The Highs and Lows of Maternal Depression: Cluster Analysis of Depression Symptoms in a Sample of African American Women

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Background: Maternal depression affects between 10% and 15% of US mothers. Emerging evidence suggests that variability in symptoms is linked to different risk factors and different pathological subtypes. Building on this research, this study examines manifestations of depression symptoms and risk factors associated with different manifestations among a socioeconomically heterogeneous sample of African American mothers.

Methods: Data were collected via telephone interviews with a community sample of 208 self-identified African American women with children 2 to 18 months old. Mothers were screened for depression symptoms using the Center for Epidemiological Studies Depression scale and reported on several psychosocial factors including social support, history of depression, and demographic characteristics. Cluster analysis was used to determine whether there were distinct subtypes of depression symptoms in this sample.

Results: A *k*-means cluster analysis of the 57 women with a positive depression symptom screen revealed 2 distinct groups characterized by higher versus lower symptom severity. A logistic regression indicated that mothers were more likely to fall into the high severity cluster if they were employed and reported lower levels of social support.

Limitations: Because of its cross-sectional design, this study could not explore the timing and the course of depression symptoms, which may be more closely related to risk and functional impairment than the severity distinction found in this research.

Conclusions: Researchers, pediatricians, and obstetricians working with African American mothers should screen for social support, with the understanding that those with low levels may be at increased risk for severe depression symptoms. Finally, the heterogeneity in symptoms suggests that clinicians should be aware of all depression symptoms among their patients rather than looking for specific, potentially stereotypical symptoms as cues.

Key Words: maternal depression, symptom differentiation, typology, African American women, cluster analysis, social support

(*J Investig Med* 2010;58: 887–892)

Depression is a serious public health problem; in the US, lifetime prevalence is estimated at 16.2%, 6.6% within the last 12 months.[1] Women are at twice the risk for depression compared with men[2]; mothers of young children experience an added risk of depression, and mothers who are minorities are at particularly high risk.[3] Although the negative implications of maternal depression for families and children have been well established,[4,5] these outcomes are not uniform. Both psychotherapies[6] and antidepressant treatments[7] have been successful in treating depression in mothers of young children, but there is variability in treatment acceptability and response. Discovering groups of individuals who vary by type or severity of depression symptoms, especially in a traditionally high-risk group, may suggest new lines of research on etiology, treatment, and interpersonal consequences that can lead to more precise screening tools, fewer treatment failures, and more focused family interventions. This research aimed to increase our collective understanding of variation in the manifestation and presentation of depression symptoms, specifically in minority mothers of young children. Cluster analysis was used to establish groups of women with distinct depression symptom manifestations; psychosocial factors associated with the clusters were also explored.

Variability in Depression Symptoms

In general, depression is characterized by low affect and feelings of low self-worth, sadness, and hopelessness. Studies using factor analysis have confirmed that the types of symptoms characterizing depression are consistent across diverse racial groups in the United States. For example, Nguyen et al.[8] conducted a factor analysis of the Center for Epidemiological Studies Depression (CES-D)[9] scale with a sample of low-income African Americans and confirmed the same 4-factor structure found in a large-scale study of whites. This evidence supports the validity of the CES-D for measuring depressive symptoms in diverse populations and establishes a standard for comparing racial/ethnic groups on the 4 subscales of somatic complaints, depressed affect, positive affect, and interpersonal problems. Recent studies based on community and convenience samples have tested whether there are differences between cultures in how depression manifests. For example, differential item functioning analysis revealed that Native Americans are more likely to endorse somatic symptoms rather than affective symptoms, when compared with a white reference group.[10] In addition, in a sample of adults receiving treatment of major depressive disorder, African Americans were found to have more severe somatic complaints and poorer overall physical functioning than whites.[11] Although these studies suggest racial/ethnic differences in symptom manifestation using validated screening scales, little research has explored such differences within specific racial/ethnic groups.

Studies of subscales within depression screening instruments have demonstrated heterogeneity in etiology of depression symptoms. Participants who screened positive for mild depression symptoms on the CES-D scale were found to vary in symptom type by precipitating events. Individuals who experienced a social loss were more likely to experience greater arousal

and crying, whereas those with increased stress and failure to reach a goal were more likely to express fatigue and pessimism.[12] Tuohy and McVey[13] demonstrated that different events (difficulty in pregnancy vs difficulty in delivery) predicted different types of symptom endorsement on the Edinburgh Postnatal Depression Scale—nonspecific depression and anxiety, respectively. A prospective study of depression symptoms in mothers of 14-month-olds, followed until the children turned 30 months, also found that symptom severity over time, adjusted for a depression diagnosis, had negative effects on family functioning and child social-emotional development.[14] Taken as a whole, studies of maternal depression symptoms indicate that different manifestations of symptoms, whether varying in type, timing, duration, or severity, may be associated with different precursors or functional impairments.

