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SYMPTOM FEATURES OF POSTPARTUM DEPRESSION: ARE THEY DISTINCT?

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Abstract

The clinical features of postpartum depression and depression occurring outside of the postpartum period have rarely been compared. The 16-item Quick Inventory of Depressive Symptomatology-Self-report (QIDS-SR_{16}) provides a means to assess core depressive symptoms. Item response theory and classical test theory analyses were conducted to examine differences between postpartum (n = 95) and nonpostpartum (n = 50) women using the QIDS-SR_{16}. The two groups of females were matched on the basis of age. All met DSM-IV criteria for nonpsychotic major depressive disorder. Low energy level and restlessness/agitation were major characteristics of depression in both groups. The nonpostpartum group reported more sad mood, more suicidal ideation, and more reduced interest. In contrast, for postpartum depression sad mood was less prominent, while psychomotor symptoms (restlessness/agitation) and impaired concentration/decision-making were most prominent. These symptomatic differences between postpartum and other depressives suggest the need to include agitation/restlessness and impaired concentration/decision-making among screening questions for postpartum depression.

Keywords

Quick Inventory of Depressive Symptomatology; item response theory; Samejima graded response model; postpartum depression

INTRODUCTION

Various investigators have questioned whether postpartum depression is a special form of depression that reflects hormonal changes associated with parturition [e.g., Ahokas et al., 2000; Bloch et al., 2000] or a depressive illness that is simply temporally related to recently giving birth [Ballard et al., 1993; Whiffen and Gotlib, 1993]. A possible approach to exploring this issue is to assess whether there are symptomatic differences between depressed women who have recently given birth and depressed women who have not recently given birth. The idea that postpartum depression is a special form of depression is implicit in the development of the Edinburgh Postpartum Depression Scale (EPDS) [Cox et al., 1987]. This scale deliberately does not rate selected symptoms such as changes in weight and difficulty sleeping

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that are viewed as routinely present in pregnancy and in the postpartum period. However, the general content of the remaining items is highly similar to that found in depression scales designed for the general population.

This report uses a symptom questionnaire, the 16-item Quick Inventory of Depressive Symptomatology–Self-report (QIDS-SR_{16}) [Rush et al., 2000, 2003b, 2006; Trivedi et al., 2004b] to evaluate symptom features of postpartum patients diagnosed with depression and a control group of age-matched females who were neither pregnant nor had recently given birth. The QIDS-SR_{16} is a 16-item subset of the 30 items used in the Inventory of Depressive Symptomatology–Self-report (IDS–SR_{30}) [Rush et al., 1996, 2000; Trivedi et al., 2004b] that assess the nine criteria symptom domains needed to diagnose a major depressive episode (MDE).

SUBJECTS AND METHODS

SUBJECTS

The postpartum sample was obtained from two sources. Both studies were conducted in accordance with international guidelines for good clinical practice and the Declaration of Helsinki, and each was approved by the relevant Institutional Review Board at the University of Texas Southwestern Medical Center (Dallas, TX) or Yale University (New Haven, CT), as well as by each local Institutional Review Board or Human Subjects Committee where applicable. All patients provided written informed consent prior to participation in these studies.

One source consisted of data originally described in Yonkers et al. [2001]. Their initial samples included 802 females, of which 75% were Hispanic, 25% were African-Americans, and 5% were “other,” including white non-Hispanics. Those with IDS-SR_{30} scores greater than 18 or EPDS scores greater than 12 at initial screening conducted about 3 weeks postpartum were followed up ≈ 2 weeks later, and the IDS-SR and EPDS were readministered. Those who continued to score positive were assessed with the Structured Clinical Interview for DSM-III-R [First et al., 1996]. This study includes 37 patients who were diagnosed with a nonpsychotic major depressive disorder (MDD) based on the SCID conducted 4–5 weeks postpartum. The ages ranged from 19 to 29 years (mean = 23.3, *SD* = 3.0).

A second postpartum sample (n = 59) was recruited in one of two urban areas in the northeast and southwest United States. These unpublished data were obtained during a baseline session for a randomized clinical trial assessing the efficacy of a pharmacological treatment for postpartum depression. Women were referred to this study by obstetrical providers, although a smaller group responded to media advertisements for a study on postpartum depression. Preliminary analyses indicated that the two samples could be pooled to provide more stable estimates. The average age for the second sample was 26.0 years (*SD* = 6.3). For this cohort, 38.5% were white and non-Hispanic, 23% were black non-Hispanic, and 38.5% were white and Hispanic. The average parity was 1.8. Women had received 12.5 years of education on average (*SD* 2.8) and 42% were employed. All entered the treatment study. Women in this second cohort were only included in that particular study if they reported a postpartum onset of illness. While this report of postpartum onset was obtained retrospectively and therefore was at risk for bias, the attempt was to limit inclusion to women with postpartum onset of illness.

