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Major depressive disorder during pregnancy and emotional attachment to the fetus

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Abstract

While there is good evidence that depression negatively impacts mother-to-infant emotional attachment in the postpartum period, the impact of depression in pregnancy on maternal emotions and cognitions about the fetus (often termed “maternal–fetal attachment” or MFA) is unclear. This study compared MFA scores from women meeting clinical criteria for Major Depressive Disorder (MDD) with scores from nondepressed women. Participants were 161 women enrolled at 23–36 weeks gestation, of whom 65 met criteria for MDD via the Structured Clinical Interview for the DSM-IV-TR during their second and/or third trimesters. Cranley’s Maternal Fetal Attachment Scale was administered at 26 and 36 weeks gestation. Generalized linear modeling was used to assess the effect of MDD, anxiety, and antidepressant use on MFA. MDD was negatively related to MFA (LR)=4.58, df=1, $p<0.04$). Neither anxiety (LR=0.22, $p<0.64$), nor antidepressant use (LR=0.20, df=1, $p<0.66$) were related to MFA. Depression severity was negatively related to MFAS scores ($B=-0.005$, SE=.002, $p<0.0012$) when including the interaction of MDD group and HRSD scores in the model. This study is the first to demonstrate that clinically defined MDD during pregnancy negatively impacts MFA, suggesting that the basis for poor mother-to-infant attachment in postpartum MDD may have roots in pregnancy.

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Keywords

Depression; Pregnancy; Mother–infant relationship

Introduction

Maternal–fetal attachment is a term that has been used to describe the emotional connection a woman develops with her fetus during pregnancy, expressed in feelings, cognitions, and behaviors (Salisbury et al. 2003). Establishing an emotional connection to the fetus is considered an important part of the process of identification with the maternal role (Mercer 2004). Since its initial description, self-report measures have been developed to examine maternal–fetal attachment (MFA) by asking women about their thoughts and feelings toward their unborn baby as well as behaviors that indicate changes in lifestyle to promote health of the fetus (Condon 1993; Cranley 1981; Muller 1993). Particular thoughts, feelings, and behaviors toward the fetus are common among pregnant women, though there is a wide degree of variability in the extent to which they are experienced (Leifer 1977; Cranley 1981). There is evidence for MFA to increase over the course of pregnancy (Grace 1989), and that attachment to the fetus in the antenatal period may lay the groundwork for the mother-to-infant relationship in the postpartum period (Siddiqui and Hagglof 2000; Muller 1993; Fuller 1990). It is well known that the early mother–infant relationship can influence future social, emotional, and cognitive development in the child (Ainsworth 1979; Ranson and Urichuk 2008). Therefore, it is important to increase our understanding of prenatal attachment, factors that influence it, and its association to the mother–infant relationship in the postpartum period. The purpose of this study is to examine one important question within these overall goals: to determine whether antenatal Major Depressive Disorder (MDD) has an impact on MFA.

Major Depressive Disorder is a significant public health problem in the United States, and perinatal MDD is a particular concern. It is estimated that 6.8%–12.9% of women experience MDD during pregnancy and/or the postpartum period (Gavin et al., 2005). Women diagnosed with MDD during pregnancy are more likely to have postpartum MDD (Josefsson et al. 2001; Steer et al. 1992). Mothers with higher levels of depression tend to interact differently with their infants than their nondepressed counterparts; specifically, by showing less behavioral synchrony with their infants, being less responsive to their infants' cues, and less affirming of their infants' behavior (Field et al. 1990; Murray et al. 1996). Depressed women are also less likely to feel confident in the mothering role (Fowles 1998). Infants of depressed mothers, in turn, are more likely to display insecure attachment relationships (Teti et al. 1995; Herring and Kaslow 2002; Murray et al. 1996). It has been proposed that increased depressive symptoms in the peripartum period may negatively impact women's internal attachment model and view of relationships (Scharfe 2007). Because maternal depression clearly impacts mother–infant relations in the postnatal period, it is plausible that depression during pregnancy could affect maternal–fetal attachment as well.

