Depression During Pregnancy and the Risk of Preterm Birth, Low Birth Weight, and Intrauterine Growth Restriction

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ABSTRACT

Background:

Depression during pregnancy is a common yet underdiagnosed condition and is increasingly recognized as an important risk factor for adverse neonatal outcomes such as preterm birth, low birth weight, and intrauterine growth restriction. Early detection and timely intervention may reduce maternal and fetal complications.

Objectives:

To determine the prevalence of antenatal depression and evaluate its association with preterm birth, low birth weight, intrauterine growth restriction (IUGR), and NICU admission among pregnant women attending a tertiary care centre.

Methods:

A hospital-based prospective cohort study was conducted in the Department of Obstetrics and Gynaecology at Chettinad Hospital and Research Institute, Tamil Nadu. A total of 250 antenatal women (28–36 weeks gestation) with singleton pregnancies were enrolled using consecutive sampling. Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS). Participants were followed until delivery and neonatal outcomes were recorded from hospital records. Associations between antenatal depression and adverse outcomes were analyzed using the Chi-square test, and predictors of depression were identified using logistic regression.

Results:

The prevalence of antenatal depression (EPDS ≥10) was 26.0%, including 13.6% possible depression and 12.4% probable depression. Preterm birth occurred in 26.2% of depressed women compared to 8.1% in non-depressed women (p <0.001). Low birth weight was observed in 35.4% of neonates born to depressed mothers versus 11.9% among non-depressed mothers (p <0.001). IUGR was present in 23.1% of depressed women compared to 7.6% in non-depressed women (p = 0.001). NICU admission was significantly higher in neonates of depressed mothers (27.7% vs 10.8%; p = 0.003). Independent predictors of antenatal depression included low socio-economic status (AOR 2.4), unplanned pregnancy (AOR 2.9), poor spousal/family support (AOR 3.7), and previous adverse pregnancy outcome (AOR 2.1).

Conclusion:

Antenatal depression affected approximately one-fourth of pregnant women in this tertiary care cohort and was significantly associated with increased risk of preterm birth, low birth weight, IUGR, and NICU admission. Integrating routine depression screening into antenatal care and strengthening psychosocial support may improve maternal wellbeing and neonatal outcomes.

Keywords:

Antenatal depression; EPDS; Preterm birth; Low birth weight; IUGR; NICU admission; Pregnancy outcomes

Introduction

Depression during pregnancy, also known as antenatal depression, is a common mental health disorder that can significantly affect maternal wellbeing and pregnancy outcomes. Pregnancy is often considered a period of happiness and anticipation; however, for many women it is associated with emotional stress, hormonal changes, social pressure, and increased vulnerability to psychiatric illnesses. Antenatal depression may vary from mild depressive symptoms to major depressive disorder, and if left untreated, it can interfere with daily functioning, nutrition, sleep, self-care, and adherence to antenatal services. Recognition of maternal mental health problems has become increasingly important in modern obstetric care because of the effects of depression on both the mother and the fetus [1].

Adverse birth outcomes such as preterm birth, low birth weight (LBW), and intrauterine growth restriction (IUGR) continue to remain major causes of neonatal morbidity and mortality globally. Preterm birth, defined as delivery before 37 completed weeks of gestation, is a leading cause of neonatal deaths and is associated with long-term complications such as respiratory

distress, neurodevelopmental delay, and chronic health issues in surviving infants [2]. LBW, defined as birth weight less than 2500 grams, is an important indicator of maternal and child health, reflecting fetal growth and maternal nutritional status. It is strongly associated with increased risk of neonatal infections, impaired growth, and higher risk of adult chronic diseases such as diabetes and hypertension [3]. IUGR. Intrauterine growth restriction (IUGR) is defined as fetal growth below the 10th percentile for gestational age. It is commonly referred to as fetal growth restriction and describes a fetus that does not reach its genetically determined growth potential and is linked to increased risk of perinatal asphyxia, stillbirth, neonatal complications, and poor long-term developmental outcomes [4].

