PERINATAL OUTCOME OF FETAL GROWTH RESTRICTION AND FACTORS ASSOCIATED WITH IT AT ASELLA TEACHING AND REFERRAL HOSPITAL, SOUTH-EAST ETHIOPA

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ABSTRACT

BACKGROUND: Fetal growth restriction (FGR) is a disorder of fetal growth and development caused by decreased nutrient and oxygen supply to the fetus, often due to placental insufficiency during intrauterine life. FGR is associated with a variety of adverse perinatal outcomes. There is a scarcity of data on the perinatal outcomes of FGR and the factors associated with it in the study area. This study aims to assess perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes at Asella Teaching and Referral Hospital.

METHODS: A hospital-based cross-sectional study was conducted at Asella Teaching and Referral Hospital from February 1, 2022, to September 30, 2022. Pregnant mothers with singleton gestation diagnosed with IUGR participated in the study. Data were entered into EpiData version 4.6 and exported to SPSS version 26 for cleaning and analysis. Logistic regression analysis was performed to identify factors associated with unfavorable perinatal outcomes. The results are reported with 95% confidence intervals for both crude and adjusted odds ratios. Statistical significance was determined using a p-value threshold of <0.05.

RESULTS: A total of 172 pregnant mothers who gave birth to FGR fetuses were enrolled. Of these deliveries, 107 (62.2%) cases had unfavorable perinatal outcomes. Mothers aged between 20–34 years (AOR: 0.098, 95% CI: 0.016–0.58) and those without any maternal risk factors for FGR (AOR: 0.21, 95% CI: 0.049–0.918) were associated with decreased odds of developing unfavorable perinatal outcomes by 90.2% and 79%, respectively, compared to mothers aged >35 years and those with at least one risk factor for FGR. Additionally, mothers with a pre-pregnancy BMI between 18.5–24.9 kg/m² (AOR: 0.20, 95% CI: 0.07–0.55) and BMI >25 kg/m² (AOR: 0.116, 95% CI: 0.02–0.68) were associated with decreased odds of developing unfavorable perinatal outcomes by 80% and 88.4%, respectively, compared to mothers with a BMI <18.5 kg/m². Conversely, stage 1 FGR (AOR: 9.07, 95% CI: 2.83–29.10) and stage 2 FGR (AOR: 22.66, 95% CI: 1.84–278.55) were associated with 9 times and 22 times increased odds of developing unfavorable perinatal outcomes, respectively, compared to stage 0 FGR. The presence of maternal hypertension (AOR: 5.83, 95% CI: 1.14–29.76) was associated with a six-fold increased risk of unfavorable perinatal outcomes compared to mothers without hypertension.

CONCLUSIONS AND RECOMMENDATIONS: Maternal age between 20–35 years, a pre-pregnancy BMI of 18.5–24.9 kg/m² or >25 kg/m², and the absence of maternal risk factors for FGR were associated with a decreased risk of unfavorable perinatal outcomes. However, stage 1 FGR, stage 2 FGR, and maternal hypertension significantly increased the risk of unfavorable perinatal outcomes. It is recommended to counsel women on nutrition to increase their pre-pregnancy BMI before conception and to intervene in minimizing the risk of FGR development in the community.

KEYWORDS: Early neonatal death, fetal growth restriction, intrauterine growth restriction, low birth weight, small for gestational age, stillbirth, unfavorable perinatal outcome

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INTRODUCTION

Fetal growth restriction (FGR), also known as intrauterine growth restriction (IUGR), is a disorder of fetal growth and development characterized by deceleration of fetal growth. This is determined by a change in fetal growth velocity due to diminished or impaired nutrient and oxygen supply to the fetus as a result of placental insufficiency during intrauterine life[1,2]. An abnormal umbilical artery Doppler pulsatility index, reflecting increased impedance to flow in the umbilical circulation, is considered an indicator of placental disease. FGR and small-for-gestational-age (SGA) are not synonymous[2]. FGR describes fetuses with an estimated fetal weight (EFW) or abdominal circumference (AC) below the 10th percentile for gestational age (GA), whereas SGA exclusively describes newborns with a birth weight below the 10th percentile for GA[1]. Using fetal weight <10th percentile as a criterion may overclassify FGR, as many fetuses might be constitutionally small and healthy, not at increased risk of adverse perinatal outcomes (APOs)[3,4]. The combined finding of an EFW <10th percentile and abnormal umbilical artery Doppler velocimetry is widely accepted as indicative of FGR[2,5].