Published literature on the association between MFA and prenatal depression has been inconsistent and thus the nature of the association remains unclear. Discrepant findings across studies may be related to methodological issues, including limitations in how depression is assessed. Specifically, the majority of studies have used cross-sectional designs with a single administration of a self-report depression severity scale to establish depression during pregnancy, rather than a more in-depth diagnostic assessment of a woman's depression status. In some studies, depressive symptoms have predicted lower levels of MFA (Brandon et al. 2008; Mercer et al. 1988; Condon and Corkindale 1997).

However, others only found significant relationships between MFA and depression when control< ling for demographic characteristics (Lindgren 2001), when using one MFA scale but not another (Kunkel and Doan 2003), or during the second trimester, but not the first (Honjo et al. 2003). Hart and McMahon (2006) failed to find any significant correlation between depression and MFA. More recently, Yarcheski et al. (2009) performed a meta-analysis of predictors of MFA, including 15 empirical studies examining the relation between depression and MFA. Results of the meta-analysis indicated that although depression was found to be a predictor of MFA, the effect size was low. However, to date, no study has investigated the relationship between clinically diagnosed MDD and MFA. Because a diagnosis of MDD requires that a woman's symptoms meet a threshold of severity for a certain duration of time, it is likely to yield a more stable and reliable account of the woman's depression status, com< pared to self-report depression measures that reflect a shorter period of time, and which can sometimes be affected by under- or overreporting of symptoms. Although women who meet criteria for an MDD diagnosis will still experience episodic changes in symptoms over the course of the pregnancy, it is likely that interviewer-assessed MDD diagnosis represents a more useful construct than a single self-report symptom assessment when examining the association of depression to MFA.

To our knowledge, this is the first study to determine whether pregnant women clinically diagnosed with MDD differ from nondepressed women in their level of MFA. In addition, we also include an examination of the association between severity of depression at multiple time points and MFA. We hypothesized that pregnant women with a MDD diagnosis will show lower levels of MFA than pregnant women without an MDD diagnosis and that increased severity of depressive symptoms will be negatively correlated with MFA.

Methods

Participants

Between 2002 and 2007, expectant mothers were recruited by informational flyers from community obstetrician offices, clinics, and mental health practices through a university-affiliated teaching hospital in Providence, RI. All participating mothers provided informed consent as approved by the hospital's Institutional Review Board. Women were enrolled if they were between the ages of 18 and 40, 23 to 36 weeks of gestation with a healthy, singleton pregnancy, no known fetal abnormalities, no bipolar or psychotic disorders (confirmed with clinical interview), no reported illicit drug use, hypertension or diabetes, alcohol use less than 0.5 drinks per day, no binge drinking and smoking fewer than ten cigarettes per day during the pregnancy based on semistructured interviews. Of the 189 women enrolled in the study, 161 (85.2%) continued to meet eligibility criteria through the infants' birth and completed study measures detailed below.

Procedures

Pregnant women were interviewed in our research offices at two occasions during their pregnancy: between 26 and 28 weeks gestation, and between 36 and 38 weeks gestation. We used a standard semistructured diagnostic interview to determine past and present psychiatric diagnoses. Additional interview-based and self-report measures (listed below) were also completed at these visits.

Measures

The measures used in this study included the Structured Clinical Interview for the DSM-IV (SCID-I/NP), (First et al. 2002) the Timeline Follow Back interview (TLFB), (Sobell et al. 1996) the Hamilton Rating Scale for Depression (HRSD) (Hamilton 1960) the Maternal Fetal Attachment Scale (MFAS) (Cranley 1981), and the Hollingshead Four Factor Index of

Social Status (Hollingshead 1975). All measures, except for the Hollingshead Index, were administered at both study assessment points.

The SCID-I/NP is a widely used semistructured interview composed of nine modules, seven of which assess for current and lifetime occurrences of major Axis I psychiatric diagnoses according to DSM-IV criteria.

The TLFB interview (Sobell et al. 1996) is a calendar-based semistructured interview used to measure drug and alcohol use as well as medication adherence (Ingersoll et al. 2004; Ingersoll et al. 2011). The TLFB has excellent psychometrics across clinical and nonclinical populations (Sobell et al. 2001) as well as pregnant women (Dum et al. 2009) and was used in this study to obtain the type and timing of treatment for MDD (pharmacological and non-medication treatments) in addition to caffeine, tobacco, and alcohol use over pregnancy.

