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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

Proportion Of Intrauterine Growth Restriction And Its Associated Factors Among Women Who Gave Birth At Tibebe Ghion Specialized Hospital North West Ethiopia, 2024gc

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A THESIS SUBMITTED TO DEPARTMENT OF OBSTETRICS AND GYNECOLOGY, SCHOOL OF MEDICINE, COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF SPECIALITY IN OBSTETRICS AND GYNECOLOGY

DECEMBER, 2024

BAHIRDAR, ETHIOPIA

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF MEDICINE

INTRAUTERINE GROWTH RESTRICTION AND ITS ASSOCIATED FACTORS AMONG WOMEN WHO GAVE BIRTH AT TIBEBE GHION SPECIALIZED HOSPITAL NORTHWEST ETHIOPIA, 2024GC

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DECEMBER,2024

BAHIR DAR, ETHIOPIA

DECLARATION

This is to certify that the thesis entitled proportion of intrauterine growth restriction and its associated factors among women who gave birth at TibebeGhion Specialized Hospital north West Ethiopia, 2024GC: cross-sectional study , submitted in partial fulfillment of the requirements for specialty certificate in gynecology and obstetrics Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance help and I received during the course of this investigation have been duly acknowledged.

Name of the candidate ...Date ...Place ...

APPROVAL OF THESIS

I hereby certify that I have supervised, read, and evaluated this thesis titled "proportion of intrauterine growth restriction and its associated factors among women who gave birth at TibebeGhion Specialized Hospital North West Ethiopia, 2024GC : cross-sectional study" by Dr. DesalegnAdane Awoke prepared under my guidance. I recommend the thesis be submitted for oral defense.

Advisor's Name

1 Dr Semagn Mekuria Signature _____ Date 16/01/2025

2 Dr. Hagenenges + Astatkie Signature _____ Date January 16, 2024

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF MEDICINE, DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

Approval of thesis for defense result

We hereby certify that we have examined this dissertation entitled "proportion of intrauterine growth restriction and its associated factors among women who gave birth at TibebeGhion Specialized Hospital north West Ethiopia, 2024GC: cross-sectional study" by Dr. DesalegnAdaneWe recommend and approve the dissertation a degree of "specialty certificate in Obstetrics and Gynecology.

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ABSTRACT

Introduction: Intrauterine growth restriction is defined as the rate of fetal growth that is below the normal growth potential of a specific infant as per the race and gender of the fetus.

Method: An institutional based cross-sectional study was conducted. Among 291 women who visited delivery unit at TGSH in Bahir Dar city from August 1 to October 30, 2024 GC. Study subjects were selected using systematic random sampling technique. Data was collected using interviewer administered well-structured questionnaire and check list. The collected data were coded and analyzed using SPSS 25. Bivariable and multivariable logistic regressions were fitted to assess the association between independent and the dependent variables. P-value less than 0.05 at 95 % CI was used to declare statistical significance association. The result was presented using descriptive statistics by using tables and pie chart.

Result: The prevalence of intra uterine growth restriction was25.1% (95% CI: 20-30). Mothers who have no formal education (AOR=10.455, 95%CI(1.056-103.521), having BMI less than 18.5 kg/m2 (AOR=9.065, 95% CI(1.641-50.059), having MUAC less than 23 (AOR=8.193, 95% CI(1.818-36.923), having malaria (AOR=6.206, 95% CI(1.952-19.729) having pregnancy induced hypertension (AOR=7.913, 95% CI(1.437-43.582), newborn being SGA(AOR=8.527, 95% CI(3.066-23.719) and weight of the placenta less than 350(AOR=3.745, 95% CI(1.305-10.742)were significantly associated with IUGR in multivariable logistic analysis with P value less than 0.05.

