Factors Associated with Postpartum Maternal Functioning in Women with Positive Screens for Depression

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Abstract

Background: Functional assessment may represent a valuable addition to postpartum depression screening, providing a more thorough characterization of the mother's health and quality of life. To the authors' knowledge, this analysis represents the first examination of postpartum maternal functioning, as measured by a patient-centered validated tool aimed at ascertainment of functional status explicitly, and its clinical and sociodemographic correlates.

Materials and Methods: A total of 189 women recruited from a large, urban women's hospital in the northeastern United States who both (1) screened positive for depression between 4 and 6 weeks postpartum and (2) completed a subsequent home (baseline) visit between October 1, 2008, and September 4, 2009, were included in this analysis. Multiple linear regression was conducted to ascertain which clinical and sociodemographic variables were independently associated with maternal functioning.

Results: The multivariate analysis revealed independent associations between bipolar status, atypical depression, depression score (17-item Hamilton Rating Scale for Depression), and insurance type with postpartum maternal functioning. The beta coefficient for bipolar status indicates that on average we would expect those with bipolar disorder to have maternal functioning scores that are 5.6 points less than those without bipolar disorder.

Conclusions: Healthcare providers treating postpartum women with complicating mental health conditions should be cognizant of the potential ramifications on maternal functioning. Impaired functioning in the maternal role is likely to impact child development, although the precise nature of this relationship is yet to be elucidated.

Introduction

PERINATAL MENTAL HEALTH is a recognized national priority, and laws have been enacted to support the goals of increased screening, awareness, and education in the United States.¹ New Jersey (2006), Illinois (2008), and West Virginia (2009) have each established legislation related to perinatal depression screening,¹ which may take place during pregnancy, immediately after childbirth, and during the first postpartum year. Depression screening, followed by referral for screen-positive women, is the most available option for promoting maternal emotional wellness. Several validated tools are available² for the purpose of screening, including the Edinburgh Postnatal Depression Scale (EPDS),³ which is the most widely used measure worldwide for the childbearing time frame.⁴ The EPDS gauges feelings of misery, panic, sadness, and anxiety, as well as thoughts of self-harm.

Depression screening has both advocates and detractors. The utility of depression screening has yet to be firmly justified⁵ as healthcare practices often lack the resources to engage and follow screen-positive women.⁶ In addition, the stigma surrounding depression is often a deterrent to treatment engagement.^{7,8} Depression evaluation is focused on the negative, rather than positive, aspects of new motherhood such as emotional fulfillment. Nevertheless, the breadth and depth of research that exist reporting the deleterious effects of undetected unchecked depression, including diminished cognitive performance and insecure attachment in offspring,^{6,9–11} provide a powerful incentive for continued monitoring.¹²

This increased focus on perinatal mental health has also spurred interest in alternate, and potentially complementary, methods of capturing maternal wellness.^{13–17} The primary goal for most individuals seeking medical care is improved

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daily functioning,¹⁸ rather than a specific reduction in depression scores. Alternate methods of assessing maternal wellness may be especially beneficial for those disinclined toward depression evaluation and treatment. Functional assessment may represent a powerful addition to perinatal depression screening, providing a more thorough characterization of the mother's health. Multiple indications of an individual's health, rather than depression status alone, have been used to classify treatment response in multi-site clinical trials of chronic and treatment-resistant depression,^{19,20} and perinatal mental health outcome definitions could likewise be enhanced.

The Barkin index of maternal functioning (BIMF)¹³ was developed to address this need for an assessment of maternal functioning in the 12 months following childbirth.^{13,14} Focus groups of new mothers informed the initial content, representing a patient-centered approach to assessment and ensuring content validity by integrating women's experiences and ideas regarding what constitutes "optimal maternal functioning" at the item creation stage.¹³ The BIMF has adequate internal consistency reliability (Cronbach's $\alpha = 0.87$)^{13,15} and favorable psychometric properties on the whole.¹⁵ A factor analysis was performed to explore the underlying factor structure of the BIMF and met key interpretability criteria, including a rotated factor pattern with a simple structure.¹⁵ The measure has also been linguistically validated in a medically underserved, low-income obstetric population.²¹ Recently, the BIMF has been successfully implemented in (1) large, federally funded clinical trials, (2) hospital settings, (3) community-based settings, and (4) various other academic research projects. The development of a threshold signaling "patient requires follow-up" is underway in response to specific queries regarding implementation and because the BIMF was originally conceived of as both a clinical and academic research tool. Domains, such as maternal self-care,²² infant care, social support,²³ management, adjustment, and psychological well-being (of the mother), are incorporated in a multidimensional look at the transition to parenthood.^{13,14}

