

Are Pregnant and Postpartum Women Moodier? Understanding Perinatal Mood Instability

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Abstract

Objective: To better understand mood changes in pregnancy and postpartum, we studied mood instability in a group of perinatal women and in a group of normally menstruating non-pregnant women.

Methods: Perinatal women (n = 45) completed the Edinburgh Postnatal Depression Scale at 16 weeks' and 30 weeks' gestation and again at four weeks postpartum. Immediately after completing the Edinburgh Postnatal Depression Scale, participants also completed mood diaries with separate visual analogue scales for depressed, irritable, anxious, and euphoric/activated moods. This was done twice daily for one week. A comparison group of 31 non-perinatal women without depression or premenstrual symptoms completed identical mood diaries for seven consecutive weeks. Mood instability was represented by the mean square successive difference statistic.

Results: Perinatal women showed higher mean levels of depressed, irritable, anxious, and high mood instability than the non-perinatal women. The findings held when pregnant women who were depressed were removed from the comparison, except that the difference in depressed mood instability was no longer significant.

Conclusion: Wider fluctuation in mood in pregnant and postnatal women is consistent with the common belief that perinatal women are moodier than non-perinatal women.

Résumé

Objectif : Pour mieux comprendre les modifications de l'humeur pendant la grossesse et la période postpartum, nous avons étudié l'instabilité de l'humeur au sein d'un groupe de femmes pendant la période périnatale, ainsi qu'au sein d'un groupe de femmes n'étant pas enceintes et connaissant des règles normales.

Méthodes : Les femmes se trouvant en période périnatale (n = 45) ont rempli l'échelle *Edinburgh Postnatal Depression Scale* à 16 semaines et à 30 semaines de gestation, ainsi que quatre semaines à la suite de l'accouchement. Immédiatement après avoir rempli l'échelle *Edinburgh Postnatal Depression Scale*, les participantes ont également rempli un journal sur l'humeur au moyen d'échelles visuelles analogues distinctes en ce qui concerne les états suivants : déprimée, irritable, anxieuse et euphorique / activée. Ce journal a été rempli deux fois par jour, pendant une semaine. Un groupe de comparaison comptant 31 femmes ne se trouvant pas en période périnatale et ne présentant pas de symptômes dépressifs ou prémenstruels ont rempli des journaux sur l'humeur identiques pendant sept semaines consécutives. L'instabilité de l'humeur a été représentée par la moyenne du carré des différences successives.

Résultats : Les femmes se trouvant en période périnatale ont montré des taux moyens plus élevés d'instabilité de l'humeur de type dépressif, irritable, anxieux et euphorique que les femmes ne se trouvant pas en période périnatale. Ces résultats sont demeurés les mêmes lorsque les femmes enceintes déprimées ont été retirées de la comparaison, à l'exception du fait que la différence en matière d'instabilité de l'humeur de type dépressif n'était alors plus significative.

Conclusion : La constatation d'une fluctuation élargie de l'humeur chez les femmes enceintes et se trouvant en période postpartum concorde avec la croyance commune voulant que les femmes se trouvant en période périnatale soient plus susceptibles de présenter une instabilité de l'humeur que les femmes ne se trouvant pas en période périnatale.

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INTRODUCTION

Many women describe pregnancy as the most fulfilling time of their life,¹ but pregnancy is often associated with moodiness.² Research suggests a higher prevalence of depressive symptoms early in pregnancy, but these decrease as pregnancy progresses and may rise again just around delivery.^{1,3-5} A few studies describe labile

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depressive, irritable, and “high” symptoms around the time of delivery,^{6,7} particularly when self-report measures are used.⁴

In a previous study of antenatal depression in 402 pregnant women (at a mean 15 ± 6.5 weeks' gestation), depressive symptoms measured by the Edinburgh Postnatal Depression Scale⁸ were associated with positive responses to questions about “mood swings” and “moods going up and down” (OR 2.97; 95% CI 1.59 to 5.53, $P < 0.001$).⁹ Collinearity between the EPDS score and “mood swings” was low (tolerance = 0.984), suggesting that they are sufficiently different to justify studying them as separate concepts.^{10,11}

Most clinical assessments of mood are retrospective, assuming that the respondent's mood has been stable over the period being assessed; for example, a one-week window is used for the EPDS.^{8,12} In fact, serial prospective assessments of mood in people with mood disorders show that mood fluctuates over hours and days.^{10,11,13} This is operationalized as mood instability, which involves severe and frequent fluctuations of mood over time¹⁴ and warrants attention in pregnant and postpartum women.