We obtained 50 age-matched nonpsychotic, nonpostpartum females suffering from MDD treated in the public sector Texas Medication Algorithm Project (TMAP) [Rush et al., 2003a; Trivedi et al., 2004a]. These subjects also ranged in age from 19 to 29 (mean = 25.3, *SD* = 2.9). Data for this control sample were taken from their first measurement occasion.

The SCID was administered to all participants. Only women who were included in the study were included in the report. Women were not engaged in treatment at the baseline assessment. While it is possible that some symptoms were elevated by virtue of women being postpartum, the average clinical global impression scale score was 4.5, indicating a group of women that was moderate to severely ill.

STATISTICAL METHODS

The QIDS-SR_{16} was extracted from the IDS-SR_{30} for all datasets. The data were first analyzed using classical test theory (CTT) to provide item means, item/total correlations (r_{it}), and response distributions for the two groups. However, item response theory (IRT) [Embretson and Reise, 2000; Hambleton and Swaminathan, 1985] analysis was emphasized, as it allows for more explicit, theory-based tests of these group differences. This framework was previously used by our group [Rush et al., 2006; Trivedi et al., 2004b] and by others [Bech et al., 1978, 1981; Gibbons et al., 1985; Evans et al., 2004] to study depression. The results of the IRT and CTT analyses are usually complementary. The IRT analysis provides a theory-based evaluation and allows for very explicit hypothesis testing; the CTT analysis deals with more familiar, observable quantities.

The particular IRT model that was employed was the Samejima [1969, 1997] graded response model. This model was designed for tests like the QIDS-SR_{16} that employ an ordered series of responses (item responses are scored as 0–3 in the present case). It is assumed that the probability that one will choose the higher of two response categories, e.g., 1, 2, or 3 vs. 0, is an S-shaped (logistic) function of the latent trait (generically symbolized "θ" but always denoting depression in this study). The three possible categorizations in the present case (0 vs. >0 or normal vs. pathological, ≤ 1 vs. >1 or normal and mildly pathological categories vs. moderately or severely pathological, and ≤ 2 vs. 3 or normal, mildly pathological, and moderately pathological categories vs. severely pathological) are assumed to have a common slope but differ in location along the depression axis and form what are known as *category response functions*. The slope that is common to the three functions is designated "*a*." The three locations along the depression axis are designated b_1, b_2, and b_3 (b_i collectively).

Slope differences imply that the symptom differs in its ability to discriminate levels of depression in the two groups. Intercept differences for an item imply that the symptom occurs with different frequency. Such differences, when they exist, are known as *differential item functioning* (DIF). DIF is highly undesirable when found in employment settings, e.g., between black and white applicants, because they imply something other than skill separates the two groups. However, the presence of DIF in the present case where postpartum and nonpostpartum women are contrasted suggests that postpartum depression presents or is characterized by a different symptom profile from major depression in general. Thus, the question under investigation in this study is whether parameter differences exist in postpartum and nonpostpartum depressed women. The QIDS-SR_{16} data were fit to the Samejima model using Thissen's [2003] Multilog for Windows program. Rush et al. [2006] provide a recent application comparing the parameter estimates for the three versions of the $QIDS_{16}$.

Two basic types of IRT models were fit: 1) an unconstrained model in which the pairs of symptom domain parameters were free to vary between groups, and 2) a constrained model in which all *a* and/or all b_i parameters for the two samples were made equal. This does not mean that any constraints were placed on the nine domains within each group so that the parameters for items 1 and 2, for example, were estimated independently in both models. Follow-up analyses were conducted in which specific pairs of items were constrained while the remaining eight pairs were left free to vary. Both models provide a measure of fit known as "−2 log likelihood." In large samples, this is distributed as a likelihood ratio chi-square (G^2), which is distributed as the more familiar Pearson χ^2. The difference between the two models can also

be interpreted as a G^2 with *df* equal to the difference in *df* between the two models. A significant value means that the process of constraining the groups degraded the fit so that there is a significant difference between groups with regard to the parameters being tested, i.e., there is DIF.

