

# Factors associated with antenatal depression in pregnant Korean females: the effect of bipolarity on depressive symptoms

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**Background:** This cross-sectional study sought to identify factors associated with antenatal depression in pregnant Korean females, including sociodemographic parameters, social support, social conflict, and bipolarity.

**Methods:** Eighty-four pregnant women were recruited to complete questionnaires on sociodemographic factors, obstetric history, depressive symptoms, and bipolarity. Depressive symptoms were assessed using the Korean version of the Edinburgh Postnatal Depression Scale. Bipolarity was assessed using the Korean version of the Mood Disorder Questionnaire.

**Results:** Nineteen participants (22.6%) had positive Mood Disorder Questionnaire scores, suggesting the presence of bipolarity, and were significantly more likely to score high on the Edinburgh Postnatal Depression Scale. Antenatal depression was associated with bad marital communication and marital dissatisfaction.

**Conclusion:** These results suggest that spousal interactions play a significant role in antenatal depression, and pregnant women with bipolarity may be more depressed than those without bipolarity.

**Keywords:** antenatal depression, bipolarity, pregnancy, Korea

## Introduction

Pregnancy is associated with many psychological, physical, and hormonal changes, during which women are vulnerable to psychiatric illness, particularly depression. Major depressive disorder is found in 8%–12% of all pregnant women, and clinically significant depressive symptoms that do not meet the criteria for major depressive disorder are present in about 20%.<sup>1</sup>

Antenatal depression, ie, depression during pregnancy, can increase the incidence of other psychopathologies. Women with antenatal depression have a 6.5-fold increased risk of postpartum depression,<sup>2</sup> and about one half of women with depressed mood during pregnancy also experience depressed mood postpartum, with about one third of cases of postnatal depression starting during pregnancy.<sup>3,4</sup>

Untreated antenatal depression has adverse outcomes for both the fetus and mother. Complications of antenatal depression include inadequate weight gain, increase in substance abuse, lack of prenatal care, low infant birth weight, decreased Apgar scores, decreased fetal head circumference, and premature birth.<sup>5–7</sup> Antenatal depression may also negatively affect the emotional and cognitive development of the fetus.<sup>8</sup> A longitudinal study demonstrated that children of mothers who were depressed during pregnancy were more likely to be difficult to soothe as babies and to be hyperactive by 4 years of age.<sup>9</sup> Because antenatal depression has these unfavorable outcomes,

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it must be identified and treated. Despite the potential clinical impact of antenatal depression, the majority of recent studies have focused on postpartum depression, with few addressing antenatal depression.

In addition, multiple studies have investigated the relationship between postpartum depression and bipolarity, but few have addressed the relationship between antenatal depression and bipolarity. Given that bipolar disorder usually begins in adolescence or early adulthood, women are at risk of having mood episodes throughout the reproductive years.<sup>9</sup> Studies have found that approximately 9.6%–20.4% of women in nonclinical populations have manic symptoms immediately following delivery.<sup>10</sup> The issue of whether bipolar illness improves during pregnancy is controversial; however, pregnancy is not protective for all women with bipolar disorder.<sup>11</sup> Women with bipolar disorder are at high risk for symptom exacerbation during the immediate postpartum period, as indicated by a nearly seven-fold higher risk of admission for a first episode and a nearly two-fold higher risk for a recurrent episode in puerperal women, compared with nonpostpartum and nonpregnant women.<sup>11</sup>

Identification of factors associated with antenatal depression would facilitate its prevention and management. Therefore, the purpose of this study was to identify factors associated with antenatal depression, including sociodemographic parameters, social support, social conflicts, and bipolarity.

## Materials and methods

### Participants and assessment methods

During the 12-month study period between May 2011 and April 2012, pregnant women without a lifetime history of psychiatric illness, including depressive disorder, were recruited consecutively from two obstetrics clinics and the obstetrics department of a single hospital in Jeju, Korea. All were assessed for lifetime psychiatric diagnosis using a semistructured interview composed of various screening checklists. Some of the women were excluded from the study on the basis of their psychiatric screening. All subjects gave their informed consent to participate in this study after the procedure had been fully explained to them. Ninety pregnant women were initially willing to participate, but six candidates refused to complete the self-report questionnaire, leaving 84 enrolled subjects.