FGR can be classified in various ways. Based on GA at diagnosis, it is sub-classified into early and late FGR, depending on whether the onset is before or after 32 weeks of gestation, respectively[4]. The Delphi consensus standardized the definition of early and late-onset FGR using size (biometry) and functional parameters (Doppler blood flow)[2,4,6]. Early FGR is associated with umbilical artery Doppler abnormalities, while late FGR is often associated with a low pulsatility index in the middle cerebral artery[2]. FGR can also be classified as asymmetric or symmetric. In asymmetric growth, somatic growth (e.g., AC and lower body) shows significant delay, with relative or absolute sparing of head growth. In symmetric growth, both body and head growth are similarly affected[7,8].

The etiology of FGR can be broadly categorized into maternal, fetal, environmental, and placental factors. Although the primary pathophysiologic mechanisms underlying these conditions differ, they often share a common final pathway: suboptimal uterine–placental perfusion and fetal nutrition[1,7,8]. Identifying the factors responsible for FGR is crucial for early intervention and improved perinatal outcomes[7].

FGR is the second leading cause of perinatal mortality after prematurity, affecting 10–15% of pregnancies[9]. Identifying pregnancies at risk for preventable perinatal handicap is a primary goal for obstetric care providers. Birth weight plays a critical role in infant mortality, morbidity, development, and future health[10]. Growth-restricted fetuses are predisposed to cognitive delay in childhood and diseases like obesity, type 2 diabetes mellitus, coronary artery disease, and stroke in adulthood[1]. Compared to appropriately grown counterparts, perinatal mortality rates in neonates with FGR are 6–10 times higher, with rates as high as 120/1000 for all cases of IUGR and 80/1000 after excluding anomalous infants. Up to 53% of preterm stillbirths and 26% of term stillbirths are growth-restricted[8].

Studies have identified several predictive factors for adverse outcomes, including pregnancy-induced hypertension, chronic hypertension, maternal weight gain <8 kg, early-onset FGR, EFW <5th percentile, amniotic fluid index <5 cm, and abnormal umbilical artery Doppler [11]. Another study reported that GA <30 weeks, absent/reversed end-diastolic flow, chronic hypertension, superimposed preeclampsia, and umbilical artery pulsatility index >95th percentile were predictors of perinatal death and severe adverse outcomes in FGR cases[12].

The prevalence of low birth weight in Ethiopia is estimated to be 14%[10]. However, the prevalence and outcomes of FGR in Ethiopia remain understudied, making it challenging to develop strategies to reduce IUGR prevalence and its associated risks. This study aims to assess perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes at Asella Teaching and Referral Hospital (ATRH).

METHOD

Study Area, Study Design, and Study Period

A hospital-based cross-sectional study design was employed to conduct this study at ATRH from February 1, 2022, to September 30, 2022. ATRH is located about 175 km from Ethiopia's capital city, Addis Ababa, in the southeast direction. ATRH is staffed by midwives, interns, gynecology and obstetrics residents, and obstetrics and gynecology consultants. It has an average monthly delivery rate of 650. The hospital also has a neonatal intensive care unit (NICU).

Source Population and Study Population

The source population comprised pregnant mothers who gave birth to FGR newborns at ATRH, while the study population included all singleton gestations with FGR who gave birth at ATRH during the study period. All pregnant mothers with singleton gestation admitted to ATRH labor ward with the diagnosis of FGR for delivery service were included, except for deliveries complicated by congenital anomalies, RH isoimmunization, and pregnancies with unknown gestational age (GA).

Sample Size and Sampling Procedures

The required sample size was determined using the single population proportion formula, considering the proportion of low APGAR scores (12.9%) among all FGR deliveries in a study conducted at St. Paul Hospital[5], with a 95% confidence interval, 5% margin of error, and a 5% non-response rate. Thus, the sample size was calculated to be 182. All singlet on gestations with FGR who gave birth at ATRH during the study period were enrolled consecutively until the sample size was reached.

