RELATIONSHIP BETWEEN PREMENSTRUAL SYNDROME AND POSTNATAL DEPRESSION: AN EXPLORATORY STUDY

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ABSTRACT

The present study examined the relationship between postnatal depression (PND) and premenstrual syndrome, using the Menstrual Distress Questionnaire (MDQ) and the Edinburgh Postnatal Depression Scale (EPDS). Fifty-one mothers participated in the study. A nondepressed group consisted of 25 mothers with no reported PND symptoms, while a depressed group comprised 26 mothers with clearly diagnosed PND symptomatology. The present findings provide further evidence of an association between premenstrual syndrome and the later development of postnatal depression, raising the possibility of predicting subsequent PND from pre-existing premenstrual syndrome (PMS).

STUDY

Postnatal depression (PND) is one of three mood disorders affecting 10% to 20% of women after childbirth (Dalton, 1989). Symptoms unique to the experience of PND include the worsening of moods in the morning rather than evenings as well as suicidal and infanticidal thoughts (Pfost, Stevens, & Matejcak, 1990). Conflicting research has yet to identify any singular cause for the development of PND. However, the following factors have been reported as being correlated with development of the disorder: excessive progesterone (Harris, 1996; O'Brein & Pitt, 1994), oestrogen (Weick, 1996; Glover, 1992), thyroid dysfunction (Harris, 1996; Boyce, 1994), high cortisol levels (O'Hara, Schlechte, Lewis, & Wright, 1991; Bonnin, 1992), neuroticism (Boyce, 1994), external locus of control (Terry, Mayocchi, & Hynes, 1996), cognitive dysfunction (Meager & Milgrom, 1996) antenatal and/or previous depression (Zelkowitz & Milet, 1996; Green & Murray, 1994), lack of social support (Small, Astbury, Brown, & Lumley, 1994; Albright, 1993), marital dissatisfaction (Murray, Cox, Gail, & Jones, 1995), infant temperament (Terry et al., 1996), as well as life stressor events during and after pregnancy (Meager & Milgrom, 1996; Mills & Kornblith, 1992).

Premenstrual syndrome (PMS) has also been implicated as a factor involved in the development of PND. Gitlin and Pasnau (1989) discussed the difficulties of the research on PMS due to poor definitions, few controlled treatment studies, and conflicting results. Due to these difficulties prevalence rates for PMS have varied widely. Gitlin and Pasnau reported a prevalence rate of 40% of women experiencing some mild premenstrual symptoms and 2% to 10% reporting more severe symptoms. More recently, Boyle (1997, p.38) stated that, "up to 50 percent of all menstruating women suffer acute menstrual pains (dysmenorrhea)." Psychosocial explanations for the development of PMS include the effects of significant life events and marital satisfaction (Ussher, 1992). Ussher also reported associations between levels of PMS and high scores on neuroticism scales. Biological explanations for PMS include the influence of increasing levels of progesterone during ovulation prior to a rapid drop before menstruation (Weick, 1996). One theory for this is the withdrawal of the "euphoric" effect created by high levels of progesterone (O'Brein & Pitt, 1994).

Warner, Bancroft, Dixson, and Hampson (1991, p.22) reported that the severity of premenstrual depression was related to a previous history of PND indicating that "those women with the severest premenstrual reaction are most likely to have experienced depressive mood change after childbirth, possibly reflecting some common aetiological, neurendocrine mechanism." The results showed that women who are currently exhibiting premenstrual depression are more likely to report a previous history of depression or PND, than are women without premenstrual depression. Graze, Nee, and Endicott (1990, p.203) reported an association between a history of PMS and an increased risk of developing a depressive disorder stating that, "retrospective reports of premenstrual depressive changes serve as a predictor for subsequent major depressive episodes." This relationship was still significant after controlling for the effects of antecedent depression and a family history of affective disorders.

