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Postpartum Anxiety and Maternal-Infant Health Outcomes

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WHAT'S KNOWN ON THIS SUBJECT: Guidelines encourage pediatric health care providers to aid in identifying women with postpartum depression but not postpartum anxiety, yet the major life event of childbirth can be anxiety provoking for many women.

WHAT THIS STUDY ADDS: During the postpartum hospital stay, anxiety was far more common than depression among breastfeeding women. Anxiety remained more common for the 6 months after childbirth, and was associated with increased health care use and reduced breastfeeding duration, particularly among primiparous women.

abstract

OBJECTIVE: Postpartum anxiety screening does not typically occur, despite changes in life roles and responsibility after childbirth. We sought to determine the prevalence of postpartum anxiety during the maternity hospitalization and its associations with maternal and child outcomes. We further aimed to compare correlates of anxiety with correlates of depression.

METHODS: For a randomized controlled trial of mothers with "well" newborns ≥34 weeks' gestation comparing 2 post–hospital discharge care models, mothers completed baseline in-person interviews during the postpartum stay and telephone surveys at 2 weeks, 2 months, and 6 months to assess health care use, breastfeeding duration, anxiety, and depression. All participants intended to breastfeed. State anxiety scores ≥40 on the State Trait Anxiety Inventory (STAI) and depression scores ≥12 on the Edinburgh Postnatal Depression Survey (EPDS) were considered positive.

RESULTS: A total of 192 (17%) of 1123 participating mothers had a positive baseline STAI; 62 (6%) had a positive EPDS. Primiparity was associated with a positive STAI (20% vs 15%, $P = .02$), but not a positive EPDS (4% vs 7%, $P = .05$). Positive STAI scores were associated with cesarean delivery (22% vs 15%, $P = .001$), reduced duration of breastfeeding ($P = .003$), and increased maternal, but not infant total unplanned health care utilization within 2 weeks of delivery ($P = .001$). Positive STAI scores occurred more frequently than positive EPDS scores at each assessment through 6 months postpartum.

CONCLUSIONS: Postpartum state anxiety is a common, acute phenomenon during the maternity hospitalization that is associated with increased maternal health care utilization after discharge and reduced breastfeeding duration. State anxiety screening during the postpartum stay could improve these outcomes. *Pediatrics* 2013;131:e1218–e1224

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KEY WORDS

postpartum depression, postpartum anxiety, health care utilization, breastfeeding, maternal-child health

ABBREVIATIONS

EPDS—Edinburgh Postnatal Depression Survey
HNV—home nursing visit
OBC—office-based care
STAI—State Trait Anxiety Inventory

Dr Paul conceptualized and designed the study, and drafted the initial manuscript; Dr Downs conceptualized the use of the primary outcome measurement tool for this manuscript; Mr Schaefer carried out the initial analyses; Ms Beiler participated in conceptualizing the study design and coordinated the trial's execution; Dr Weisman served as a mentor for this project and participated in conceptualizing the study design; Drs Downs, Schaefer, Beiler, and Weisman reviewed and revised the manuscript; and all authors approved the final manuscript as submitted.

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The American Academy of Pediatrics strongly encourages pediatricians to routinely screen for postpartum depression among mothers of their infant patients.[1] This recommendation is logical given the prevalence of postpartum depression, its effects on families and parenting, and the frequent encounters that pediatricians have with mothers in the year after childbirth.

Although postpartum depression is common and classically does not acutely present in the first days after childbirth, the major life event of childbirth and the immediate change in life roles and responsibilities after the birth of a child may be anxiety provoking. Despite this, and the anecdotally obvious anxious behavior of many new parents, routine screening for postpartum anxiety does not typically occur during the maternity stay, although some have called for such screening of new and expectant mothers.[2–4]

As summarized by Spielberger,[5] anxiety refers to an unpleasant emotional state or condition. Spielberger[5] and others have further described different components of anxiety, which includes an individual's proneness to anxiety or "trait anxiety" and a more acute phenomenon in response to a perceived stressful, dangerous, or threatening situation, which is labeled, "state anxiety." Therefore, using data from a large, prospective clinical trial that compared 2 models of mother-infant health care delivery after discharge from the maternity-nursery hospitalization,[6] we sought to determine the prevalence of maternal state anxiety during the postpartum hospital stay and its associations with maternal and child health outcomes. We also aimed to compare perinatal clinical correlates of anxiety with perinatal clinical correlates of depression during the postpartum hospital stay.

