

Association of Maternal Mood Symptoms in Pregnancy with Exclusive Breastfeeding at Six Weeks Postpartum: A Cross-Sectional Study

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Abstract

Background: Previous studies have shown that postpartum depression negatively affects breastfeeding practices. However, it is not clear whether maternal mood symptoms during pregnancy affect exclusive breastfeeding (EBF) behavior. Our study aimed to quantify the relationship between maternal mood symptoms (depression/anxiety) during pregnancy and EBF.

Methods: A cross-sectional study was conducted at Baoan Maternal and Child Health Hospital, Shenzhen, China, from January 1, 2016, to December 31, 2016, among women who had delivered in the hospital and completed the 6-week postpartum visit. A structured questionnaire was designed to collect information on maternal mood symptoms during pregnancy and EBF status at 6 weeks postpartum. Logistic regression models were used to evaluate the associations between maternal mood symptoms (depression/anxiety) during pregnancy and EBF at 6 weeks postpartum.

Results: In total, 6324 women were included in this study. In univariate analysis, we observed that depression during pregnancy was associated with a reduced risk for EBF (OR = 0.66; 95% CI: 0.54-0.81; $P < 0.001$). In the fully adjusted model, depression during pregnancy was still significantly associated with a reduced risk of EBF (OR=0.69; 95% CI: 0.56–0.86; $P < 0.001$). However, there was no significant difference in the rate of EBF between the anxiety and non-anxiety groups of women (OR=0.88; 95% CI: 0.77–1.01; $P > 0.05$).

Conclusion: We believe that our findings confirm the adverse impact of maternal depression during pregnancy on EBF behavior. Therefore, to improve conditions for breastfeeding of infants, additional attention should be paid to women with depressive symptoms during pregnancy.

Background

Exclusive breastfeeding (EBF) is recommended as the optimal feeding method for infants by the World Health Organization (WHO), defined as no other food or drink (including water), except breast milk for 6 months of life. In addition, the infant may receive oral rehydration solution, drops, and syrups (vitamins, minerals, and medicines) during this period [1]. The advantages of breastfeeding are numerous and well-established, particularly offering benefits for both maternal and infant health [2]. Several studies have already suggested that breastfed infants have a lower risk of various short- and long-term negative health outcomes, including food allergies, gastrointestinal tract infections, asthma, atopic dermatitis, and chronic diseases such as obesity, hypertension, and dyslipidemia [2–4]. Breastfeeding also provides health benefits for mothers, including lower cholesterol and triglyceride levels after childbirth, faster uterine involution, and a reduced risk of breast and ovarian cancer [5]. Additionally, breastfeeding seems to be a low-cost intervention that provides optimal nutrition for infants; non-breastfeeding may also contribute to substantial monetary losses to society and family [6–8]. Although the health benefits of breastfeeding are widely acknowledged, the rate of breastfeeding among mothers still remains low. Only 29.2% of infants are exclusively breastfed within 6 months after birth in China, which is far below the average proportion of infants that are breastfed globally (43%) and in low- and middle-income countries (37%) [9]. There still remains a significant gap towards the goal of reaching 50% of the EBF rate, which has been proposed by the ‘National Nutrition Plan (2017–2030) (China) [10]’ and the ‘Global Targets 2025(WHO) [11]’.

Maternal mood symptoms during pregnancy have been speculated to negatively impact breastfeeding practices [12]. However, this relationship continues to remain unclear. Sharifi et al. found that women with depressive symptoms and anxiety during pregnancy were less likely to implement breastfeeding [13]. Similar results were reported in a study by Coo [14]. However, other studies have demonstrated contrasting results, indicating that EBF practice is not associated with maternal mood symptoms during pregnancy [15, 16].