Recognizing distinctions between groups of people with different manifestations of depressive symptoms can direct innovative research on interventions and screening protocols that target specific symptom types or symptom severity. Such research is particularly important among African American mothers who are at increased risk for depression[3] and for whom the consequences of depression have negative, long-term implications in their children's healthy development.[5,15] The current study used cluster analysis within a socioeconomically diverse sample of African American mothers of infants and toddlers to uncover groups of participants who display systematic differences in depressive symptoms.

Psychosocial Risk Factors for Maternal Depression

Several prospective studies have uncovered demographic and psychosocial risk factors for depression in mothers of young children[16,17]; however, many of such studies include predominantly 25- to 35-year-old, white, middle- to upper-class mothers.[18] In a meta-analytic review, O'Hara and Swain[19] identified the following consistent risk factors for postpartum depression: lower socioeconomic status, life stress during pregnancy, a difficult pregnancy, marital discord, lack of social support, prior psychopathological condition, and a vulnerable personality. These same factors and self-esteem, childcare stress, prenatal anxiety, infant temperament, and unplanned/unwanted pregnancy were identified by Beck[20] in her updated meta-analysis.

Studies that have focused on minority mothers' mental health typically include inner-city, low income samples, following the assumption that this group is at increased risk owing to chronic stressful life events associated with lower socioeconomic status.[21,22] The most consistent finding from such research is that women who lack social support, particularly in the form of a live-in partner, are at greatest risk for postpartum depression.[21,23–25] The current study expands this literature by exploring risk factors specific to African American mothers from diverse socioeconomic backgrounds and how factors may be specific to distinct manifestations of depressive symptoms.

In summary, the current study uses a relatively diverse sample of African American mothers to examine within-group variation in depressive symptom manifestation and to assess risk factors associated with these manifestations. Identifying unique risk factors for women with distinct symptoms may bring new insights into prevention and intervention research. Based on previous research that used factor analysis on depression scales,[26] we hypothesized that women would cluster by symptom type (ie, somatic and mood). A secondary hypothesis was that the data would show variability by degrees of severity in the depression symptoms, for example, that our data would reveal groups of women experiencing mild, moderate, and severe levels of depressive symptoms as indicated by the Beck Depression

Inventory.[27] For psychosocial risk, we specifically explored mothers' education, employment status, and partner residence because of their relevance to recent federal social policy initiatives (eg, Temporary Assistance for Needy Families, Promoting Responsible Fatherhood) and number of children, history of depression, and social support because of their consistently robust association with maternal depressive symptoms.

MATERIALS AND METHODS

The Working to Improve Maternal Mental Wellness project comprises several studies of depression among mothers with young children. The current analyses are based on a cross-sectional, community-based study of a convenience sample of 208 African American mothers of 2- to 18-month-old infants living in a large metropolitan area. A hospital institutional review board approved all study procedures and measures.

Procedures

Recruitment followed a multipronged protocol and lasted from January 2007 through September 2008. At 4 community well-child centers and their affiliated Women, Infants, and Children clinics, mothers and female caregivers were given a sheet in which they could declare interest or disinterest in participating in psychosocial research projects. These forms were collected bimonthly by research staff. In addition, project information was advertised on flyers distributed at various community sites frequented by mothers of infants (eg, Head Start centers, community centers, baby retail stores), through announcements played on a children's hospital hold line, and in a hospital publication placed in outpatient waiting rooms. The most productive recruitment efforts were through the community clinics, referrals from a friend, and via the hospital publication or hold line (27%, 14%, and 13% of the participants, respectively).

Study staff called interested mothers who responded via the forms at the clinics. Alternatively, mothers who found information about the study via flyers, friends, or the on-call message contacted study staff. At the first telephone contact with an interested mother, staff provided her with more information about the study and screened for eligibility. Mothers were eligible to participate if they self-identified as black or African American; they and their babies were born in the United States; they were at least 21 years old and their infant was 2 to 18 months old; their infants were born full-term and had no serious medical problems at birth; and they considered themselves and their infants relatively healthy. If the mother was eligible to participate, study staff obtained verbal informed consent and scheduled a telephone interview.

