

## Overlap of Postnatal Depression and Postcoital Dysphoria in Women- Implications for Common Underlying Mechanisms

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### Abstract

Postnatal depression is a common disorder occurring in 13% to 15% of pregnant women and is associated with deleterious health outcomes for mother, infant and families. There is a subset of women with increased susceptibility to estrogen fluctuations which may represent an underlying risk factor for postnatal depression. Given the crosstalk between different endocrine systems, we interrogated whether hormonal sensitivity might influence other hormonal phases in women such as post-sex distress or postcoital dysphoria.

We assessed 1,801 women using questionnaires. Data analyses were carried out using SPSS Version 17.0. Women with postnatal depression had significantly higher rates of postcoital dysphoria (P-value=0.009, 99% CI of 0.007-0.012), this remained significant even after corrections for multiple testing. Women with postnatal depression reported higher rates of anxiety (P-value= $2 \times 10^{-6}$ ), depression (P-value= $2.9 \times 10^{-11}$ ), childhood sexual abuse (P-value=0.022), childhood physical abuse (P-value=0.001), childhood emotional abuse (P-value=0.000103), adult sexual abuse (p-value=0.001), physical abuse (P-value=0.000313) and emotional abuse (P-value=0.002).

Women with postnatal depression tended to have increased rates of postcoital dysphoria, implying a likely common vulnerability mechanism for the disorders. These findings have implications for preventive diagnosis and treatment.

**Keywords:** Postcoital; Postnatal; Depression; Women; Post-partum

### Introduction

Women are twice as likely as men to suffer from depression. Windows of increased vulnerability during hormonal fluctuation phases prime women for higher risk of depression [1,2]. Postnatal depression (PND) occurs in about 13% to 15% of pregnant women and is associated with negative health consequences for both mother and infant. Previously, we and others have investigated genome-wide gene expression in postnatal depression and identified a subset of genes whose expression in the third trimester of pregnancy predicted with high accuracy which women went to develop PND [3]. Our findings suggested that there was a subset of women who were more susceptible to rapid estrogen fluctuations and this estrogen sensitivity was an underlying risk factor for PND. This was in line with other evidence that a subset of women is more likely to develop depressive symptoms in periods with physiological changes in sex steroid hormones and that this is mediated by a differential sensitivity rather than abnormal levels of steroid hormones [4-6].

Given the crosstalk between different endocrine systems, in the current study we extend the estrogen-sensitivity hypothesis and test whether estrogen-sensitivity is a more general phenomenon of hormonal sensitivity that might influence other hormonal phases in women. Here, we sought to investigate Postcoital dysphoria (PCD) or post-sex blues, which is a form of distress associated with sexual activity, commonly defined as the experience of negative emotions such as tearfulness, feelings of melancholy or depression, anxiety, agitation, or aggression after sexual intercourse [7,8]. Previously, twin studies have revealed that sexual distress has a heritability of 46%, accounting for additive genetic and non-shared environmental factors [8].

PCD is an under-investigated disorder and is reported to have a lifetime prevalence of 32% to 46% in women but the molecular mechanism underpinning this disorder are not well understood [9,10]. It is still unclear whether PCD is an endocrine-related phenomenon, occurring as a result of hormonal changes during sexual intercourse that can cause highs and lows, precipitating the symptoms.

The aim of this study was to investigate whether women with PND were more likely to experience PCD, and if so this might reflect an underlying hormonal sensitivity among high-risk women.

### Materials and Methods

#### Participants and outcome measures

The data was collected via an open online survey questionnaires constructed using Qualtrics software. Participants were notified that their consent to participate would be inferred by their decision to click the "Next" button. No identifying information was obtained. Ethics approval was obtained from the University Human Research Ethics Committee (Approval Number 1600000961).