The HRSD is a widely used clinician-rated measurement composed of 17 items used to assess severity of depression in adults. Scores on the HRSD range from zero to 63, with greater than 25 indicating levels of severe depression, 18 to 24 moderate, eight to 17 mild, and seven or less indicating no depression.

The MFAS is a self-report measure composed of 24 statements intended to measure the extent to which pregnant women engage in behaviors that reflect a connection or affiliation with their unborn child. Each statement is followed by five response options ranging from “Definitely Yes” to “Definitely No.” Responses are scored from one to five points, with five points representing an optimal response, for a maximum score of 120. Aspects of the relationship between mother and fetus on the original MFAS scale were designated into to five subscales: (1) differentiation of self from the fetus, (2) interaction with the fetus, (3) attributing characteristics and intentions to the fetus, (4) giving of self and (5) role-taking. The MFAS authors reported the reliability for the overall MFAS scale to be 0.85, with reliability for the five individual subscales ranging from 0.52 to 0.73 (Cranley 1981).

The Hollingshead Index of Social Status (SES) interview was conducted to calculate the Hollingshead Four Factor SES Index (Gottfried 1985) from measures of income, living conditions, education, and occupation. Low SES was defined as Hollingshead index of four or five.

Data analysis

Independent variables: diagnosis, antidepressant treatment, and depression severity—SCID-derived diagnoses were used to establish group categorization for the primary binomial independent variable of the MDD group. Women were included in the MDD group (*N*=65) if they met MDD criteria for at least 2 weeks in the second or third trimester of this pregnancy (13–36 weeks GA; none of the women met MDD criteria in the first trimester alone); women were included in the NonMDD group (*N*=96) if they did not meet MDD criteria at any point during this pregnancy. Due to the high comorbidity of MDD and anxiety disorders, women with a current anxiety disorder diagnosis (generalized anxiety disorder, panic disorder, social phobia, or anxiety not otherwise specified) were included in both MDD groups. Women with a current diagnosis of posttraumatic stress disorder (PTSD) were also included; however, there were no cases of PTSD in the NonMDD group. Women meeting criteria for any other Axis I diagnosis were excluded from the study at enrollment. Therefore, additional independent variables tested in the models include: presence of a current anxiety disorder (None, *N*=123; Current Dx, *N*=38) and current antidepressant medication use (None, *N*=109; Current Antidepressant treatment, *N*=52). See Fig. 1. Secondary analyses tested the relationship between depression severity on the HRSD and MFAS scores.

Dependent variable: maternal–fetal attachment scores—Of the 161 participants, 157 (97.52%) completed the MFAS measure at 26 weeks GA, 123 (76.40%) at 36 weeks GA, and 122 (75.78%) completed the MFAS at both study visits. MFAS total scores in this sample ranged from 2.66 to 4.92. Cronbach's alpha for the entire MFAS scale was 0.79 at 26 weeks and 0.82 at 36 weeks, suggesting good internal consistency for this measure. However, consistent with the findings of several other authors (Cranley 1992; Muller and Ferketich 1993), alpha reliabilities for the five MFAS subscales originally proposed by Cranley were uniformly low. Therefore, only the total MFAS score was used for this study. Scores of one ("definitely no") to five ("definitely yes") on the individual MFAS items showed varying distributions within the sample, with most skewed toward a score of "five." Spearman rank order correlations were calculated to determine stability of scores from 26 to 36 weeks GA (Table 2). All of the items had significant Spearman *R* values from 26 to 36 weeks GA. Therefore, the average of each item from both the 26-week and 36-week GA assessment was used in subsequent analyses. Scores on one MFAS item (#24, "I grasp my baby's foot through my tummy to move it around") was skewed toward zero, without clear evidence that a reverse score of this item was indicated. Therefore, this item was eliminated from calculation of the total MFAS score, which is an average of all items, with a range of one to five.

Generalized linear models, which are an extension of the classical linear model with specifications for distribution and link functions to allow for both normal and nonnormal distributions in the dependent measures, were used to examine the contribution of each independent variable and their interactions on MFAS scores. Maternal demographic, health and delivery variables have the potential to contribute the MFAS outcomes and were included in the model building process to determine the best fitting model. HRSD scores were also included in secondary models to determine the contribution of depression severity to MFAS scores. The most complete model having the lowest Akaike Criterion Score, indicative of model "goodness of fit", was chosen (see "Results").

