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Effect of Antenatal Depression on Fetal Growth Outcomes at the Jos University Teaching Hospital Jos, Plateau State, Nigeria

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Abstract

Background: Depression is the most prevalent psychiatric disorder in pregnancy and it is associated with psychosocial and obstetric factors. Studies have shown that pregnancy does not prevent women from becoming depressed; rather, it may be a time when depression occurs for the first time in some women. Antenatal depression has been identified as a risk factor for post natal depression, adverse obstetric outcomes, poorer neonatal outcomes and higher growth retardation in infants. Purpose: This study aimed to determine the fetal growth outcomes among depressed pregnant women in their third trimester attending antenatal clinic at the Jos University Teaching Hospital (JUTH), Jos, Plateau State, Nigeria. Method: A prospective cohort study design was used to assess 514 women who consented to the study (256 cases and 258 controls). A socio-demographic questionnaire was given to the women to fill out the study entry. Edinburgh Post Natal Depression Scale (EPDS) was used to screen for depression and MINI neuropsychiatric interviews were used to diagnose depression in those women found to be at risk of depression using the EPDS. Ultrasonography was used to determine the fetal weight in the third trimester of pregnancy. The birth weight of the babies born to the women was obtained from the birth register in the labor ward and the fetal growth rate was calculated from the estimated fetal weight on ultrasound scan in late pregnancy and the birth weight of babies. Result: The mean fetal weight in the third trimester for non-depressed women was slightly higher than in depressed women though the difference was not statistically significant (P = 0.431). The difference in the mean calculated fetal growth rate

for fetuses of non-depressed women in the third trimester was statistically significantly higher than in depressed women (p = 0.000). Depressed women also had babies with lower birth weight than non-depressed women and the difference was statistically significant (p = 0.00).

Keywords

Depression, Antenatal Depression, Fetal Weight, Fetal Growth Rate, Birth Weight

1. Introduction

Depression as an illness is known to occur at different phases of the reproductive cycle (premenstrual dysphoric disorder, depression in pregnancy and postpartum depression) [1]. Antenatal (prenatal or antepartum) depression is a non-psychotic depressive episode that begins during pregnancy and it is the commonest mental health disorder in pregnancy [2].

Historically pregnancy is a time of joy and fulfilment for many women. However, in recent times evidence is evolving that there may be a definite increase in psychiatric morbidity, particularly depression and anxiety during pregnancy [3]. The prevalence of antenatal depression varies widely, but it is significant. In Nigeria, the prevalence ranges between 10% and 25% [3] [4] [5]. Although several studies have shown a rise in the prevalence of depression in pregnancy, relatively fewer studies have been carried out on the consequences of untreated depression in pregnancy.

Antenatal depression has been associated with a greater than 2 times risk of self-reported complications in pregnancy which include functional impairment, decreased self-care, and increased somatic complainants. The risk of pre-eclampsia was noted to be higher in pregnant women in high-income countries while an increased risk of prolonged labour, premature contraction, increased nausea and use of analgesic was noted specifically in low-income countries. [6] Those who present with somatic symptoms have been noticed to have increased healthcare utilization, functional impairment and absenteeism from work [7].

Antenatal depression has also been linked to poor pregnancy outcomes. Low birth weight and intrauterine growth restriction (IUGR) have been linked to antenatal depression in most but not all studies [8] [9] [10] [11]. The magnitude of this effect varies with respect to the country of location, socio-economic status and the instrument used to measure the symptoms of depression. Antenatal depression has also been linked to preterm deliveries and in a meta analysis done in the United States, it was found to be 2 times more in African American women. These women were also more likely to have low birth weight babies [11]. Antepartum depression is an important risk factor for postpartum depression in almost all the studies that have been carried out on these subjects [12] and has been linked with neonatal adverse effects like increased irritability, less

activity and fewer facial expressions [12] [13].

2. Materials and Methods

Subjects: The subjects consisted of 260 depressed and 260 non depressed women who were between 28 and 32 weeks pregnant recruited from the antenatal clinic of the Jos University Teaching Hospital (JUTH). Women who had co-morbid medical conditions that may affect fetal growth, psychotic symptoms, used alcohol or other psychoactive substances, or were not sure of their last menstrual period (LMP) were excluded from the study. The data was taken over a period of 8 months.

Ethical considerations: Ethical approval was obtained from the JUTH institutional health research ethical committee and the department of Obstetrics and Gynecology of the same hospital.