Study Variables

Dependent Variable: Perinatal outcome

Independent Variables:

- **Socio-demographic characteristics of mothers:** Age, educational status, family income
- **Obstetric factors:** Parity, history of FGR delivery, antenatal care (ANC) follow-up, GA, maternal weight gain, antepartum hemorrhage, hypertensive disorders of pregnancy
- **Environmental/medical characteristics:** History of chronic illness, history of smoking, history of alcohol intake, malnutrition
- **Fetal characteristics:** Sex of the fetus

Operational Definitions

- **Perinatal outcome:** An unfavorable perinatal outcome is defined by the presence of any of the following conditions: low APGAR score, low birth weight, NICU admission, meconium aspiration syndrome (MAS), neonatal sepsis, respiratory distress syndrome (RDS), stillbirth, or early neonatal death (END). A favorable perinatal outcome is characterized by the absence of these conditions[13,14].
- **Early neonatal death:** Death of a newborn within the first 7 days of life.
- **Fetal growth restriction (FGR):** Fetuses with an estimated fetal weight (EFW) or abdominal circumference (AC) less than the 10th percentile for GA.
- **Stillbirth:** Delivery of a dead fetus after the age of viability (>28 weeks) or at a weight of >1 kg.
- **Perinatal deaths:** A combination of fetal deaths (stillbirth) and END.
- **Low APGAR score:** An APGAR score less than or equal to 6.
- **Family income:** The average monthly income generated by family members per month.
- **Maternal weight gain:** Maternal weight gained during pregnancy, calculated by subtracting the pre-pregnancy weight of the mother from her weight immediately before the onset of labor.
- **Chronic illness:** Presence of any chronic medical illness requiring long-term follow-up and treatment, such as hypertension, diabetes, cardiac diseases, bronchial asthma, etc.

Data Collection Tools and Procedure

The questionnaire was adapted from other relevant literature[4,5,7,11] and translated into the local language (Afan Oromo). Three third-year obstetrics and gynecology residents were recruited and trained to collect data. The purpose of the study was explained to mothers, and their willingness to participate in the study was sought. For those who gave consent, labor progress and fetal heart rate were monitored

using a Pinard stethoscope and cardiotocography. Interviews with mothers were conducted to gather information related to the socio-demographic and obstetric characteristics of study participants. Data on neonatal outcomes were extracted from client records, delivery registers, and operation room registers. The APGAR score was used to assess the condition of newborns at the first and fifth minutes after birth. Study participants were followed from the time of admission until their discharge from the hospital. Neonatal conditions were followed for 7 days postpartum through phone interviews if the mother and neonates were discharged from the hospital.

Data Quality Assurance

To maintain data quality, data collectors were trained for one day and selected based on their educational level, work experience, and knowledge of FGR. Moreover, the questionnaire was pre-tested on 5% of the total sample at Adama Hospital Medical College to assess the appropriateness of the data collection tool, language clarity, and responses. The collected data were reviewed and checked for completeness and consistency by the principal investigator daily during the data collection period.

Data Processing and Analysis

Data were entered and cleaned using Epi-data version 4.6 and analyzed using SPSS version 26 statistical software. Errors related to data inconsistency were checked and corrected during data cleaning. Measures of central tendency appropriate to study variables were calculated. Descriptive analyses were conducted. A multivariate approach was applied to determine the best predictors of perinatal outcomes of FGR and factors associated with unfavorable perinatal outcomes. Adjusted odds ratios (AOR) and corresponding 95% confidence intervals (CI) were used to quantify the degrees of association between dependent and independent variables. Variables with a p-value ≤ 0.25 in the univariate analysis were entered into the multivariate logistic regression model to control for possible confounding factors. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of Arsi University. Informed verbal consent was obtained from each selected study participant. The purpose of the study and their right to decline participation were explained to the participants. Furthermore, the information collected was kept confidential by omitting personal identifiers.

RESULTS:

Socio-demographic, obstetric and reproductive characteristics of respondents

A total of 172 study participants were enrolled to this study making response rate of 94.5%. Only 10 (5.8%) participants complete their college or university education while 78(45.3%) of the mother attended their high school education. Almost the entire mother 169 (98.3%) live in union with their husband. Majority of the mothers were housewife 158(91.9%) and primiparous 80(46.5%) while all of them (100%) have ANC follow up. About 47 (27.3%) of mother have low pre pregnancy BMI, <18.5.and 146(86.6%) have inadequate weight gain during pregnancy. Majority of the FGR 104 (60.5%) were stage 0 (normal Doppler of umbilical artery) and nearly half mothers 84(48.8%) gave birth through cesarean section. Fifty two (30.2%) of the neonates were delivered preterm [**Table 1**].