Maternal demographics were compared between MDD groups using one-way ANOVA for continuous measures and χ^2 tests of independence for categorical measures using exact methods. All data were analyzed using SPSS Statistics 17.0 (SPSS, Inc., 2008) and Statistica 9.0 (StatSoft, Inc.).

Results

Sample description

Table 1 presents the demographic characteristics of women in the MDD (*n*=65) and NonMDD (*n*=96) groups. In this sample, women with MDD had more children than women without MDD. In addition, more women with MDD than those without MDD were single and experienced pregnancy-related complications (pregnancy-induced hypertension, gestational diabetes, vaginal bleeding, or pre-term labor) during the current pregnancy.

Demographic characteristics and MFAS scores

Variables of maternal age, number of living children, maternal race, SES, presence of pregnancy complications (preterm labor, pregnancy-related medical condition such as hypertension or gestational diabetes), and presence of delivery complications (unplanned C-section, maternal illness related to delivery) were used in the models to determine their effect on MFAS scores. Optimal AIC criterion scores were achieved with maternal age, number of living children, and maternal race included in the model.

The distribution of the total MFAS scores is presented in Fig. 2. The distribution was slightly skewed toward more optimal scores; therefore, a gamma distribution with a log link was used for the GLZ models.

Maternal age was negatively related to total MFAS score (B=−0.019, SE=0.007, p<0.003). Number of living children and maternal race were not significantly related to total MFAS scores (p's>0.20).

Main effects—There were no significant effects for SRI use on MFAS total score (Likelihood Ratio Chi Square (LR-χ^2)=0.20, df=1, p< 0.66) and removal of SRI use as a factor improved the AIC criterion score (221.27 vs. 214.04). Therefore, only the independent variables of MDD and Anxiety (ANX) were tested in subsequent models with the additional covariates. There was a significant main effect of MDD on total MFAS scores (LR-χ^2=12.76, df=1, p<0.001); however, the main effect of ANX was not significant (LR-χ^2=0.003, df=1, p< 0.96), and the interaction of MDD and ANX was not significant (LR-χ^2=2.96, df=1, p<0.09).

Pairwise comparisons (with sequential Bonferonni corrections for multiple comparisons) of the MFAS estimated marginal means revealed that women in the MDD group had significantly lower total MFAS scores (M(SE)=3.97 (0.06)) than women in the NonMDD group (M(SE)=4.33 (07); Wald χ^2=15.88, df=1, p<0.001).

Depression severity—HRSD scores had high stability across the second and third trimesters with a significant Pearson correlation of 0.75, p< 0.001. Women meeting MDD criteria had higher HRSD scores than women who did not meet MDD criteria in the second trimester (MDD: M(SE)=14.34(0.70); NonMDD M (SE)=3.66(0.54), F(1,154)=190.24, p<0.00001) and the third trimester (MDD: M(SE)=14.300(0.73); NonMDD M (SE)=5.42(0.57), F(1,121)=99.55, p<0.00001). Therefore, the mean of the two HRSD scores was used for analyses. Figure 3 presents the scatterplot of unadjusted average HRSD scores and MFAS scores for the MDD and NonMDD groups. As expected, the range of HRSD scores in the MDD group was higher than the NonMDD group. Although the vast majority of women in the MDD group had at least mild depressive symptoms, 7.69% (N=5) had a mean score below seven. In the NonMDD group, 10.42% (N=10) of the women had an average HRSD score in the mildly depressed range.

The mean HRSD and total MFAS scores were analyzed in GLZ models to examine the relationship between depression severity and MFAS scores while controlling for maternal age, number of living children and maternal race. The interaction term of MDD*HRSD scores was included in the model in addition to the covariates to account for possible relationships due to between-group variance in HRSD scores. There was a significant negative relationship (B=−0.005, SE=0.002, p<0.0012) between HRSD scores and MFAS scores as well as a significant relationship between the interaction of MDD group and HRSD scores and MFAS scores (B=−0.006, SE=0.003, p<0.02). In Fig. 3, this interaction can be seen with the opposing slopes of the fit lines for the nonMDD and MDD groups.

