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## The EPDS-Lifetime: Assessment of Lifetime Prevalence and Risk Factors for Perinatal Depression in a Large Cohort of Depressed Women

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### Abstract

**Background**—Perinatal depression (PND) is a common complication of pregnancy and postpartum associated with significant morbidity.

**Objectives**—We had three goals: 1) to explore the performance of a new lifetime version of the Edinburgh Postnatal Depression Scale (EPDS-Lifetime) to assess lifetime prevalence of PND; 2) to assess prevalence of lifetime PND in women with prior histories of MDD; and 3) to evaluate risk factors for PND.

**Methods**—Subjects were from the Netherlands Study of Depression and Anxiety (NESDA). The EPDS was modified by adding lifetime PND screening questions, assessing worst episode and symptom timing of onset.

**Results**—Of 682 women with lifetime MDD and a live birth, 276 (40.4%) had a positive EPDS score of  $\geq 12$  consistent with PND. Women with PND more often sought professional help ( $p < 0.001$ ), and received treatment ( $p = 0.001$ ). Independent risk indicators for PND included younger age, higher education, high neuroticism, childhood trauma, and sexual abuse.

**Conclusions**—We found that two in five parous women with a history of MDD had lifetime PND and that the PND episodes were more severe than MDD occurring outside of the perinatal period. The EPDS-Lifetime shows promise as a tool for assessing lifetime histories of PND in clinical and research settings.

### INTRODUCTION

Perinatal depression (PND) is a common complication of pregnancy and the postpartum period and is often defined as a major depressive episode (MDD) occurring either during pregnancy or postpartum (O'Hara and Swain 1996; Yonkers, Ramin et al. 2001) (Gavin, Gaynes et al. 2005; Gaynes, Gavin et al. 2005). The time of onset in the postpartum period is a matter of some debate in the field (Elliott 2000; Wisner, Moses-Kolko et al. 2010). The DSM defines postpartum depression (PPD) as onset of symptoms occurring within the first

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four weeks postpartum(DSM-IV 1994). However, in clinical practice, a broader definition is frequently described, such as onset of symptoms in the first 3–6 months postpartum, and thus, could be considered a reasonable definition both clinically and epidemiologically(Wisner, Moses-Kolko et al. 2010). The prevalence of PND ranges from 10–15% and has been associated with poor childbirth outcomes such as preterm birth (Rahman, Iqbal et al. 2004; Smith, Shao et al. 2010). Other significant consequences include maternal suicide and infanticide (Murray and Stein 1989) (Flynn, Davis et al. 2004; Marmorstein, Malone et al. 2004; Lindahl, Pearson et al. 2005; Feldman, Granat et al. 2009; Field 2010), decreased maternal sensitivity and engagement,(Network 1999; Campbell, Brownell et al. 2004) and decreased attachment with the infant (Network 1999; Campbell, Brownell et al. 2004; Paulson, Dauber et al. 2006) (Fleming and Corter 1988; Murray and Cooper 1997; O'Connor and Zeanah 2003; Bergman, Sarkar et al. 2010).

Given the prevalence and adverse consequences of PND, lifetime PND assessment should be an essential component of the medical history of all reproductive aged women. A lifetime history of PND significantly increases the risk for a subsequent episode (O'Hara and Swain 1996; Robertson, Grace et al. 2004; Milgrom, Gemmill et al. 2008; Micali, Simonoff et al. 2011; Viguera, Tondo et al. 2011). The risk of recurrence of PPD after a previous episode is 25% (Wisner, Parry et al. 2002) and women with a history of PND must be carefully followed as they have increased risk for both unipolar and bipolar depression (Kumar and Robson 1984) (Munk-Olsen, Laursen et al. 2011). Unfortunately, assessment of lifetime PND is generally not obtained in primary care, obstetrical, or mental health settings, although assessment of current PND is increasingly common. Other than asking a few general screening questions that do not allow for accurate classification, PND is not specifically assessed by most structured psychiatric diagnostic instruments including the Structured Clinical Interview for DSM-IV (First MB 1995), the Composite International Diagnostic Interview, (Hans-Ulrich; Wittchen, Burke et al. 1989; Wittchen, Robins et al. 1991) and the Diagnostic Interview for Genetic Studies (Nurnberger, Blehar et al. 1994).

Our goal was to develop a lifetime assessment instrument for PND that could be used in both clinical and research settings. Cox et al. previously reported that women demonstrate accurate recall of prior episodes of PPD including both severity and duration of symptoms. (Cox JL 1984) Therefore, we focused on modifying the Edinburgh Postnatal Depression Scale (EPDS) to assess lifetime episodes of PND (Cox, Holden et al. 1987). The EPDS is a common and widely studied PND screening instrument (Cox, Holden et al. 1987; Cox, Murray et al. 1993; Boyd, Le et al. 2005; Hewitt and Gilbody 2009). The 10-item, self-reported EPDS focuses on current symptoms, has been successfully used during both pregnancy and postpartum (Cox, Holden et al. 1987; Gaynes, Gavin et al. 2005; Flynn, Sexton et al. 2011), and minimizes confounding of somatic symptoms of MDD with the demands inherent to parenting an infant (e.g., insomnia) (Cox, Holden et al. 1987).