METHODS

Participants

Mother-newborn dyads with deliveries at the Penn State Milton S. Hershey Medical Center (Hershey, PA) between September 12, 2006, and August 1, 2009, were screened for participation in the Nurses for Infants Through Teaching and Assessment after the Nursery study.[6] Briefly, this study's primary goal was to compare office-based care (OBC) with an alternative care model using a home nursing visit (HNV) as the initial postdischarge encounter for "well" breastfeeding newborns and mothers after the maternity/nursery hospitalization. Eligible newborns were singletons and twins born at ≥34 weeks' gestational age to English-speaking mothers attempting to breastfeed during the maternity hospital stay and with intent to continue breastfeeding after discharge. Additional inclusion/exclusion criteria and other details are provided in the study's primary outcome manuscript.[6] The study was approved by Penn State College of Medicine's Human Subjects Protection Office, and registered at http://www.clinicaltrials.gov before the first participant's enrollment.

Study Design

A total of 1154 participating mothers and their newborns were randomized to either the OBC or HNV groups after informed consent was obtained. After recommendations of 2 American Academy of Pediatrics policy statements at the time the trial began,[7,8] HNVs were scheduled to occur within 48 hours of discharge, typically 3 to 5 days after childbirth. All HNVs were conducted by 1 of 7 maternal-child health nurses employed by a single, private home health nurse organization. Before hospital discharge, an office visit was also scheduled for HNV group newborns ~1 week after the HNV to establish a medical home for the newborn and to ensure recovery from expected, initial weight loss after birth. Depending on individual circumstances (eg, day of week, gestational age, early discharge), these visits were scheduled to occur 5 to 14 days after birth. Postdischarge visit timing for OBC newborns was determined by the newborn nursery physician, and maternal office follow-up was scheduled by the obstetricians for both study groups. HNVs followed a standard, maternal/child newborn visit protocol that included anticipatory guidance topics for both the mother and the infant. OBC was provided by pediatric primary care providers and obstetricians for infants and mothers, respectively.

Data Collection and Outcome Measures

During the maternity/nursery hospital stay, maternal interviews and hospital chart abstractions were conducted for baseline data collection, including demographics, pregnancy and birth history, and selected surveys. Telephone interviews with mothers were then conducted by study coordinators blinded to study group 2 weeks, 2 months, and 6 months after childbirth. The primary outcome for this analysis, state maternal anxiety, was assessed at baseline and at telephone assessments by using the state version of the validated State-Trait Anxiety Inventory (STAI)[5] with a score ≥40 serving as a positive screen, as has been done previously.[9,10] Maternal postpartum depression screens using the validated Edinburgh Postnatal Depression Survey (EPDS)[11] also was conducted at the same time points with scores ≥12 indicating a positive screen. At telephone interviews only, we assessed participant health care utilization via maternal self-report and breastfeeding duration and exclusivity, measured using questions adapted from the Infant Feeding Practices Study II

Neonatal Questionnaire and Infant Month 2 Questionnaire.[12]

Statistical Analysis

Associations of positive anxiety and depression screens at baseline with each other, demographic, maternity-nursery stay–related variables, and health care use were assessed by using χ^2 tests. A multivariable regression model was built to determine independent association with a positive anxiety screen at baseline. The relationship between anxiety and depression screen findings at baseline with breastfeeding duration was analyzed by using Kaplan-Meier methods.[13] We investigated possible effects of the intervention by conducting all analyses adjusted for randomized study group but found no meaningful differences with the unadjusted results. Therefore, we reported all results unadjusted for study group. Of note, we previously have reported modest effects on breastfeeding duration for those randomized to the HNV group, but there was no effect of study group assignment on any other study outcome reported in the current analysis.[6]

RESULTS

Demographics

From the entire study cohort of 1154 mothers, 15 participants were excluded from the current analyses because they delivered twins and 16 were excluded because of missing baseline STAI and EPDS screens, leaving a cohort of 1123 mothers (Table 1). Among these 1123 new mothers, the mean maternal age was 29.0 ± 5.5 years, and most women were married and non-Hispanic white. Nearly half were primiparous, and roughly one-third delivered by cesarean delivery. Their infants, 52.1% of whom were male, were born at a median of 39.3 weeks with a mean birth weight of 3.44 ± 0.47 kg.