Increasing evidence indicates that maternal depression during pregnancy is associated with a higher risk of preterm birth, LBW, and IUGR [5]. This relationship is clinically important because depression is common, frequently underdiagnosed, and potentially treatable.

The association between antenatal depression and poor fetal outcomes can be explained through multiple mechanisms. One key biological pathway involves dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis. Depression is associated with increased maternal stress responses and elevated cortisol levels. Cortisol may influence placental function and fetal development and can stimulate biochemical processes that increase the likelihood of early initiation of labor, thereby contributing to preterm birth [5]. In addition, depression is linked with inflammatory activation. Increased inflammatory markers and cytokines can affect placental blood flow, uteroplacental perfusion, and nutrient delivery to the fetus, potentially resulting in fetal growth restriction and LBW [6].

Behavioral and lifestyle factors also contribute significantly to this association. Depressed pregnant women may have poor appetite, inadequate dietary intake, reduced sleep quality, and limited motivation to seek timely antenatal care. Depression is also associated with increased substance use behaviors such as tobacco smoking, which independently increases the risk of LBW and IUGR due to placental insufficiency and impaired fetal oxygenation [6]. Poor adherence to micronutrient supplementation, missed antenatal visits, and delayed treatment of infections or anemia may further worsen maternal and fetal health outcomes.

Social determinants such as poverty, poor social support, domestic violence, and chronic psychosocial stress are closely linked with antenatal depression and can also independently contribute to adverse pregnancy outcomes. Therefore, the relationship between depression and outcomes like preterm birth and IUGR may be influenced by confounding factors; however, even after adjustments for these factors, evidence suggests that antenatal depression remains an important predictor of unfavorable birth outcomes [7]. Because preterm birth and LBW are major contributors to neonatal mortality and long-term developmental problems, addressing antenatal depression offers an opportunity for prevention and improved maternal and child health.

In summary, depression during pregnancy is an important maternal health condition with strong implications for fetal growth and neonatal outcomes. Understanding the relationship between antenatal depression, preterm birth, LBW, and IUGR highlights the importance of early screening, counseling, psychosocial support, and integration of mental health services within routine antenatal care.

Materials and Methods

Study Design, Duration and Setting

This hospital-based prospective cohort study was conducted in the Department of Obstetrics and Gynaecology at Chettinad Hospital and Research Institute (CHRI), a tertiary care teaching institution located in Kelambakkam, Tamil Nadu. The study was conducted over a period of 6 months from May 2025 to October 2025

Study Population

The study population included antenatal women attending the Obstetrics and Gynaecology outpatient department (OPD) and antenatal wards (between 28–36 weeks gestation) at the institute during the study period.

Inclusion Criteria

• Gestational age between 28–36 weeks
 • Singleton pregnancies
• Willing to participate and provide written informed consent

Exclusion Criteria

• Multiple gestations
• Known psychiatric illness diagnosed before pregnancy
• Current psychiatric medication
• Major medical disorders known to affect fetal outcomes such as:
    Pre-eclampsia/eclampsia, Uncontrolled diabetes, Chronic hypertension, Severe anemia
• Fetal congenital anomalies

Sample Size Estimation

The sample size was calculated using Dobson's formula for single-proportion estimation:

$$n = [z^2 \times P \times (1-P)]/ d^2$$

Where:
Z = 1.96 for 95% confidence interval
p = prevalence of antenatal depression
p = 19.1% based on similar existing literature [8]
d = allowable margin of error = 5%

$$n = \frac{(1.96)^2 \times 0.19 \times (1-0.19)}{(0.05)^2} = 237.44$$

$$n \sim 237$$

Thus, the final sample size is rounded up to 250 participants to account for any minor data loss or incomplete forms

Sampling Technique

A consecutive sampling method was used. All eligible women meeting the inclusion criteria attending the antenatal clinic were approached for participation until the sample size of 250 was achieved.

Data Collection Tool

Data were collected using a structured proforma consisting of two parts:

1. Socio-demographic and Obstetric Questionnaire: To record age, parity, education, socio-economic status, and obstetric history.