Prior studies have primarily focused on assessing the relationship between the mental health of pregnant women in the postpartum period and breastfeeding outcomes [15, 17]. Available data on the impact of antenatal maternal mood

symptoms on EBF are limited [13]. In addition, few studies have assessed the interactions between other factors and symptoms of antenatal depression [18]. These previous studies had several limitations, including small sample sizes and confounding factors associated with uncontrolled unaccounted factors, including EBF. Therefore, there is still a gap in understanding the relationship between maternal mood symptoms during pregnancy and EBF.

In order to address this knowledge gap, we conducted a cross-sectional study, accounting for several important confounders, in order to compare EBF practices at 6 weeks postpartum among mothers who experienced depression/anxiety during pregnancy. Furthermore, we explored whether other maternal and infant-related factors interact with maternal mood symptoms in EBF at 6 weeks postpartum.

Methods

Study design and population

This was a cross-sectional study carried out at Baoan Maternal and Child Health Hospital, Shenzhen, China, from January 1, 2016, to December 31, 2016. We included puerperae who delivered in the hospital and completed a postpartum visit 6 weeks after delivery. We excluded puerperae who were missing information about maternal mood symptoms during pregnancy and EBF status at 6 weeks postpartum. Other exclusion criteria were as follows: (1) presence of past psychiatric history or family history of psychotic disorders; (2) multiple pregnancies; (3) high-risk pregnancy; (4) preterm labor; and (5) offspring deformity.

All procedures of the study were in strict accordance with the ethical guidelines of the 1975 Declaration of Helsinki and were approved by the ethics committee of Baoan Maternity and Child Health Hospital of Jinan University. Written informed consent was obtained from all participants.

Measurements

A structured questionnaire was designed to collect data on maternal mood symptoms in pregnancy and EBF at 6 weeks after childbirth, consisting of four sections: (1) sociodemographic characteristics (i.e., age at birth, education level, economic conditions, employment status, living arrangement, height and weight before pregnancy); (2) maternal pregnancy and childbirth-related factors (i.e., attending a pregnancy school, mode of delivery, parity, depression, and anxiety during pregnancy); (3) infant-related factors (i.e., birth weight, offspring sex, neonatal disease, 1-minute Apgar score); (4) breastfeeding outcomes at 6 weeks postpartum (i.e., exclusively breastfeeding). Information on these variables were recorded at 6 weeks postpartum for each woman and included in the analyses. The data were checked with the participants' medical records to ensure accuracy.

Maternal mood symptoms in pregnancy

In the present study, maternal mood symptoms mainly focused on depression and anxiety symptoms during pregnancy, which were obtained through interviews with mothers. The occurrence of depression/anxiety during pregnancy was defined by asking the mother a question about depression/anxiety and getting a positive answer: "Are there any depression /anxiety symptoms during pregnancy?" (No/Yes), which has been previously validated for evaluating maternal mood symptoms [16, 19].

Exclusive breastfeeding (EBF)

During the interview at 6 weeks postpartum, the mothers were asked about the breastfeeding practice: "Did you exclusive breastfeed at 6 weeks after childbirth?" (No/Yes). The variable "exclusive breastfeeding at 6 weeks after childbirth" was based on each participant's retrospective self-report.

Statistical analyses

Data were analyzed using SPSS software (version 20.0; SPSS, Inc., Chicago, Illinois). Descriptive analysis was used to indicate the characteristics of mothers who experienced depression/anxiety. Group comparisons were performed using Student's t-test and χ^2 test or Fisher's exact test, as appropriate. Associations between maternal mood symptoms (depression/anxiety) during pregnancy and EBF at 6 weeks postpartum were assessed using multivariable logistic regression analysis. The interaction of other variables and maternal mood symptoms during pregnancy was tested by stratification analyses and likelihood ratio tests in the logistic regression model. Statistical significance was defined as a two-sided *P* value <0.05.