Anxiety, Depression, and Associations at Baseline

The mean state anxiety score on the STAI during the postpartum maternity hospital stay was 31.0 ± 8.6 with 192 women (17.1%) screening positive for state anxiety with a score of 40 or more. This prevalence of a positive STAI was significantly more common than a positive EPDS, with only 62 (5.5%) scoring 12 or more on the depression screen ($P < .0001$). The mean EPDS score was 4.9 ± 3.7. Forty-two women (3.7%) had positive STAI and EPDS at this baseline assessment, and scores for the 2 screening tests were moderately correlated with a correlation coefficient = 0.53 (95% confidence interval 0.49–0.57). Among the demographic and baseline characteristics, it was notable that primiparous women were more likely to have a positive baseline STAI than multiparous women (20% vs 15%, $P = .02$), but less likely to have a positive baseline EPDS (4% vs 7%, $P = .05$). New mothers delivering via cesarean delivery were more likely to screen positively for both state anxiety and depression compared with those delivering vaginally (STAI 22% vs 15%, $P = .001$; EPDS 7% vs 5%, $P = .07$). In a logistic regression model (Table 2), a positive baseline EPDS, parity, and delivery mode all remained significantly associated with a positive baseline state anxiety screen even after including parameters for education, marital status, mother's age, race/ethnicity, insurance status, infant's gestational age, infant's birth weight, and treatment group, of which only newborn birth weight was associated with a positive baseline STAI.

Health Care Use

Positive screening tests during the maternal hospital stay for state anxiety and depression were examined for their association with health care use within the first 14 days of childbirth (Table 3). Mothers with a positive STAI were significantly more likely to use hospital-based services (inpatient or emergency department, $P = .03$). They were also more likely to have unplanned outpatient visits ($P = .008$) and 2 or more overall provider visits ($P < .001$), whereas women with positive EPDS were only more likely to have unplanned outpatient visits ($P = .009$). Multivariable logistic regression analyses adjusting for delivery

TABLE 1 Demographics and Baseline Characteristics

Characteristic	Overall Cohort, $n = 1123$
Maternal age, mean (SD), y	29.0 (5.5)
Maternal race/ethnicity, *n* (%)	
White, not Hispanic or Latino	946 (84.5)
White, Hispanic or Latino	45 (4)
Black, not Hispanic or Latino	62 (5.5)
Black, Hispanic or Latino	8 (0.7)
Asian	49 (4.4)
Other	10 (0.9)
Marital status, *n* (%)	
Married	884 (79)
Not married, living w/partner	100 (8.9)
Single	126 (11.3)
Other	9 (0.8)
Education, *n* (%)	
Some high school	29 (2.6)
High school graduate	166 (14.8)
Some college/technical school	280 (25.0)
College graduate	416 (37.1)
Postgraduate training/degree	229 (20.4)
Income, *n* (%)	
<$25 000	96 (8.5)
$25 000–$49 999	206 (18.3)
$50 000–$74 999	247 (22)
$75 000–$99 999	216 (19.2)
≥$100 000	237 (21.1)
Missing/Refused/Don't know	121 (10.8)
Health insurance, *n* (%)	
Private health insurance	880 (79.1)
Medicaid	148 (13.3)
Self-pay	9 (0.8)
Other	72 (6.5)
None	3 (0.3)
Prenatal class attendance, *n* (%)	408 (36.3)
Parity, *n* (%)	
Primiparous	534 (47.6)
Multiparous	589 (52.4)
Delivery type, *n* (%)	
Vaginal	770 (68.6)
Cesarean	353 (31.4)
Randomized group	
OBC	559 (49.8)
HNV	564 (50.2)

TABLE 2 Parameter Estimates and 95% Confidence Intervals for Logistic Regression Model for Anxiety