The study participants completed a questionnaire regarding their sociodemographic and clinical characteristics, including data on age, duration of education, religious practices, household income, employment status, subjective socioeconomic

status, obstetric history, communication with their partner, relationship satisfaction, family history of psychiatric illness, and any current obstetric or medical problems.

Depressive symptoms were assessed using the Korean version of the Edinburgh Postnatal Depression Scale (EPDS).<sup>12</sup> The EPDS screening is sensitive and specific for postnatal depression, and has been validated for use in the antenatal setting.<sup>13</sup> The EPDS is a self-report instrument composed of ten items rated on a four-point scale screening for depressed mood, anhedonia, guilt, anxiety, and suicidal ideation. A high score indicates increased depressive symptoms within the previous 7 days, and the cutoff point of EPDS to detect depression among pregnant females is a score of 9/10 based on a previous validation study in pregnant Korean females.<sup>12</sup>

Bipolarity was assessed using the Korean version of the Mood Disorder Questionnaire (K-MDQ), which is a three-part, self-report questionnaire that screens for a lifetime history of manic or hypomanic episodes.<sup>14</sup> Part 1 is composed of 13 “yes” or “no” questions regarding manic symptoms. Part 2 determines whether multiple manic symptoms are experienced simultaneously. Part 3 assesses the degree of functional impairment. Typically, a positive K-MDQ result is defined as a score of at least 7 (7 positive symptoms) with symptoms that co-occur in the setting of moderate or severe functional impairment (sensitivity 0.28, specificity 0.97).<sup>15</sup> Recently, it has been suggested that the K-MDQ cutoff should be a score of  $\geq 7$  regardless of the results of the supplementary questions (parts 2 and 3).<sup>16</sup> The alternative scoring algorithm has excellent sensitivity (89%) and specificity (84%).<sup>16</sup> In this study, we defined a positive K-MDQ screen as a minimum of 7 of 13 co-occurring symptoms.

Social support and social conflicts were assessed using the Korean version of a social support and social undermining scale, consisting of two subscales with six social support items and five social undermining items. This scale was developed by Abbey et al<sup>17</sup> and the Korean version was adapted by Yoo and Kwon.<sup>18</sup> The social support and undermining scale was used to measure participants' perception of social support and social undermining by significant others. Participants were asked to indicate responses on five-point Likert scales. Higher scores indicated more social support and a greater degree of social undermining. The study was approved by the institutional review board of the Jeju National University Hospital.

### Data analysis

Descriptive statistics were used to summarize participant characteristics. For categorical variables, the significance

of differences in EPDS scores between groups was determined using the independent Student's *t*-test and differences among groups by one-way analysis of variance. Correlations between EPDS scores and social support or social conflict were evaluated using Pearson's correlation coefficient. Multivariate regression analysis was used to identify factors associated with antenatal depression. Factor analysis was conducted using a principal axis factor analysis with varimax rotation. All statistical analyses were performed using Statistical Package for the Social Sciences version 18.0 software (SPSS Inc., Chicago, IL, USA), and statistical significance was determined using an alpha level of 0.05 (two-tailed tests).

## Results

As shown in Table 1, the study comprised 84 pregnant women of mean age  $30.6 \pm 4.0$  years with a mean gestational age of  $30.1 \pm 4.4$  weeks. All were married and lived with their partner. The sociodemographic and obstetric characteristics of the study participants are shown in Table 1. Most of the women were educated beyond college level (73.8%), had a monthly household income of <2 million won (51.2%), planned their current pregnancy (83.3%), did not have a family history of psychiatric illness (95.2%), and had no current obstetric or medical problems (94.0%). None of the participants abused substances such as alcohol, tobacco, or drugs during pregnancy. The majority (78.6%) reported being of middle socioeconomic status. The rate of unemployment was 16.7%. More than half of the participants were multiparous. Spousal communication was reported as "good" by 45.2% of women and "bad" by 15.5%. Marital satisfaction was reported by 31% of women, with 17.9% reporting being dissatisfied with their marriage.

There were no significant differences in likelihood of antenatal depression, determined by EPDS scores, arising from age, education, religious practices, socioeconomic status, monthly household income, employment status, gestational age, parity, pregnancy intention, family history of psychiatric illness, and current obstetric or medical problems. However, there were significant relationships between antenatal depression, spousal communication, and marital satisfaction (Table 2), indicating that spousal interactions play a greater role in antenatal depression than sociodemographic and obstetric variables. EPDS scores had a significant negative correlation with social support and a positive correlation with social conflict (Table 3).