2. Edinburgh Postnatal Depression Scale (EPDS) [9] A 10-item self-report scale validated for use in pregnancy. Scoring:

• 0–9: No depression

• 10–12: Possible depression

• ≥13: Probable depression

The Edinburgh Postnatal Depression Scale (EPDS) is chosen for this study because it is the most widely validated, reliable, and pregnancy-appropriate screening tool for detecting depressive symptoms during the antenatal period. Although originally developed for postpartum use, the EPDS has been extensively validated for use during pregnancy, and is now recommended internationally including by the World Health Organisation (WHO) [10], American College of Obstetricians and Gynaecologists (ACOG) [11], and Royal College of Obstetricians and Gynaecologists (RCOG) [12] as the preferred tool for screening antenatal depression.

Data Collection

After obtaining informed consent, the socio-demographic details were recorded. Participants completed the EPDS questionnaire in a private setting to ensure confidentiality. The participants were followed up on until delivery. Perinatal outcomes (Gestational age at delivery, Birth weight, Mode of delivery, and NICU admission) were recorded from hospital records post-delivery.

Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 27.0.

Descriptive statistics: Continuous variables (e.g., EPDS score, birth weight) were presented as Mean ± Standard Deviation (SD). Categorical variables (e.g., presence of depression, LBW, PTB) were presented as frequencies and percentages.

Inferential statistics: The Chi-square test was used to assess the association between depression (EPDS scores) and adverse outcomes (PTB, LBW, IUGR).

A p-value of <0.05 was considered statistically significant. Variables with $p <0.20$ in univariate analysis were entered into the multivariable logistic regression model to identify independent predictors of antenatal depression.

Ethical Consideration

The study protocol was reviewed and approved by the Institutional Human Ethics Committee (IHEC) of Chettinad Hospital and Research Institute (Ref No: IHEC-I/092/11/2025). All participants provided written informed consent prior to inclusion in the study. Confidentiality and privacy were strictly maintained throughout the research process. Participation in the study did not alter clinical care, impose financial costs, or require additional investigations beyond routine clinical management.

Results

Table 1: Socio-demographic characteristics of the study participants (n = 250)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	<25	78	31.2
	25–29	112	44.8
	≥30	60	24.0
Education status	Illiterate	18	7.2
	Primary	54	21.6
	High school	96	38.4
	Graduate & above	82	32.8
Occupation	Homemaker	175	70.0
	Employed	75	30.0
Socio-economic status (Modified Kuppuswamy)	Upper / Upper middle	65	26.0
	Lower middle	85	34.0
	Upper lower	60	24.0
	Lower	40	16.0
Type of family	Nuclear	150	60.0
	Joint	100	40.0
Spousal / family support	Adequate	188	75.2
	Poor	62	24.8

Table 1 describes the socio-demographic characteristics of the 250 antenatal women included in the study. The majority of participants (44.8%) were aged between 25 and 29 years, while 31.2% were below 25 years of age and 24.0% were aged 30 years or above. Regarding educational status, most women had completed high school education (38.4%), followed by graduates and above (32.8%).

A large proportion of participants were homemakers (70.0%), and nearly one-third (30.0%) were employed. With respect to socio-economic status, 34.0% belonged to the lower-middle class, while 26.0% were from upper or upper-middle socio-economic groups. Nuclear families constituted 60.0% of the study population. Adequate spousal or family support was reported by 75.2% of women, whereas 24.8% perceived poor support.

Table 2: Obstetric characteristics of antenatal women

Variable	Category	Frequency (n)	Percentage (%)
Gravida	Primigravida	110	44.0
	Multigravida	140	56.0
Parity	Nulliparous	105	42.0
	Para 1	90	36.0
	Para ≥2	55	22.0
Planned pregnancy	Yes	162	64.8
	No	88	35.2
Previous adverse pregnancy outcome	Yes	62	24.8
	No	188	75.2
Body Mass Index (BMI)	<18.5 kg/m²	22	8.8
	18.5–24.9 kg/m²	142	56.8
	≥25 kg/m²	86	34.4

Table 2 shows the obstetric profile of the study participants. More than half of the women were multigravida (56.0%), while 44.0% were primigravida. Nulliparous women constituted 42.0% of the study population, whereas 36.0% were parous with one child, and 22.0% had parity of two or more.