In addition to assessing lifetime history of PND, we wanted to assess its risk factors. The literature documents a wide range of risk factors for PND (Warner, Appleby et al. 1996; O'Hara 2009) (O'Hara and Swain 1996; Robertson, Grace et al. 2004; Milgrom, Gemmill et al. 2008), including those with overlap with non-perinatal MDD (i.e., MDD outside of the perinatal period), such as maternal age (Rubertsson, Waldenström et al. 2003), education (Tammentie, Tarkka et al. 2002), family history, prior history of MDD (Beck 2001; Milgrom, Gemmill et al. 2008; Kupfer, Frank et al. 2011), (O'Hara and Swain 1996), social support (Brugha, Sharp et al. 1998; Milgrom, Gemmill et al. 2008), anxiety disorders (Beesdo, Bittner et al. 2007; Moffitt, Harrington et al. 2007; Penninx, Nolen et al. 2011), and histories of abuse/trauma (Meltzer-Brody, Zerwas et al. ; Kendall-Tackett 2007; Records and Rice 2009; Silverman and Loudon 2010). However, one of the major gaps in prior studies is the lack of a comparison group of women with a diagnosis of lifetime non-

perinatal MDD. Previous studies usually recruited perinatal women from the general population and then inquired about a prior history of MDD (O'Hara and Swain 1996; Milgrom, Gemmill et al. 2008). Some prior studies of perinatal risk factors lack any assessment of past psychiatric history (Warner, Appleby et al. 1996; Tammentie, Tarkka et al. 2002; Rubertsson, Waldenström et al. 2003). In order to address these gaps, we wanted to measure the prevalence and risk factors of PND in a cohort of women with documented histories of lifetime MDD.

The three goals of our study were: 1) to explore the performance of a new lifetime version of the Edinburgh Postnatal Depression Scale (EPDS-Lifetime) to assess lifetime prevalence of PND; 2) to assess prevalence of lifetime PND in women with histories of MDD; and 3) to evaluate risk factors for PND, including age, education, family history, personality, and histories of abuse/trauma and anxiety disorders, and compare to non-perinatal MDD and healthy controls.

## MATERIALS AND METHODS

### Study sample

NESDA is an ongoing, multi-site naturalistic cohort study examining the long-term course and consequences of MDD and anxiety disorders in adults. A detailed description of the NESDA study design and sampling procedures can be found elsewhere (Penninx, Nolen et al. ; Penninx, Beekman et al. 2008). Briefly, 2,981 subjects were included for the baseline assessment in 2004–2007, consisting of healthy controls (22%) and subjects with depressive/anxiety disorders (78%) (Penninx, Beekman et al. 2008). To represent various settings and stages of psychopathology, subjects were recruited from the community (19%), primary care (54%) and outpatient mental health care services (27%). Community-based participants had previously been identified in a population-based study; primary care participants were identified through a three-stage screening procedure (involving the Kessler-10 (Kessler, Andrews et al. 2002) and the short-form Composite International Diagnostic Interview psychiatric interview by phone) (Gigantesco and Morosini 2008) conducted among a random sample primary care; and mental healthcare participants were recruited consecutively when newly enrolled at one of the 17 participating mental health organization locations (Bijl, van Zessen et al. 1998) (Landman-Peeters, Hartman et al. 2005). (Donker, Comijs et al.). Controls were recruited from two groups; 1) from primary care settings where subjects had agreed to undergo a mental health screen and were completely negative for a psychiatric disorder; and 2) a prior cohort study conducted in The Netherlands that recruited adolescents at risk for anxiety and depression based on family history (Landman-Peeters, Hartman et al. 2005). All subjects were administered the Composite International Diagnostic Interview (version 2.1) (Wittchen, Robins et al. 1991) to establish DSM-IV diagnoses of psychiatric disorders (DSM-IV 1994), including MDD. The CIDI is highly reliable and valid in assessing psychiatric disorders (Wittchen, Robins et al. 1991) and was administered by specially trained research staff. Subjects with insufficient command of the Dutch language or a primary clinical diagnosis of bipolar disorder, obsessive compulsive disorder, severe substance use disorder, psychotic disorder or organic psychiatric disorder were excluded.

For the present study, we used data from the baseline, 2-year and 4-year follow-up assessments with the EPDS-Lifetime included in the 4-year assessment. The research protocol was approved by the Ethics Committees of participating universities, and all participants provided written informed consent.

