Society of Biological Psychiatry 66th Annual Meeting, San Francisco, California, May 12-14, 2011.

SEASONAL EFFECTS ON DEPRESSION RISK (EPDS≥10) AND SUICIDAL SYMPTOMS IN POSTPARTUM WOMEN.

Authors: Dorothy Sit[1], Katherine L Wisner[1], Howard Seltman[2], Michael Terman[3]

Western Psychiatric Institute and Clinic, University of Pittsburgh[1]; Department of Statistics, Carnegie Mellon University[2]; Department of Psychiatry, Chronobiology Program, Columbia University[3]

ABSTRACT

Objective: We examined the relationship between seasonal variation and risk for depression risk and suicidal ideation (SI) in postpartum women.

Methods: From 2006-2010, women who were 4-6 weeks after delivery received telephone screenings for postpartum depression (PPD) with the Edinburgh Postnatal Depression Scale (EPDS). The outcome variables were: EPDS≥10 (depression risk) and EPDS item10≥1 (suicidality). The explanatory variable included the calendar months of the year. We used spectral analysis to explore seasonal variations in risk for depression and suicidal symptoms.

Results: The team screened 9339 women; 1316 (14%) women had positive EPDS≥10 scores which suggested PPD risk; 294 (3%) women had suicidal ideation (EPDS item10≥1). Patients with depression risk had high odds for any SI (OR=41; 95%CI 30-59). Depression risk peaked in the winter. We detected no seasonal effect on risk for suicidal symptoms.

Conclusion: Postpartum depressed patients may have changes in monoamine activity. The biological effects of seasonal light may contribute to increased risk for depressive symptoms in some patients. Suicidal symptoms may be compounded by increased levels of maternal depression.

Key Words: Seasonal, Depression Risk, Suicidality, Postpartum

Acknowledgements: All the staff at Women's Behavioral HealthCARE, recruiters at Magee Womens Hospital and Michael Terman, Ph.D. for his comments.

INTRODUCTION

Postpartum depression (PPD) is the most common complication after delivery. A new episode of PPD strikes 10 to 15% of mothers (Gaynes et al, 2005). Episodes of PPD can last for 7 months or longer in 25-50% of patients (O'Hara et al, 1987). Lasting episodes are related to maternal problems with social conditions or relationships even after recovery (Segre et al, 2007).

The relationship between depressive disorders and reduced serotonin (5HT) neurotransmission (Drevets al. 1999) likely extends to depressed mothers after childbirth. Women with PPD respond to treatment with serotonergic agents such as sertraline (and equally well to the noradrenergic agent nortriptyline)(Wisner et al. 2006). The reduction in 5HT 1A receptor binding by 20-28% in depressed mothers compared to non-depressed postpartum controls (Moses-Kolko et al. 2008) suggests that depressed patients after delivery may have lowered serotonergic tone. Although 5HT1A receptor binding was not associated with estradiol concentration (Moses-Kolko et al. 2008), altered neurotransmitter activity may be related to the postpartum milieu (Sacher et al. 2010). Depression, suicide and serotonergic activity vary across the seasons (Klompenhouwer et al. 1990). Increased serotonin transporter (SERT) binding in the fall and winter (correlated with low levels of daily sunshine) could explain seasonal susceptibility to depressive symptoms (Praschak-Rieder et al. 2008). In patients with seasonal affective disorder (SAD), the hyperfunctional SERT state is reversed with bright light therapy or natural summer remissions (Willeit et al. 2008). A substantial portion of SAD patients have suicidal ideation during an acute winter depressive episode (80/191=42%)(Lam et al. 2000). Suicidal symptoms resolved in 45% of the SAD patients with appropriate bright light therapy (Lam et al. 2000). In contrast, completed suicides peak during the spring and summer (Bjorksten et al. 2009). The effects of seasonal light may contribute to completed suicide (Lambert et al. 2003) and suicidal symptoms in SAD.

HYPOTHESES

We hypothesized that postpartum women have an increased frequency of depression risk (EPDS ≥10) in the winter and suicidal ideation (EPDS item 10 ≥1) in the spring compared to other times of the year.