The women included in this study were part of a larger study aimed at investigating post-coital experiences. Participants were included in the study only if they had provided all the data required for the current analysis. Demographic and background information including gender, age, ethnic background, level of education, sexual orientation, current relationship status, relationship and sexual satisfaction and whether they had given birth was collected using a self-report questionnaire administered via the online survey.

The prevalence of postnatal depression was evaluated asking the questions "Have you ever given birth?" followed by "Following giving

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birth, did you experience sadness or depression (postnatal/postpartum depression)?”.

Lifetime and 4-week prevalence of PCD were surveyed based on Bird et al.’s study [10]. To indicate PCD, the questions asked were: “Have there been any times in your life where you have experienced inexplicable tearfulness, sadness or irritability immediately following consensual sexual activity? And “During the past 4 weeks have you experienced inexplicable tearfulness, sadness, or irritability immediately following consensual sexual activity?”

To assess a history of childhood and adult sexual, physical and emotional abuse three items adapted from Bird were included and responses were coded as either “Yes” or “No.”[10].

### Statistical analysis

Data handling and all statistical analyses were carried out using SPSS Version 17.0 for Mac (SPSS Inc., Chicago, IL, USA). For all analyses, a P-value less than 0.05 were considered statistically significant. Multiple testing corrections across all tests were performed using 5% false discovery rate.

Sample characteristics and variables of interest were reported on the basis of means and standard deviations or numbers and percentages, as appropriate. To investigate the overlap of samples between different groups, a Pearson chi-square test using 2 df was performed. Univariate analysis of variance was performed to test between-subject effects for relationship and sexual satisfaction.

## Results

### Demographics

The initial online survey data comprised of 4,496 individuals. From these, a total of 1,801 women with informed consent for the study and self-identified as Caucasian background were included in the current analysis. Sample demographics of the women involved in the analysis

Characteristics	Mean (SD)/N (%)
Age (in years)	29.54 (10.7)
Education - Completed secondary school (in years)	1706 (94.7%)
Education - >5 years post-secondary school	627 (36.8%)
<b>Relationship Status</b>	
Single	368 (20.4%)
In a relationship	549 (30.5%)
Living with partner	435 (24.2%)
Married	381 (21.2%)
Separated	17 (0.9%)
Relationship satisfaction	82.93 (0.51)
Sexual satisfaction	78.29 (0.55)
Anxiety disorder diagnosis	998 (55.4%)
Depression diagnosis	973 (54%)
Childhood sexual abuse	526 (29.2%)
Childhood physical abuse	465 (25.8%)
Childhood emotional abuse	801 (44.5%)
Adult sexual abuse	619 (34.4%)
Adult physical abuse	470 (26.1%)
Adult emotional abuse	985 (54.7%)
Postcoital dysphoria lifetime	1103 (61.2%)
Postcoital dysphoria current (last 4 weeks)	539 (31.9%)
Postnatal Depression	228 (49.1%)

# % are indicated based on available data-points

**Table 1:** Table of demographics of the 1801 women included in the study.

are depicted in Table 1. A total of 1706 (94.7%) women completed secondary school education and of these 627 women (36.8%) had 5 or more years of education following secondary school. Among the women, 368 (20.4%) were single, 549 (30.5%) were in a relationship but not living together, 435 (24.2%) were living with partner but not married, 381 (21.2%) were married and 17 (0.9%) were separated.

The average age of the women was 29.54 (10.7) and the ages ranged between 18-73 years. Relationship and sexual satisfaction was described on a scale of 0-100, with 0 being least satisfied and 100 being most satisfied. The average relationship and sexual satisfaction value of the sample was 82.93 (0.51) and 78.29 (0.55) respectively, indicating an overall high level of satisfaction.

### Association of PND with PCD

Of the 1801 analyzed women, a total of 1683 (93.4%) women answered the recent Postcoital Dysphoria (PCD) question (Last 4 weeks PCD) and 1690 (93.8%) women answered the lifetime Postcoital Dysphoria (PCD) question. For the PCD, 981 women (68%) had not experienced PCD while 32% women had experienced PCD over the previous 4 weeks.