Nearly two-thirds of the pregnancies (64.8%) were planned, while 35.2% were unplanned. A history of previous adverse pregnancy outcome was reported by 24.8% of participants. With respect to nutritional status, the majority of women had a normal BMI (56.8%), while 34.4% were overweight or obese, and 8.8% were underweight.

Table 3: Prevalence and severity of antenatal depression (EPDS) (n = 250)

EPDS category	EPDS score	Frequency (n)	Percentage (%)
No depression	0–9	185	74.0
Possible depression	10–12	34	13.6
Probable depression	≥13	31	12.4
Overall depression	≥10	**65**	**26.0**

Table 3 depicts the prevalence and severity of antenatal depression among the study participants based on EPDS scoring. Nearly three-fourths of women (74.0%) had EPDS scores below 10 and were classified as having no depression. Possible depression (EPDS score 10–12) was observed in 13.6% of participants, while 12.4% had probable depression with EPDS scores of 13 or above.
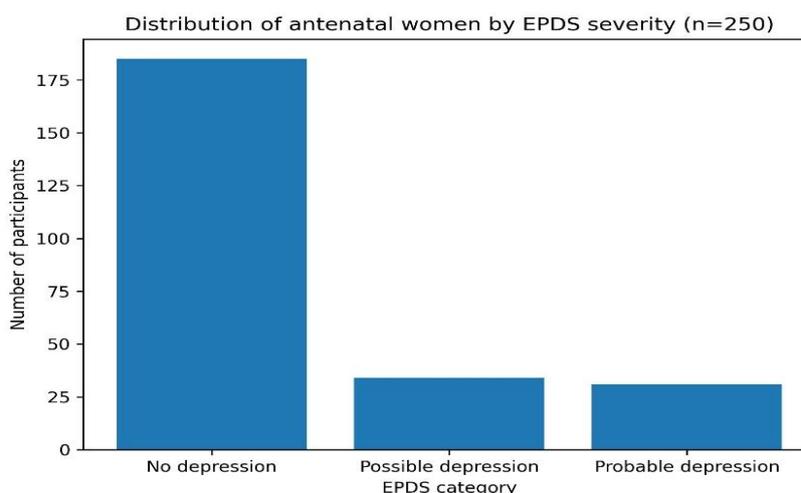

Figure 1. Distribution of antenatal women based on EPDS severity categories (n = 250).
Figure 1 shows the distribution of EPDS severity categories among the study participants.
Overall, antenatal depression (EPDS ≥10) was identified in 26.0% of pregnant women in the study population.

Table 4: Association between antenatal depression and preterm birth

Antenatal depression (EPDS)	Preterm birth (<37 weeks) n (%)	Term birth (≥37 weeks) n (%)	Total	χ^2	p-value
No depression (EPDS <10)	15 (8.1%)	170 (91.9%)	185	13.9	<0.001
Depression (EPDS ≥10)	17 (26.2%)	48 (73.8%)	65		
Total	32 (12.8%)	218 (87.2%)	250		