Discussion

This study is the first to examine the relationship between clinically-diagnosed MDD during pregnancy and MFA. Our findings suggest that a clinical diagnosis of MDD is related to significantly lower levels of MFA as measured by Cranley's MFAS scale (1981) across the second and third trimesters. Maternal fetal attachment is likely to be the culmination of a woman's own reflections on pregnancy and motherhood, her enjoyment of pregnancy, excitement about mothering, and hopefulness for the future. It is expressed through specific

behaviors that show care for the fetus' wellbeing even if that requires sacrifices in certain areas of a woman's lifestyle. Although there has been discussion in recent literature as to whether the construct of MFA would be better termed as the maternal–fetal "relationship" (Van den Bergh and Simons 2009) or the beginnings of a "caregiving system" (Walsh 2010) as opposed to "attachment" per se, the basic construct being examined involves the nature of the mother's connection to her unborn child, and how this is expressed behaviorally. In considering the phenomenology of depression, it is not surprising that clinically depressed women experience lower MFA. Anhedonia, worthlessness, decreased energy, sleep disturbances, and hopelessness are cardinal features of MDD in both pregnant and nonpregnant samples (Manber et al. 2008), and women with MDD may lack energy or motivation to carry out lifestyle changes. Strong feelings of worthlessness and guilt, experienced by many depressed individuals, may also make it difficult for depressed pregnant women to feel confident as an expectant mother, or could lead some women to resist conceptualizing themselves in the maternal role entirely, which could in turn affect MFA. Moreover, problems in MFA, if viewed as an early beginning of a caregiving relationship, are also consistent with the clinical picture of depression in that major depressive episodes are frequently marked by disturbances in social functioning across many different types of relationships (Davila et al. 1997; Overbeek et al. 2006; Downey and Coyne 1990) including among perinatal depressed women (Whisman et al. 2011). For these reasons, it is not surprising that women with an MDD diagnosis have decreased MFA. As expected, an inverse relationship was found between increasing severity of depression (i.e., HRSD scores) and decreasing MFA. This suggests that improving a woman's MDD symptoms may potentially also improve MFA. It highlights the clinical importance of screening for depression during pregnancy, as well as the potential benefit of ensuring adequate depression treatment.

A strength of the current study is inclusion of a sample of pregnant women diagnosed with MDD using a structured clinical interview rather than a sample defined as depressed by only symptom elevations on a depression severity scale. Women scoring in the depressed range on self-report scales may in fact meet criteria for MDD (Beck 1998); however, the positive predictive value of a high score on a depression severity scale, in terms of predicting actual depression diagnosis, is often quite limited. For example, a high score on the Edinburgh Postpartum Depression Scale, a commonly used self-report measure in the perinatal period, averages a positive predictive value of only 50% (Matthey 2010). Moreover, scores on depression severity measures can be confounded by pregnancy symptoms that are often similar in nature to depression symptoms (i.e., appetite disturbance, sleep disturbance, decreased energy) and high levels of symptoms present at the time of assessment may be transient (Matthey 2010). Caution must be used in interpreting these scales at a single time point, particularly in a pregnant sample. A clinical diagnosis of MDD requires at least one full Major Depressive Episode, defined as "a period of at least two weeks during which there is either depressed mood or the loss of interest or pleasure in nearly all activities" as well as other clinically significant symptoms (American Psychiatric Association 2000). Our data support the notion that symptom rating scales may merely reflect transient depressive symptoms rather than a true MDD diagnosis; 26.6% of the women who did not meet MDD criteria had mild depressive symptoms on the HRSD on at least one assessment.

Several study limitations should be noted. First, while the MFAS assessment tool has been widely used in studies of maternal–fetal attachment, it has received some criticism in recent years (Doan 2003). For example, some items on the MFAS may be outdated (i.e., separate items asking whether names have been selected for a female child and a male child, when the majority of women now know the gender of the baby through prenatal ultrasounds). In light of these issues, we utilized the total score on the MFAS rather than subscale scores or examination of any individual items; however, use of multiple measures, and perhaps

multimodal assessment strategies of MFA may provide additional benefit in future research. Second, while our sample included a representative range of SES levels, and the racial and ethnic diversity in our sample mirrored the local geographic area, we did observe a relatively high proportion of single mothers in our depressed subsample. Although we did not observe marital status to function as a predictor of MFA in our analyses, it would seem important to further examine the MFA–MDD association in samples with higher proportion of married and partnered women. Finally, in this study we assessed antidepressant usage via self-report only rather than by nonself-report measures (e. g., pharmacy claims, blood assay, et cetera). This strategy may be limited in that the concordance of self-report measures with other methods varies greatly (Garber et al. 2004). Including nonself-report measures would strengthen the findings related to SRI effects on MFAS score.