In addition to the incentive for attractive clinical options or augments to depression screening, the maternal child health literature would be enriched from a dedicated investment in the study of maternal functioning, its correlates, and how it impacts the family unit longitudinally. Since a validated, comprehensive assessment tool aimed explicitly at evaluation of functional status did not exist until recently,¹⁴ our understanding of its influence on family health is limited, although it stands to reason that improved functioning could only represent an advantage both in the immediate and long term. The primary aim of this analysis was to evaluate clinical and sociodemographic factors potentially associated with maternal functioning (at baseline) in a population of postpartum women who screened positive for depression. The Identification and Therapy of Postpartum Depression Study (Screening Study) provides the opportunity to examine the relationship between maternal functioning, sociodemographic variables, and clinical variables such as depression, bipolar status, and atypical depression. Information about how clinical characteristics such as depression, atypical depression, and bipolar status interact with maternal functioning may impact treatment approaches to pregnant or postpartum women with complicating mental health conditions.

Materials and Methods

Setting and participants

To examine the factors associated with maternal functioning, data were extracted from the home visit (baseline assessment) portion of the Identification and Therapy of Postpartum Depression Study (Screening Study). In addition to establishing diagnostic category through the Structured Clinical Interview for DSM-IV (SCID),²⁴ several constructs were assessed during the home visit, including (but not limited to) global functioning, quality of life, medical history, satisfaction in the maternal role, depressive symptom severity, and maternal functioning; sociodemographic information was collected immediately in advance of the home visit. At the outset of the analysis, the research team carefully considered each of the available clinical variables in terms of their potential relevance to postpartum functioning; this was the primary impetus for inclusion. Conventional sociodemographic variables were included as well as those with potential associations with postpartum functioning.

Subsequent to approval from the University of Pittsburgh's Institutional Review Board, Screening Study participants were recruited during pregnancy from a large, urban women's hospital in Pittsburgh, PA. They were contacted between 4 and 6 weeks postpartum and screened with the EPDS.³ Women who scored ≥ 10 on the EPDS were offered a home (baseline) visit where they provided written informed consent and were evaluated diagnostically with the SCID. Home visits were scheduled after the EPDS screening and before 12 weeks postpartum. Women who were determined to be eligible were then invited into a Randomized Clinical Trial (RCT) of either telephone-based depression care management or treatment as usual. Primary aims of the larger RCT included (1) an evaluation of the impact of a telephone-based screening and care management program on the timeliness, access, and the adequacy of depression care for women with postpartum depression (PPD) and (2) measurement of the impact of the telephone-based care management program on women's levels of symptom and global functioning at 3, 6, and 12 months after entering the intervention.

The present analysis is focused on women who completed home (baseline) visits between October 1, 2008, and September 4, 2009. Over the course of this time period, 189 women completed the BIMF. Of those 189 women, 183 completed each of the 20 items and therefore received a total maternal functioning score.

Variables of interest

Sociodemographic variables. The sociodemographic variables of interest were race, Hispanic ethnicity, marital status, education level, type of medical insurance, age of mother (at baseline), and age of baby (at baseline).

Maternal functioning. Maternal functioning was assessed through the BIMF,¹³ a 20-item self-report measure designed to evaluate functional status during the first year postpartum. The measure consists of a series of statements that the respondent is asked to rate on a Likert scale²⁵ from 0 "Strongly Disagree" to 6 "Strongly Agree." The items are summed to form a total score, which ranges from 0 to 120. Larger scores indicate higher levels of functioning (Fig. 1).