	Odds Ratio (95% Confidence Interval)	*P* Value
Depression (EPDS ≥12)		
Yes	14.4 (7.96–26.0)	<.001
No	(ref)	
Parity		
Primiparous	1.57 (1.08–2.29)	.02
Multiparous	(ref)	
Delivery		
Vaginal	(ref)	
Cesarean	1.46 (1.02–2.09)	.04
Age, 1 y increase	0.99 (0.95–1.03)	.54
Education		
High school grad (or less)	0.76 (0.43–1.37)	.37
Some college	1.13 (0.73–1.74)	.59
College grad (or more)	(ref)	
Marital status		
Married	(ref)	
Other (nonmarried)	1.27 (0.77–2.10)	.35
Insurance		
Private	(ref)	
Other	1.09 (0.66–1.82)	.73
Race/Ethnicity		
White/Non-Hispanic	(ref)	
Other	0.92 (0.57–1.50)	.74
Gestational age, 1-wk increase	0.94 (0.81–1.10)	.45
Birth weight, 1-kg increase	1.54 (1.05–2.26)	.03
Randomized group		
HNV	1.06 (0.76–1.49)	.74
OBC	(ref)	

mode and positive EPDS still revealed a significant relationship between positive STAI and use of hospital-based services (P = .03) and overall provider visits (P = .002). Infants of women with positive STAI and EPDS scores did not have greater health care use in the first 2 weeks after delivery than those without positive screen results.

TABLE 3 Relationship Between Baseline Maternal Anxiety and Depression Screen Scores and Maternal-Infant Health Care Use Within 14 Days of Childbirth[a]

	STAI < 40, *n* = 931	STAI ≥ 40, *n* = 192	*P*	EPDS < 12, *n* = 1061	EPDS ≥ 12, *n* = 62	*P*
Maternal outcomes						
Readmission or emergency department visit, *n* (%)	38 (4.3)	14 (8.3)	.03	50 (5.0)	2 (3.6)	.64
Unplanned outpatient visit, *n* (%)	77(8.8)	26 (15.4)	.008	92 (9.3)	11 (20.0)	.009
Total provider visits, *n* (%)						
0	421 (48.0)	71 (42.0)	.036	471 (47.5)	21 (38.2)	.18
1	375 (42.8)	65 (38.5)	.122	415 (41.9)	25 (45.5)	.60
2 or more	81 (9.2)	33 (19.5)	<.001	105 (10.6)	9 (16.4)	.18
Infant outcomes						
Readmission or emergency department visit, *n* (%)	26 (3.0)	5 (3.0)	1.00	28 (2.8)	3 (5.5)	.26
Unplanned outpatient visit, *n* (%)	344 (39.1)	77 (45.6)	.12	400 (40.3)	21 (38.2)	.76
Total provider visits, *n* (%)						
0 or 1	189 (21.5)	27 (16.0)	.05	207 (20.8)	9 (16.4)	.42
2	421 (47.9)	84 (49.7)	.71	477 (48.0)	28 (50.9)	.69
3	167 (19.0)	31 (18.3)	.55	189 (19.0)	9 (16.4)	.62
4 or more	102 (11.6)	27 (16.0)	.22	120 (12.1)	9 (16.4)	.35

[a] Missing data existed for 77 mothers and 75 infants.

Breastfeeding

A positive STAI during the maternity stay was associated with reduced breastfeeding duration during the first 6 months after childbirth (P = .003, Fig 1). Analyses stratified by parity and delivery mode indicate that this positive state anxiety screen was significantly associated with reduced breastfeeding duration in primiparous but not multiparous women and those delivering vaginally, but not via cesarean delivery. A positive EPDS was marginally associated with reduced breastfeeding duration (P = .06), particularly among first-time mothers (P < .001) and those delivering operatively (P = .03), but was not associated with breastfeeding duration among multiparous women and those delivering vaginally.

Natural History of Anxiety and Depression Screens

The prevalence of a positive screen for state anxiety was highest during the postpartum hospital stay, as described previously, but sharply declined 2 weeks after delivery (Table 4). At the 2-week, 2-month, and 6-month assessment, the proportion of women with a positive STAI remained relatively consistent between 5.8% and 7.2%. Importantly, among the original cohort of 192 women with a positive screen at the baseline assessment during the postpartum hospital stay, only 17.7% (30 of 169) who completed the 2-week assessment still had a positive screening test for state anxiety.