While the current study clarified the nature of the association between antenatal MDD and MFA, there is much more work to be done in the investigation of MDD and MFA. The importance of MFA is found largely in its relationship to maternal self-care behaviors that promote positive birth outcomes, and ultimately, in its relation to postnatal mother–infant attachment and maternal caregiving behaviors. Thus, a key question for future study will be clarifying the association between antenatal attachment to the fetus and postnatal attachment to the newborn, and the extent to which antenatal and postpartum depression affect the mother's relationship with the baby and her caretaking behaviors. Does low MFA reflect difficulties in the caregiving role, which translate into problems caring for the newborn—or are these antenatal experiences unrelated to problems postnatally? If an association does exist between antenatal MFA and the postnatal maternal–infant relationship, what factors moderate that association? It is plausible that, for some women, unpleasant symptoms and discomforts during pregnancy may contribute to lower MFA; in these cases, the postbirth relationship with the baby may be quite different than that during the pregnancy. For other women, there may be a more consistent pattern in maternal relationship with her child from the antenatal period to postpartum. Several previous studies have indeed found evidence for a relationship between antenatal MFA and postnatal attachment; however, methods used and study findings have been inconsistent (Siddiqui and Hagglof 2000; Muller 1996; Bloom 1995; Fuller 1990), highlighting again the need for more definitive studies. Moreover, none of these studies examined pre- and postnatal attachment in the context of MDD. In light of research suggesting greater likelihood of problems in parent–child interactions among depressed parents, it is important to understand whether these difficulties in the parent–child relationship begin prenatally.

Further, an important area for research is examining whether psychiatric interventions may be effective in increasing MFA, if poor MFA in the prenatal period does indeed adversely affect postnatal outcomes. Previous studies have attempted to intervene to improve MFA in at-risk samples; however, results have been disappointing (Konlak-Griffin and Verzemnieks 1991). Although a significant main effect of SRI treatment was not found in our data, the significant negative relationship between HRSD and MFAS scores suggests that women with MDD could potentially increase their MFA if depressive symptoms were controlled. The importance of adequately detecting and treating antenatal depression has been recognized by many experts in the field (e.g., Bonari et al. 2004; Flynn et al. 2006) as problems in antenatal MFA may represent an additional important reason to prioritize adequate treatment. However, a number of practical and attitudinal barriers limit engagement in depression care (Battle and Salisbury 2010; Flynn et al. 2006). For example, many women have strong reluctance to use SRIs due to concerns regarding impact on fetus (Goodman 2009; O'Mahen and Flynn 2008). Psychosocial treatments may be highly effective in treating antenatal MDD and these treatments may be more acceptable to women; however, other factors may limit engagement in these interventions, such as lack of childcare or insurance. In light of the serious consequences to untreated maternal depression

for mother and child—including apparent disruption in MFA as the initial development of the maternal–child relationship—it is essential to develop effective, acceptable means of identifying and treating depression during pregnancy. For frontline clinicians in OB and primary care settings, it may be particularly important to not only screen for depression symptoms, but also to engage women in a discussion regarding which depression treatment strategies they view to be acceptable and that they would actually pursue. Prescribing antidepressants without assessing the likelihood of women reliably taking the medication could lead to a breakdown in communication and may result in some women not receiving any treatment for their depression.

Although empirically validated treatments do not yet exist to target change in MFA directly, at a minimum it may be useful for clinicians to bear in mind that many depressed pregnant women experience levels of MFA much lower than their nondepressed peers. Such awareness and sensitivity may help counterbalance the comments that pregnant women often receive from others, reflecting the cultural expectation to feel happy, eager to be a parent, and positively connected with their unborn child. Acknowledgment from service providers that not all pregnant women possess a smooth, positive, and strong connection with their unborn child may help create room for candid discussion that could ultimately provide great support for women who are struggling with low MFA and associated guilt, and to assess how their feelings may be shaping their health behaviors during the current pregnancy.