Results

Characteristics of Study Participants

In our study, 8561 pregnant women were initially enrolled, 26.1% of whom were deemed ineligible according to the exclusion criteria. Finally, 6324 women were included. Table 1 presents the sociodemographic characteristics, maternal pregnancy features, childbirth-related factors, and infant information of the participants. Among the 6324 participants in the study, the gestational age of participants ranged from 16 to 45 years, with an average age at birth of 29.3 years (SD, 4.05), 67.8% had a college degree or above, almost half were primiparas (51.5%), and 16.2% had attended pregnancy school. A total of 6.7% of women reported depression during pregnancy, and 17.3% reported anxiety during pregnancy. The EBF rate at 6 weeks postpartum was 60.3%.

Our study showed that there were significant differences between the two groups of depression during pregnancy and non-depression during pregnancy in some sociodemographic characteristics such as age at birth, education level, employment status, economic conditions, living arrangement, primipara, and neonatal diseases. Similarly, there were significant differences between the two groups (anxiety in pregnancy and non-anxiety in pregnancy) in terms of age at birth, employment status, economic conditions, living style, parity, and neonatal diseases. In addition, more pregnant women with non-anxiety during pregnancy attended pregnancy school compared to those with anxiety during pregnancy. The results of the comparison suggested that the non-depression group had a higher rate of EBF at 6 weeks postpartum compared to the depression group (61.0% vs. 50.9%, $P < 0.001$). However, the proportion of EBF at 6 weeks postpartum in the non-anxiety group was not significantly higher than that in the anxiety group (60.8% vs. 57.8%, $P = 0.05$).

Multivariable logistic regression analysis for the association of maternal mood symptoms in pregnancy and EBF at 6 weeks postpartum

As shown in Table 2, depression during pregnancy was significantly associated with a higher risk of non-EBF in model 1 (OR = 0.66; 95% CI: 0.54-0.81; $P < 0.001$). After adjusting for sociodemographic characteristics (including age at birth, BMI before pregnancy, education level, employment status, economic conditions, and living arrangement), depression during pregnancy was still associated with the risk of EBF (model 2: OR=0.69; 95% CI: 0.56–0.85; $P < 0.001$). Considering the effects of maternal pregnancy and childbirth-related factors on the outcome variables, we added these variables into the multivariate logistic regression model. The association between depression during pregnancy and the risk of non-EBF remained significant (Model 3: OR=0.69; 95% CI: 0.56-0.85; $P < 0.001$). Finally, infant-related factors including 1-minute Apgar score, birth weight, infant sex, and neonatal disease were included in Model 4. Mothers with depression during pregnancy had a lower rate of EBF at 6 weeks postpartum compared to those in the non-depressed group (model 4: OR=0.69; 95% CI: 0.56–0.86; $P < 0.001$). However, in the fully adjusted model, no significant difference in the rate of EBF between the anxiety and non-anxiety groups was demonstrated (model 4: OR=0.88; 95% CI: 0.77–1.01; $P > 0.05$).

Interaction between other variables and depression in pregnancy

Stratification analyses did not find any interaction between depression during pregnancy and other variables on non-EBF at 6 weeks postpartum (P for interaction > 0.05) (Fig. 1).

Discussion

This was a cross-sectional study to evaluate the relationship between maternal mood symptoms during pregnancy and EBF at 6 weeks postpartum. A higher risk of non-EBF in mothers who experienced depression during pregnancy, but not in mothers with anxiety during pregnancy, was observed in the logistic regression model analysis. However, no interaction was found between the presence of depressive symptoms during pregnancy and other factors on EBF at 6 weeks postpartum.