METHODS

The University of Pittsburgh Institutional Review Board approved the study. This prospective study involved the screening of postpartum mothers for major depression at 4-6 weeks after delivery. Discharge nurses on the postpartum units informed eligible women about the study. The nurses obtained a waiver for written informed consent for the phone screen which allowed the team to ascertain the participants' eligibility, before asking participants to complete extensive study procedures. The waiver was justified because the screening presented no more than minimal risk of harm to participants and involved no procedure for which written consent is normally required outside of the research context. The information obtained in the screening phone call was the same type of information that would be collected on patients who are setting up an appointment at a clinic to seek treatment for PPD.

Inclusion Criteria	Exclusion Criteria
Recently given birth	No telephone access
English speaking	Recent suicide attempt in past 6 months
EPDS > or = 10	DSM-IV Bipolar Disorder Type I or II, Psychotic episode,
Able to provide informed consent	Active substance abuse in past 6 months

Depression Risk. The choice of a screening tool is critical to the accurate identification of depression symptoms. An ideal self-report tool is easy to read, short, acceptable to the participant, inexpensive, and sensitive and specific for a disorder in a particular population. The EPDS is an acceptable, rapidly completed screen to identify women with risk for PPD in the first year after childbirth. An EPDS ≥10 (positive score) corresponds with acceptable levels of sensitivity and specificity reported by Cox et al, 1987 (91% and 76%, respectively) and Cox et al, 1996 (88% and 72%) when concurrent diagnoses were made by DSM-III-R or Research Diagnostic Criteria (RDC). We used the EPDS ≥10 cut-point to identify eligible participants.

Suicide Risk. Item10 of the EPDS is an inquiry about the mother's thoughts to harm herself. Possible responses are 0=never, 1=hardly ever, 2=sometimes, 3=quite often. Urgent Clinical Situations. During the phone screening, the participant who scores on item10 ≥ 1 (indicating thoughts of self-harm in the past 7 days) is staffed with the physician and an immediate clinical intervention is developed to ensure her safety.

METHODS

Data Analysis. We assessed the cumulative percentage of participants, rates of positive EPDS scores, rates of any (item10≥1) or increased levels (item10≥2) of suicidal symptoms (Table1). For the association between positive EPDS ≥10 (categorical) and any or increased suicidal symptoms, we used the chi-square test and Fisher's Exact Test (count data)(Table2; Figures1,2). For the seasonal effect on positive EPDS ≥10 and any SI, we used periodic binomial regression analysis (Fourier Basis)(Stoffer, 1991) and corrected for over-dispersion. Months were converted to radians (1yr=2pi). We explored for frequencies from f1-f4 (Table3a; Figure3). For the seasonal effect on the association between positive EPDS≥10 and any SI (continuous), we used general linear models (Table3b).

Edinburgh Postnatal Depression Scale

This scale was developed by mental health experts for screening women in the post-birth period for depression. It does not provide a diagnosis of depression; it *screens* for the possibility of depression.

Please check the answer that best describes how you have felt over the past 7 days:

1. I have been able to laugh and see the funny side of things
   - ☐ 0 As much as I could
   - ☐ 1 Not quite so much now
   - ☐ 2 Definitely not so much now
   - ☐ 3 Not at all
2. I have looked forward with enjoyment to things
   - ☐ 0 As much as I ever did
   - ☐ 1 Rather less than I used to
   - ☐ 2 Definitely less than I used to
   - ☐ 3 Hardly at all
3. I have blamed myself unnecessarily when things went wrong
   - ☐ 3 Yes, most of the time
   - ☐ 2 Yes, sometimes
   - ☐ 1 Hardly ever
   - ☐ 0 No, not at all
4. I have been anxious or worried for no good reason
   - ☐ 3 Yes, very often
   - ☐ 2 Yes, sometimes
   - ☐ 1 Hardly ever
   - ☐ 0 No, not at all
5. I have felt scared or panicky for no good reason
   - ☐ 3 Yes, quite a lot
   - ☐ 2 Yes, sometimes
   - ☐ 1 No, not much
   - ☐ 0 No, not at all
6. Things have been getting on top of me
   - ☐ 3 Yes, most of the time I haven't been able to cope at all
   - ☐ 2 Yes, sometimes I haven't been coping as well as usual
   - ☐ 1 No, most of the time I have coped quite well
   - ☐ 0 No, I have been coping as well as ever
7. I have been so unhappy that I have had difficulty sleeping
   - ☐ 3 Yes, most of the time
   - ☐ 2 Yes, sometimes
   - ☐ 1 Not very often
   - ☐ 0 No, not at all
8. I have felt sad or miserable
   - ☐ 3 Yes, most of the time
   - ☐ 2 Yes, quite often
   - ☐ 1 Not very often
   - ☐ 0 No, not at all
9. I have been so unhappy that I have been crying
   - ☐ 3 Yes, most of the time
   - ☐ 2 Yes, quite often
   - ☐ 1 Only occasionally
   - ☐ 0 No, never
10. The thought of harming myself has occurred to me
    - ☐ 3 Quite often
    - ☐ 2 Sometimes
    - ☐ 1 Hardly ever
    - ☐ 0 Never

RESULTS

Annual Recruitment from 2006-2010

Cumulative # and Percent Screened Each Year

	#months / year	Frequency	Percent	Cumulative Percent
2006	8	876	9.4	9.4
2007	12	2516	26.9	36.3
2008	12	2873	30.8	67.1
2009	12	2608	27.9	95
2010	3	466	5	100
Total	**47**	**9339**	**100**	**100%**

RESULTS

Table1a. % Women with Positive EPDS Scores (EPDS≥10) and Suicidal Ideation (item10≥1) Across Calendar Months

Month	#/month	EPDS<10	EPDS≥10	%EPDS≥10	item10≥1	%item10≥1
1	720	616	104	14.5	24	3.3
2	692	595	97	14	20	2.9
3	630	544	86	13.7	20	3.2
4	517	441	76	14.7	17	3.3
5	775	673	102	13.2	17	2.2
6	827	731	96	11.6	24	2.9
7	751	657	94	12.5	21	2.8
8	877	766	111	12.7	25	2.9
9	758	643	115	15.2	39	5.1
10	1040	890	150	14.4	24	2.3
11	928	775	153	16.5	38	4.1
12	824	692	132	16	25	3
Totals	**9339**	**8023**	**1316**	**14.1**	**294**	**3.1**

Table2. Association between Positive EPDS (EPDS≥10) and Any Suicidal Ideation or Increased Suicidal Ideation

Variable	EPDS<10	EPDS≥10	%	Odds Ratio	95% CI	Pearson's χ2 test (with Yates' correction)	df	p-value
No suicidal ideation (item10=0)	8023	1316	14.1	1.0				
Any suicidal ideation (item10 ≥ 1)	9045	294	3.1	41.3	29.8 - 58.6	1243.9	1	2.2 x 10 -16
Increased suicidal ideation (item10 ≥ 2)	9269	70	0.8	217.1	58.1 - 1837.6	394.8	1	2.2 x 10 -16

Figure1. Percentage of Patients with Any Suicidal Ideation across EPDS Scores.

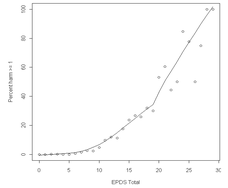


Figure2. Percentage of Patients with Increased Suicidal Ideation across EPDS Scores.