Figure 1 depicts a flowchart illustrating NESDA. Of the 2981 subjects enrolled into NESDA at baseline, 2402 subjects had complete data at the 4-year follow-up assessment. Subject

inclusion criteria were as follows: presence of a lifetime MDD (excluded: N=743), women (excluded: N=511) and a history of one or more live births (excluded: N=466), leaving a sample of 682 female subjects for analyses. We included only those women who had delivered a living child to avoid confounding related to pregnancy loss and grief reactions. We also included a control group of women (N=141) who gave birth to a living child but did not have lifetime MDD or anxiety (based on the CIDI) and did not have a diagnosis of PND (based on the modified EPDS).

### **PND assessment**

We are unaware of a gold-standard assessment tool for lifetime assessment of PND (Gaynes, Gavin et al. 2005). We therefore developed a new lifetime PND questionnaire derived from the EPDS (Table 1) (Cox, Holden et al. 1987). The EPDS was designed to identify current PND symptoms and has good sensitivity and specificity (Gavin, Gaynes et al. 2005). We modified the EPDS to assess lifetime PND retrospectively (EPDS-Lifetime). A positive score on the original 10-item EPDS was defined as a total score  $\geq 12$  and based on standard literature cut-off scores (Cox, Holden et al. 1987; Wisner, Parry et al. 2002). We expanded the EPDS-Lifetime by adding two screening questions prior to the 10-item EPDS: 1) “During how many of your pregnancies did you feel sad, miserable, or very anxious? By this we mean a period of at least 2 weeks when you were not yourself and which was worse than the normal ups and downs of life?” 2) “After how many of your deliveries, within the first six months postpartum, did you feel sad, miserable, or very anxious? By this we mean a period of at least 2 weeks, when you were not yourself and which was worse than the normal ups and downs of life?” For women answering yes to either question, we then asked them to focus on the worst PND episode, and to complete the 10-item EPDS based on the worst episode. We believed that asking about the worst episode would increase the accuracy of reporting. We also included questions about the timing of initial onset of symptoms (trimester of pregnancy or months postpartum), and history of seeking mental health treatment for perinatal mood symptoms.

### **Risk factors and correlates**

We examined the relation between PND and sociodemographic and other risk factors including age marital status and history of a live birth at the 4-year follow-up assessment, worst episode of lifetime PND, level of education, family history of MDD, personality (degree of neuroticism), history of childhood and adult abuse/trauma, and presence of lifetime anxiety disorder. We picked these risk factors based on the literature. Family history of MDD among first degree relatives was obtained using the family tree method at the baseline assessment (Fyer and Weissman 1999). Personality was evaluated using the NEO personality questionnaire at the baseline assessment (Costa Jr and McCrae 1995). The childhood trauma inventory, as assessed at baseline, quantified a cumulative childhood trauma index consisting of emotional neglect, psychological abuse, physical abuse and sexual abuse during the first 16 years of life (Wiersma 2009). Abuse that occurred after age 16 was assessed using an adverse life events scale (Brugha T 1985). Lifetime anxiety disorder was based on CIDI interviews at baseline, 2-year, and 4-year follow-up (Penninx, Beekman et al. 2008; Boschloo, Vogelzang et al. 2011).

### **Statistical analyses**

Analyses were conducted using SPSS (v.15. Chicago, Illinois). In our sample of women with lifetime MDD who had a history of one or more live births, we explored the performance of the lifetime EPDS using descriptive statistics and tested the internal consistency using Cronbach’s alpha. As an indication for the validity of the EPDS, we tested whether the clinical characteristics of non-PND (i.e., EPDS < 12) and PND (i.e., EPDS  $\geq 12$ ) differed in a sample of women with lifetime MDD who answered yes on our two-item

screeners. Characteristics were summarized for women with PND and non-PND MDD and these were compared to controls using  $\chi^2$  statistics for categorical variables and analysis of variance for continuous variables. To determine whether characteristics were specific risk-indicators for PND or non-PND MDD, we tested differences in characteristics between women with PND and non-PND MDD. Finally, we performed multivariate logistic regression analyses to identify potential independent risk factors for PND.

## RESULTS

### Performance of the EPDS-Lifetime

We explored the performance of the EPDS-Lifetime in women with lifetime MDD who had a live birth. Of all women with valid data on the screener (N=682), 363 women (53.3%) screened positive on at least one of the two screening questions about lifetime mood and anxiety symptoms during pregnancy (N=214) and/or after giving birth (N=266) (see also Figure 1). We assessed EPDS scores among all women who screened positive on at least one of the two screening questions and had valid data on the EPDS (n=361). EPDS scores showed a normal distribution with a mean of 16.4 and standard deviation of 6.2. Cronbach's alpha for this scale was 0.82, indicating good internal consistency (Bland and Altman 1997).