Nineteen participants (22.6%) had positive K-MDQ scores, suggesting the presence of bipolarity, and

**Table 1** Sociodemographic and obstetric characteristics of participants (n=84)

Characteristics	n (%)
Age, years	
<30	35 (41.7)
30–34	34 (40.5)
≥35	15 (17.9)
Education level	
≤ High school	22 (26.2)
≥ College	62 (73.8)
Religious practices	
No	48 (57.1)
Yes	35 (41.7)
Socioeconomic status	
High	3 (3.6)
Middle	66 (78.6)
Low	14 (16.7)
Monthly household income (10,000 won)	
<200	43 (51.2)
200–399	33 (39.3)
≥400	8 (9.5)
Employment status	
Employed	70 (83.3)
Unemployed	14 (16.7)
Communication with spouse	
Good	38 (45.2)
Moderate	33 (39.3)
Bad	13 (15.5)
Marital satisfaction	
Satisfied	26 (31.0)
Medium	43 (51.2)
Dissatisfied	15 (17.9)
Gestational age	
<30 weeks	47 (56.0)
≥30 weeks	37 (44.0)
Parity	
Primiparous	40 (47.6)
Multiparous	44 (52.4)
Planned pregnancy	
Yes	70 (83.3)
No	14 (16.7)
Family history of psychiatric illness	
No	80 (95.2)
Yes	4 (4.8)
Current obstetric or medical problems	
No	79 (94.0)
Yes	5 (6.0)

K-MDQ-positive subjects were significantly more likely to score high on the EPDS (Table 4). In factor analysis of the K-MDQ, three factors were found to account for 56.9% of the total variance. Factor 1 with the highest eigenvalue (36.08%) included "more energy", "more activity", "more self-confidence", "more socially minded or outgoing", and "more talkative", which are all energetic behavioral symptoms of mania (Table 5). The multiple regression model showed that social conflict and positive K-MDQ scores were

**Table 2** Differences in EPDS scores according to sociodemographic and obstetric characteristics

Characteristics	EPDS scores	
	Mean (SD)	P-value
Age, years		0.193
<30	6.8 (3.2)	
30–34	8.2 (3.2)	
≥35	7.3 (2.2)	
Education level		0.114
≤ High school	8.3 (4.1)	
≥ College	7.1 (2.6)	
Religious practices		0.844
None	7.5 (3.1)	
Christian	7.3 (3.1)	
Socioeconomic status		0.719
High	5.7 (2.1)	
Middle	7.2 (3.0)	
Low	8.9 (3.3)	
Monthly household income (10,000 won)		0.904
<200	7.5 (3.2)	
200–399	7.2 (2.8)	
≥400	7.6 (3.9)	
Employment status		0.184
Employed	7.6 (3.1)	
Unemployed	6.4 (2.7)	
Communication with spouse		0.027*
Good	6.5 (2.7)	
Moderate	7.9 (3.1)	
Bad	8.9 (3.4)	
Marital satisfaction		0.012*
Satisfied	6.7 (2.7)	
Medium	7.2 (2.8)	
Dissatisfied	9.5 (3.7)	
Gestational age		0.769
<30 weeks	7.3 (2.9)	
≥30 weeks	7.5 (3.3)	
Parity		0.519
Primiparous	7.2 (2.9)	
Multiparous	7.6 (3.3)	
Planned pregnancy		0.705
Yes	7.5 (3.1)	
No	7.1 (3.3)	
Family history of psychiatric illness		0.200
No	7.6 (3.1)	
Yes	5.5 (2.1)	
Current obstetric/medical problems		0.316
No	7.5 (3.1)	
Yes	6.0 (2.9)	

**Note:** \*Statistically significant.

**Abbreviations:** EPDS, Edinburgh Postnatal Depression Scale; SD, standard deviation.

**Table 3** Correlations between EPDS scores and social support or social conflict

	EPDS scores	
	r	P-value
Social support	-0.347	0.001*
Social conflict	0.472	<0.001*

**Note:** \*Statistically significant.

**Abbreviations:** r, correlation coefficient; EPDS, Edinburgh Postnatal Depression Scale.

**Table 4** Difference of EPDS scores according to K-MDQ

	EPDS scores	
	Mean (SD)	P-value
K-MDQ		0.001*
Positive (n=19)	9.4 (3.9)	
Negative (n=65)	6.9 (2.5)	

**Note:** \*Statistically significant.

**Abbreviations:** EPDS, Edinburgh Postnatal Depression Scale; K-MDQ, Korean version of the Mood Disorder Questionnaire; SD, standard deviation.

significantly correlated with high EPDS scores (Table 6). The model predicted 41% of EPDS scores.