Previous studies have suggested an association between maternal mood disorders and suboptimal breastfeeding outcomes [20–22]. Cato et al. reported that depressive symptoms during pregnancy increase the odds of non-EBF at 6 weeks postpartum [18]. Figueredo et al. found that depression in pregnancy increased the risk of early cessation of EBF [20]. Similarly, our research also indicated that EBF was negatively affected by depression during pregnancy. However, Sharifi et al. [13] and Fukui et al. [23] reported that depression was not associated with failure to breastfeed exclusively. A possible explanation for the difference in results could be that they are limited to a point in the perinatal period, regardless of the pregnancy period. In addition, our findings demonstrating that anxiety disorders during pregnancy are not significantly associated with EBF is consistent with those of previous studies [15, 23, 24]. However, a North Carolina study reported that anxiety symptoms were associated with earlier introduction of formula supplementation and cessation of breastfeeding [25]. In their study, participants with a history of depression or anxiety were not excluded, which may have led to discrepancies in their research conclusions.

This study confirms and extends earlier work on the association between depressive symptoms during pregnancy and EBF. Depression in pregnancy impairs the practice of EBF, which could be explained from psychological and biological standpoints.

Available evidence suggests that maternal depression is related to reduced breastfeeding self-efficacy [15], particularly with breastfeeding initiation [21], which is the most significant predictor of subsequent breastfeeding behavior [26]. Women with depressive symptoms during pregnancy are more likely to develop postpartum depression (PPD) [27]. Moreover, PPD contributed to reducing the practice of EBF [28]. Hence, it could be speculated that women who have experienced depression during pregnancy may increase the risk of non-EBF practice. In addition, pregnant women who are depressed during pregnancy may opt to use antidepressant drugs depending on their condition. Clinicians may recommend avoiding breastfeeding for parturient women who are on psychiatric medications owing to the possibility that these medications may be secreted in their breast milk [29, 30]. Additionally, both antenatal and postpartum depressive symptoms adversely affect postpartum mother-infant bonding [31, 32]. Poor mother-infant bonding reduces breastfeeding self-efficacy and autonomous breastfeeding motivation [33–35]. Consequently, mothers with depression during pregnancy may be less likely to breastfeed exclusively.

Furthermore, the finding that mothers with depressive symptoms during pregnancy had an increased risk of non-EBF suggests the existence of neuroendocrine mechanisms. Oxytocin (OT), a neuropeptide hormone synthesized in the hypothalamus, is critical in breastfeeding physiology because it stimulates milk ejection [36]. A review study demonstrated that depressive symptoms were inversely correlated with OT levels [37]. These results are in agreement with earlier findings showing that perinatal depression is associated with diminished OT release, further triggering failed establishment of lactation [38, 39]. Accordingly, women with a history of depression during pregnancy are less likely to implement EBF.

The main strengths of this study are the large sample size and adjustment for several potential confounders, including sociodemographic characteristics, maternal pregnancy, childbirth-related factors, and infant-related factors. Nevertheless, there are some limitations to this study. First, a cross-sectional study design cannot infer direct causality between depression during pregnancy and EBF. Second, we used self-reported methods to assess mothers' moods during pregnancy, not on scales, although it has been proven feasible in a previous study [16]. Third, the study was a single-center

study; therefore, the results should be generalized with caution. More multicenter cohort studies are required to verify our results.

Conclusion

Our study suggests that depression during pregnancy adversely affects EBF practices. Therefore, screening for maternal depression in the pregnancy period should be routine in clinical care; for women who experienced depression in pregnancy, targeted and timely breastfeeding support should be provided after birth.

Abbreviations

WHO World Health Organization

EBF Exclusive breastfeeding

PPD Postpartum depression

OT Oxytocin

Declarations

Ethics approval and consent to participate

The present study was approved by the Ethics Committee of the Baoan Maternal and Child Health Hospital, Jinan University. Informed consent of all subjects had been obtained before participating the study.

Consent for publication

Written informed consent from the patient was obtained.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the research still being carried on but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors contributed significantly to this work. SP designed the study, directed the statistical analysis. XL did the statistical analysis, and drafted the initial manuscript. ZY helped collected the data. LM assisted with data collection, revised the manuscript. SP reviewed the manuscript. All the authors listed have seen and approved the contents of the submitted manuscript.