Barkin Index of Maternal Functioning

ID: _____ Date: ____ / ____ / ____ Visit: _____

Please circle the number that best represents how you have felt over the past two weeks. Please try to answer each question as honestly as possible as your responses will help us better understand the postpartum experience.

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
1. I am a good mother.	0	1	2	3	4	5	6
2. I feel rested.	0	1	2	3	4	5	6
3. I am comfortable with the way I've chosen to feed my baby (either bottle or breast, or both).	0	1	2	3	4	5	6
4. My baby and I understand each other.	0	1	2	3	4	5	6
5. I am able to relax and enjoy time with my baby.	0	1	2	3	4	5	6
6. There are people in my life that I can trust to care for my baby when I need a break.	0	1	2	3	4	5	6
7. <i>I am comfortable</i> allowing a trusted friend or relative to care for my baby (can include baby's father or partner).	0	1	2	3	4	5	6
8. I am getting enough adult interaction.	0	1	2	3	4	5	6
9. I am getting enough encouragement from other people.	0	1	2	3	4	5	6
10. I trust my own feelings (instincts) when it comes to taking care of my baby.	0	1	2	3	4	5	6
11. I take a little time each week to do something for myself.	0	1	2	3	4	5	6
12. I am taking good care of my baby's physical needs (feedings, changing diapers, doctor's appointments).	0	1	2	3	4	5	6
13. I am taking good care of my physical needs (eating, showering, etc).	0	1	2	3	4	5	6
14. I make good decisions about my baby's health and well being.	0	1	2	3	4	5	6
15. My baby and I are getting into a routine.	0	1	2	3	4	5	6
16. I worry about how other people judge me (as a mother).	0	1	2	3	4	5	6
17. I am able to take care of my baby <u>and</u> my other responsibilities.	0	1	2	3	4	5	6
18. Anxiety or worry often interferes with my mothering ability.	0	1	2	3	4	5	6
19. <i>As time goes on</i> , I am getting better at taking care of my baby.	0	1	2	3	4	5	6
20. I am <i>satisfied</i> with the job I am doing as a new mother.	0	1	2	3	4	5	6

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FIG. 1. Barkin index of maternal functioning (BIMF). The copyright for the BIMF is owned by the University of Pittsburgh; the BIMF may be reprinted without charge only for noncommercial research and educational purposes. You may not make changes or modifications to the BIMF without prior written permission from the University of Pittsburgh. If you would like to use this instrument for commercial purposes or for commercially sponsored research, please contact the Office of Technology Management at the University of Pittsburgh at 412-648-2206 for licensing information. Questions about the development of the BIMF may be directed to the corresponding author.

Depressive symptom severity. The 17-item Hamilton Rating Scale for Depression (HAM-D-17)^{26,27} was captured as part of the clinician-administered Structured Interview Guide for the Hamilton Depression Rating Scale with Atypical Depression Supplement (SIGH-ADS).²⁸ The HAM-D-17 is used

to assess severity of depression and includes the following constructs: mood, anhedonia, social withdrawal, guilt, sleep, energy, anxiety, somatic symptoms, agitation, insight, psychomotor retardation, and suicidality. The total score ranges from 0 to 54, with higher scores denoting greater severity of depression.

Atypical depression. Atypical depression was also assessed through the SIGH-ADS.²⁸ The scale comprises eight items, including social withdrawal, weight gain, appetite increase, increased eating, carbohydrate craving or eating, hypersomnia, fatigability, and diurnal variation. The atypical total ranges from 0 to 26, with higher scores indicating greater severity of atypical depression.

Bipolar diagnosis. Bipolar Diagnosis was determined by the SCID²⁴ at the Screening Study's baseline assessment (home visit). The complete SCID was administered during the home visit by master-level clinicians and generally lasted no more than 3 hours. All diagnostic assessments were reviewed by a board-certified psychiatrist.