The 90-minute telephone interview included sociodemographic measures, depression and anxiety screens, and assessments of resilience, personal resources before and after the pregnancy, quality of housing, social support, exposure to community violence, ethnic identity, and life stress. Trained, African American research assistants with demonstrated cultural awareness conducted the interviews. The interviewers followed an institutional review board–approved referral protocol for participants who reported suicide ideation. Participants were mailed a $30 Visa gift card for completing the interview.

Participants

Overall, 635 of 698 women who completed forms or called study staff expressed interest in the study. Two hundred eighty-three interested women (45%) could not be contacted after 6 phone call attempts, typically because of disconnected phone numbers. Another 141 interested women (22%) were ineligible primarily because they and/or their infants were born outside the

United States (29%), their infant was outside the age range (37%), and/or their infant was born prematurely (47%). Two of the 211 eligible mothers discontinued participation after beginning the interview. Owing to missing data on the CES-D form, one participant was omitted from analysis; thus, the final analytic sample was 208.

Measures

Maternal Depression

Because the aim of this study was to describe depression symptoms and their risk factors rather than deriving estimates of prevalence of depressive disorders, we used a depression screener instead of diagnostic clinical interviews. Each participant was screened for depression symptoms with the CES-D inventory.[8] The CES-D has been widely used in community-based studies of maternal depression.[28,29] Cronbach α for the current sample was excellent (α, 0.90).

Psychosocial Factors

Collected demographic information included maternal age, number and ages of biological children, employment status (full- or part-time), educational attainment (highest level completed and current enrollment), household income, and household members. Educational attainment was recoded into a categorical variable with scores ranging from 0 (less than high school) through 3 (postbachelors). The current analyses focus on maternal age, number of biological children, employment status, educational attainment, and whether the child's father is coresident (as an indictor of partner support).

Information was also collected about each mother's depression history and current social support. Mothers indicated whether they had ever had an "emotional problem when you were not feeling or behaving like your normal self" and whether there had ever been a time "you had trouble taking care of responsibilities or relationships because of emotional problems or the way you were feeling or acting." If either item was endorsed, the participant was labeled positive for a history of depression.

Social support was measured using a 15-item version of the Personal Resources Questionnaire.[30] Participants rated how well each statement (eg, "Among my group of friends, we do favors for each other"; "I have relatives and friends who are willing to help me out evening if I can't pay them back") described their current situation on a 7-point Likert scale. A composite score was calculated by reverse-scoring negatively worded items and summing item responses. Cronbach α for this sample was good (α, 0.88).

Analytic Strategy

First, we examined descriptive statistics for all variables of interest to confirm that their distributions met normality assumptions, and we explored differences in demographic characteristics between African American mothers with and without a positive depression screen.

To address our first research question, what are the distinct manifestations of depression symptoms in the study population who screened positive for depression, we used *k*-means clustering of the 20 CES-D items for the subsample of mothers whose total CES-D score met the clinical cutoff for depression (≥16). Cluster analysis was used because this analytic strategy uncovers distinct groups or clusters of participants as opposed to factor analysis, which reveals correlations of items/symptoms across all participants. In other words, cluster analysis is useful for revealing statistically distinct groups of participants who are similar in their profiles of depression symptoms. In line with our hypotheses, 2- and 3-cluster solutions were explored (sample size restrictions precluded analysis of more clusters). Clusters were compared with each other and judged to differ if at least half of the item means were significantly different ($P < 0.01$) between the clusters and if the overall pattern of means reflect meaningful and conceptually distinct clusters. We also explored whether clusters differed significantly on CES-D total scores.

To address the second research question, what psychosocial risk factors are associated with the distinct manifestations of depression symptoms, we conducted a logistic regression model predicting depression cluster membership from demographic

TABLE 1. Sample Characteristics

	Full Sample (n = 208)		Depressed (n = 59)		Nondepressed (n = 149)			
	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	F	χ²
Age, yr	28.71 (5.94)		28.58 (5.68)		28.76 (6.06)		0.04	
Education								9.20*
<High school		12		19		9		
High school/GED		30		36		28		
Some college		50		34		56		
Postbachelors		8		12		7		
Employed								1.14
Part-time		11		14		9		
Full-time		31		28		33		
No. biological children	2.41 (1.44)		2.73 (1.58)		2.29 (1.37)		4.00*	
No. household members	4.30 (1.50)		4.49 (1.78)		4.22 (1.37)		1.37	
Resident father of baby		42		32		46		3.14
Social support	90.21 (12.59)		83.29 (15.71)		92.97 (9.88)		27.74‡	
Personal depression history		59		86		48		25.41‡
Depression symptoms (CES-D)	12.81 (10.24)		26.20 (8.73)		7.51 (4.11)		439.48‡	

*$P < 0.05$; †$P < 0.01$; ‡$P < 0.001$.