Table 1: Socio-Demographic, Obstetric and Reproductive Characteristics of the Mother at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.

Variable	Variable Category	Frequency N= 172	Percent
AGE in years	< 20	10	5.8
	20-34	146	84.9
	≥35	16	9.3
Marital status	Single	2	1.2
	Married	169	98.3
	Divorced	1	0.6
Level of education	College or university	10	5.8
	High school	78	45.3
	Primary education	56	32.6
	Able to read & write	16	9.3
	Unable to read & write	12	7
Occupation	Housewife	158	91.9
	Merchant	5	2.9
	Government employee	6	3.5
	Private employee	3	1.7
Religion	Orthodox	79	45.9
	Muslim	77	44.8
	Protestant	9	5.2
	Catholic	7	4.1
Ethnicity	Oromo	136	79.1
	Amhara	36	20.9
Family income per month *	Lower middle income	24	14
	Upper middle income	148	86
Parity	Primiparous	80	46.5
	Para 2-4	76	44.2
	Para≥5	16	9.3
Stage of IUGR	Stage 0	104	60.5
	Stage 1	47	27.3
	Stage 2	21	12.2
Mode of delivery	Ceserean Delivery	84	48.8
	Spontaneous vaginal delivery	27	15.7
	Successful Induction	61	35.5
GA at delivery	<37wks	52	30.2
	≥37wks	120	69.8
Previous_IUGR delivery	Yes	7	4.1
	No	165	95.9

*2015 World Bank classification

Perinatal Outcome

Of the total cases, 107 (62%) had unfavorable perinatal outcome. Majority of newborn had low birth weight, 122(70.9%) between 1.5kg-2.49kg and 21(12.2%) has very low birth weight between 1kg-1.49kg. About 92(53.5%) of newborns were female. Majority of neonate have normal 5th minute Apgar score, 158(91.9%). About 107 (62.2%) needed NICU admission for different reasons. About 14(8.1%) of the newborns has ended up with early neonatal death (END) and 11(6.4%) were still birth. The summaries of perinatal outcomes are provided by the table below [**Table 2**].

TABLE 2: Neonatal Outcome of FGR neonates born at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.

Variable	Category	Frequency	Percent
Birth weight	1.1kg-1.49kg	21	12.2
	1.5kg-2.49kg	122	70.9
	2.5kg-4kg	29	16.9
Sex	Male	80	46.5
	Female	92	53.5
Apgar score	Normal	158	91.9
	Low	14	8.1
NICU admission	Yes	103	59.9
	No	69	40.1
Stillbirth	Yes	11	6.4
	No	161	93.6
END	Yes	14	8.1
	No	158	91.9
Perinatal outcome(PO)	Unfavorable PO	107	62.2
	Favorable PO	65	37.8
Oligohydramnios	Yes	71	41.3
	No	101	58.7

Maternal condition associated with FGR

Of all participants, only 74(43%) have known risk factor for FGR. From the known maternal risk factors 58 (33.7%) have hypertension followed by low pre-pregnancy BMI (<18.5 kg/m2) 47(27.3%) and antepartum hemorrhage 15(8.7%).

Factors associated with unfavorable perinatal outcomes

On binary logistic regression participants who attended College or University, preterm delivery, pre pregnancy BMI of 18.5-24.9 kg/m2 and > 25kg/m^2, stage 1 FGR, stage 2 FGR, absence of known maternal risk factor for FGR, and presence of maternal hypertension have shown association with unfavorable perinatal outcome compared to illiterate, term delivery, BMI <18.5 kg/m^2, stage 0 FGR and presence of maternal risk factors counterparts at P-value of <0.05.