In sum, in a relatively large, longitudinally-assessed sample of depressed and nondepressed pregnant women, we found that women with clinically diagnosed MDD had lower levels of MFA than their nondepressed counterparts. Future studies are needed to further clarify the nature of this relationship, examine the impact of depression treatment on MFA, as well as the postnatal consequences of lower prenatal attachment in depressed women.

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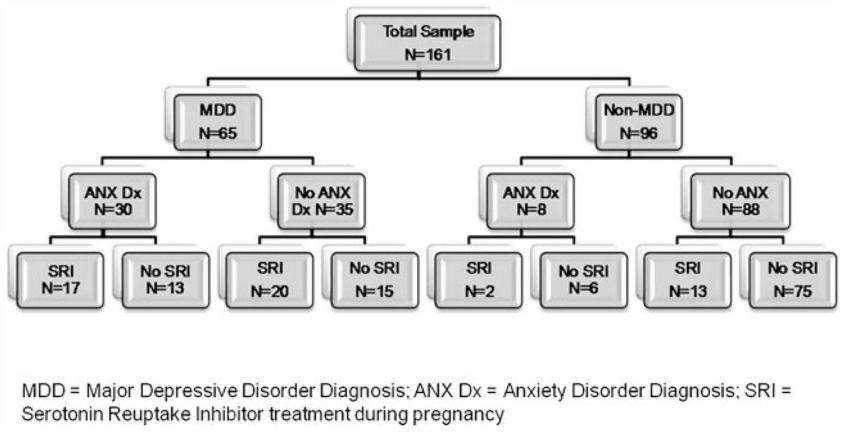

Fig. 1.

Sample groups. MDD= Major depressive disorder diagnosis, ANX Dx=anxiety disorder diagnosis, SRI=serotonin reuptake inhibitor treatment during pregnancy

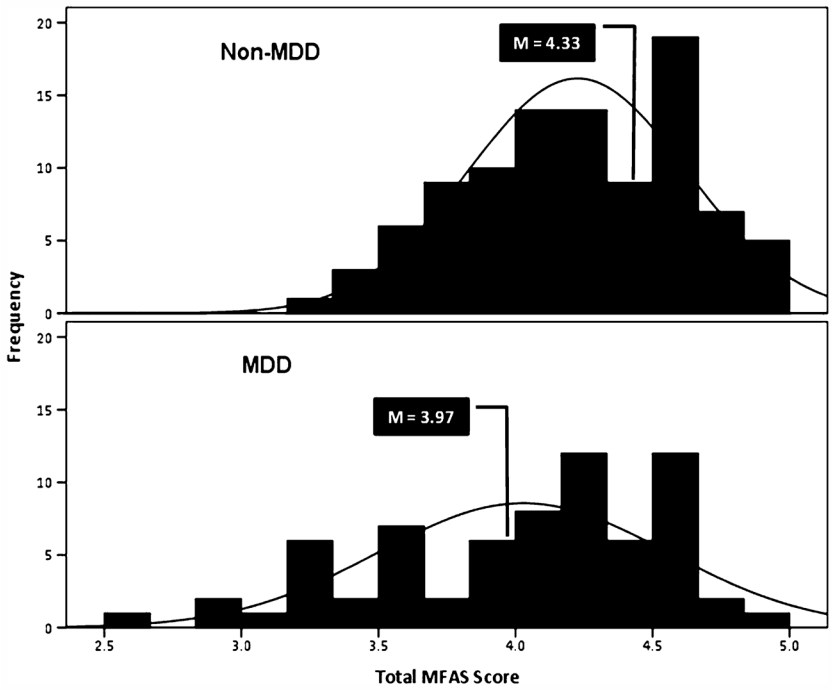

Fig. 2.
Maternal–fetal attachment scale score distribution and means for the NonMDD and MDD groups