A total of 464 women (25.8%) answered the postnatal depression (PND) question. The prevalence of PND among the women who answered the question was 49.1% (n=228).

Next, we compared the frequencies of women with PND and PCD and observed that this was significant (P-value=0.009, 99% CI of 0.007-0.012), such that women with PND had higher rates of PCD, with 61.3% women with PND also reporting PCD. This overlap remained significant even after corrections for multiple testing.

### Association of PND with anxiety, depression, trauma and social factors

In the overall sample the rate of lifetime diagnosis of anxiety was 55.4% and depression was 54%. A total of 29.2% women reported childhood sexual abuse, 25.8% childhood physical abuse and 44.5% childhood emotional abuse. A total of 34.4% women reported adult sexual abuse, 26.1% for adult physical abuse and 54.7% for adult emotional abuse.

Women with PND had higher rates of anxiety (p-value= $2 \times 10^{-6}$ ) and depression (p-value= $2.9 \times 10^{-11}$ ) diagnosis. Women with PND also had higher rates of childhood sexual abuse (p-value=0.022), childhood physical abuse (p-value=0.001) and childhood emotional abuse (p-value=0.000103). Moreover, women with PND had increased rates of adult sexual abuse (p-value=0.001), physical abuse (p-value=0.000313) and emotional abuse (p-value=0.002).

Finally, to assess the contribution of social factors we assessed the influence of relationship and sexual satisfaction. There were no significant differences in relationship (P-value=0.054) nor sexual satisfaction (P-value=0.637) and women with or without PND.

## Discussion

Several biological pathways might act in concert to increase the risk of PND and understanding these biological mechanisms is essential. Reproductive hormones influence virtually every biological system implicated in PND, and there is robust evidence that a subgroup of women seem to be particularly sensitive to the effects of postnatal changes in hormone levels. It has previously been proposed that these high-risk women constitute a “hormone-sensitive” PND phenotype,

which should be studied to identify underlying pathophysiology and develop novel treatment targets [9]. Along these lines, in the current study we questioned if women with PND were more likely to be affected by PCD or post-sex distress.

This is the first study investigating the overlap between postnatal depression and Postcoital Dysphoria. In our study we observed that 32% women had experienced recent PCD, these rates are in concordance with those from previous studies [9,10]. In line with our hypothesis, we observed that women with PND were more likely to also suffer from PCD, with 61.3% women with PND also reporting to have PCD. This overlap was significant and greater than expected by chance. The number of previous episodes of depression, a history of PND, and depression during pregnancy are also significant risk factors for PND [11,12]. PND has been described as a clinical integration of risk and protective factors that culminate in the triggering of a mood episode in the context of a biological or reproductive state. In our study we observed that women with PND comprised a high-risk group of women who had increased rates of anxiety, depression and childhood and adult trauma.

Epidemiologic studies have suggested that risk, social and psychological factors play a large role in the pathogenesis of PND. Decreased social support, poor quality social support, and poor marital satisfaction increase the risk of PND [11,13,14]. Here, no significant differences in sexual or relationship satisfaction among women with PND were seen.

The results are limited by the fact that they were based on self-report questionnaires and there is currently no validated psychometric scale for assessing PCD. Replication of these results in larger, independent cohorts is warranted. Understanding of the pathways by assessing biological markers such as longitudinal changes in gene expression and DNA methylation would be useful [15].

## Conclusion

In summary, our results indicate a significant overlap of women suffering from PND and PCD, indicating that there might be common vulnerability mechanism such as sensitivity to rapid hormonal fluctuations that might trigger both conditions. PND is an important health condition that has deleterious effects for the entire family and our findings improve our understandings of the biological pathways involved, opening avenues for better diagnosis of susceptible women and personalized treatment.

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## Disclosure

The authors have no disclosures to declare.

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