For depression, the proportion of women with a positive EPDS at the baseline and 2-week assessment was similar at 5.5%. Among the 62 women with initial positive EPDS scores, 27.3% (15 of 55) reevaluated at 2 weeks were still positive. The overall cohort prevalence dropped at the 2-month and 6-month assessments, which showed positive EPDS rates at <3%.

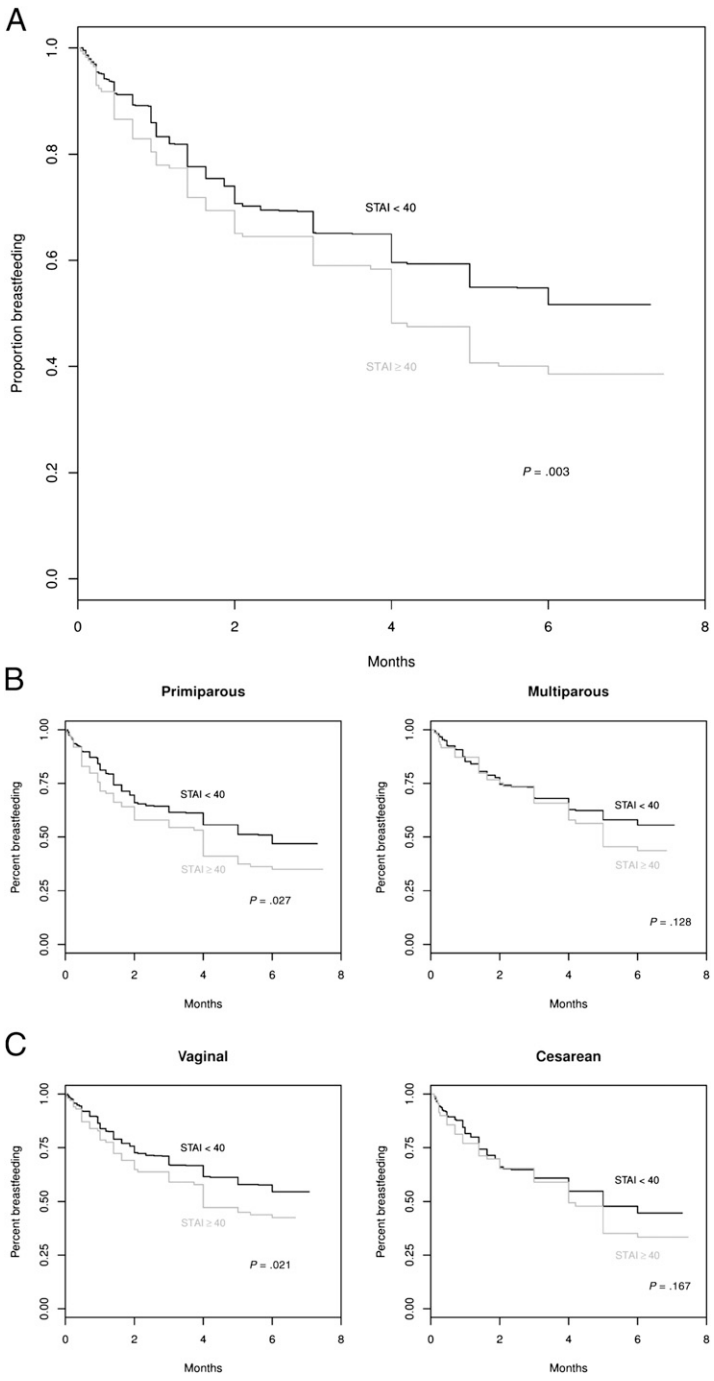

FIGURE 1

Kaplan-Meier plot of breastfeeding duration by anxiety screen group for the following: A, the entire cohort; B, subgroups stratified by parity; and C, subgroups stratified by delivery mode.