Because studies of mood instability in pregnancy are sparse, we investigated whether pregnant and postpartum women would have higher levels of mood instability than non-pregnant women who were regularly menstruating.³⁻⁵ We also studied the pattern of mood instability for four different moods: depressed, irritable, anxious, and euphoric/activated over the course of pregnancy and the postpartum period in the perinatal women and over two menstrual cycles in the non-pregnant women.

METHOD

We invited women enrolled in the Feelings in Pregnancy and Motherhood Study¹ (a longitudinal study of depression in pregnant and postpartum women) to participate in a more detailed sub-study of their moods. The study involved interviews at three time points: early pregnancy (mean gestation 16.4 weeks, SD 4.4), late pregnancy (mean gestation 30.4 weeks, SD 2.3), and postpartum (mean 4.3 weeks after delivery, SD 1.5).

ABBREVIATIONS

EPDS	Edinburgh Postnatal Depression Scale
MSSD	mean square successive difference
VAS	visual analogue scale(s)

We recruited 47 women, but one woman miscarried and another delivered prematurely; therefore complete data were available on 45 pregnant women. Depression in participants was assessed using the EPDS, which is the most widely used perinatal depression screening instrument.⁸

We concurrently recruited a group of non-pregnant, healthy women for a separate study of moods during the menstrual cycle.¹⁵ These women had regular menstrual periods without premenstrual symptoms, and none had delivered within one year or were using any form of hormonal contraception or psychotropic medication. To ensure that they were not depressed, we excluded women with a Beck Depression Inventory score of 20 or greater¹⁶ at screening (the suggested criterion for clinical depression) and also interviewed them using the Mini-International Neuropsychiatric Interview to ensure that they had never experienced an episode of major depression.¹⁷ This screening resulted in 31 non-pregnant women composing the comparison group. All participants provided signed informed consent and received a modest stipend for participation.

Both groups of women completed identical mood diaries consisting of four 10 cm visual analogue scales asking them to rate their mood in the past few hours. The four moods assessed were “depressed,” “irritable,” “anxious,” and “euphoric/activated.” The ratings were recorded in the morning and evening for seven consecutive days for a total of 14 ratings.

The pregnant women completed the mood diaries for one week following the interviews for the original study and at the three time points mentioned above: early pregnancy (16.4 weeks), late pregnancy (30.4 weeks), and postpartum (4.3 weeks after delivery). The non-pregnant women in the comparison group completed diaries for two successive menstrual cycles or eight weeks, but ratings in the eighth week were often incomplete. To take into account the range of ratings, we decided a priori to use ratings from the first, fourth, and seventh weeks of the two menstrual cycles.

The two groups were compared for similarity in age, education, and income distribution at the first assessment. Mood instability for both groups was assessed with the mean square successive difference statistic derived from the serial VAS ratings. The MSSD assesses point-to-point variability of mood and takes into account the temporal order of ratings.¹⁸ Student *t* or chi-square tests were used for comparisons as appropriate.

The linear mixed modelling procedure was used to examine the trajectory of mood instability over three periods. Linear mixed models allow the estimation of fixed and random

Table 1. Final models of mood instability in perinatal and non-perinatal women (n = 74)

	Depression	Irritability	Anxious	Euphoric/activated
Fixed effects				
Intercept	0.92 (0.17)*	2.09 (0.44)*	0.58 (0.13)*	2.98 (0.44)*
Time	N/A	-1.04 (0.47)**	N/A	-1.65 (0.56)*
Time (quadratic)	N/A	0.23 (0.12)**	N/A	0.33 (0.11)*
Group	0.58 (0.22)*	1.31(0.22)*	0.58 (0.17)*	0.04 (0.32)
Group × Time	N/A	N/A	N/A	0.39 (0.13)*
Random effects				
Intercept	0.70 (0.14)	0.66 (0.15)	0.37 (0.09)	0.53 (0.12)
Residuals	0.55 (0.06)	0.68 (0.08)	0.54 (0.06)	0.61 (0.07)
* $P < 0.01$				
** $P < 0.05$				

effects, where the former are the quantities of interest (e.g., whether there is a between-group difference or a change over time) and the latter are artifacts of sampling from a population. For each emotion, we started with a null model that allowed individuals to have a random intercept but a fixed slope. Next, we added predictors one by one, including group (coded “1” for perinatal and “0” for non-perinatal women), time (coded as “1,” “2,” or “3”), and the interaction of these two terms. A quadratic term for time was also tested for significance in each model. The Bayesian information criterion was used to determine the model that provides the best balance between prediction and parsimony.

