychosocial RI
Depression at birth[a]	0.25*	0.17	0.23**
Depression at 6 months[b]	–	0.44***	0.40***
Depression at 18 months[b]	–	–	0.33**
Chronicity score[c]	–	–	0.34***

EPDS, the Edinburgh Postnatal Depression Scale; SCID, structured clinical interviews.
[a]Depression assessed via the SCID.
[b]Depression assessed via EPDS.
[c]Computed as number of times each woman met diagnostic criteria (as defined by SCID diagnosis or above EPDS cutoff score) from birth to 18 months postpartum (possible range 0–3, actual range 0–2).
N varies between 73 and 96 due to missing values.
$^{*}P<.05$, $^{**}P<.01$, $^{***}P<.001$.

TABLE 3. Psychosocial risk factors by depression at birth (SCID diagnosis)

	Depression at birth			
	Yes ($n = 14$)	No ($n = 91$)		
	N (*SD*)	*N* (*SD*)	*t*-test	*P*-value
Maternal age	29.8 (5.1)	28.6(4.9)	−.84	NS
Pregnancy weight gain (kg)	14.7(6.2)	13.6(4.6)	−.73	NS
	N (%)	*N* (%)	χ^2	*P*-value
Household crowding	5 (5.5)	2(14.3)	1.51	NS
Unwanted pregnancy	5 (35.6)	16 (17.6)	2.50	NS
Problems during pregnancy	5 (41.7)	22(24.7)	1.55	NS
Financial difficulties	8 (61.5)	26 (28.6)	5.62	.018
Dissatisfaction with social support	2 (14.3)	12(13.3)	0.41	NS

SCID, structured clinical interviews; NS, not significant.

in Table 4. The first two steps provide information regarding the independent contribution of depression at birth and at 6 months to maternal depression at the 18 month follow-up. At the third step the RI score was entered, thus providing information regarding the independent contribution of psychosocial risk factors to maternal depression at 18 months, controlling for the influence of earlier depression. Finally, the interaction term between maternal depression at birth and the RI scores were entered at the fourth step to determine whether psychosocial risk factors moderate the stability of maternal depressive symptomatology.

Consistent with results of the correlational analyses, the standardized β-coefficient at Step 1 for maternal SCID diagnosis was not significant. At Step 2, the highly significant coefficient for a 6-month EPDS scores indicates that the depressive symptoms from 6 to 18 months postpartum were highly correlated, even when controlling for the presence of depression at birth. At Step 3, the RI score did not add significantly to the explained variance in the dependent measure beyond the contribution of mothers' depression at 6 months. However, the interaction term at the fourth step was significant, suggesting that psychosocial risk factors moderate the stability of depressive symptomatology during the postpartum period.

To examine this moderating influence in more detail, the sample was divided into two separate groups: low psychosocial risk (RI < 2) ($n = 58$) and high psychosocial risk (RI > 2) ($n = 38$). Table 5 presents the zero-order Pearson's correlations among the measures of depression run separately for the high- versus low-risk groups. Women with two or more risk factors at birth were likely to have stable depressive symptomatology from birth to 6-months ($r = 0.36$, $P = .05$) and from 6 months to the 18 month follow-up ($r = 0.55$, $P = .005$), whereas the intercorrelations among the depression measures at all three time-points were not significant for women with fewer than two risk factors.

DISCUSSION

The present prospective longitudinal study aimed to identify risk factors for persistence of PPD. In particular, we examined whether a cumulative risk model would predict the chronicity of depression from birth to 18 months postpartum. Results indicated that a number of risk factors were independently related to maternal depression immediately after the child's birth. Furthermore, the cumulative influence of these psychosocial risks predicted both the onset and the persistence of depression. It is often the cumulative

TABLE 4. Hierarchical multiple regression to maternal depressive symptomatology at 18 months (EPDS scores)

Predictors	Step 1	Step 2	Step 3	Step 4
Step 1: Depression at birth	.17	.04	.01	.32
Step 2: Depression at 6 months	–	.43***	.40**	.39**
Step 3: Multiple Risk Index (MRI)	–	–	.16	.27*
Step 4: Interaction (MRI × Depression at birth)	–	–	–	−.42*
Total R^2	.02	.20***	.23**	.29***
R^2 change	–	.20***	.02	.06*

EPDS, the Edinburgh Postnatal Depression Scale.
Numbers in matrix for Steps 1 to 4 represent standardized β coefficients.
*$P<.05$, **$P<.01$, ***$P<.001$.