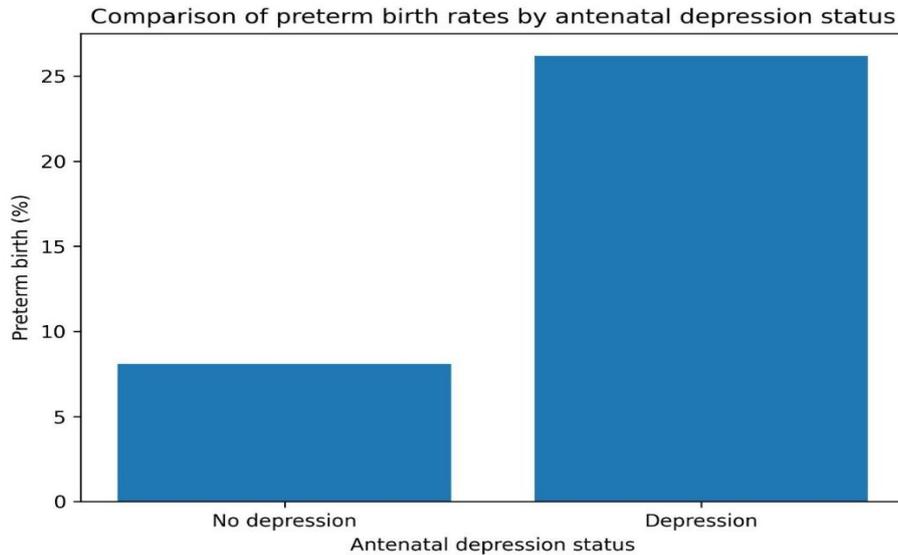Comparison of preterm birth rates by antenatal depression status

Figure 2. Comparison of preterm birth rates between antenatal women with and without depression.
Table 4 shows the association between antenatal depression and preterm birth. Among women without depression (EPDS <10), preterm birth occurred in 8.1% of cases, whereas 26.2% of women with antenatal depression (EPDS ≥10) delivered preterm.
The difference in preterm birth rates between the two groups was statistically significant (χ^2 = 13.9, p < 0.001), indicating a strong association between antenatal depression and increased risk of preterm delivery.

Table 5: Association between antenatal depression and low birth weight (<2.5 kg)

Antenatal depression (EPDS)	Low birth weight n (%)	Normal birth weight n (%)	Total	χ^2	p-value
No depression (EPDS <10)	22 (11.9%)	163 (88.1%)	185	16.8	<0.001
Depression (EPDS ≥10)	23 (35.4%)	42 (64.6%)	65		
Total	45 (18.0%)	205 (82.0%)	250		

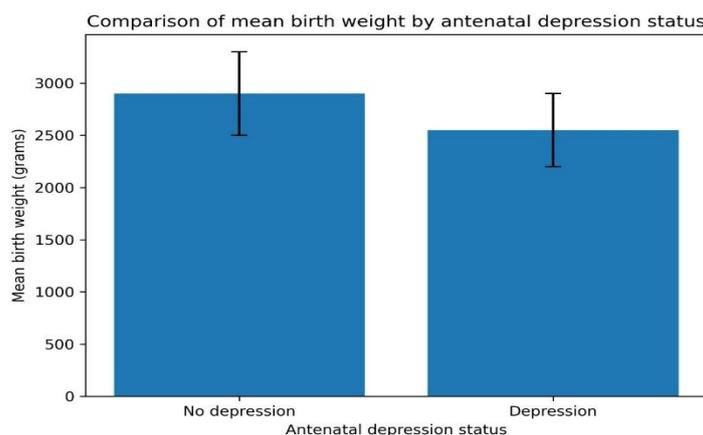Comparison of mean birth weight by antenatal depression status

Figure 3. Comparison of mean birth weight (Mean ± SD) among neonates born to depressed and non-depressed mothers. Mean birth weight among neonates of depressed mothers was 2500 ± 50 g compared to 2900 ± 50 g in non-depressed mothers.
Table 5 illustrates the association between antenatal depression and low birth weight. Low birth weight was observed in 11.9% of neonates born to mothers without depression, compared to 35.4% among those with antenatal depression.
The association between antenatal depression and low birth weight was statistically significant (χ^2 = 16.8, p < 0.001), indicating that depressive symptoms during pregnancy were associated with a substantially higher risk of delivering a low-birth-weight infant.

Table 6: Association between antenatal depression and intrauterine growth restriction (IUGR)

Antenatal depression (EPDS)	IUGR present n (%)	IUGR absent n (%)	Total	χ²	p-value
No depression (EPDS <10)	14 (7.6%)	171 (92.4%)	185		
Depression (EPDS ≥10)	15 (23.1%)	50 (76.9%)	65	**10.9**	**0.001**
Total	29 (11.6%)	221 (88.4%)	250		

Table 6 demonstrates the association between antenatal depression and intrauterine growth restriction. IUGR was observed in 7.6% of pregnancies among women without depression, compared to 23.1% among those with antenatal depression.
A statistically significant association was observed between antenatal depression and IUGR ($\chi^2 = 10.9$, p = 0.001), indicating that depressive symptoms during pregnancy were associated with an increased risk of impaired fetal growth.