All authors contributed significantly to this work. SP collected the data, did the statistical analysis, and drafted the initial manuscript. ZY and XL helped design the study, collected the data. LM and JQ assisted with data collection, revised the

manuscript. KW designed the study, directed the statistical analysis, and reviewed the manuscript. All the authors listed have seen and approved the contents of the submitted manuscript.

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Tables

Table1 Sample Demographics, n (%) or Mean (Standard Deviation), by Maternal mood symptoms during pregnancy

characteristics	study sample	Depression during pregnancy		P-value	Anxiety during pregnancy		P-value
	N	No[n=5898]	Yes[n=426]		No[n=5228]	Yes[n=1096]	
Sociodemographic characteristics							
Age at birth (years)	29.30(4.05)	29.33(4.08)	28.92(3.67)	0.025	29.40(4.08)	28.83(3.90)	<0.001
<35	5644(89.2)	5250(89.0)	394(92.5)	0.025	4637(88.7)	1007(91.9)	0.002
≥35	680(10.8)	648(11.0)	32(7.5)		591(11.3)	89(8.1)	
BMI before pregnancy	20.50(5.07)	20.47(4.78)	20.92(8.06)	0.257	20.50(4.91)	20.47(5.77)	0.857
Underweight	1345(21.3)	1241(21.0)	104(24.4)	0.063	1095(20.9)	250(22.8)	0.189
Normal	4183(66.1)	3925(66.5)	258(60.6)		3482(66.6)	701(64.0)	
Overweight	548(8.7)	507(8.6)	41(9.6)		455(8.7)	93(8.5)	
Obesity	248(3.9)	225(3.8)	23(5.4)		196(3.7)	52(4.7)	
Education level				0.005			0.453
Junior middle school or less	595(9.4)	557(9.4)	38(8.9)		501(9.6)	94(8.6)	
Senior middle school	1440(22.8)	1369(23.2)	71(16.7)		1197(22.9)	243(22.2)	
College or university	4289(67.8)	3972(67.3)	317(74.4)		3530(67.5)	759(69.3)	
Employment status				0.012			0.014
Full-time employed	4128(65.3)	3820(64.8)	308(72.3)		3384(64.7)	744(67.9)	
Self-employed	747(11.8)	712(12.1)	35(8.2)		610(11.7)	137(12.5)	
Housewife	507(8.0)	480(8.1)	27(6.3)		421(8.1)	86(7.8)	
Other	942(14.9)	886(15.0)	56(13.1)		813(15.6)	129(11.8)	
Economic conditions ^a				0.001			0.008
Poor	92(1.5)	78(1.3)	14(3.3)		66(1.3)	26(2.4)	
Average	4380(69.3)	4073(69.5)	307(72.7)		3612(69.5)	768(70.7)	
Good	1809(28.6)	1708(29.2)	101(23.9)		1517(29.2)	292(26.9)	
Living arrangement ^b				<0.001			<0.001
living only with husband	3157(49.9)	2979(53.0)	178(44.1)		2662(53.5)	495(47.4)	
living with parents	794(12.6)	749(13.3)	45(11.1)		675(13.3)	133(12.7)	