TABLE 5. Zero-order correlations between longitudinal measures of depression conducted separately by high versus low RI status

	High risk (RI ≥2) $n = 30$		Low risk (RI <2) $n = 52$	
	Depression 6 months	Depression 18 months	Depression 6 months	Depression 18 months
Depression at birth (SCID)	.36*	.04	.14	.22
Depression at 6 months (EPDS)	–	.55**	–	.26

EPDS, the Edinburgh Postnatal Depression Scale; RI, psychosocial risk index; SCID, structured clinical interviews.
*$P<.05$, **$P<.01$.

effect of environmental and social risk factors, rather than single indicators, that are of most significance in predicting problematic outcomes.[18] Our results lend support to this assertion, revealing that the additive effect of several risk factors is positively associated with greater depressive symptomatology, and with greater stability of depressive symptoms across the postpartum period. The interaction between depression at birth and psychosocial risk factors assessed at the same time in predicting the stability of depression months later underscores the apparent moderating, or protective role of low-risk environments. In low risk contexts PPD is less stable; high-risk environments appear to increase the odds that depression will be stable from the first into the second year of the infant's life.

The importance of psychosocial and environmental influences for the onset of postpartum depressive disorders has been underscored by a number of researchers.[4,21,22] Thus our finding that psychosocial risk factors are associated with greater incidence of PPD should not be surprising. Several decades ago a social-origins model of depression was proposed,[23] and more recently this model has been adapted for the study of PPD in a transcultural context.[24] Our results are consistent with these earlier findings, supporting the notion that psychosocial influences may heighten the risk for the onset of postpartum depressive disorder.

There are a number of clinical implications of the current results. In particular, these findings emphasize the importance of assessing these psychosocial risk factors as well as depression when working clinically with women after childbirth. Our results indicate that the cumulative effect of multiple risk factors may increase chronicity of PPD. Thus, these findings suggest that therapists working with postpartum depressed women may need to assess and target multiple indices of psychosocial risk to effectively prevent a chronic course of illness. In a general population sample researchers have undertaken a similar effort, the creation of a Persistence of Depression Score.[25] They included depression, physical illness, and social support and found that with increasing scores the persistence of depression after 12 months increased from 7 to 40%.

In addition, the results of this present study have implications for prevention of chronic PPD. It is perhaps not surprising that having a depressed mood at birth, coupled with the necessity to cope with multiple psychosocial risk factors, may create a vicious circle for a woman who is trying to deal with the many challenges of parenting a young infant, thus increasing the likelihood she will remain depressed. State of the art health care during pregnancy and the early postpartum period should include screening for the presence of a variety of psychosocial risk factors, and women identified with such risks need to be provided with adequate help.[5] Identifying women at risk early in the pregnancy may significantly aid prevention

efforts and thus decrease the numbers of mothers who develop postpartum illness.

Finally, early identification of women at risk for persistent postpartum depressive symptomatology may help to further reduce problematic child outcomes associated with chronic PPD. For example, young children exposed to chronically depressed mothers were more likely to show high levels of distractibility and hyperactivity[2] and successful treatment of maternal depression is reducing child behavior problems and symptoms substantially.[26] Identifying women at risk for chronic depressive symptomatology, through screening for multiple psychosocial risk indicators during pregnancy, may facilitate more successful prevention targeting risks for problematic early child development.

All mothers who met diagnosis of depression or had elevated depressive scores at 6 months were invited to participate in a psychotherapy treatment trial.[27] Although we do not have data regarding whether women utilized other outside sources of help during the postpartum period, the fact that only one mother consented to participate in our offered treatment trial is consistent with earlier studies that have demonstrated limited treatment utilization by women who suffer from PPD.

There are several limitations to the current investigation. In particular, the specification of psychosocial risk in this present study was based on single-item indicators for each individual risk factor; subsequent studies may benefit from a more detailed analysis of each risk factor. In addition, the present sample was not selected on the basis of risk status; replication of these findings using a sample of clinically referred women would further validate the importance of assessing psychosocial risk factors. In addition, the present sample was relatively economically advantaged, with high levels of education and a predominance of intact marriages, and thus replication of these findings with a high-risk, economically and socially disadvantaged population is also clearly warranted. Notably, however, the important role of psychosocial risk was underscored even among this sample of relatively low-risk women. Finally, for reasons related to the feasibility of this present study, two different measures of depression were employed across the three time points. It is therefore possible that the association between the 6 and 18 months depression scores (versus associations with depression at birth) are stronger at least in part because shared method variance. Specifically, the 6 and 18-month follow-up assessments both relied upon the EPDS, a continuous rating self-report measure administered by phone that is specifically designed to assess PPD symptoms. In contrast, the initial assessments of depression at birth were made using the SCID, a validated structured clinical diagnostic instrument administered in the context of a face-to-face interview. It is worth noting, however, that the moderating effect of the psychosocial risk variable was observed specifically in predicting the stability of depressive symptom scores obtained using the same measure of PPD from 6 to 18 months post delivery.

Finally, as the majority of women who met criteria for PPD at the 6-month assessment declined intervention services offered, it is clear that the development of strategies designed to increase service utilization among PPD women warrants continued research and clinical attention.

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