Analytic methods. The statistical analysis was performed using SAS[®] Statistical Software. Bivariate analyses were performed to examine which sociodemographic and clinical variables were associated with maternal functioning. Associations between maternal functioning and two-level categorical variables were examined using the Wilcoxon Rank Sum Test. The Kruskal-Wallis was performed for variables with three or more levels. Pearson correlation coefficients were generated to examine the relationships between maternal functioning and the other continuous variables. Bivariate associations were considered to be significant where $p < 0.05$.

Exploratory stepwise linear regression was performed to identify factors independently associated with maternal functioning; stepwise regression is particularly useful when the goal is a simple model and there is a relatively large set of candidate predictor variables. All variables that were examined in the bivariate analysis were also included as covariates in the multivariate regression models. The variables retained in the final models were all significant at the 0.1500 level, which was also the threshold for variable entry in the stepwise analysis; the level of 0.1500 is the default threshold in SAS for stepwise regression.

Results

Sample characteristics

The baseline characteristics of the sample of 189 women are displayed in Table 1. The sample was primarily White (73.8%), Non-Hispanic (97.2%), and unmarried (57.9%). Public insurance was being utilized by 53.5% of the sample, while 44.3% was using private insurance. Only four (2.2%) of the women were uninsured. A substantial percentage of the sample was diagnosed with bipolar disorder (32.2%).

On average, mothers were 28.4 years old ($SD=5.8$) at baseline and babies were 6.4 weeks old ($SD=1.4$). There was little variation in the baby's age at baseline, as women who had not completed a home visit by 12 weeks postpartum were excluded from the study. The mean HAM-D-17 score of 14.0 ($SD=4.2$) does not signify an extremely depressed population, which is reflective of the Screening Study's inclusion criteria. An EPDS score ≥ 10 allowed women in the mild range of depressive symptoms to be included in the study. In addition, the mean atypical depression score was 5.3 ($SD=2.7$).

Mean maternal functioning as measured by the BIMF was 80.0 ($SD=17.0$), and total scores ranged from 30 to 116. A total score of 30 represents the lowest functioning woman

TABLE 1. CHARACTERISTICS OF 183 PATIENTS WITH COMPLETED BASELINE BIMF ASSESSMENTS

Baseline characteristics	n	Subjects (%)	
Race			
White	135		73.8
Non-White	48		26.2
Hispanic			
Yes	5		2.8
No	177		97.2
Marital status			
Married	77		42.1
Not married	106		57.9
Education			
<High school	14		7.6
High school diploma or GED	40		21.9
Some college or trade	71		38.8
College degree	41		22.4
Degree(s) beyond college	17		9.3
Bipolar			
Yes	59		32.2
No	124		67.8
Insurance			
Private	81		44.3
Public	98		53.5
Uninsured	4		2.2
		Mean (SD)	Median (range)
Mother's age (at home visit, years)	178	28.4 (5.8)	28.0 (18.0–43.0)
Baby's age (at home visit, weeks)	176	6.4 (1.4)	6.1 (4.1–11.3)
BIMF	183	80.0 (17.0)	80.0 (30–116)
Ham-D-17	175	14.0 (4.2)	14.0 (4.0–23.0)
Atypical	179	5.3 (2.7)	5.0 (0–17.0)

BIMF, Barkin index of maternal functioning; HAM-D-17, 17-item Hamilton Rating Scale for Depression.

in the sample population, whereas the highest functioning woman received a score of 116.

Bivariate analysis

The results of the bivariate analysis are displayed in Table 2. Maternal functioning was significantly and negatively correlated with the mother's age, depression (HAM-D-17), and atypical depression.

Multivariate analysis

The results of the multivariate analysis are presented in Table 3. Bipolar diagnosis, type of insurance, depression, and atypical depression were found to be independently associated with maternal functioning. Depression, atypical depression, and bipolar diagnosis were related to diminished maternal functioning, whereas relative to private insurance, public insurance and absence of insurance were related to increased functioning. Post hoc testing through the Wilcoxon Rank Sum test revealed a significant difference between