DISCUSSION

Maternal state anxiety after childbirth is understandable, given the physical and emotional stress and lifestyle changes that occur after this major life event. The current analyses confirm the anecdotal experiences of many clinicians by demonstrating that state anxiety is indeed common for women during the postpartum hospital stay. Importantly, they also reveal an association with increased maternal health care use and reduced breastfeeding duration, particularly for first-time mothers. The results also demonstrate that although state anxiety and depression screening scores are moderately correlated, in most instances the 2 conditions affect different women with very few having positive screens for both.

These findings corroborate the evidence from the only other study to our knowledge that assessed state anxiety before maternity hospital stay discharge.[10] In that study, Britton[10] reported that 1 in 4 women had a positive STAI before discharge. The positive screens were associated with maternal perception of perinatal stress and negatively associated with mastery (defined as self-perception of being in control of the forces affecting their life), marital satisfaction, and choice of infant health care provider, all variables not specifically collected in the current trial.

Although state anxiety symptoms may occur at various times throughout pregnancy and in general increase during pregnancy,[14] Breitkopf et al[15] have shown that they may not appear until the postpartum period. Although Britton[16] reported that maternal state anxiety increased to a prevalence of >30% at 1 month postpartum, our data are similar to that of Dipietro et al,[14] which show a decreasing proportion of state anxiety symptoms during in the weeks and months after delivery, as might be expected as mothers adapt to their new life role.

Regarding our findings of increased maternal health care use among women with positive baseline screenings for state anxiety, no previous study to our knowledge has explicitly evaluated this prospectively beginning during the postpartum hospital stay, although retrospective associations between maternal mental health diagnoses and health care use have been studied. For example, an Australian study found that women with EPDS

TABLE 4 Maternal Anxiety and Depression Scores in the First 6 Months After Childbirth

	Baseline $n = 1123$	2 wk $n = 1049$	2 mo $n = 985$	6 mo $n = 936$
STAI score, mean (SD)	31.0 (8.6)	26.7 (7.3)	25.9 (7.2)	26.0 (7.8)
STAI $\geq$ 40, *n* (%)	192 (17.1)	72 (6.9)	57 (5.8)	67 (7.2)
EPDS score, mean (SD)	4.9 (3.7)	4.4 (3.7)	3.4 (3.3)	3.4 (3.3)
EPDS $\geq$ 12, *n* (%)	62 (5.5)	57 (5.5)	26 (2.6)	27 (2.9)

scores of $\geq$12 at 4 months postpartum had increased health care use for themselves and their infants in the period since childbirth.[17] Similar results were discovered in other trials with vastly different demographics.[18,19] One further study demonstrates a limitation of the current report. Mandl et al[20] found that neonatal health care use predicted the higher levels of maternal depressive symptoms, and this finding could suggest the reverse mechanism from what we are proposing; that is, increased perinatal morbidity, including difficulty with breastfeeding, is the source of the state anxiety. Although our data are unable to determine the direction of the association, and also unfortunately did not have the capability to monitor health care use for the entire 6-month follow-up period of the study, this is a potential area for future research to evaluate directionality of this association.

Our findings of worse breastfeeding outcomes for women with positive state anxiety and depression screens are consistent with several other trials.[18,21–24] Dewey[25] proposed a mechanism for this association. She hypothesizes that impairment of the milk ejection reflex via a reduction of oxytocin release results when women are under either physical or mental stress, although it is acknowledged that difficulty with lactation could itself be a major source of state anxiety.

In addition to the limitations already stated, this study was conducted at a single health center where women were mostly white and relatively few were low income. Further, we had no data on prenatal or prepregnancy state anxiety and depression, and could not account for whether cesarean deliveries were planned or unplanned in many cases. Last, and perhaps most importantly, our cohort consisted entirely of women intending to breastfeed during the postpartum hospital stay. Although this is representative of most women in the United States, our findings cannot be generalized to mothers intending to formula feed their newborns.

CONCLUSIONS

Postpartum state anxiety is very common during the maternity hospitalization and is far more prevalent than depression in the first days after childbirth. Its association with adverse maternal and child health outcomes makes it relevant for both maternal and pediatric health care providers, who have ample opportunity, to screen for state anxiety and potentially intervene, particularly among those most affected, such as first-time mothers.

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