Twelve of the 45 pregnant women were depressed (EPDS ≥ 13) at the early pregnancy assessment. Since the non-perinatal women were not depressed, the more stringent test would be to compare these (n = 31) with the 33 non-depressed perinatal women. This was done as a secondary analysis. Finally, because the EPDS scores were positively skewed, we determined the non-parametric association (Spearman rank correlation) between depressed mood instability and the EPDS score at the three assessment points.

Ethics approval for the study was provided by the Behavioural Research Ethics Board of the University of Saskatchewan.

RESULTS

The mean age of the 45 perinatal women was 29.6 years (SD 3.9); the majority were Caucasian, 63.8% had completed post-secondary education, and 46.8% had a family income over \$60 000 per year. The mean age of the 31 non-perinatal women in the comparison group was

29.6 years (SD 6.8); the majority were Caucasian, 90.4% had completed post-secondary education, and 35.5% had a family income greater than \$60 000. The groups were similar in age and income levels, but the non-perinatal women had a higher proportion of post-secondary graduates ($\chi^2 = 5.25$, $df = 2$, $P = 0.02$). As might be anticipated, more of the perinatal women were married or living common-law (93.6%) than the non-perinatal women (46%) ($\chi^2 = 19.55$, $df = 1$, $P < 0.01$).

In the initial analysis, the 45 perinatal women were compared with the 31 non-perinatal women. Three of the final models indicated a significant group effect for depressed, irritable, and anxious mood instability, meaning that mean mood instability was greater in the perinatal women than in the non-perinatal women (Table 1). In addition, the final model for euphoric/activated mood instability showed a significant Group × Time interaction, indicating that the trajectory differed between perinatal and non-perinatal women. Post hoc comparison revealed that euphoric/activated mood instability was greater in the perinatal women (mean score 2.22, 95% CI 1.82 to 2.60) in the postpartum period (mean 4.3 weeks after delivery, SD 1.5) than in the non-perinatal women (mean score 0.97, 95% CI 0.69 to 1.26) (Table 1).

In the secondary analysis, which was restricted to the 33 perinatal women who were not depressed at the first assessment, the group effects were attenuated but similar and significant for irritable mood instability ($\beta = 1.28$ [SE 0.24], $P < 0.01$) and anxious mood instability ($\beta = 0.32$ [SE 0.16], $P = 0.05$). The raw mood instability scores for the four moods are shown in Table 2. For euphoric/activated mood instability, the Group × Time interaction ($\beta = 0.38$ [SE 0.12], $P < 0.01$) was likewise significant. Neither the group nor the time effects were significant for depressed

Table 2. Means (SE) of mood instability scores on three occasions

Group	n	Depression			Fear		
		Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Perinatal	33	1.36 (0.20)	0.97 (0.15)	1.41 (0.18)	0.99 (0.17)	0.85 (0.13)	0.85 (0.18)
Non-perinatal	31	0.86 (0.16)	1.02 (0.20)	0.85 (0.17)	0.64 (0.11)	0.56 (0.13)	0.55 (0.14)
Group	n	High mood			Irritability		
		Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Perinatal	33	2.01 (0.19)	1.71 (0.18)	2.10 (0.21)	2.55 (0.26)	2.11 (0.19)	2.39 (0.23)
Non-perinatal	31	1.64 (0.24)	1.05 (0.16)	0.97 (0.14)	1.10 (0.17)	1.11 (0.16)	0.98 (0.18)

*In these tables, times 1, 2, and 3 for perinatal women were assessed at a mean of 16.4 weeks' gestation, 30.4 weeks' gestation, and 4.3 weeks postpartum, respectively.