Table 7: Association between antenatal depression and NICU admission

Antenatal depression (EPDS)	NICU admission – Yes n (%)	NICU admission – No n (%)	Total	χ²	p-value
No depression (EPDS <10)	20 (10.8%)	165 (89.2%)	185	**9.1**	**0.003**
Depression (EPDS ≥10)	18 (27.7%)	47 (72.3%)	65		
Total	38 (15.2%)	212 (84.8%)	250		

Table 7 depicts the association between antenatal depression and NICU admission. NICU admission was required for 10.8% of neonates born to mothers without depression, compared to 27.7% among neonates born to mothers with antenatal depression. The association between antenatal depression and NICU admission was statistically significant ($\chi^2 = 9.1$, p = 0.003), indicating that neonates of depressed mothers had a higher likelihood of requiring intensive neonatal care.

Table 8: Predictors of antenatal depression among study participants (n = 250)

Predictor variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Age ≥30 years	1.6	0.9 – 2.8	0.087
Low socio-economic status	**2.4**	**1.3 – 4.2**	**0.004**
Unplanned pregnancy	**2.9**	**1.6 – 5.1**	**<0.001**
Poor spousal / family support	**3.7**	**2.0 – 6.8**	**<0.001**
Previous adverse pregnancy outcome	**2.1**	**1.2 – 3.8**	**0.011**
BMI <18.5 kg/m²	1.4	0.7 – 2.9	0.246

Table 8 presents the predictors of antenatal depression identified through binary logistic regression analysis. Low socio-economic status was independently associated with antenatal depression (AOR = 2.4; 95% CI: 1.3–4.2; p = 0.004). Women with unplanned pregnancies had nearly three times higher odds of depression compared to those with planned pregnancies (AOR = 2.9; 95% CI: 1.6–5.1; p < 0.001).
Poor spousal or family support emerged as the strongest predictor of antenatal depression (AOR = 3.7; 95% CI: 2.0–6.8; p < 0.001). A history of previous adverse pregnancy outcomes was also significantly associated with higher odds of depression (AOR = 2.1; 95% CI: 1.2–3.8; p = 0.011). Age ≥30 years and low BMI were not independently associated with antenatal depression after adjustment.

Discussion

The present prospective cohort study assessed the prevalence of antenatal depression and its association with adverse pregnancy and neonatal outcomes among antenatal women attending a tertiary care centre. Using the Edinburgh Postnatal Depression Scale, antenatal depression (EPDS ≥10) was identified in **26.0%** of participants, with **12.4%** exhibiting probable depression. Women with antenatal depression demonstrated significantly higher risks of **preterm birth, low birth weight, intrauterine growth restriction, and NICU admission**, indicating a consistent and clinically relevant adverse outcome profile.

Prevalence of antenatal depression

The prevalence of antenatal depression observed in this study is comparable to findings reported across Indian settings. A recent systematic review examining antenatal depression in Indian women documented a wide prevalence range, largely influenced by study setting, screening tools, and socio-cultural factors; however, most studies reported prevalence estimates between 15% and 30% .[13] The present findings fall well within this range and reinforce the substantial burden of antenatal depression in Indian populations.
Studies from South India employing EPDS screening have reported similar prevalence patterns, particularly in hospital-based cohorts where psychosocial stressors, obstetric risk, and health-seeking behaviours may differ from community samples.[14] Variations across studies are expected due to differences in gestational age at screening, socio-economic composition, and support systems, but the overall evidence consistently indicates that antenatal depression remains under-recognised despite its high prevalence.