living with parents-in-law	2069(32.7)	1888(33.6)	181(44.8)	1653(33.2)	416(39.8)
Maternal pregnancy and childbirth related factors					
Parity	<0.001			<0.001	
>1	3067(48.5)	2905(49.3)	162(38.0)	2616(50.0)	451(41.1)
=1	3257(51.5)	2993(50.7)	264(62.0)	2612(50.0)	645(58.9)
Attend pregnancy school^c	0.117			<0.001	
No	5274(83.4)	4931(83.9)	343(80.9)	4417(84.8)	857(78.5)
Yes	1027(16.2)	946(16.1)	81(19.1)	792(15.2)	235(21.5)
Mode of delivery	0.584			0.913	
Normal delivery	4427(70.0)	4134(70.1)	293(68.8)	3658(70.0)	769(70.2)
Caesarean delivery	1897(30.0)	1764(29.9)	133(31.2)	1570(30.0)	327(29.8)
Infant related factors					
1-minute Apgar score^d	0.340			0.824	
0-3	4.0(0.1)	4(0.07)	0(0.0)	4(0.1)	0(0.0)
4-6	29.0(0.5)	25(0.42)	4(0.9)	23(0.4)	6(0.5)
7-10	6287.0(99.4)	5865(99.51)	422(99.1)	5199(99.5)	1088(99.5)
Birth weight	0.151			0.137	
Low birth weight	97(1.5)	86(1.5)	11(2.6)	77(1.5)	20(1.8)
Normal weight	5962(94.3)	5567(94.4)	395(92.7)	4921(94.1)	1041(95.0)
macrosomia	265(4.2)	245(4.2)	20(4.7)	230(4.4)	35(3.2)
Gender	0.071			0.549	
female	2998(47.4)	2778(47.1)	220(51.6)	2469(47.2)	529(48.3)
male	3326(52.6)	3120(52.9)	206(48.4)	2759(52.8)	567(51.7)
Neonatal disease^e	0.001			0.001	
No	5822(92.1)	5451(92.9)	371(88.3)	4842(93.1)	980(90.1)
Yes	467(7.4)	418(7.1)	49(11.7)	359(6.9)	108(9.9)
Breastfeeding status at 6 weeks	<0.001			0.072	
Non-Exclusive breastfeeding	2510(39.7)	2301(39.0)	209(49.1)	2048(39.2)	462(42.2)

Exclusive breastfeeding	3814(60.3)	3597(61.0)	217(50.9)		3180(60.8)	634(57.8)
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Note:

^aThis category excludes 43 [0.679949] mothers with missing data, including 39 mothers in the non-pregnancy depression group and the pregnancy depression group 4 mothers; including 33 mothers in the non-pregnancy anxiety group and the pregnancy anxiety group 10 mothers.

^bThis category excludes 304 [4.807084] mothers with missing data, including 282 mothers in the non-pregnancy depression group and the pregnancy depression group 22 mothers; including 252 mothers in the non-pregnancy anxiety group and the pregnancy anxiety group 52 mothers.

^cThis category excludes 23 [0.363694] mothers with missing data, including 21 mothers in the non-pregnancy depression group and the pregnancy depression group 2 mothers; including 19 mothers in the non-pregnancy anxiety group and the pregnancy anxiety group 4 mothers.

^dThis category excludes 4 [0.063251] mothers with missing data, including 4 mothers in the non-pregnancy depression group; including 2 mothers in the non-pregnancy anxiety group and the pregnancy anxiety group 2 mothers.

^eThis category excludes 35 [0.553447] mothers with missing data, including 29 mothers in the non-pregnancy depression group and the pregnancy depression group 6 mothers; including 27 mothers in the non-pregnancy anxiety group and the pregnancy anxiety group 8 mothers.

Table 2 Multivariable logistic regression analysis for the association of Maternal mood symptoms in pregnancy and exclusive breastfeeding

Characteristics	Depression during pregnancy			P- value	Anxiety during pregnancy			P- value
	No	Yes			No	Yes		
Model 1	Ref.	0.66	(0.55 -0.81)	<0.001	Ref.	0.88	(0.77-1.01)	0.067
Model 2	Ref.	0.69	(0.56 -0.85)	<0.001	Ref.	0.87	(0.76-1.00)	0.057
Model 3	Ref.	0.69	(0.56-0.85)	<0.001	Ref.	0.88	(0.76-1.01)	0.067
Model 4	Ref.	0.69	(0.56-0.86)	0.001	Ref.	0.88	(0.77-1.02)	0.082

Abbreviation: OR, odds ratio; CI, confidence interval.

Model 1: unadjusted.