Conclusion: the prevalence of intrauterine growth restriction is high and a major Public Health concern. Maternal education, birth weight to gestational age, maternal BMI, maternal mid-upper arm circumference, placental weight, malarial infection and pregnancy induced hypertension were found the most predictor variable**.**

Recommendation: Education is the core center of knowledge, so the government should address at least primary education for females. Health professionals shall have to counsel women about the importance of nutrition and nutritional intervention to increase maternal weight and thereby reduce the risk attributable to IUGR.

Key words: Intra uterine growth restriction**,** Tibebe GhionSpecialized Hospital, cross-sectional study**.**

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ACRONYMS AND ABBREVIATIONS

AOR Adjusted Odds Ratio

AFI Amniotic Fluid Index

AGA Appropriate for Gestational Age

BDU Bahir Dar University

BMI Body Mass Index

CAN score Clinical Assessment of Nutrition score

CPR Cerebro Placental Ratio

COR Cruds odds Ratio

FGR Fetal Growth Retardation

GA Gestational Age

GYNY/OBS Gynecology and Obstetrics

HTN Hypertension

HIV Human Immune Virus

ICU Intensive Care Unit

IUGR Intra Uterine Growth Restriction

LGA Large for Gestational Age

MUAC Middle Upper Arm Circumference

MAC/HC Middle Arm to Head Circumference

MAS Meconium Aspiration Syndrome

PI Pondral Index

S/D Systolic to Diastolic ratio

SGA Small for Gestational Age

TGSH TibebeGion Specialized Hospital

UA-AEDF Umblical Artery Absent End Diastolic Flow

UAPI Umblical Artery Pulsatility Index

UtAPI Uterine Artery Pulsatility Index

1. INTRODUCTION

1.1Background

Intrauterine growth restriction (IUGR) is defined as the rate of fetal growth that is below the normal growth potential of a specific infant as per the race and gender of the fetus. It has also been described as a deviation from an expected fetal growth pattern and is usually the result of innate reduced growth potential or because of multiple adverse effects on the fetus. The "normal" neonate is the one whose birth weight is between the 10^{th} and 90^{th} percentile as per the gestational age, gender and race with no feature of malnutrition and growth retardation[1].

The terms "IUGR" and "small for gestational age (SGA)" have been used synonymously in medical literature, but there exist small differences between the two. Small for gestational age definition is based on the cross-sectional evaluation (either prenatal or postnatal), and this term has been used for those neonates whose birth weight is less than the 10^{th} percentile for that particular gestational age or two standard deviations below the population norms on the growth charts. An IUGR is a clinical definition and applies to neonates born with clinical features of malnutrition and in-utero growth retardation, irrespective of their birth weight percentile. Henceforth, appropriate for gestational age (AGA) infants can be labeled as IUGR if they have features of in-utero growth retardation and malnutrition at the time of birth[2].

Therefore, it is important to keep in mind that neonates with a birth weight less than the 10th percentile will be SGA, but not an IUGR if there are no features of malnutrition, and a neonate with a birth weight greater than the 10th percentile will be an IUGR despite being an AGA, if the infants have features of malnutrition at birth[3].

Fetal growth is regulated at multiple levels and successful placentation is mandatory for coordination between key component of Maternal, Fetal, and Placental components. Several conditions may interfere with normal placentation and lead either to pregnancy loss or IUGR. Causes of IUGR are broadly categorized into Maternal, Placental and Fetal causes. Maternal cause could be due to placental vascular insufficiency like Pre-eclampsia, Chronic HTN, Chronic Renal Diseases etc., or it may be due to Malnutrition, Smoking, Alcohol intake etc. Placental cause includes cases of poor uterine blood flow to placental site for a long time leading to chronic placental insufficiency with inadequate substrate (Glucose, Amino acid and Oxygen) transfer as in Placenta previa, Placental infarct, circumvallate placenta, Chorioangiomata or

Velamentous cord insertion. Fetal cause is when there is substrate in the maternal blood which crosses the placenta but is not utilized by the fetus like in Chromosomal anomalies (trisomy13/18/21) or Congenital malformations (cardiovascular disease, renal disease,gastroschiasis)[4-8].