### Prevalence and Severity of PND and MDD in the NESDA Cohort

Of 361 women with MDD who endorsed one of the EPDS-Lifetime screening questions, 276 women (76.5%) had an EPDS score  $\geq 12$  indicating PND based on our study definition. Table 2 shows that women with PND consistently demonstrated a more severe and chronic clinical course of illness than women with MDD outside of the perinatal period, including more functional impairment ( $p < 0.001$ ), having sought professional help ( $p < 0.001$ ), and receiving treatment ( $p = 0.001$ ).

When we examined women in NESDA with histories of MDD who gave birth to a living child (N=682), 276 (40.6%) met criteria for PND in our study. Of those women with PND, 54.0% had experienced an episode of MDD *before* the onset of PND. Figure 2 depicts the timing of the onset of symptoms in women with PND: 57.3% reported postpartum onset and 42.7% had onset during pregnancy. In the postpartum period, the largest percentage of women reported onset of depression occurring within the first four weeks postpartum – approximately 34%. An additional 13% reported on onset of symptoms between 4–12 weeks postpartum and 10% reported onset after greater than 12 weeks (between 3–6 months postpartum).

### Risk Factors for PND and MDD

We compared risk characteristics for three groups: 1) women with a history of a live birth and histories of MDD outside of the perinatal period (non-PND MDD); 2) women with a history of a live birth and both MDD and PND (PND+MDD); and 3) a control group of women with a history of a live birth who did not report a lifetime history of PND or MDD (Table 3). The mean age at time of the NESDA 4-year follow-up interview of those with PND+MDD was 47.9 years, significantly younger than the control and non-PND MDD groups ( $p = 0.002$ ). In all groups, most were married or partnered and had a high school education. A family history of MDD was significantly higher in the PND group compared to those with non-PND MDD ( $p = 0.03$ ) and controls ( $p < 0.001$ ). History of a lifetime anxiety disorder was significantly higher in the PND group ( $p = .003$ ) and the PND group had higher neuroticism compared to the non-PND MDD group ( $p < 0.001$ ) and controls ( $p < .001$ ).

Rates of abuse/trauma were high but particularly in women with PND. We observed statistically significant increased rates of childhood trauma in the PND group compared to

both the control ( $p < 0.001$ ) and the non-PND MDD groups ( $p = 0.002$ ). More than half (54.7%) of women in the PND group reported childhood emotional neglect and this was higher compared to the MDD only group ( $p = .003$ ) and controls ( $p < 0.001$ ). Childhood psychological abuse was increased in those with PND versus non-PND MDD only ( $p = 0.02$ ) and controls ( $p < 0.001$ ). Moreover, 30.4% of those in the PND group reported a history of childhood sexual abuse and 30.8% reported a history of sexual abuse after age of 16. This finding was statistically significant compared to the non-PND MDD group only for those with histories of sexual abuse after age 16 ( $p = 0.001$ ) but was highly significant compared to controls at both time points ( $p < 0.001$ ).

Finally, multivariate logistic regression analyses were performed to identify independent risk identifiers for PND compared to the non-PND MDD group. After adjustment for all socio-demographic and vulnerability factors, younger age ( $p = 0.009$ ), greater education ( $p = 0.001$ ), higher neuroticism ( $p = 0.04$ ), childhood trauma (total score) ( $p = 0.03$ ) and sexual abuse after age 16 ( $p = 0.04$ ) emerged as significant independent risk factors for PND.

## DISCUSSION

The NESDA cohort is the first study to use a newly modified version of the EPDS to assess lifetime PND in a large, naturalistic cohort study. NESDA subjects were recruited from three settings representing a broad range of individuals including those with histories of MDD. Of women with histories of MDD who gave birth to a living child, 276 (40.6%) met criteria for PND based on a positive lifetime EPDS score (EPDS  $\geq 12$ ).

The EPDS-Lifetime performed well in our study. The internal consistency of the EPDS was good (Cronbach's  $\alpha = 0.82$ , with  $\alpha > 0.7$  defining acceptable internal consistency) (Bland and Altman 1997). These results are encouraging and suggest that the EPDS-Lifetime could be used in a variety of settings to screen women of reproductive age retrospectively for lifetime PND. It would provide valuable information regarding women at risk of developing a new episode of PND in a subsequent pregnancy and those who may be vulnerable to reproductive mood disorders across the lifecycle (Schmidt, Nieman et al. 1998; Bloch, Schmidt et al. 2000; Rubinow 2005; Rubinow and Schmidt 2006).