However, variables that have shown positive significant association with development of unfavorable perinatal outcome at P-value of < 0.05 on multivariate logistic regression were; stage 1 FGR [AOR= 9.07, 95%CI: (2.83-29.10)], stage 2 FGR [AOR= 22.66, 95%CI:(1.84-278.55)], and presence of maternal hypertension [AOR=5.83, 95%CI: (1.14-29.76)] while maternal age of 20-35 years [AOR=0.096, 95%CI:(O.016-0.58)], Normal pre-pregnancy BMI [AOR= 0.20, 95%CI:((0.07-0.55)], pre-pregnancy BMI of >25 kg/m^2 [AOR=0.116, 95%CI: (0.02-0.68)], and absence of any of maternal risk factor for FGR [AOR=0.21, 95%CI: (0.049-0.918)] were significantly associated with decreased risk of unfavorable perinatal outcome [**Table 3**]

Table 3. **Multivariate logistic regression analysis of adverse perinatal outcome among FGR neonates born at Asella Teaching & Referral Hospital, South-East Ethiopia, 2022.**

Variables	Category	Unfavorable PO	Favorable PO	COR(95%CI)	AOR(95%CI)	P-Value
Age in years	< 20	8(80%)	2(20%)	0.92(0.12-1.9)	0.236(0.018-3.13)	0.27
	20-35	86(59)	60(41)	0.33(0.9-1.21)	0.096(O.016-0.58)	0.01*
	≥35	13(81)	3(19)	REF	REF	
Educational status	College/University	3(30)	7(70)	0.14(0.02-0.93)	0.28(0.25-3.17)	0.3
	High School	51(65)	27(35)	0.63(0.15-2.52)	2.55(0.38-17.16)	0.33
	Primary school	31(55%)	25(45)	0.41(0.10-1.69)	1.2(0.19-8.18)	0.8
	Able to read and write	13(81)	3(19)	1.44(0.23-8.84)	8.39(0.83-84.06)	0.07
	Unable to read and write	9(75)	3(25)	Ref	Ref	
Pre-pregnancy BMI	<18.5	37(78.7)	10(21.3)	REF	REF	
	18.5-24.9	64(55.6)	51(44.4)	2.9(1.33-6.40)	0.20(0.07-0.55)	0.002*
	>25	6(60)	4(40)	2.4(0.5-10.46)	0.116(0.02-0.68)	0.018*
Weight gain during pregnancy	Adequate	11(47.8)	12(52.2)	REF	REF	
	Inadequate	96(64.4)	53(35.6)	0.50(0.20-1.2)	1.83(0.56-5.82)	0.31
Gestational age at delivery	≥37wk	63(52.5)	57(47.5)	REF	REF	
	<37wk	44(84.6)	8(15.4)	4.97(2.16-11.46)	1.81(0.56-5.82)	0.32
Stage of FGR	Stage 0	47(45.2)	57(54.8)	REF	REF	
	Stage 1	40(85)	7(15)	0.14(0.059-0.35)	9.07(2.83-29.10)	0.01*
	Stage 2	20(95.2)	1(4.8)	0.04(0.005-0.319)	22.66(1.84-278.55)	0.015*
Presence of any known maternal risk factor for FGR	Yes	53(71.6)	21(29.4)	REF	REF	
	No	54(55.1)	44(44.9)	2.05(1.08-3.91)	0.21(0.049-0.918)	0.038*
Presence of maternal hypertension	Yes	48(82.7)	10(17.3)	4.47(2.06-9.70)	5.83(1.14-29.76)	0.034*
	No	59(51.7)	55(49.3)	REF	REF	

DISCUSSION

In this study, the magnitude of unfavorable perinatal outcomes was found to be 107 (62.2%). Adverse perinatal outcomes occurred in 44.6% of cases[11], in 39.7% of cases[12], and in one-third of cases[15] in different studies. The finding of our study is relatively similar to those studies, whereas the proportion of fetuses with adverse perinatal outcomes was 5% in another study conducted in Ireland[16]. The significant difference between the Ireland study and ours might be due to methodological variation in the operational definition of APO we used. In the Ireland study, APO was defined as a composite of intraventricular hemorrhage, periventricular leukomalacia, bronchopulmonary dysplasia, necrotizing enterocolitis, sepsis, hypoxic-ischemic encephalopathy, and death, which are rare occurrences with FGR. In our case, we defined APO as a composite of low APGAR score, low birth weight, NICU admission, meconium aspiration syndrome (MAS), neonatal sepsis, respiratory distress syndrome (RDS), stillbirth, and early neonatal death (END).