There are 36 *df* for comparisons involving the nine sets of *a* and *b* parameters (9 items × 4 parameters/item either allowed to vary freely or be constrained to equality), 9 *df* for comparisons involving only the nine *a* parameters, 27 *df* for comparisons involving only the nine sets of *b* parameters, 4 *df* for comparisons involving both *a* and b_i for specific items, 1 *df* for comparisons involving only *a* for specific items, and 3 *df* for comparisons involving only b_i for specific items.

RESULTS

CLASSICAL TEST THEORY RESULTS

Although there was no deliberate attempt to match the postpartum and nonpostpartum samples on their mean QIDS-SR_{16} scores, the respective means (standard deviations) were 14.6 (4.4) and 14.5 (5.3), which were not significantly different, $t(143)<1.0$.

Table 1 contains the means of the nine symptom domains, standard deviations, and item/total correlations (r_{it}). The internal consistency reliabilities were 0.69 for the postpartum depressed and 0.76 for the nonpostpartum depressed. The pattern found in the nonpostpartum group is typical of previous findings with the $QIDS_{16}$ in its three forms [Rush et al., 2006]. Note that the mean domain differences between the two groups were not large, but the values of r_{it} for the first three domains (sleep, sad mood, and appetite/weight) were much lower in the postpartum group. Note also that sleep disturbances were commonly reported, especially among the postpartum, but sleep disturbance was not strongly related to overall depression. More critically, note that sad mood, though common in both groups, related poorly to overall depression among postpartum patients. The statistical significance of these differences in item means and item/total correlations was evaluated using the corresponding IRT measures and the slopes and locations of the trace lines (see below).

It is possible that sad mood's apparently lower item/total correlations in the postpartum group relative to the control group resulted from the substantial difference in ethnic composition of the two groups. This was explored by computing correlations within the overall postpartum group as a function of ethnicity (this was not done in the control sample since their data were typical of previously published data, e.g., Rush et al. [2006], and the sample was small to begin with). Among postpartum participants, the correlation between sad mood and total QIDS score was 0.56 among the 16 African–Americans, ranking seventh in magnitude among the nine domains. It was 0.69 among the 51 Hispanics, ranking sixth, and 0.43 among the 12 whites, ranking ninth. Ethnicity data were missing on the remaining participants. Thus, the relatively low correlation between sad mood and overall depression is not an artifact of differences between Hispanics or other patient subgroups.

ITEM RESPONSE THEORY (IRT) ANALYSIS

Table 2 shows the resulting estimates. Larger values of a for *a* domain means that the domain in question was more discriminating within that group, controlling for absolute level of depression. In contrast, larger values of b_i imply that the more pathological category was *less* often used in that group, again controlling for absolute level of depression.

The fit provided by the unrestricted model was 1465.5. The fit of a model in which all 9 *a* parameters (slopes) were constrained to equality and the 27 b_i parameters intercepts were allowed to vary freely was 1477.3, for a difference $G^2(9)$ of 11.8 (not significant, ns). However,

significant differences were noted for the slopes of two individual domains, 2 (sad mood) and 3 (appetite/weight). Specifically, the separate estimates of 0.99 vs. 2.64 and 0.25 vs. 1.23 for the postpartum vs. control groups were larger than could be accounted for by chance. This may be interpreted to mean that variation in sad mood and appetite/weight related less to variation in overall depression among postpartum depressed patients than depressives in general.

In contrast, constraining all nine sets of three b_i parameters to equality between groups, but letting all the a parameters vary freely, provided a difference $G^2(27)$ of 36.0, $P<.01$. All three comparisons held level of depression (θ) constant. Individually, intercept differences were found for sleep, sad mood, and thoughts of death or suicide. Specifically, postpartum women were more likely to report sleep-related symptoms than controls at all three levels of severity. In contrast, postpartum females were more likely to report mild or moderate sadness but less likely to report severe sadness. Finally, postpartum females were less likely to report thoughts of death or suicide than controls at all three levels of severity.

DISCUSSION

Both CTTand IRTanalyses indicated that sad mood and appetite/weight related differentially to the overall magnitude of depression in postpartum and nonpostpartum depressed women. Intercept differences for sleep, sad mood, and thoughts of death or suicide indicated that the levels of these three symptoms were different between the groups, holding overall depression severity constant. Some of these differences, particularly those involving sleep and appetite/weight, could be directly attributed to the effects of pregnancy and birth that are partially independent of depression. The differences involving thoughts of death or suicide are consistent with the notion that the majority of new mothers feel that their newly born child gives them something for which to live.