TABLE 2. Clusters of African American Mothers with Positive Depression Screen by Symptom Severity

	F	Low Severity (n = 47) Mean	SD	High Severity (n = 10) Mean	SD
CES-D total	64.64‡	23.17	5.78	39.80	6.70
Unusually bothered	5.33*	1.09	0.95	1.90	1.29
Poor appetite	16.80‡	0.89	0.94	2.20	0.79
Could not shake off blues	10.34†	1.47	0.86	2.40	0.70
Felt as good as others (reverse)	.31	1.30	1.00	1.10	1.10
Trouble concentrating	4.36*	1.19	0.90	1.90	1.29
Depressed	9.91†	1.28	0.83	2.20	0.92
Everything was an effort	3.23	1.85	0.88	2.40	0.84
Felt hopeful (reverse)	1.95	1.23	0.94	1.70	1.06
Thought life was failure	5.97*	0.77	0.79	1.50	1.18
Fearful	0.36	0.83	0.79	1.00	0.94
Restless sleep	16.62‡	1.26	0.94	2.60	0.97
Happy (reverse)	1.99	1.55	0.88	2.00	1.05
Talked less	11.91‡	0.98	0.87	2.10	1.20
Lonely	28.04‡	1.34	0.98	3.00	0.00
People unfriendly	12.91†	0.62	0.77	1.70	1.25
Enjoyed life (reverse)	1.70	1.15	0.93	1.60	1.26
Crying spells	8.16†	1.38	1.01	2.40	1.07
Sad	29.17‡	1.28	0.77	2.70	0.67
People disliked me	15.02‡	0.55	0.75	1.70	1.25
Could not get going	6.25*	0.96	0.78	1.70	1.16

Two participants with a positive depression screen were excluded from the cluster analysis because they were each missing a response to a single CES-D item. Their total CES-D scores were high enough that they would have screened positive regardless of the response on the missing item.

*$P < 0.05$; †$P < 0.01$; ‡$P < 0.001$.

factors, depression history, and social support. There was sufficient statistical power to test the logistic regression model according to general applied heuristics (ie, 10 cases per predictor variable).[31] All analyses were conducted using Stata 11.0 statistical software (StataCorp LP, College Station, TX).

RESULTS

Descriptive Analyses

Of the 208 mothers, 59 (28%) screened positive for depression symptoms on the CES-D. Table 1 presents descriptive statistics for the full sample and by CES-D depression status. Overall, study participants were between 21 and 45 years old (mean, 29), mostly high school (30%) or college (50%) educated and not working outside the home (58%). Mothers who screened positive for depression symptoms were less likely to be college educated than mothers who had lower depression scores. Household sizes ranged from 2 to 9 persons (mean, 4); over half of the mothers were not living with the father of their baby. Mothers had between 1 and 8 children (mean, 2), with those who screened positive for depression having slightly more children, on average. More than half of the total sample claimed to have had a previous episode of depression, compared with 86% of those mothers who screened positive for depression symptoms.

On the whole, mothers reported receiving a high level of social support, but mothers who screened positive for depression symptoms reported less social support than mothers whose self-reported depression symptoms did not reach clinical cutoff. More than half of the sample reported a history of depression, with a significantly higher rate among mothers who screened positive for depression symptoms (86% vs 48%).

Cluster Analysis

Based on results of *k*-means cluster analysis, the 2-cluster solution was a more parsimonious solution compared with the 3-cluster solution. The 3-cluster solution had only 2 clusters (1 and 3) that were significantly different on more than 10 items. Furthermore, the pattern of item means for these 2 clusters (1 and 3) did not differ from the pattern of item means for the 2-cluster solution.

One of the clusters of participants who screened positive for depression (n = 10) was distinguished by higher means across depression symptoms. These participants reported worse severity for each endorsed symptom (ie, each symptom occurred more frequently); thus, this group was labeled *high severity*. Table 2 shows that the 2 clusters were significantly ($P < 0.01$) different about their responses to each of the following CES-D items: poor appetite, feeling blue, feeling depressed, being restless, talking less than usual, feeling lonely, perceiving others as unfriendly, having crying spells, feeling sad, and feeling disliked.