Mills and Kornblith (1992) discussed the relationship between PMS and the development of PND or Post-Partum Psychosis (PPP) stating that this relationship may be reflective of the woman's oversensitivity to hormonal fluctuations in her body. Evidence points towards the development of PMS following recovery from PND. Dalton (1989) discussed the recovery phase of PND, stating that often women will have a depressive relapse premenstrually and concluded that women have a 90% chance of developing PMS after suffering from PND.

Research also points towards an association between maternity blues and PMS (Gitlin & Pasnau, 1989). Likewise, O'Hara et al. (1991, p. 805) reported "a rather consistent association between histories of both reproductive-related (i.e. premenstrual syndrome) and nonreproductive-related affective disorders and the blues." Bonnin (1992) also highlighted the fact that mothers who suffer from postpartum blues also tend to suffer from premenstrual depression and restlessness. Research has also focused upon the effects of PMS on psychosis sufferers. Women suffering psychosis were reported to show wild swings in their behavior during ovulation and menstruation, but then improving following menstruation (Dalton, 1989).

In light of the above research, it is proposed that there is an association between history of premenstrual syndrome symptoms before pregnancy, as measured by the Menstrual Distress Questionnaire (MDQ) and the subsequent development of postnatal depression, as measured by the Edinburgh Postnatal Depression Scale

(EPDS). It is hypothesized (H1) that mothers who develop Postnatal Depression are more likely to have suffered from Premenstrual Syndrome before pregnancy as measured by the MDQ. Second, it is hypothesized (H2) that the more severe the premenstrual syndrome experienced before pregnancy, the more severe the postnatal depression will be. Combined use of the MDQ and EPDS scales provides an advantage over earlier studies in enabling more precise psychometric assessment of PMS and PND conditions respectively (cf. Boyle, 1992, 1997).

METHOD

PARTICIPANTS

Participants were child bearing women recruited from two Mothers Day Care Centers within the Gold Coast area, and several health centers within the Murray River area in lower south-east New South Wales (located in Finley, Deniliquin, Cobram, and Berrigan). The final sample comprised 51 women, of whom 25 formed the non-PND group, with ages ranging from 22 to 36 years (mean 28 years). The PND group was selected on the basis of EPDS scores (see below) and comprised 26 women with a mean age of 31 years (Range 20 to 51 years). Fifteen of the depressed women were primiparous (first child), while eight women had two children, two women had three children, and one mother had four children. The non-PND group included 15 women having one child, eight women having two children, and two women having three children, respectively.

At the time of testing the average time since childbirth for the depressed mothers was 7.30 months (*SD* = 6.66). Mean time since childbirth for the non-depressed mothers was 7.56 months (*SD* = 10.07). The depressed mothers had all been diagnosed previously by medical authorities as suffering specifically from PND. Generally, women of childbearing age and mothers of young children are at increased risk for experiencing depressive symptoms and disorders. However, the diagnosis of PND in the present study was not in doubt, even though current level of depressive symptoms was assessed in mothers of infants ranging in age from one month to slightly over 12 months. Interestingly, 76% of the depressed mothers were married or living in a defacto relationship as compared with only 45.8% of the control group. Some 61.5% of the depressed mothers were currently working, as well as child rearing, as compared with 45.8% of the nondepressed mothers who were working outside of the home. Some 88.5% of the depressed mothers had a previous history of PMS, and 30.8% of the depressed group reported a previous episode of PND. In comparison, only 32% of the nondepressed group reported a history of PMS, and only 4% reported a history of PND.

PROCEDURE

Participants were tested once, following childbirth. Booklets consisting of an information sheet, consent form, demographics questionnaire (DQ), Menstrual Distress Questionnaire (MDQ), and the Edinburgh Postnatal Depression Scale (EPDS) were placed in the clinics. In addition to addressed reply paid envelopes, a box was provided in the various Gold Coast clinics for participants to return their completed questionnaires. The majority of completed questionnaires were received through the mail, although the response rate was low, around 20%. There was no a priori reason to doubt that those mothers who returned the com-

pleted questionnaires were not representative of the population of mothers suffering from PND.