This leaves the difference in sad mood. The large difference between postpartum and nonpostpartum groups was not anticipated, and it was clearly present in each of the two postpartum groups when they were separately evaluated (data not shown). At first glance, this finding seems to differ from Ross et al. [2003a,b], who found a substantial correlation (0.68) between the depressed mood item and total score on the Hamilton Rating Scale for Depression [Hamilton, 1960, 1967] in their postpartum sample. However, they then limited their sample to the 20 patients scoring 12 or above and found that this correlation actually decreased from 0.72 to 0.62 at their 6-week follow-up. This is perhaps within the boundaries of chance, but, if anything, this decrease from 50% variance account for to 37% variance accounted for is consistent with our findings that sad mood and overall depression are more loosely coupled in postpartum than in other forms of depression.

Since variation in ability to concentrate was as highly related to overall depression in the postpartum group as it was in the nonpostpartum group, we offer a hypothesis as to how the etiology of postpartum depression may be somewhat distinct. Insomnia is a well-known symptom of depression in general. It is also common in late pregnancy and in the postpartum interval. However, sleep disturbance seems to operate differently among those women from the sleep problems surveyed in questions like the $QIDS_{16}$ and similar scales encountered more generally. Patients suffering from nonpostpartum depression either cannot sleep or awaken early because they ruminate about depression-related events. In other words, depression causes insomnia. In contrast, postpartum women cannot sleep for external reasons, e.g., the discomfort of pregnancy, the need of the infant to be changed or fed, etc. This insomnia either causes or worsens the depression. Although insomnia is nearly universal for new mothers, other variables, such as resilience [Anderson, 1994; Bartelt, 1994; Cicchetti and Garmezy, 1993; Garmezy and Masten, 1986], can allow some women to withstand this stress better than others. Perhaps depression can exacerbate the situation.

Chaudron et al. [2001] surveyed a sample of 465 women who were not depressed 1 month postpartum to predict who would become depressed at 4 months postpartum. One predictor was difficulty falling asleep at 1 month postpartum. The effect of this predictor was strengthened when the women also had thoughts of death or dying even though, by definition, they were not clinically depressed at this time.

Evidence that sleep deprivation plays a role in postpartum depression dates at least as far back as Karacan et al. [1968], and no claim is made that the above hypothesis is novel. More recently, Ross et al. [2005] did a critical review that implicates disturbance in the quality and quantity of sleep as a causal factor in depression. Other studies cited that support the role of sleep disturbance in postpartum depression include Frank et al. [1987], Coble et al. [1994], and Lee et al. [2000]. Ross et al.'s article also dealt with the paradox that sleep deprivation is often used to treat depression, as the timing of the deprivation is aimed at minimizing REM sleep, which provides a poor quality of sleep. Their suggestion was that sleep deprivation late at night helps reset a disturbed circadian rhythm. Subsequently allowing sleep allows for a "catch-up" period (quotes theirs).

Sleep disturbances and other somatic symptoms may confound severity of depression in pregnant and postpartum women with the pregnancy and childbirth itself. Some reports in the literature have evaluated this issue. The commonness of sleep disturbances in pregnancy and in the postpartum interval is, of course, what led to the aforementioned EPDS. However, Klein and Essex [1995] very carefully attempted to separate depressive symptomatology from pregnancy-related symptoms among women in their second trimester. Similarly, Chaudron et al. [2001] carefully modified their probles to differentiate whether somatic symptoms in pregnant women could be attributed to stress or to pregnancy and hence more accurately estimate the prevalence of depression in pregnancy. Unfortunately, depressed patients often find explanations for their symptoms and may inaccurately attribute them to pregnancy rather than stress or the illness itself. While we generally assume that normative experiences of pregnancy or postpartum elevate estimates of depression and the severity of depression we are still awaiting empirical support for this. Preliminary analyses conducted by one of us (K.A.Y.) found that depressed and postpartum women with depression are more likely to endorse neurovegetative symptoms of depression than are nondepressed women who are pregnant or postpartum, so clearly there remains value to their symptom ratings. In general, the fact that sleep disturbances may go beyond simply being a normal part of the period surrounding childbirth indicates that more attention should be paid to sleep disturbances, in contrast to its deliberate exclusion on scales like the EPDS. Sugawara et al. [1999] also explored this issue, proposing a three-factor model that excluded somatic items.