Risk Factors for Symptom Severity

Results of a logistic regression model predicting mothers' membership in the high-severity cluster are presented in Table 3. These results indicate that the significant risk factors for high symptom severity were being employed and having less social support. Of the mothers who screened positive for depression, those who were employed were 7 times more likely to fall into the high-severity cluster as those who were not employed. However, having more social support slightly reduced mothers' odds of being classified with high symptom severity. None of the other psychosocial factors were significantly associated with cluster membership, although the odds ratio for mothers with

TABLE 3. Psychosocial Predictors of Severe Depression Symptoms for African American Mothers With Positive Depression Screen

	High Severity Odds Ratio	95% Confidence Interval	P
Education			
High school/GED or less	1	1–1	
At least some college	0.88	0.11–7.26	0.91
Employment			
Not employed	1	1–1	
Employed	7.49	0.98–57.54	0.05
No. biological children	1.19	0.60–2.38	0.61
Partner residence			
Nonresident	1	1–1	
Resident	0.95	0.11–8.43	0.97
Personal depression history			
No history	1	1–1	
Previous episode	2.71	0.19–38.04	0.46
Social support	0.89	0.82–0.97	0.01

previous depression episodes falling into the high symptom severity group was large.

DISCUSSION

This study of African American mothers replicates earlier findings of higher risk of depression symptoms among minority women,[3,21] as almost a third of our sample screened positive for depression symptoms. Cluster analyses yielded 2 groups of African American mothers with depressive symptoms differentiated by symptom severity. Mothers who were employed and lacked social support were significantly more likely to fall into the more severely depressed group.

These analyses, unlike factor analyses cited earlier, did not find clusters of mothers distinguished by symptom type (i.e., mood, somatic, etc). The lack of evidence in support of differentiation by symptom type is relevant because of the literature suggesting somatic symptoms are more commonly reported among depressed African Americans.[11] The heterogeneity in symptoms found in this study calls for clinicians to be aware of all depression symptoms among patients with a similar racial/ethnic backgrounds, rather than looking for specific, potentially stereotypical symptoms as cues.

Demonstrating 2 clusters based on symptom severity is significant because different degrees of severity have been found to have differential impacts on child health and development[32] and on family functioning.[14] Moreover, the findings of Yonkers and colleagues suggest that higher depression scores at 3 weeks postpartum increase the likelihood of persistent and clinically significant symptoms 2 weeks later.[21] Whether high symptom severity later in the postpartum period studied herein indicates chronicity of symptoms is an important question for future research.

There are several possible explanations for why employment acts as a risk factor belonging to the severe symptom cluster. One theory is that paid employment for the mother during her infant's first year can be egodystonic. The role expectations for mothers in the workforce can create emotional conflict or distress, as women balance their role as mother with their need to work. Employed mothers may have more invested in their work identity than nonemployed mothers, which may also create greater demands for emotional and structural adjustment postpartum.

The importance of social support has been consistently reported in the literature on maternal depression,[33] particularly among inner-city minority women.[21,23–25] Our findings extend this literature in 2 important ways. First, we found that lack of social support is indeed a risk factor for depression symptoms and, moreover, that lower levels of social support are associated with women experiencing more severe symptoms. Second, we found that the protective quality of social support was the instrumental support from friends and family (captured by the Personal Resources Questionnaire), rather than the presence of a spouse or partner at home. This finding further underscores the need for clinicians to ask pregnant women and mothers of young children about their sources and quality of social support to monitor those at risk for depression and potentially prevent the onset or progression of depression if additional support can be garnered. It also suggests that treatment success may be measured by reduction or prevention of symptom severity, and not only complete symptom remission.

Although this study makes important strides in understanding maternal depression symptoms among African American women, it has several limitations. First, it is cross-sectional, which precludes the examination of the course of depression symptoms or exploration of the potential causal relationship between psychosocial factors and depression manifestations. It may be that mothers in the cluster with more severe symptoms had also experienced longer bouts of depression, and it may actually be this chronicity that is associated with employment and social support. Future longitudinal research is necessary to examine the interplay of symptom severity and timing. Second, although the rate of positive screens for depression in this sample was comparable with other reports,[34] the subsample of mothers screening positive was too small to examine additional psychosocial risk factors. Finally, this study is also limited by its reliance on self-report of psychological symptoms and all psychosocial variables. As with all community-based studies that use survey tools, this methodology is vulnerable to biases inherent in self-reporting.

Conclusions and Implications

Researchers, pediatricians, and obstetricians working with African American mothers should screen for social support, with the understanding that those with low levels may be at increased risk for severe depression symptoms. Furthermore, these results, with results from other studies that include different populations, can inform treatment studies; it may be that groups of individuals with distinct symptom clusters also have differential responses to treatment. Furthermore, prevention research that focuses on reducing symptom severity by enhancing social support may uncover favorable impacts on the family and on child development in particular.

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