INSTRUMENTS

Edinburgh Postnatal Depression Scale (EPDS). The EPDS was used to assess the mothers' severity of PND. The EPDS is a 10-item self-rating depression scale designed specifically for the identification of PND. It tests for concerns such as anxiety, stress, blame and fear in relation to the previous seven days. The mothers were asked to express how they had generally been feeling for the previous week on a four-point scale ranging from usually (all the time) to no (not at all). Designed by Cox, Holden, and Sagovsky (1987), the EPDS was developed in response to an "urgent need to develop methods to identify such depression (PND) for use in primary care settings" (Cox, 1994, p.115). The original validation of the 10-item scale on 84 women concluded with positive results (Cox et al., 1987). Most literature using the scale employs a cut-off score of 13, and approximately 10% of mothers scoring greater than 13 appear typical. Thus, a score of 13 was designated as a cut-off score for depression, with women falling above this score being regarded as depressed. This "provide(s) an effective screen in clinical practice and in research studies where it is important to identify all those who are depressed" (Thorpe, 1993, p.124). Also, Murray and Carothers (1990, p.289) reported a high response rate from postal administration indicating "impressive evidence of the scale's acceptability to women in the postnatal period."

Cox et al. (1987) reported a sensitivity level (proportion of depressed mothers correctly identified) of 86%, a specificity level (proportion of nondepressed mothers correctly identified) of 78%, and a positive predictive value (proportion of women identified as depressed who are truly depressed) of 73%. Further validation on an Australian sample reported a sensitivity of 100%, a specificity of 95.7% and a positive predictive value of 69.2% (Boyce, Stubbs, & Todd, 1993). The split-half coefficient for the EPDS was reported as being 0.88, with a standardized alpha coefficient of 0.87, indicating that the EPDS is a homogeneous instrument for detection of depression (Cox, 1994). Item redundancy (see Boyle, 1991) was reduced after a validation of the original 13-item EPDS (Cox et al., 1987). Other research has also suggested the internal consistency of the EPDS (alpha = 0.92)—(O'Hara, 1994). However, such high estimates of item homogeneity may also suggest moderately high levels of item homogeneity, and the possibility of associated item redundancy and narrow breadth of measurement (cf. Clark & Watson, 1995; Cortina, 1993; Boyle, 1991).

Menstrual Distress Questionnaire (MDQ). The MDQ is a 47-item self-report inventory for "use in diagnosis and treatment of premenstrual and menstrual distress" (Conoley & Impara, 1994, p.151). The MDQ contains eight scales labeled, pain, water retention, autonomic reactions, negative affect, impaired concentration, behavior change, arousal, and control, derived from factor analysis (see Moos, 1985). Boyle (1992, p.13) reported the results of LISREL analysis of the MDQ stating that it is a "reasonably reliable and valid instrument." Smith, Holland and Studd (1994) also supported the reliability and validity of the MDQ as an assessment tool for PMS. The MDQ employs a five point Likert scale ranging from 0 (no signs of symptoms) to 4 (severe sign of symptoms) and ass-

esses three time frames, menstrual distress (MD), premenstrual distress (PMD) and intermenstrual distress (ID).

Aganoff and Boyle (1994) reported that PMS symptoms and mood changes could start as early as eight days premenstrually. Likewise, Cumming, Urion, Cumming and Fox (1994) also reported symptoms as beginning as early as 14 days premenstrually. Consequently, a broader definition of PMS is employed in the present study, incorporating much of the second half of the intermenstrual phase in addition to the specifically premenstrual phase as defined by the MDQ instrument.

Form C of the MDQ was used, and women were asked to report their premenstrual experiences during their last period before pregnancy. Retrospective reporting of premenstrual syndrome has been found to be reasonably reliable (Boyle & Grant, 1992; Hart, Coleman, & Russell, 1987). In the initial normative study, the MDQ also contained a memory scale. Moos (1985, p.9) reported the results from this scale and found "indications that symptom reports did not diminish (or increase) in intensity over time." Moos (1985) reported no links between symptom severity and either time elapsed since the symptoms occurred, nor the menstrual-cycle phase a woman is in at time of report.