Antenatal depression and preterm birth

In the present study, antenatal depression was significantly associated with preterm birth. Women with depressive symptoms were more than three times as likely to deliver preterm compared to their non-depressed counterparts. This finding aligns with

robust evidence from meta-analyses demonstrating an increased risk of preterm delivery among women experiencing depression during pregnancy. [15-16]

Biological mechanisms proposed to explain this association include dysregulation of the hypothalamic–pituitary–adrenal axis, elevated cortisol levels, and inflammatory pathways that may precipitate early onset of labour. Additionally, behavioural factors such as poor nutritional intake, inadequate antenatal care utilisation, and sleep disturbances may further compound the risk of preterm birth among depressed women.

Association with low birth weight

Low birth weight was significantly more common among neonates born to mothers with antenatal depression, with a clinically meaningful reduction in mean birth weight compared to neonates of non-depressed mothers. This observation is consistent with several systematic reviews and meta-analyses that have established antenatal depression as an independent risk factor for low birth weight. [15-17]

Indian cohort studies have similarly demonstrated that maternal psychological distress during pregnancy is associated with impaired fetal growth, particularly in settings where maternal undernutrition and socio-economic vulnerability are prevalent.[18] The findings of the present study further support the role of maternal mental health as an important determinant of fetal growth in Indian populations.

Antenatal depression and IUGR

The proportion of intrauterine growth restriction was significantly higher among women with antenatal depression. This association has been previously documented in both international and Indian studies, suggesting that chronic maternal stress and depressive symptoms may adversely affect placental perfusion and nutrient transfer to the fetus. [19]

In India, where baseline rates of maternal anaemia, undernutrition, and social disadvantage remain high, the impact of antenatal depression on fetal growth may be further amplified. The present findings therefore highlight the importance of recognising maternal mental health as an integral component of strategies aimed at reducing fetal growth restriction.

NICU admission and neonatal consequences

Neonates born to mothers with antenatal depression had a significantly higher likelihood of requiring NICU admission. This finding likely reflects the cumulative effects of prematurity, low birth weight, and growth restriction observed in the depressed group. Similar associations have been reported in previous studies, indicating that antenatal depression may indirectly increase neonatal morbidity and the need for specialised care.[16-17]

Although NICU admission is influenced by institutional protocols and clinical judgement, the observed difference between groups underscores the broader neonatal impact of untreated antenatal depression.

Predictors of antenatal depression

Low socio-economic status, unplanned pregnancy, poor spousal or family support, and a history of adverse pregnancy outcomes emerged as independent predictors of antenatal depression in this study. These findings are consistent with existing literature emphasising the strong influence of social determinants on perinatal mental health. [13-19]

Poor social support, in particular, emerged as the strongest predictor and represents a potentially modifiable risk factor. Strengthening family involvement, partner support, and counselling services during pregnancy may therefore play a critical role in reducing the burden of antenatal depression.

Implications for clinical practice

The findings of this study provide strong support for the routine integration of mental health screening into antenatal care. The World Health Organization has emphasised maternal mental health as a core component of comprehensive maternal healthcare, particularly in low- and middle-income countries. [20] Professional bodies such as the American College of Obstetricians and Gynecologists also recommend routine screening for perinatal depression during pregnancy. [11]

Implementing EPDS-based screening, coupled with timely referral and psychosocial support, may contribute to improved maternal wellbeing and better pregnancy outcomes.

Strengths and limitations

The strengths of this study include its prospective design, adequate sample size, use of a validated screening tool, and objective assessment of pregnancy outcomes. Limitations include the use of a screening instrument rather than diagnostic interviews and the possibility of residual confounding from unmeasured psychosocial variables. Additionally, as the study was conducted in a tertiary care setting, generalisability to community-based populations may be limited. Depressive symptoms were assessed at a single time point, which may not reflect changes in mental health status across pregnancy.

Conclusion

Antenatal depression affected approximately one-fourth of women in this tertiary care cohort and was significantly associated with adverse maternal and neonatal outcomes. Addressing antenatal depression through routine screening and targeted psychosocial interventions may play a crucial role in improving pregnancy outcomes and neonatal health.

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