Historically, IUGR has been categorized as Symmetrical or Asymmetrical depending upon the onset or etiology of a particular fetal insult. In symmetrical growth restriction, an early insult could result in a relative decrease in cell number and size, with proportionate reduction of both head and body size. Asymmetrical growth restriction might follow a late pregnancy insult with preferential shunting of oxygen and nutrients to the brain, which allows normal brain and head growth so-called brain sparing [4-6, 9].

There are two main phenotypes of FGR which differ significantly in many aspects, such as prevalence, prediction by first-trimester ultrasound, gestational age at onset, placental histopathological findings, Doppler velocimetric profile, maternal associated disease, severity and perinatal outcome. Which are defined as early-onset(before 32weeks of gestational age) and late-onset FGR(after 32 weeks of gestational age) based on the observation that one phenotype is more frequent in early gestation and the second near term[10].

The definition of FGR varies between different guidelines and author groups. The criteria proposed by an international Delphi consensus represent the most recognized definition of FGR.

Table 1Definitions for early- and late-onset fetal growth restriction (FGR) in absence of congenital anomalies, based on international Delphi consensus

Early FGR: GA<32 weeks, in absence of congenital anomalies	Late FGR: GA ≥32 weeks, in absence of congenital anomalies
AC/EFW <3rd centile or UA-AEDF Or 1. AC/EFW <10th centile combined with 2. UtA-PI >95th centile and/or 3. UA-PI >95th centile	AC/EFW <3rd centile Or at least two out of three of the following 1. AC/EFW <10th centile 2. AC/EFW crossing centiles >2 quartiles on growth centiles 3. CPR <5th centile or UA-PI >95th centile

AC, fetal abdominal circumference; AEDF, absent end-diastolic flow; CPR, cerebroplacental ratio; EFW, estimated fetal weight; GA, gestational age; PI, pulsatility index; UA, umbilical artery; UtA, uterine artery[10].

Early-onset FGR has a prevalence of 0.5%–1%, is usually more severe, and is more likely to be associated with abnormal umbilical artery Doppler than late-onset FGR. The underlying placental pathology is frequently similar to that observed in cases of early- onset pre-eclampsia which explains the strong association of early-onset FGR with pre-eclampsia. Therefore, early-onset FGR is usually easier to detect, and the natural history tends to follow a predictable sequence of Doppler changes in the umbilical artery and ductusvenosus. The main challenge in cases of early-onset FGR is management (i.e. timing of delivery), by attempting to determine the optimal balance between the opposing risks of stillbirth and prematurity[11].

Late-onset FGR is more common than early-onset FGR with a prevalence of 5%–10%. In contrast to early-onset FGR, it is usually milder, is less likely to be associated with pre-eclampsia, and is usually associated with normal umbilical artery Doppler. Therefore, the main challenge with regard to late-onset FGR is diagnosis, while management (i.e. delivery) is relatively simple given that the diagnosis is commonly made during the late-preterm or term periods, where the risks associated with delivery are relatively small. The diagnosis of late-onset FGR mainly relies on adaptive changes in the cerebral circulation (“redistribution” or “brain-sparing effect”), which is reflected by low resistance to flow in the middle cerebral artery thereby generating a low cerebroplacental ratio. Given that the umbilical artery and ductusvenosus

Doppler studies are usually normal in cases of late-onset FGR, the natural history in these cases is less predictable and there is a risk of sudden decompensation and stillbirth [11].

Diagnosing IUGR after delivery may be challenging. There are different methods used to diagnose IUGR after delivery like PI(Pondral index), MAC/HC(mid upper arm to head circumference) and CAN (clinical assessment of nutrition) score. Neonatal ponderal index (NPI) = 100x [birth weight (gram) / length (cm)3]. Miller and Hassanein[12] proposed that a full term infant is growth retarded if his PI is < 2.2.Ponderal index relies on the principle that length is spared at the expense of weight during period of acute malnutrition; weight and length velocities may be proportionately impaired so infants with chronic insult in utero may be misclassified by PI.