Demographics Questionnaire (DQ). A short questionnaire was designed for this study to determine demographic factors such as age, marital status, number of children, dates of delivery, occupation and previous histories of PMS or PND.

RESULTS

In addition to previous medical diagnosis of PND, and on the further basis of elevated EPDS scores, 26 mothers were classified as suffering PND. A nondepressed sample of 25 mothers served as the non-PND group. Correlations between the demographic variables (occupation, marital status, number of children, the baby's age and the mothers age) and the total EPDS scores were mostly nonsignificant. While EPDS scores correlated significantly with Marital Status ($0.13, p < .05$), and Baby's Age ($0.16, p < .05$), the highest correlation was with age of the mother ($0.49, p < .001$).

As measured via the MDQ instrument, among the PND group, 19 mothers suffered little or mild menstrual cycle distress, four suffered moderate distress, while three suffered severe menstrual cycle distress. Twenty three of the non-PND group suffered little or mild menstrual cycle distress and only two mothers suffered moderate distress. Table 1 shows the means and standard deviations of the scores obtained on the EPDS and the MDQ instruments, for PND and non-PND groups, respectively.

Overall, the depressed (PND) sample scored higher on the MDQ ($M = 90.39$, $SD = 61.88$) than did the nondepressed (non-PND) sample ($M = 29.08$, $SD = 26.59$). When the nondepressed subjects were compared to the depressed subjects, in relation to their MD scores, a significant difference between means was found. The non-PND group had a combined observed mean of 13.36 in comparison to the PND group mean of 48.42 ($F (1, 49) = 29.09, p < .0001$). This suggests that there was a relationship between PMS sufferers and the later development of PND. Analyses on the PMD scores indicated similar results. The non-PND group mean was only 17.68 in comparison with 44.27 for the PND group, a highly

TABLE 1
EPDS AND MDQ MEANS AND STANDARD
DEVIATIONS ACROSS GROUPS

	Depressed Women (N = 26)		Nondepressed Women (N = 25)	
	M	SD	M	SD
EPDS Scores	16.81	6.62	4.32	2.48
MDQ Total Scores	90.39	61.88	29.08	26.59
MDQ Menstrual	48.42	30.61	13.36	11.10
MDQ Premenstrual	44.27	31.32	17.68	20.34
MDQ Intermenstrual	29.94	26.38	7.8	8.56

significant difference (F (1, 49) = 12.81, $p < .0001$). Depressed women also differed significantly during the intermenstrual phase in comparison with non-PND women (the mean non-PND group score was 7.8; while the mean PND group score was 29.92, (F (1, 49) = 15.09, $p < .0001$). Correlations between the eight MDQ subscales and EPDS scores were computed for each menstrual-cycle phase. For the menstrual (MD) phase, correlations ranged from .66 (negative affect) to .14 (arousal). Negative affect (.50) and arousal (.11) also exhibited the highest and lowest correlations with the EPDS scores for the premenstrual phase. For the intermenstrual (ID) phase, autonomic reactions correlated the least (.18) and negative affect the most (.44) with EPDS scores. Otherwise, all correlations were highly significant.

In order to minimize effects due to covariates, a MANCOVA was conducted on the eight MDQ subscales and the EPDS controlling for age, marital status, number of children, and occupational status, for each of the three MDQ defined menstrual cycle phases. Table 2 shows the mean MDQ subscale scores across the menstrual (MD), premenstrual (PMD) and intermenstrual (ID) phases, respectively.

Results for the menstrual phase revealed a significant multivariate effect (F (3, 36) = 8.14, $p < .0001$). Significant multivariate effects were also found for the premenstrual (F (9, 36) = 7.96, $p < .0001$) and intermenstrual phases (F (9, 36) = 7.82, $p < .0001$), respectively. The univariate effects are shown in Table 3.