## Discussion

This study investigated factors associated with antenatal depression, including bipolarity. There was a positive correlation between poor spousal communication, marital dissatisfaction, and high EPDS scores (depression). The severity of antenatal depression was not significantly different according to education, religious practices, subjective socioeconomic status, household income, employment status, gestational age, parity, or pregnancy intention. These results suggest that the relationship with a partner is more influential in antenatal depression than are sociodemographic or obstetric factors. Significant correlations were also found between EPDS score and social support/conflict. In other words, the degree of antenatal depression is associated with social support and conflict.

Previous studies have demonstrated a link between a poor relationship with a partner, lack of social support, including by the partner, and antenatal depression.<sup>1,4</sup> The results of these earlier studies are consistent with our present findings, and suggest that pregnant women regard their partner

**Table 5** Factor analysis of K-MDQ

K-MDQ item	Factor 1	Factor 2	Factor 3
More energy	0.823		
More active	0.776		
More self-confident	0.685		
More social or outgoing	0.673		
More talkative	0.646		
Felt so good or hyper		0.739	
So irritable		0.721	
Less sleep		0.659	
Excessive, foolish, or risky			0.737
Easily distracted			0.647
Spending money			0.546
More interested in sex			0.544
Thoughts raced			0.519
Eigenvalue	4.69	1.50	1.21
Total variance explained	36.08%	11.52%	9.29%

**Abbreviation:** K-MDQ, Korean version of the Mood Disorder Questionnaire.

**Table 6** Factors predicting EPDS scores

Characteristics	EPDS scores ( $R^2=0.410$ )		
	$\beta$	t	P-value
Age, years	0.146	1.524	0.132
Social support	-0.187	0.104	0.067
Social conflict	0.307	3.332	0.004*
K-MDQ (reference negative)			
Positive	0.305	2.609	0.003*
Communication with spouse (reference good)			
Moderate	0.788	0.712	0.918
Bad	1.105	0.670	0.820
Marital satisfaction (reference satisfied)			
Medium	0.772	-0.013	0.339
Dissatisfied	1.173	0.048	0.210

**Note:** \*Statistically significant.

**Abbreviations:**  $\beta$ , beta coefficient; EPDS, Edinburgh Postnatal Depression Scale; K-MDQ, Korean version of the Mood Disorder Questionnaire.

as an important source of emotional support.<sup>1</sup> Partners are usually required to participate in the pregnancy as well as childbirth, and to take part in the preparations for birthing and the early life of the infant. During this time, the partner is an important assistant and provides support for the pregnant woman.

Social support, including from the partner, may shield pregnant women from stressors.<sup>19</sup> Women undergo constant changes during pregnancy, childbirth, and motherhood, making this a psychologically vulnerable time. Therefore, some pregnant women may experience extreme stress and emotional distress. Emotional support from the significant people in their lives might improve their ability to cope with these stressors. From a biological perspective, emotional distress may cause functional abnormalities in neural pathways.<sup>1</sup> Emotional support might normalize the brain alterations involved in the pathologic process of antenatal depression.<sup>20</sup>

In a review article by Lancaster et al factors associated with antenatal depression were prenatal anxiety, stressful negative life events, overall life events, history of depressive disease, lack of support from the partner, lack of social support, unwanted pregnancy, and quality of the relationship with the partner.<sup>21</sup> However, routine daily stress, socioeconomic status, unemployment, abuse of illegal substances, and obstetric history were not related to antenatal depression.<sup>21</sup> Excluding unwanted pregnancy, our results were similar. In the review by Lancaster et al whether or not the pregnancy was planned was unrelated to antenatal depression in some of the studies reviewed, whereas in others, unplanned pregnancy showed a medium correlation with depressive symptoms in a bivariate analysis.<sup>21</sup> Awareness by clinicians of the factors associated with antenatal depression

would allow identification of women at risk of depression, facilitating early intervention.