A strength of the present study is that it is one of the first to examine the prevalence of PND in a large cohort of women with past histories of MDD diagnosed by structured clinical interviews and to examine risk factors for PND. We found that 40% of parous women with MDD had a history of PND. Women with PND reported the perinatal depressive episodes as more severe than MDD episodes occurring outside of the perinatal period as evidenced by being associated with greater impairments in daily functioning, more often seeking professional help and initiating treatment. In terms of risk factors for PND, we found that a family history of MDD, higher neuroticism, anxiety disorders and trauma significantly increased risk. After controlling for all socio-demographic and vulnerability factors, multivariate logistic regression identified significant independent risk factors for PND including younger age, greater education, higher neuroticism, and history of childhood trauma and sexual abuse after age 16. Taken together and consistent with the literature (Silverman and Loudon 2010), this information supports the importance of screening and monitoring women with histories of MDD throughout the perinatal period.

In our sample, 54% of women had already experienced an episode of MDD before the onset of PND. This finding has significance for a number of important reasons. First, the timing of onset of perinatal depression is an area of intense research and controversy within the field of perinatal psychiatry (Elliott 2000; Gaynes, Gavin et al. 2005; Munk-Olsen, Laursen et al. 2006; Wisner, Moses-Kolko et al. 2010). The inherent heterogeneity of PND (phenotype by

timing of onset of symptoms occurring before pregnancy, during pregnancy or postpartum) has complicated efforts to determine underlying pathophysiology and to develop targeted treatments. We examined the timing of onset of PND symptoms and found that 57.3% of subjects reported an onset after delivery, whereas 42.7% had an onset during pregnancy. Of women reporting onset of PND in the first trimester (~25%), we believe it possible that most had an ongoing episode of MDD predating pregnancy.

Second, our findings support the clinical recommendation that women with histories of MDD need to be monitored during the perinatal period as they are at risk for developing PND. Most women have extensive contact with the health care system during pregnancy and are open to screening and interventions that improve their health and that of their child (Suellentrop K 2006; Dott, Rasmussen et al. 2010). Therefore, the perinatal period presents a window of opportunity to actively screen for lifetime MDD, abuse and other important risk factors in order to prevent adverse outcomes associated with PND.

The high prevalence of abuse in women with a history of PND is striking but consistent with previous studies (Meltzer-Brody, Zerwas et al. ; Kendall-Tackett 2007; Onoye, Goebert et al. 2009; Silverman and Loudon 2010). However, the sample size of the present study is much larger than most prior work. More than half of the PND group reported histories of neglect and almost one-third reported a history of sexual abuse. Furthermore, the long-term psychological consequences of sexual abuse are well-documented and associated with adverse consequences on emotional and physical health (Leserman, Drossman et al. 1996; McCauley, Kern et al. 1997; Kendler, Bulik et al. 2000; Romans, Belaise et al. 2002; Leserman 2005) and increased risk for adverse outcomes during the perinatal period (Buist 1998; Grimstad, Backe et al. 1998; Leeners, Richter-Appelt et al. 2006; Leeners, Stiller et al. 2010; Lukasse, Vangen et al. 2011).

The methodological strengths of this study include the analysis of a notably large sample of women with a history of MDD diagnosed by administration of a structured psychiatric interview and compared to a new lifetime assessment of PND. The primary limitations of our study are the retrospective nature of the assessment of lifetime PND and lack of data on some other aspects of pre-partum functioning. In addition, in the PND+MDD group, compared to the PND alone group, the increased psychiatric comorbidity and severity of illness could be due in part to the greater number of lifetime episodes of unipolar major depression. As women with bipolar disorder were excluded from the NESDA study, we were not able to examine the prevalence or severity of PND in those with bipolar disorder and compare to those with unipolar MDD.

## CONCLUSIONS

PND is a severe and persistent form of MDD that is one of the most frequent complications of pregnancy and childbirth. NESDA is one of the *first* studies to carefully assess for lifetime history of PND in a large sample of women with MDD. In this sample, a new modified, lifetime version of the EPDS (the EPDS-Lifetime), demonstrated great promise as a useful tool for the assessment of lifetime histories of PND. Two in five women with a live birth and a history of MDD also had lifetime PND, and the PND episodes were more severe than MDD occurring outside of the perinatal period. Histories of abuse and trauma were significantly increased in women with PND, compared to women with non-perinatal MDD as well as healthy controls. Identification of the independent risk factors and phenotypic characteristics that distinguish PND from MDD has important and far reaching clinical and research implications that could provide insight into psychological, biological and genetic vulnerabilities to PND. Specifically, the perinatal period presents a window of opportunity

to actively screen for lifetime histories of depression, abuse and other important risk factors of psychiatric illness.