Model 2: adjusted for sociodemographic characteristics: age at birth, BMI before pregnancy, education level, employment status, economic conditions, living arrangement.

Model 3: adjusted for covariates in model 2 and maternal pregnancy and childbirth related factors: parity, attend pregnancy school, mode of delivery

Model 4: adjusted for covariates in model 3 and infant related factors:1-minute Apgar score, birth weight, infant gender, neonatal disease.

Figures

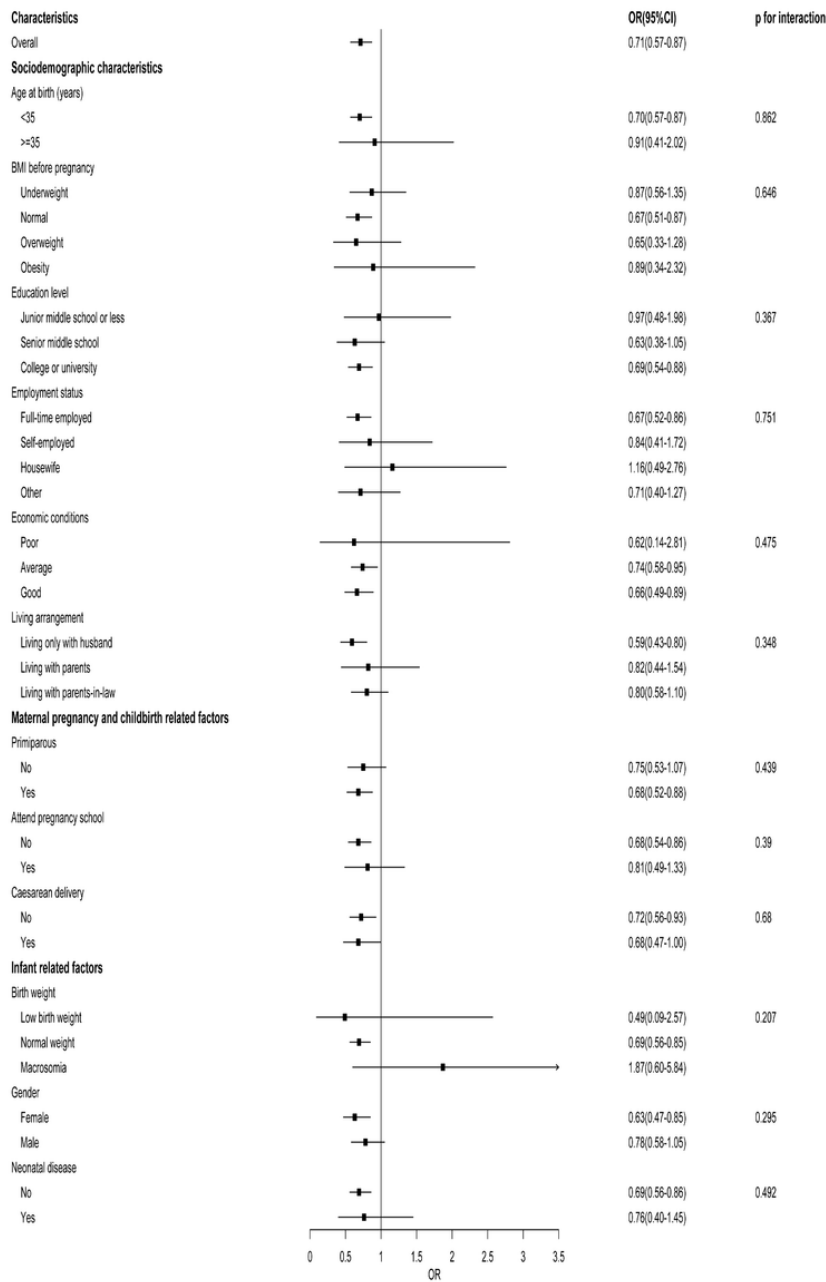


Figure 1

Interaction between other variables and depression in pregnancy