Pregnancy and childbirth trigger many psychological, physical, and hormonal changes, and the risk of onset of a mood disorder and relapse is increased, especially during the perinatal period. The prevalence of major depressive disorder during pregnancy and the postpartum period ranges from 5.5% to 33.1%.<sup>22</sup> In the general population, 10%–15% of women experience postpartum depression after delivery. In a study of 2,252 pregnant women, 23% of those with bipolar disorder relapsed during pregnancy, and 52% of bipolar women relapsed during the postpartum period.<sup>22</sup> In women with a prior diagnosis of major depressive disorder, a 4.6% and 30.0% relapse rate was observed during pregnancy and postpartum period, respectively.<sup>23</sup> In a recent study of 120,378 women diagnosed with any type of psychiatric disorder (excluding bipolar affective disorder) during their first psychiatric contact, 3,062 had an inpatient or outpatient diagnosis of bipolar affective disorder at a later time point.<sup>24</sup> Approximately 14% of women whose first psychiatric contact was during the first postpartum month received a bipolar diagnosis within 15 years, compared with 4% of women with a first psychiatric contact not related to childbirth. A psychiatric episode in the immediate postpartum period significantly predicted conversion to bipolar affective disorder during the 15-year follow-up period.<sup>24</sup> This result indicates that presentation of a psychiatric disorder in the postpartum period is likely to be an early manifestation of bipolar affective disorder.

Psychiatric disorders that occur during the postpartum period may be a marker of underlying bipolar illness, but the majority of women are diagnosed with a psychiatric illness other than bipolar disorder.



Therefore, accurate diagnosis of bipolar disorder is often delayed. Most of the earlier studies were limited to the postpartum period. However, awareness by clinicians of the features of bipolarity during pregnancy (not only during the postpartum period) would facilitate diagnosis of bipolar disorder during pregnancy because some patients may experience onset of symptoms antenatally, which are exacerbated after delivery.<sup>24</sup>

The present study was the first to investigate the association between bipolarity and antenatal depression in women without a lifetime history of psychiatric disorders in Korea. The 19 K-MDQ-positive participants (22.6%) also had significantly higher EPDS scores. In other words, K-MDQ-positive participants were more depressed than K-MDQ-negative participants. This implies that pregnant women with features of bipolarity have more severe depressive symptoms. In a multivariate regression model, K-MDQ score and social conflict were associated with antenatal depression. The presentation of bipolar depression can range from a major depressive episode of mild intensity to a severe one.<sup>25</sup> In one paper, severe depression was considered to be a specific feature of bipolar disorder, with the author suggesting that part of the severity comes from the bipolarity itself.<sup>25</sup>

An accurate diagnosis of bipolar disorder is often delayed because it is commonly misdiagnosed as unipolar major depressive disorder.<sup>16</sup> Mood disorders during pregnancy, including both bipolar disorder and unipolar depressive disorder, will present with depressive symptoms.<sup>23</sup> The present study indicates that although both disorders present with depressive symptoms, severely depressed pregnant women may also have features of bipolarity. Therefore, bipolar disorder should be considered in women with antenatal depression, and clinicians should remain open to the possibility of bipolar disorder to ensure accurate diagnosis and treatment.

There are several limitations to this study. First, it was comprised of a small sample of women from several clinics at a specific location and may not be representative of the general pregnant population in Korea. Jeju-do is an island far from mainland South Korea, which may have affected our results. Subjects volunteered to participate in this study, so the study findings may not be representative of all pregnant women. Second, the study used self-report questionnaires rather than specific diagnostic criteria by an expert. Therefore, self-report bias might have influenced the results. For example, a woman who is depressed during pregnancy may be more likely to perceive a lack of social or partner support. Third, we did not evaluate health-related factors that may have influenced mood stability, such as exercise, sleep, body

mass index, and food intake. A further concern is that we did not evaluate the association between trimester and depressive symptoms. Finally, the cross-sectional nature of the study design limits the interpretation of its results. Our findings should be considered preliminary, and future longitudinal studies are needed to investigate the accuracy of diagnosis and course of bipolarity in K-MDQ-positive subjects.

## Conclusion

Factors associated with antenatal depression include lack of social support, social conflict, marital satisfaction, spousal communication, and bipolarity. Pregnant women with bipolarity were more depressed than those without bipolarity. Bipolar disorder should be considered in pregnant women with depression. Physicians should be aware of factors associated with antenatal depression to provide effective management.

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## Disclosure

The authors report no conflicts of interest in this work.

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