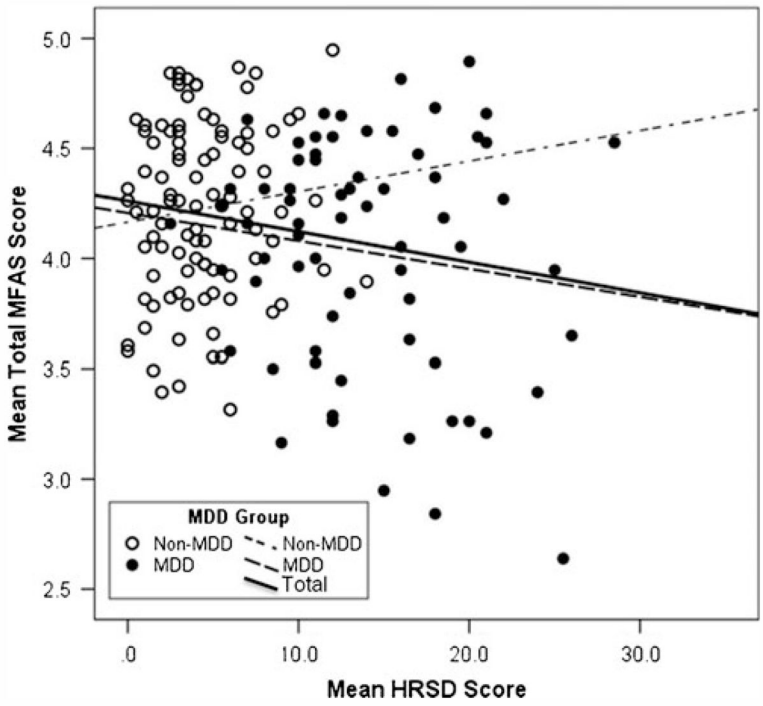

Fig. 3.
Mean HRSD score and total MFAS score

Table 1

Maternal demographics

	MDD		**NonMDD**		***F***	***p*<**
	***N*=65**		***N*=96**			
	Mean	**SD**	**Mean**	**SD**		
Maternal age	28.31	6.06	29.63	4.61	2.45	0.120
Number of children	1.22	1.35	0.79	1.03	5.10	**0.025**
	%	(*N*)	%	(*N*)	χ^2	*p*<
Primiparous	24.62	(16)	50.77	(33)	1.31	0.252
Prior prenatal loss	46.15	(30)	44.62	(29)	4.24	0.058
Single	56.92	(37)	24.62	(16)	26.21	**0.001**
NonWhite Race	18.46	(12)	13.85	(9)	2.78	0.153
Hispanic	20.00	(13)	23.08	(15)	0.54	0.463
Low SES	18.46	(12)	10.77	(7)	3.63	0.057
Complications in pregnancy[a]	27.69	(18)	23.08	(15)	11.96	**0.035**

[a]Complications include: pregnancy-induced hypertension, gestational diabetes, pre-term labor, and vaginal bleeding

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Table 2

Maternal–fetal attachment scale item reliability from the second to the third trimesters

Item no.	Item	Spearman R^a
1	I talk to my unborn baby.	0.426
2	I feel all the trouble of being pregnant is worth it.	0.640
3	I enjoy watching my tummy jiggle as the baby kicks inside.	0.612
4	I picture myself feeding the baby.	0.641
5	I'm really looking forward to seeing what the baby looks like.	0.457
6	I wonder if the baby feels cramped in there.	0.505
7	I refer to my baby by a nickname.	0.649
8	I imagine myself taking care of the baby.	0.624
9	I can almost guess what my baby's personality will be from the way she/he moves.	0.598
10	I have decided on a name for a girl baby.	0.445
11	I do things to try and stay healthy that I would not do if I were not pregnant.	0.443
12	I wonder if the baby can hear inside of me.	0.539
13	I have decided on a name for a boy baby.	0.774
14	I wonder if the baby thinks and feels "things" inside of me.	0.441
15	I eat meat and vegetables to be sure my baby gets a good diet.	0.598
16	It seems my baby kicks and moves to tell me it's eating time.	0.643
17	I poke my baby to get him/her to poke back.	0.651
18	I can hardly wait to hold the baby.	0.532
19	I try to picture what the baby will look like.	0.484
20	I stroke my tummy to quiet the baby when there is too much kicking.	0.573
21	I can tell that the baby has the hiccoughs.	0.544
22	I feel my body is ugly.	0.463
23	I give up doing certain things because I want to help my baby.	0.710
24	I grasp my baby's foot through my tummy to move it around.[b]	0.690

[a] Spearman *R* values between mean item scores from the second trimester to the third trimester

[b] The distribution of this item's scores was skewed toward zero without clear evidence that a reverse score was indicated; therefore, it was eliminated from the calculation of the total MFAS score in each trimester