Meadow and colleagues[13] concluded that the MAC/HC ratio, independent of birth weight, readily discriminated the late gestation growth retarded baby. Their study showed that this ratio can be used as a reliable test to identify neonates whose growth is retarded, even when their weight does not fall below 10th percentile. But those babies whose head circumference is reduced because of proportionate growth retardation might not be identified. The low value in this study might indicate the chronic stress these infants face in utero. The cut off value to say IUGR is MAC/HC ratio less than 0.27.

Clinical assessments of nutritional status by using observation and a hands-on estimate of the loss of subcutaneous tissue and muscles (CAN) score which is simple and rapid. Clinical Assessment of Nutrition (CAN score): is a scoring system based on nine superficial readily detectable signs of malnutrition in the newborn baby. A CAN score of < 25 was used to define malnutrition. This score offered the best breakpoint between growth retarded and normal infants as determined by weight for age[14].

Table 2 The Nine Signs for Clinical Assessment of Nutritional (CAN) Status in the Newborn (CAN score system).

CAN score	1	2	3	4
1. Hair	Straight "staring" hair with depigmented stripe (flag sign)	Still thinner, more straight, "staring" hair which does not respond to brushing	Thinner, some straight, "staring" hair	Large amount, smooth, silky, easily groomed
2. Cheek	significantly reduced bucal fat with narrow, flat face	Flat, poor or small pad of fat	Flat with good pad of fat	Full buccal pads and round face
3. Neck and Chin	No fat fold, neck with loose, wrinkled skin, very evident	some mandibular fat, minimal neck fat	Full mandibular fat, moderate neck fat, no rolls	Double or triple chin fat fold, neck not evident
4. Arms	sub cutaneous tissue minimal,skin very loose, easily grasped and pulled away from elbow	some sub cutaneous tissue present on upper and lower arm, pleats easily, can pick from elbow but not on back of hand and forearm	moderate sub cutaneous tissue present on upper and lower arm , slight pleating of skin, can not pick from elbow or back of hand and forearm	Full, round, cannot elicit "accordion" folds or lift folds of skin from elbow or tricep area
5. Legs	sub cutaneous tissue minimal, skin very loose, easily grasped and pulled away	some sub cutaneous tissue present, pleats easily	moderate sub cutaneous tissue present, slight pleating of skin	Full, round, cannot elicit folds or lift folds
6. Back	skin loose, easily lifted in a thin fold from the interscapular area	Flat (not full) but definite fat present	Round, less full, less firm	Difficult to grasp and lift skin in the interscapular area
7.Buttock	virtually no evident gluteal fat and skin of the buttocks and upper posterior high loose and deeply wrinkled	Skin upper medial thigh loose, skin easily picked up over anterior thigh but not over tibia and knee	Some subcutaneous tissue, can pick up easily but good turgor	Full round gluteal fat pads
8. Chest	progressively prominence of the ribs with obvious loss of intercostal tissues	Prominent ribs, some intercostal tissue	Intercostal space prominent, ribs obvious	Full, round, ribs not seen

9. Abdomen	distended or scaphoid, but with very loose skin, easily lifted, wrinkled	Scaphoid but not very loose skin, easily lifted and with some wrinkles	Round with loose skin, not easily lifted with no wrinkle	Full round with no loose skin

The advantage of CAN score is that it is a simple, clinical index for identifying fetal malnutrition and may have the potential to predict neonatal morbidity associated with it without the aid of any sophisticated equipment[14]. For this study Iuse CAN score to diagnose IUGR after delivery.