For the MD and PMD phases of the MDQ the subscales of autonomic reactions (such as dizziness, nausea, hot flushes), behavior change (naps/stay in bed, avoid social activity), control (feelings of suffocation, heart pounding), impaired concentration (insomnia, confusion, forgetfulness), negative affect (anxiety, irritability, tension), pain (headaches, cramps, fatigue), and water retention (tender breasts, weight gain) were all significantly correlated with EPDS scores. For the

intermenstrual phase, six MDQ subscales exhibited significant correlations with EPDS scores (behavior change, control, impaired concentration, negative effect, pain and water retention). Overall, the results suggest a relationship between PMS before pregnancy and the later development of PND.

TABLE 2
MEANS FOR THE EIGHT MDQ SUBSCALES FOR EACH
OF THE THREE MENSTRUAL-CYCLE PHASES.

	Depressed Women (N = 26)			Nondepressed Women (N = 25)		
	MD	PMD	ID	MD	PMD	ID
Arousal	3.56	3.28	4.31	2.12	1.96	2.79
Autonomic Reactions	2.04	1.52	1.32	0.25	0.33	0.29
Behaviour Change	6.32	5.16	3.64	0.92	1.00	0.28
Control	2.56	2.72	1.50	0.08	0.67	0.15
Impaired Concentration	7.32	6.88	4.88	1.13	1.88	0.67
Negative Affect	12.68	12.36	6.82	3.38	5.13	1.68
Pain	9.24	7.80	4.87	3.71	3.88	1.39
Water Retention	5.72	5.40	2.97	2.21	3.29	0.71

The second hypothesis (H2) was tested via product-moment correlations and chi-square tests. The correlations between the three menstrual-cycle phases measured in the MDQ and the EPDS scores are shown in Table 4.

These results show that each menstrual cycle phase (as defined by the MDQ instrument) correlated positively with EPDS scores. Consequently, these findings suggest a relationship between PMS and PND, as measured on the MDQ and EPDS scales. Evidently, severity of PND is affected by severity of PMS. Table 5 reports the results of the chi-square test, showing the highly significant relationship between menstrual, premenstrual and intermenstrual scores and EPDS scores.

All three menstrual-cycle phases related significantly with EPDS scores. Within this sample, the more severe the mothers' reports of menstrual distress before pregnancy, the more likely was the occurrence of PND following childbirth. These findings support H2, suggesting that severity of PMS before pregnancy may be predictive of the severity of PND.

TABLE 3
F-VALUES FOR THE EIGHT SUBSCALES OF THE MDQ

	Menstrual		Premenstrual		Intermenstrual	
	F	p-value	F	p-value	F	p-value
Arousal	2.58	.115	2.22	.144	2.36	.132
Autonomic Reactions	8.23	.006	3.99	.052	2.84	.099
Behaviour Change	22.74	.000	11.86	.001	9.84	.003
Control	10.71	.002	4.94	.031	12.09	.001
Impaired Concentration	23.53	.000	8.29	.006	12.03	.001
Negative Affect	26.99	.000	11.63	.001	9.06	.004
Pain	21.11	.000	5.98	.019	8.90	.005
Water Retention	16.66	.000	4.57	.038	10.08	.003

TABLE 4
CORRELATION MATRIX OF MDQ AND EPDS SCORES

	EPDS	MD	PMD	ID	Total MDQ
EPDS	--	.67	.52	.46	.56
Menstrual (MD)		--	.79	.75	.93
Premenstrual (PMD)			--	.65	.90
Intermenstrual (ID)				--	.84
Total MDQ					--

TABLE 5
CHI SQUARE TEST RESULTS

	Chi Square	*df*	*p*-value less than
Menstrual	274.36	36	.00001
Premenstrual	199.12	34	.00001
Intermenstrual	186.03	27	.00001