Procedure: Participants' informed consent was obtained in writing after due explanation of the study. The women were given a socio demographic/obstetric history questionnaire designed by the researchers to fill. The questionnaire asked about the demographic details (age, gravidity, LMP, marital status and occupation). The socioeconomic status of the women was determined using the International Labor Organization (ILO) classification of occupations. The medical/obstetric history section asked the past medical or obstetric conditions and any drug the women might be taking. Physical examination results were also recorded (These included the blood pressure in mmHg, the weight in Kg and the height in Meters. The body mass index in Kg/M^2 was calculated and recorded for each of the women).

The women then completed the Edinburgh Post Natal Depression Scale (EPDS) which is a 10 item self-reporting questionnaire in which the women were asked to rate how they have felt in the last one week. Each question is rated 0 - 3 with a resulting total score ranging from 0 - 30. For this study, a score of 6 or greater indicated probable depression. The EPDS has been validated for use in several countries including Nigeria [14].

Based on the women's scores on the EPDS, 2 groups emerged; those that scored below 6 and those that scored 6 and above. The Mini Neuropsychiatric Interview (MINI) was administered to the group that scored 6 and above and those that met the diagnostic and Statistical Manual of Disease-Fourth edition (DSM-1V) for depression were selected. The MINI is well established and widely accepted diagnosis and cares in psychiatry practice [15]. With an administration time of 15 minutes, it was designed to meet the needs of short but accurate structured psychiatric interviews for clinical trials and epidemiologic studies. MINI has been used to diagnose depression among pregnant women in Nigeria [3].

The controls (those that scored 6 and below on the EPDS) were matched to the depressed women for age, BMI and socioeconomic status to further reduce confounders.

By the next antenatal care visit (one month later), an obstetrician who was blind to the diagnosis of the women performed an obstetric ultrasound on each of the depressed women and their controls. Fetal weight was estimated at ultrasound using the femur length, abdominal circumference, and head circumference and biparietal diameter [16]. The same obstetrician and ultrasound machine were used for the obstetric scans to reduce observer machine bias. The gestational age of the pregnancy at the time of ultrasound was calculated from the LMP using the Negaels rule [17].

After delivery, the birth weight was obtained from the women's records in the labor room and the fetal growth rate in grams per week was calculated using the formula by Tiffany field [18].

$$FG = (BWT - EFWT)/(GA2 - GA1)$$

where;

FG is the fetal growth rate for the second half of pregnancy;

BWT is the birth weight;

GA1 is the estimated gestational age at time of ultrasound and;

GA2 is the gestational age at birth.

The data was analyzed using the EPI INFO version 3.5.3 (20). Participants were identified as depressed or non-depressed based on their MINI diagnosis. Results were calculated using frequencies, means and standard deviations. Comparisons were made using the chi-square test. Test of significance was computed at $p = 0.05$.

3. Results

Six women dropped out of the study (2 from the control group and 4 from the non-depressed group). A total of 515 women were analysed.

4. Discussion

Most of the respondents (70.5%) were between the ages of 24 - 35 years (70.5%) and over half were overweight (BMI 26-33). Most were of low socio-economic status ILO class V-VI (65%) and their parity was almost evenly distributed (**Table 1**).

This study found no significant difference in the mean fetal weight in the third trimester estimated by sonography [$p = 0.431$] (**Table 2**). This might be explained by the fact. It has been postulated that fetal growth prior to 20-week gestation is predominantly determined by genetic predisposition whereas growth in the third trimester is more likely determined by the intra uterine environment [2]. Maternal distress is reported not to be related to a decrease in estimated fetal weight before the third trimester but all types of maternal distress were negatively associated with fetal weight in late pregnancy [2].

A significant difference was noted in the mean gestational age at birth for depressed women compared to non-depressed women ($p = 0.004$) the last line on table 2 shows that (**Table 2**). This means the depressed women were more likely to

Table 1. Study characteristics of participants.

Sociodemographic variables	
N = 514 n	N [%]
Age range in years	
18-23	80 [15.6]
24-29	182 [35.4]
30-35	206 [40.1]
36-40	46 [8.9]
BMI IN Kg/M^2	
18-25	120 [23.3]
26-33	308 [59.9]
34-40	86 [16.7]
Socioeconomic status	
I-II	18 [3.5]
III-IV	162 [31.5]
V-VI	334 [65.0]
Parity	
1	150 [29.2]
2	138 [26.8]
3	100 [19.5]
4	126 [24.5]

Table 2. Means and standard deviations for depression and foetal weight in third trimester, birth weight and foetal growh rate.