TABLE 2. BIVARIATE TESTS FOR ASSOCIATIONS BETWEEN VARIABLES OF INTEREST AND BIMF SCORES

Factor	BIMF			
	N	Median	Range	p
Race				0.0515
White	135	79.0	30–116	
Non-White	48	85.5	48–107	
Hispanic				0.9897
Yes	5	75.0	64–107	
No	177	80.0	30–116	
Marital status				0.1934
Married	77	79.0	41–104	
Not married	106	84.5	30–116	
Education				0.1616
<High school	14	91.0	51–104	
High school diploma or GED	40	85.5	30–107	
Some college or trade	71	83.0	36–116	
College degree	41	75.0	41–106	
Degree(s) beyond college	17	75.0	53–101	
Bipolar				0.2086
Yes	59	78.0	30–108	
No	124	80.5	36–116	
Insurance				0.0637
Private	81	78.0	41–104	
Public	98	85.5	30–116	
Uninsured	4	75.5	73–95	
	N	R	p	
Mother's age	178	–0.17	0.0277	
Baby's age	176	–0.08	0.3103	
Ham-D-17	175	–0.20	0.0069	
Atypical score	179	–0.21	0.0045	

public and private insurance holders in regard to maternal functioning ($p = 0.0206$).

Discussion

In summary, mother's age, depression as measured by the HAM-D-17, and atypical depression were significantly and inversely correlated with maternal functioning. The inverse associations between maternal functioning and both mother's age and depression were also observed in the psychometric evaluation by Barkin et al.¹⁵ Multivariate models revealed independent associations between bipolar diagnosis, type of insurance, depression, atypical depression, and maternal functioning. To the authors' knowledge, this analysis represents the first multivariate examination of postpartum maternal functioning, as measured by a patient-centered validated tool aimed at ascertainment of functional status explicitly, and its correlates. In a review of the literature, Barkin et al.¹⁴ acknowledge a substantial body of existing instruments intended for use in the postnatal period. Constructs such as maternal satisfaction, fulfillment, gratification,^{29,30} self-efficacy,³¹ and competence³² have been the focus of other tools and related studies. However, the authors were unable to identify an instrument that included all rele-

TABLE 3. FACTORS INDEPENDENTLY ASSOCIATED WITH MATERNAL FUNCTIONING (BIMF; $N = 167$)

Factor	BIMF		
	$R^2 = 0.1244$		
	β	Standard error	p
Bipolar (ref: not bipolar)	–5.6	3.1386	0.0764
Insurance (ref: private)			0.0041
Public	9.7	2.8856	
Uninsured	4.9	8.3529	
HAM-D-17	–0.7	0.3376	0.0380
Atypical	–1.0	0.4988	0.0535

vant domains of maternal functioning, as defined in a focus group study of new mothers.¹⁴ This omission, in part, served as the impetus for the development of the BIMF. Due to its practicality, approaching maternal mental health assessment with the ultimate goal of improved daily performance may be appealing to women who are disinclined toward depression evaluation. Functional assessment could also potentially be paired with depression evaluation toward a more comprehensive maternal mental health appraisal. Both research and clinical settings could benefit from a robust definition of maternal wellness.

Due to the aforementioned void in the literature regarding postpartum maternal functioning, it is difficult to make direct comparisons to other investigations. Some literature has accrued related to functioning as measured by the Inventory of Functional Status After Childbirth (IFSAC),³³ the only other existing measure designed explicitly for functional evaluation. However, the IFSAC is not patient-centered or comprehensive in approach,¹⁴ and the Cronbach's alphas for several of the subscales are not ideal.¹⁵ Most significantly, in terms of scoring the IFSAC, women are penalized for not resuming all pre-birth activities. This is problematic, given the process of reprioritization that is organic to new motherhood. In a recent study by Logsdon et al.,¹⁶ functional status over the first postpartum year was reported using the Infant Care Scale,³¹ a measure of maternal self-efficacy, the Gratification Checklist,^{29,30} the Global Assessment Scale,³⁴ a measure of general functioning, and the IFSAC.