Times 1, 2, and 3 for non-perinatal women were assessed at weeks 1, 4, and 7 in a consecutive eight-week period.

mood instability, since women who were depressed at Time 1 (early pregnancy) were excluded. In fact, one perinatal woman was depressed (EPDS ≥ 13) at Time 2 (30.4 weeks pregnant), and two women were depressed at Time 3 (4.3 weeks after delivery). None of the women in the control group were depressed at Time 1 (week 1), but one woman became depressed (BDI ≥ 21) at Time 2 (week 4) and also at Time 3 (week 7) (Table 2).

The Spearman correlation coefficient between the EPDS score and depressed mood instability in early pregnancy was 0.525 ($P < 0.001$), in late pregnancy 0.298 ($P = 0.06$), and postpartum 0.478 ($P = 0.002$).

DISCUSSION

The hypothesis that pregnant women are more moody than non-pregnant women was confirmed by our main finding that depressed, irritable, anxious, and euphoric/activated mood fluctuated more widely in pregnant and postpartum women than in the control group of non-perinatal women. Except for depressed mood instability, this finding held when only the perinatal women who were not depressed were used in the comparison. This provides clearer evidence that perinatal women are more likely to experience irritable, anxious, and euphoric/activated moods than non-perinatal women.

As far as we are aware, our study is the first to demonstrate fluctuating moods of relatively short duration accompanied by irritability in the perinatal period using the MSSD. This observation of point-to-point mood variability confirms the perception of the perinatal period being associated with a higher likelihood of "moodiness."

There have been many reports of both elevated prevalence and higher mean levels of dysphoric mood in pregnancy and postpartum, including reports of anxiety^{3,5} and

irritability^{6,7} and a meta-analysis of 59 studies of postpartum depression.¹⁹ "High" mood has also been described in the postpartum period.^{4,6} Graphs of mood in the postpartum period from studies that did use the VAS for serial (usually daily) assessments^{4,20,21} also suggest fluctuations of mood.

Mood instability correlates with retrospectively assessed average mood, but the average Spearman correlation between depressed mood (EPDS) and depressed mood instability was only 0.43. This is consistent with previous findings⁹⁻¹¹ that even though prospectively measured mood instability and retrospectively assessed average mood are correlated, they are sufficiently different to be studied as separate concepts. This study indicates that dysphoric mood in pregnancy and the postpartum period is variable, contrary to the impression gained from summary retrospective mood scales of a prevailing dysphoric mood.

We have demonstrated mood instability in perinatal women. Several studies have shown that relationship difficulties, social support, and stressful events adversely affect moods in pregnancy.^{1,3,19} It has also been shown that unstable moods react to positive and negative reinforcement,^{22,23} so it is likely that stressors or events related to relationships affect perinatal moodiness. Similarly, greater fluctuations in euphoric/activated mood early in pregnancy and in the postpartum period could be a response to positive events associated with being pregnant and the birth of the baby.⁶

The largest hormonal changes in pregnant women occur in early pregnancy and again around the time of delivery. These times correspond with periods of highest irritable, euphoric, and depressed mood.^{24,25} It is likely that hormonal changes are associated with alterations in brain function that manifest as unstable moods in vulnerable women.^{15,24} Other stressors such as sleep disruption may have additional negative effects.^{26,27} Our study has some limitations. We recruited fewer women than hoped because

the larger study was underway before this sub-study on mood instability began. Nevertheless, the hypothesis was confirmed. Advertising for a study of feelings may have resulted in recruitment of women with an interest in their mood. Women who volunteered were more likely to be in a permanent relationship and of higher socioeconomic status than women in the larger study; therefore, caution is suggested in generalizing our findings to other groups of pregnant women. It is possible that a bias towards higher or lower ratings of mood instability was introduced by the non-perinatal women filling out the mood diaries every day for eight weeks, while the perinatal women completed diaries for three separate weeks at spaced intervals over approximately 28 weeks. It is also likely that ratings recorded at two points during pregnancy and once in the early postpartum period may have missed critical time periods such as just before delivery or later in the postpartum period.

CONCLUSION

Our results confirm the notion that pregnant and postpartum women are moodier than women who are not perinatal. Recognition of mood instability in perinatal women could generate new approaches to identification, understanding, and treatment of mood problems in both pregnant women and postpartum women. A prospective study of women's moods before they become pregnant, followed up during pregnancy, would be instructive.

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