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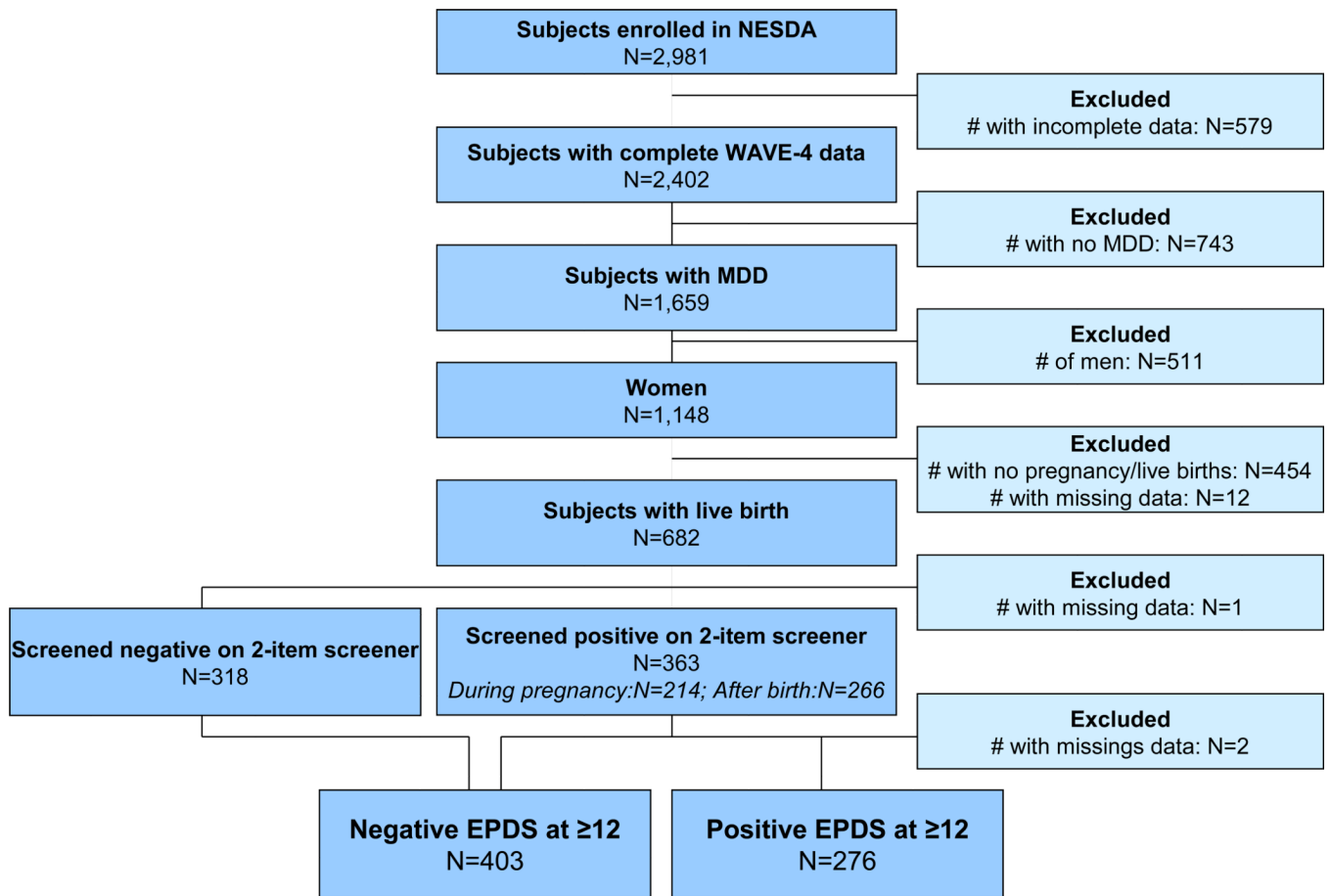