The findings regarding mother's age and insurance status are initially counterintuitive as older maternal age and private insurance might initially be associated with maturity and greater financial resources. However, there is some evidence in the literature to support our findings. In a qualitative investigation by Barkin et al.,¹³ participants were, on average, 30.9 years old and 41.9% had total household incomes in the \$70,000–\$100,000 range. While the resultant data set was rich as a result of a highly articulate study sample, it was replete with complaints regarding the transition to parenthood. Alternatively, in a similar qualitative study of adolescent mothers, the majority of who were single and attending high school, complaints were counterbalanced with positive commentary.³⁵ Additional qualitative work by Barkin et al.²¹ was focused on a low-income obstetric population in an area designed as medically underserved. The majority of the participants were on Medicaid (95.8%), and 70.8% reported a total household income of \$20,000 or less. Interestingly, the

average BIMF total score was 100.6, a relatively high score (120 represents optimal functioning) given the disadvantaged nature of the study sample. It is possible that less affluent women with fewer years of life experience are also less critical in their appraisal of their life circumstances. Barkin et al.²¹ also note that several women were concerned with the possibility of negative survey responses triggering the involvement of the Division of Family and Children Services, which might have also artificially inflated the BIMF total score. Depression status was not evaluated in this study and it is likely that the group was a mixture of women who would have screened positive (if screened) and women who would not qualify as depressed. It is also possible, but not likely, that less depression in the sample influenced the BIMF total score.

The inverse, significant association between functioning and depression is both intuitive and corroborated by the literature. In a study comparing IFSAC scores between women with and without PPD, Posmontier³⁶ found that women with PPD were 12 times less likely to attain to prepregnancy levels of functioning. As a result of their study comparing outcomes across groups defined by depression and medication status, Logsdon et al.¹⁶ concluded that functional levels are positively affected by treatment for PPD. In regard to atypical depression, a study by Matza et al.³⁷ revealed that it occurs more often in women than men and is associated with higher rates of disability, restricted activity days, and use of mental health services.³⁷ Therefore, the inverse significant relationship between atypical depression and maternal functioning also interdigitates with existing reports. The results in Table 3 indicate that for a one-point increase in HAM-D-17 or atypical score, a 0.70 and 1.0 unit drop in functioning, respectively, can be expected. While not as impressive as the effect seen with bipolar status, one point can place a patient in a different treatment category. Seemingly small differences when considered in the context of a continuous numeric scale can have a significant impact where thresholds exist that drive clinical decision-making.

The multivariate analysis indicated that, on average, we can expect those with bipolar disorder to have maternal functioning scores that are 5.6 points less than those women who have also screened positive for depression but have not been diagnosed with bipolar disorder. This result regarding bipolar disorder and maternal functioning parallels the findings from other prospective studies that indicate significant impaired functioning among those with the disorder.³⁸ Work and global functioning were significantly impaired among the majority of those with bipolar disorder in a prospective study of 95 patients with mood disorders 15 years from index hospitalization.³⁸

The strengths of this investigation include the examination of maternal functioning using a targeted, comprehensive tool and the sociodemographically diverse study sample. In addition, relationships between functioning and clinical variables such as depression severity, atypical depression severity, and bipolar status are considered, representing a novel approach. However, all associations are reported within the context of a depressed sample of postpartum women, and therefore, findings cannot be extended to the childbearing population as a whole. An additional limitation is the cross-sectional nature of the study; only baseline data were included. Future investigations should examine other potential associations as variables, such as social support, number of dependents, and cultural

background, may impact maternal functioning. Finally, the significant associations identified in this article should be confirmed in additional groups of women.

Conclusions

Healthcare providers treating postpartum women with complicating mental health conditions should be cognizant of the potential ramifications on maternal functioning in the postpartum period. The question of how postpartum functioning ultimately impacts child development and family health longitudinally is of particular importance and should be prioritized. In addition, the relationship between socio-demographic characteristics and maternal functioning should be studied in a general population without positive depression screens. Parity and level of social support, an established correlate of PPD,³⁹ should also be included in analyses of factors related to functioning. Other key questions are related to the effect of established home-visiting programs (on maternal functioning) and functional trajectories over the first postpartum year in both depressed and nondepressed women, using the BIMF.

Author Disclosure Statement

No competing financial interests exist.

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