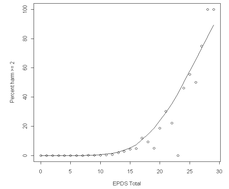


Table3. Seasonal Effect on Positive EPDS (EPDS≥10) or Any Suicidal Ideation (item10≥1)

		Periodic Binomial Regression [Fourier Basis]			
	Frequency	Estimate	s. error	z-value	Pr(z-value)
	months converted to radians (1 year = 2pi radians)				
EPDS ≥ 10	*f1 (single frequency)*	*0.117*	*0.052*	*2.26*	*0.03**
	f2	-0.0631	0.042	-1.48	0.1
	f3	-0.00518	0.043	-0.12	0.9
	f4	-0.0105	0.043	-0.25	0.8
	Null deviance=72.50 , df=46	Residual deviance=64.82 , df=45			
item10 ≥ 1	f1	0.0452	0.11	0.42	0.7*
	f2	-0.0474	0.11	-0.43	0.7
	f3	0.0229	0.11	0.21	0.8
	f4	-0.104	0.11	-0.94	0.4
	Null deviance=66.98 , df=46	Residual deviance=64.90 , df=41			

*significant effect of seasonality on positive EPDS for a single frequency, corrected for overdispersion

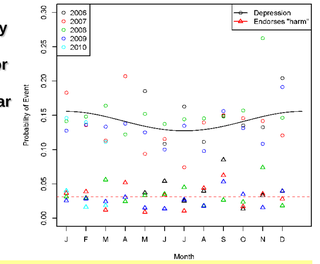
Table 4. Year to Year Effect on Positive EPDS

	Periodic Binomial Regression using the Fourier Basis			
	Frequency	Estimate	s. error	z-value	Pr(z-value)
	2007	-0.159	0.11	-1.41	0.2
	2008	0.051	0.11	0.47	0.6
	2009	-0.146	0.11	-1.30	0.2
	2010	-0.142	0.18	-0.81	0.4
	Null deviance=72.502 df=46	Residual deviance=51.891 df= 37			

Note: year to year mean differences in positive EPDS are not statistically significant.

RESULTS

Figure3. Frequency of positive EPDS scores and Risk for Suicidal Ideation Across the Calendar Months.



DISCUSSION and CONCLUSIONS

The rate of PPD risk (14%) is consistent with reported rates (Gaynes et al, 2005). The winter peak in postnatal symptoms aligns with reports of increased risk for PPD in the autumn (Hiltunen et al, 2004) but contrast with other findings (Jewell et al, 2010). The seasonal peak in mood symptoms may be from a pre-existing pattern of seasonal illness (Corral et al, 2007) or reduced sunlight exposure (Hiltunen et al, 2004)(Praschak-Rieder et al. 2008). Broader changes in neurotransmitter processes could explain the mood and vegetative changes in depression after delivery and winter depression. SAD patients have increased SERT activity (Willeit et al. 2008) and suffer depression relapse with monoamine depletion (Lam et al. 2001). Increased distribution (43%) and binding activity of brain MAO-A (Sacher et al. 2010) after delivery, could reduce monoamine levels and diminish maternal mood. The biologic milieu after delivery may introduce PPD risk with a winter onset in susceptible patients.

The frequency of SI (3%) in mothers with PPD risk is lower than rates in population based (n=386, 8.3%) or high risk mothers (n=317, 11.1%)(Pinheiro et al, 2008). The steep rise in SI in mothers with high scores (EPDS≥15) is a concern; they could be at risk for suicide attempt (39 attempts/ 156 pts with SI; Sokero et al, 2003). Suicide is the leading cause of maternal death; data from 2 large UK studies suggested that 28% of maternal deaths resulted from suicide (68 suicides/242 deaths; Oates, 2003). A clinical team must monitor the screened patients closely and assist ill mothers who need urgent treatment.

References

Gaynes BN, Gavin N, Meltzer-Brody S et al. 2005. Perinatal depression: prevalence, screening accuracy, and screening outcomes. Evidence Report: Technology Assessment (Summary) 119:1-8.

Oates M. 2003. Suicide: the leading cause of maternal death. British Journal of Psychiatry 183:279-81.

Sacher J, Wilson AA, Houle S et al. Elevated brain monoamine oxidase A binding in the early postpartum period. Arch Gen Psychiatry 67:468-474.

Willeit M, Sitte HH, Thierry N et al. 2008. Enhanced serotonin transporter function during depression in seasonal affective disorder. Neuropsychopharmacology 33(7):1503-13.