	Mean ± SD		**T**	**P**
	Non-Depressed	**Depressed**		
	n = 258	**n = 256**		
Fetal weight in g	2253.5 ± 438.8	2220.1 ± 518.2	0.786	0.431
Birth weight in g	3190.1 ± 419.8	3100.1 ± 968.7	0.709	0.479
Fetal growth rate In g/week.	208.1 ± 120.5	152.3 ± 97.9	5.768	0.000**
Gestational age At birth in weeks.	38.7 ± 1.4	38.9 ± 1.6	8.1872*	0.004**

*Kruskal Wallis H; **Significant P values.

deliver prematurely than their non-depressed counterparts. Studies have shown an inconsistent relationship between antenatal depression and prematurity. A prior study in Nigeria established a significant relationship with preterm births [2], while a study in Ghana [10] reported a marginal relationship [RR 1.32]. An

Asian study reported a significant association with preterm births [8], while another reported a significant association [9]. A meta-analysis in the USA also reported mixed results but noted that African American women with antepartum depression were 2.3 times more likely to give birth to preterm babies than their non-depressed counterparts [11].

It was also noted that the depressed women's fetuses had statistically significant lower growth rate. In the third trimester and lower birth weight (<2500 grams) (p = 0.000) (**Table 3**).

Findings in this study are consistent with previous studies from south Asian countries which documented that women with elevated depressive symptoms during pregnancy are at increased risk of delivering low birth weight infants [8] [9] [18] [19]. Very few previous studies were found on this subject carried out in African countries and they showed a similar relationship between antenatal depression and low birth weight [5] [10]. To the best of our knowledge, African studies have looked at the relationship between antenatal depression and fetal growth rate in the third trimester. Fetal growth prior to 20-week gestation is predominantly determined by genetic predisposition whereas growth in the third trimester is more likely determined by the intra uterine environment [20]. Fetal weight gain in late pregnancy has to do more with an increase in cell size than number as is the case in early trimester embryogenesis [21]; it is after the full establishment of the placenta in the late trimester that fetal growth is dependent on the integrity of the materno-placental unit which is influenced by maternal stress [21].

The cortisol hormone is the key mediator between maternal depression and low birth weight. It is said to transmit maternal stress to the unborn baby. It can directly cross the placenta. It also has been found to affect the mother's vascular function, thereby decreasing blood flow to the fetus which could affect fetal growth due to a decrease oxygen and nutrient supply to the fetus [19]. Antenatal depression has also been linked to increased inflammatory proteins which may lead to premature contraction and prematurity. Depression in pregnancy is known to predispose women to poor nutrition, poor adherence to antenatal care plans,

Table 3. Depression, foetal growth rate in third trimester and birth weight.

VARIABLE	Non-depressed	Depressed	X^2	df	P
N 514	n [%]	n [%]			
Fetal growth rate					
In g/week					
<168	120 [42.2]	166 [64.3]	15.882	1	0.000**
>168	136 [59.60]	92 [35.7]			
Birth weight [g]					
<2500	8 [3.1]	248 [96.90]	21.230	1	0.000**
>2500	38 [14.7]	220 [85.3]			

**Significant P-values.

Table 4. Relationship between prenatal depression and fetal growth rate and birthweight.

Regression path	b	S.E	P
Fetal growth rate			
Age	0.140	0.074	0.208
BMI	0.092	0.063	0.144
Parity	0.296	0.934	0.403
Socioeconomic status	−0.398	0.250	0.121
Birth weight			
Age	0.109	0.064	0.088
BMI	−0.036	0.050	0.965
Parity	0.0862	0.767	0.261
Socioeconomic status	−0.283	0.218	0.754

B = unstandardized coefficient; SE = standard error.

thereby putting their babies at risk of intrauterine growth restriction. Poor appetite which may be a symptom of depression can also lead to poor weight gain and lower BMI which directly affects the weight of the baby [6]. Some of these factors might have also contributed to the growth outcomes in depressed women's fetuses/neonates.

When age, BMI, parity and socioeconomic status were subjected to a multiple regression analysis none of them were found to contribute significantly to the prematurity or low fetal growth rate in the third trimester (**Table 4**). Therefore antenatal depression was found to have an independent association with low growth rate in the third trimester and low birth weight.

5. Conclusion

Depression in the third trimester was significantly associated with low fetal growth in the third trimester and low birth weight. The Impact of this is suggested to be higher in low-income countries where there is poor access to mental health services [22]. The results from this study also suggest that there is a need for women should therefore be routinely screened for depression during pregnancy and those found to be depressed should be closely monitored to ensure that they have good pregnancy outcomes. There is however a need for more research in this area, especially in African countries.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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