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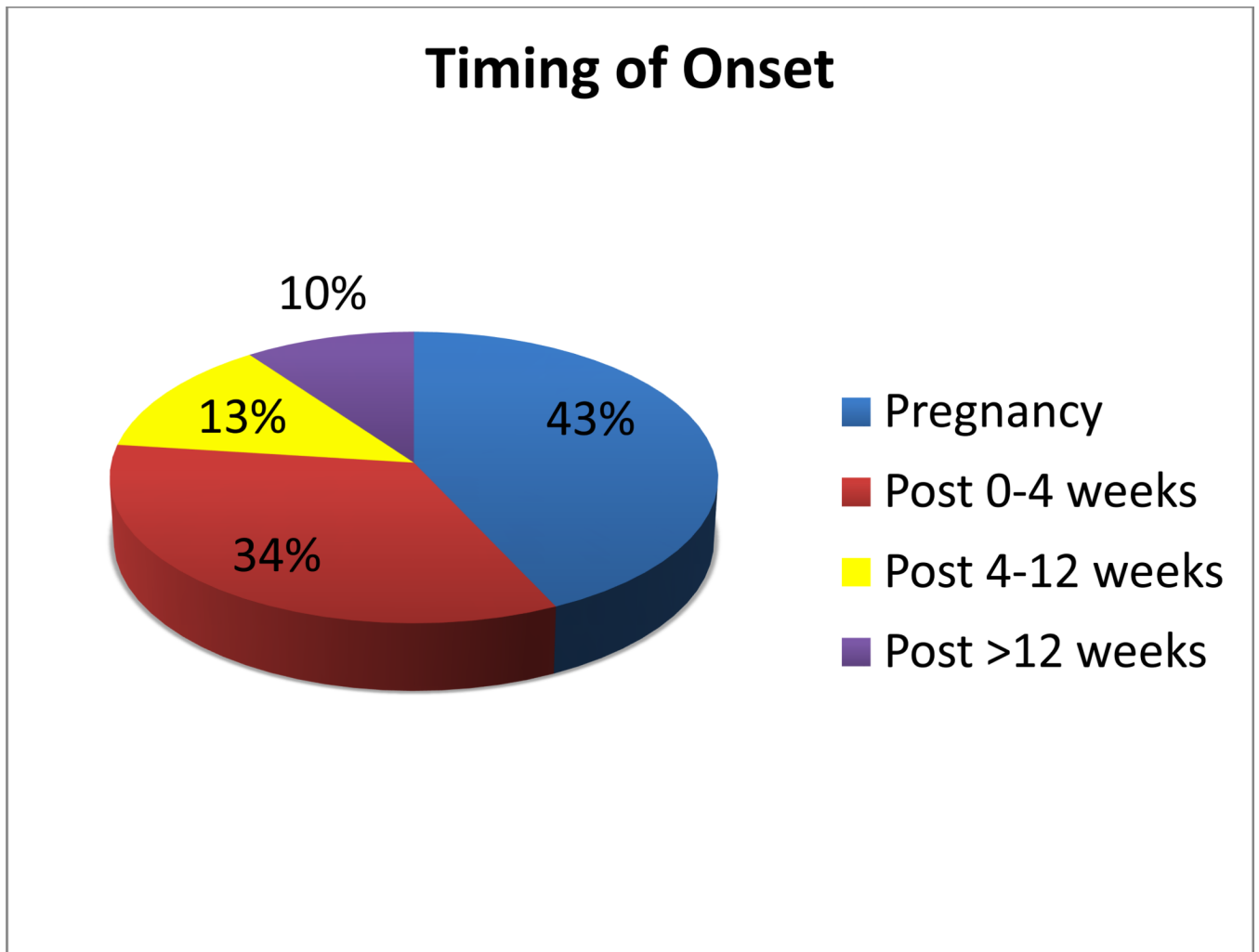
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**Figure 1.**  
Flowchart



**Figure 2.**  
Onset of PND symptoms in women with PND+MDD (N=276)

Table 1

Modified Lifetime Version of the Edinburgh Postnatal Depression Scale

How many times have you been pregnant? \_\_\_\_\_

*If you have NEVER been pregnant, SKIP to SECTION XXX BELOW.*

How many of these pregnancies resulted in live births (including caesarean sections)? \_\_\_\_\_

*If NONE of your pregnancies resulted in a live birth, AND SKIP to SECTION XXX BELOW*

During how many of your pregnancies did you feel sad, miserable, or very anxious? By this we mean a period of at least 2 weeks when you were not yourself and which was worse than the normal ups and downs of life? \_\_\_\_\_

After how many of your deliveries, within the first six months postpartum, did you feel sad, miserable, or very anxious? By this we mean a period of at least 2 weeks, when you were not yourself and which was worse than the normal ups and downs of life? \_\_\_\_\_

*Please think about the worst episode during pregnancy or after delivery.*

During the worst episode of feeling sad, miserable, or very anxious during pregnancy or following delivery, how often:

Often Sometimes Rarely Never

- Did you feel able to laugh or see the funny side of things? \_\_\_\_\_
- Were you able to look forward to things with excitement? \_\_\_\_\_
- Did you blame yourself unnecessarily when things went wrong? \_\_\_\_\_
- Were you anxious or worried for no good reason? \_\_\_\_\_
- Did you feel scared or panicky for no good reason? \_\_\_\_\_
- Did you feel overwhelmed? \_\_\_\_\_
- Were you so unhappy that you had difficulty sleeping? \_\_\_\_\_
- Did you feel sad or miserable? \_\_\_\_\_
- Were you so unhappy that you cried? \_\_\_\_\_
- Did the thought of harming yourself occur to you? \_\_\_\_\_

Severity and Timing of Onset: During the worst episode of feeling sad, miserable, or very anxious during pregnancy or following delivery:

Yes No

- a. Were the symptoms so severe that you sought professional help? \_\_\_\_\_
- b. Did the symptoms cause you problems or interfere with your day-to-day life? \_\_\_\_\_
- c. Did you require psychiatric hospitalization because of these symptoms? \_\_\_\_\_
- d. Did you receive any form of treatment such as counseling or medication because of depression during pregnancy or following delivery? \_\_\_\_\_  
 No Treatment \_\_ Counseling \_\_ Medication \_\_ Counseling and Medication
- e. During the worst episode, when did these symptoms begin? During Pregnancy: \_\_1st trimester \_\_2nd trimester \_\_3rd trimester After Delivery: \_\_0-4 weeks \_\_1-3 months \_\_more than 3 months postpartum
- f. During the worst episode, how long did these symptoms last? \_\_ Up to 2 weeks \_\_2-4 weeks \_\_1-3 months \_\_3-6 months \_\_ more than 6 months
- g. How old were you during the worst episode? \_\_\_\_\_

**Table 2**Modified EPDS Clinical characteristics of non-PND MDD and PND+MDD<sup>a</sup>

Characteristic	non-PND MDD (N=85)	PND + MDD (N=276)	p
	n (%)	n (%)	
Impairments in day-to-day life (yes)	39 (45.9%)	236 (85.5%)	<0.001
Duration of symptoms:			<0.001
– 0–2 weeks	16 (18.8%)	2 (0.7%)	
– 2–4 weeks	16 (18.8%)	27 (9.8%)	
– 1–3 months	22 (25.9%)	65 (23.6%)	
– 3–6 months	15 (17.6%)	68 (24.6%)	
– >6 months	16 (18.8%)	114 (41.3%)	
Sought professional help (yes)	23 (27.1%)	138 (50.0%)	<0.001
Received treatment (counseling/medication; yes)	15 (17.6%)	101 (36.6%)	0.001

<sup>a</sup>In a sample of women with lifetime MDD who had experienced feelings of sadness or anxiety during pregnancy or after delivery of a living child and had complete data on the EPDS (n=361).



Table 3

## Demographic and Vulnerability Factors in Women with a Live Birth

Characteristic	Controls (n=141)	Non-PND MDD (N=403)	MDD+PND (N=276)	Non-PND MDD Controls	MDD+PND MDD Controls	MDD+PND vs Non PND MDD	p <sup>5</sup>
	mean (sd) / % <sup>1</sup>	mean (sd) / % <sup>1</sup>	mean (sd) / % <sup>1</sup>	p <sup>2</sup>	p <sup>3</sup>	p <sup>4</sup>	
<u>Sociodemographics</u>							
Age in years	50.8 (12.1)	50.8 (10.6)	47.9 (10.8)	0.98	0.72	0.01	0.009
Education in years	12.9 (3.3)	11.6 (3.3)	12.3 (3.2)	<0.001	0.19	0.06	0.001
Married (yes)	63.8%	56.6%	58.7%	0.13	0.53	0.31	0.16
<u>Vulnerability factors</u>							
Family history of depression (yes)	56.0%	75.2%	82.2%	<0.001	0.40	<0.001	0.03
- Neuroticism	26.1 (6.5)	37.7 (7.9)	40.2 (7.9)	<0.001	<0.001	<0.001	0.04
- Extraversion	42.2 (6.1)	36.4 (7.1)	35.2 (6.9)	<0.001	0.78	<0.001	0.69
Childhood trauma (total score)	0.7 (1.4)	1.9 (2.3)	2.5 (2.4)	<0.001	0.003	<0.001	0.03
- Emotional neglect (yes)	18.4%	42.9%	54.7%	<0.001	-	<0.001	0.003
- Psychological abuse (yes)	9.2%	29.8%	38.0%	<0.001	-	<0.001	0.02
- Physical abuse (yes)	3.5%	17.1%	22.1%	<0.001	-	<0.001	0.11
- Sexual abuse (yes)	11.3%	26.1%	30.4%	<0.001	-	<0.001	0.21
Sexual abuse after age 16 (yes)	9.9%	20.1%	30.8%	0.007	0.30	<0.001	0.002
Lifetime anxiety disorder (yes)	n/a	73.9%	83.7%	n/a	n/a	n/a	0.003

<sup>1</sup>Based on descriptive statistics.<sup>2</sup>Unadjusted p-values, based on univariable multinomial logistic regression analyses comparing MDD only and MDD+PND to controls.<sup>3</sup>Adjusted p-values, based on multivariable multinomial logistic regression analyses comparing MDD only and MDD+PND to controls, by inclusion of all sociodemographic and vulnerability factors.<sup>4</sup>Unadjusted p-values, based on univariable logistic regression analyses comparing MDD+PND to MDD only.<sup>5</sup>Adjusted p-values, based on multivariable logistic regression analyses comparing MDD+PND to MDD only, by inclusion of all sociodemographics and vulnerability factors.