DISCUSSION

The first hypothesis (H1), that women who experience postnatal depression are more likely to suffer from premenstrual syndrome before pregnancy was supported tentatively. Seven of the MDQ subscales for the premenstrual phase and the menstrual phase and six subscales for the intermenstrual phase were significantly correlated with the EPDS scores, indicating a relationship with the development of PND. Several of the menstrual cycle distress symptoms are consistent with those reported during PND, such as anxiety, irritability and fatigue (Kaplan & Sadock,1989), in addition to weight gain, dizziness and sleep disorders (insomnia or constant need for sleep). These findings are consistent with those of Graze et al. (1990) who reported that PMS is predictive of a future major depressive disorder. The current findings also add to the findings of Gitlin and Pasnau (1989), and O'Hara et al. (1991) who reported associations between PMS and maternity blues. In light of research reported by Aganoff and Boyle (1994), and by Cumming et al. (1994), the intermenstrual phase of the MDQ was also included in the definition of PMS in the present study. The fact that associations between PND scores on the EPDS and MDQ were found for menstrual and intermenstrual phases in addition to the premenstrual phase might suggest a somewhat nonspecific association between postnatal and prenatal distress that cannot be attributed specifically to any valid PMS syndrome. However, since as reported by Cumming et al. (1994), PMS symptoms may occur as early as 14 days prior to menstruation (encompassing up to 50% of the MDQ defined intermenstrual phase), this possibility of a nonspecific association between PND and menstrual cycle phase, does not seem warranted. Evidently, the present findings do provide at least some evidence for a relationship between premenstrual syndrome and postnatal depression, suggesting the possibility of predicting future PND on the basis of pre-existing PMS.

The second hypothesis (H2) proposed that severity of PMS would predict severity of PND. The highest association was found with menstrual distress, followed by premenstrual distress. Intermenstrual distress was also significant in relation to the severity of PND. As the PMD phase measures symptoms that occur only up to four days premenstrually, inclusion of the intermenstrual phase in the analysis evidently was justified.

The present findings suggest that severity of menstrual and premenstrual distress can predict both the development and severity of postnatal depression. This finding is consistent with that of Warner et al. (1991). Nevertheless, a more parsimonious explanation of the results may be that women who have been prone to negative mood in the past (regardless of menstrual status) are more prone to depression in the postpartum period. This possibility requires further investigation in future longitudinal research studies.

Although some differences were evident between the nondepressed and depressed groups of mothers in relation to demographic factors, nonsignificant correlations and a MANCOVA showed these variables (age, marital status, occupational status and number of children) to have little effect on the development of PND. These findings are consistent with that of Hopkins, Marcus, and Campbell, (1984), Albright (1993), and Terry et al. (1996) showing little or no association between demographic factors and the development of PND.

The somewhat low response rate may have been due in part to the depressive symptoms of PND, such as irrationality, guilt and confusion. As one letter the authors received noted "Some women are reluctant to discuss how they feel in relation to their experiences with PND." Morris (1987), Small et al. (1994), Murray et al. (1995), and Meager and Milgrom (1996) also reported similar problems during subject recruitment of mothers suffering PND, highlighting some of the practical difficulties in conducting meaningful research in this important area.

Moos (1985) and Hart et al. (1987) indicated that retrospective reporting of menstrual cycle symptoms and PMS is reasonably reliable. Although women can accurately report premenstrual symptoms retrospectively, a report by postpartum women of their premenstrual symptoms may be open to influence by current depression level (as well as current premenstrual symptoms), making it difficult to rule out the effect of existing depressive symptomatology on the reporting of PMS history.

In summary, the current findings provide further evidence that premenstrual syndrome is related to the development of postnatal depression. PMS experienced before pregnancy may be a valid predictor of future PND following childbirth. The present findings are consistent with prior research indicating a significant association between current depressive symptoms in mothers of infants and retrospectively reported premenstrual symptoms. Further research is now required to expand on these findings using larger sample sizes and longitudinal studies, integrating both biological and psychological aspects. For example, it is possible that there may be differences between primiparous and nonprimiparous mothers, so that a study of this variable based on a larger sample size would seem useful.

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Footnotes

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