The present results could be interpreted as implying either that postpartum depression is different from MDD or that postpartum depression is simply depression occurring in the context of childbirth. First, there is minimal evidence that the postpartum period increases the risk of depression [Purnine and Frank, 1996]. Second, the present findings are also consistent with the view that the new child shifts the patients' expectations. As suggested above, birth may reduce suicidal ideation and mute what would have been severe sadness to lower categories. This muting of sadness would by itself be sufficient to lower the correlation between sad mood and overall depression and, therefore, the slope of the category response functions via range restriction. Appetite/weight, of course, may simply reflect large shifts in weight with delivery and breastfeeding, and sleep is worsened in the setting of childcare needs. In other words, it is possible that the symptoms of MDD can shift because of external realities. At the same time, Cooper and Murray [1995] argue that postpartum depression is a different form of depression because patients for whom a postpartum episode was a recurrence of a previous nonpostpartum episode were at increased risk for further nonpostpartum episodes, but patients

for whom the episode was novel were at increased risk for further episodes of postpartum depression but not for nonpostpartum episodes.

LIMITATIONS

Limitations include the small sample size and the potential for misclassification bias with reference to the diagnosis of MDD. Even though a structured interview was used for all interviews, there remains a largely unresolved problem of how symptoms of depression that may also be normative in postpartum women (e.g., sleep deprivation, weight, energy, and appetite changes) should be handled. While one could simply exclude these symptoms, such a strategy may well lead to a loss of important information.

This study also looked only at differences in depressive symptoms. Several recent articles have stressed the role of anxiety in the postpartum interval, e.g., Ross et al. [2003b], Hendrick et al. [2000], and Beck and Indman [2005]. In addition, self-harm, which is also a significant consideration in pregnancy and during the postpartum period [Lindahl et al., 2005], was not studied.

CONCLUSIONS

Subject to these limitations, the present data suggest symptom differences between new mothers with depression and in women of similar age who are neither pregnant nor in the postpartum period.

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TABLE 1

Depressive symptom domains in the postpartum (n = 95) and nonpostpartum (n = 50) groups

Symptom domain	Postpartum (n = 95)			Nonpostpartum (n = 50)		
	M	SD	r_{it}	M	SD	r_{it}
Sleep	2.65	0.65	0.17	2.42	0.91	0.30
Sad mood	2.00	0.85	0.36	1.96	0.90	0.66
Appetite/weight	1.89	0.95	0.10	1.72	1.03	0.37
Concentration/decision-making	1.49	0.92	0.56	1.52	0.91	0.58
Self view	1.74	1.11	0.35	1.52	1.25	0.37
Thoughts of death or suicide	0.43	0.74	0.33	0.86	1.01	0.33
General interest	1.46	1.06	0.51	1.62	1.10	0.51
Energy level	1.59	0.95	0.55	1.38	1.01	0.59
Restlessness/agitation	1.36	0.82	0.35	1.48	0.91	0.34

r_{it}, Item total correlation; SD, Standard deviation; M, Potential range is 0–3.

TABLE 2

Samejima IRT parameter estimates for symptoms of postpartum and nonpostpartum depression

Domain	Postpartum (n = 95)				Nonpostpartum (n = 50)			
	a	b_0	b_1	b_2	a	b_0	b_1	b_2
Sleep	0.32	−14.51	−8.12	−3.31	0.90	−3.53	−2.23	−0.83
Sad mood	0.99	−3.59	−1.18	0.91	2.64	−2.56	−0.34	0.38
Appetite/weight	0.25	−10.82	−1.96	2.76	1.23	−2.04	−0.26	0.80
Concentration/decision-making	1.79	−1.29	−0.20	1.65	1.82	−1.58	0.01	1.32
Self view	0.89	−2.11	−0.11	0.83	0.73	−1.14	−0.12	1.14
Thoughts of death or suicide	0.94	1.13	2.40	5.24	0.79	−0.08	1.64	3.05
General interest	1.73	−1.15	0.27	1.04	1.71	−1.13	−0.15	0.76
Energy level	2.42	−1.21	−0.31	1.24	2.93	−0.75	0.00	1.21
Restlessness/agitation	1.07	−2.14	0.58	2.50	1.05	−2.23	0.31	1.93

a, slope; b_0, b_1, b_2, locations.