In this study, normal pre-pregnancy BMI [AOR = 0.20, 95% CI: (0.07–0.55)] and pre-pregnancy BMI > 25 kg/m² [AOR = 0.116, 95% CI: (0.02–0.68)] were significantly associated with decreased odds of developing unfavorable PO by 80% and 88.4%, respectively, compared with those with pre-pregnancy BMI < 18.5 kg/m². Maternal BMI is a modifiable risk factor associated with unfavorable PO, such as low birth weight, preterm labor, and SGA. The finding of our study is similar to that of a study conducted in Gondar, which showed an association between low BMI and FGR[9]. Based on maternal BMI, the FGR risk profile was U-shaped and bidirectional. Both underweight and obesity were associated with a higher risk of FGR and APO[17,18]. In another study, maternal obesity was associated with an increased risk of perinatal mortality, genetic disorders, and intrauterine growth restriction[7].

Similarly, maternal age of 20–35 years [AOR = 0.096, 95% CI: (0.016–0.58)] and absence of maternal risk factors for FGR [AOR = 0.21, 95% CI: (0.049–0.918)] were significantly associated with decreased odds of developing unfavorable PO by 90.4% and 79%, respectively, compared with those aged > 35 years and those having maternal risk factors for FGR. Our study aligns with another study that showed a significant association between advanced maternal age and FGR or APO[17]. Advanced maternal age is an independent and substantial risk factor for different APOs, such as low birth weight, preterm birth, and low APGAR scores. Another study revealed that the odds of composite APO were higher among advanced maternal age women compared with adult-aged women (AOR = 2.01, 95% CI: 1.06–3.79)[19].

In this study, Stage 1 FGR [AOR = 9.07, 95% CI: (2.83–29.10)] and Stage 2 FGR [AOR = 22.66, 95% CI: (1.84–278.55)] were significantly associated with increased odds of developing unfavorable PO by 9 and 23 times, respectively, compared to Stage 0 FGR. Fetuses with Stage 0 FGR have normal Doppler studies, while Stage 1 FGR has abnormal Doppler flow, and Stage 2 FGR has absent or reversed Doppler flow on ultrasound assessment. The findings of our study are consistent with other studies. Newborns with affected umbilical artery Doppler studies develop APOs such as NICU admission, RDS, neonatal sepsis, neonatal hyperbilirubinemia, and END more frequently than those with normal Doppler studies. In a study conducted at Saint Paul Hospital, newborns with abnormal umbilical Doppler studies were 2.3 times more likely to develop RDS and require resuscitation compared to those with normal Doppler studies[5]. Infants with abnormal antenatal Doppler flow were at increased risk of perinatal complications in another study as well[20].

The risk of developing unfavorable perinatal outcomes increased sixfold with the presence of maternal hypertension compared to its absence [AOR = 5.83, 95% CI: (1.14–29.76)]. A history of pregnancy-induced hypertension and chronic hypertension were found to be predictors of adverse perinatal outcomes in other studies as well[11, 12].

LIMITATION

The limitation of this study was that the assessment of neonatal outcomes was restricted to short-term intrapartum events and the first seven days of neonatal life.

CONCLUSION & RECOMMENDATION

The magnitude of unfavorable perinatal outcomes among FGR fetuses was high (62%) in this study. Maternal age of 20–35 years, pre-pregnancy BMI of 18.5–24.9, and > 25 kg/m², as well as the absence of known maternal risk factors for FGR, were associated with a decreased risk of unfavorable perinatal outcomes, while Stage 1 FGR, Stage 2 FGR, and maternal hypertension were significantly associated with an increased risk of unfavorable perinatal outcomes. We recommend counseling women on nutrition to increase their pre-pregnancy BMI before conception and intervening to minimize the risk of FGR development in the community.

ABBREVIATIONS

AC: Abdominal circumference;
ANC: Antenatal care;
AOR: Adjusted odds ratio;
APO: Adverse perinatal outcome;
ATRH: Asella Teaching and Referral Hospital;
BMI: Body mass index;
CI: Confidence interval;
COR: Crude odds ratio;
CS: Cesarean section;
EFW: Estimated fetal weight;
END: Early neonatal death;
FGR: Fetal growth restriction;
GA: Gestational age;
IUGR: Intrauterine growth restriction;
MAS: Meconium aspiration syndrome;
NICU: Neonatal intensive care unit;
SGA: Small for gestational age;
RDS: Respiratory distress syndrome;
SVD: Spontaneous vaginal delivery.

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