Intra uterine growth restriction can lead to multiple complications either during the Antenatal, Intranatal or Postnatal period. It is associated with increased perinatal mortality and morbidity. During the Antenatal period there is a risk of Chronic Fetal Distress and even Fetal Death. During the Intranatal period there may be Meconium Aspiration Syndrome, Asphyxia, RDS, Hypoglycemia, Hypothermia, Bronchopulmonary Dysplasia, Hyper viscosity-thrombosis. Late complications may include increased risk of Metabolic Syndrome in adult life, Obesity, Hypertension, Diabetes, Congenital heart disease[4, 9, 15].

1.2 Statement of the problem

Fetal growth restriction is defined as the failure of the fetus to meet its growth potential due to a pathological factor, most commonly placental dysfunction. Clinically, this is reflected by a drop in fetal size percentiles over the course of gestation[11].

Screening of neonatal adverse birth outcomes including IUGR is very important for obstetricians and perinatologists. Because its effect is associated with perinatal morbidity and mortality, birth hypoxia, impaired neurodevelopment, a manifestation of the metabolic syndrome in adult life. It also leads to early and late complications, increases significantly in newborn birth weight, length, and head circumference less than the 10th percentile. Next to prematurity, IUGR is the second leading cause of perinatal mortality which is still huge problem of developing countries[16].

IUGR fetus has approximately five to ten-fold increased risk of dying in the womb, with up to 23 to 65 stillbirths [17, 18]. Around half of the preterm stillbirths and 25% of the term stillbirths were growth-retarded [19]. The greatest incidence of intrauterine growth restriction in developing countries is multi-factorial and involves a complex collaboration between fetal, placental, and maternal factors even though the maternal factors are the most predominant causes [20]. In Ethiopia, there is only one study at South Gondar conducted 5 years back about IUGR

and its associated factors which shows the proportion of IUGR to be 23.5%[3]. Currently, there is a lack of data in the study area addressing this significant public health issue. Understanding the prevalence and associated factors of intrauterine growth restriction (IUGR) is crucial. This study is particularly important in Ethiopia, where perinatal mortality rates remain alarmingly high.

1.4 Significant of the study

This study will showproportion of IUGR and its associated factors in our set up & the information can be used by practitioners for counseling of the mother while managing pregnancy complicated with IUGR. It will help us for evidence based decision making while managing such cases, since it is a local data. In addition to this study finding will be used as baseline data for clinicians to do clinical research.

2. LITERATURE REVIEW

2.1Intrauterine growth restriction (IUGR)

Intrauterine growth restriction is observed in 23.8% of the newborn and approximately 30 million babies globally suffered from it every year. Closely, 75% of all exposed newborns were occurred in developing regions[3]. A community-based prospective study in four urban squatter settlements in Karachi carried out to assess the incidence of and risk factors for intrauterine growth retardation. The incidence of term intrauterine growth retardation was 24.4% [21]. The prevalence of IUGR in Malawi was around 20.3%[21, 22].Three birth cohort studies in 1982, 1993 and 2004, in Pelotas, Southern Brazil was conducted and data for this study shows the trends in Intrauterine growth restriction decreased from 14.8% in 1982 to 9.4% in 1993, and subsequently increased to 12% in 2004[23]. Study done in Ethiopia 5 years back The prevalence of IUGR in South Gondar zone hospitals was around23.5%[3].

2.2 factors associated with intrauterine growth restriction

Community-based prospective study in four urban squatter settlements in Karachi that was carried out to assess the incidence of and risk factors for intrauterine growth retardation. The major risk factors were low level of maternal education, paternal unemployment, consanguinity, short birth-to-conception intervals, short maternal stature, and low maternal weight. The population risk estimates suggest the desirability of public health interventions to improve maternal weight and birth spacing and of improvements in socioeconomic conditions, especially maternal education. Public education programs to discourage consanguineous marriages should also be considered[21].

A prospective study conducted in the Department of Obstetrics and Gynecology, College of Medical Sciences, Chitwan, Nepal revealed maximum number of cases (38.3%) belonged to age between 26 to 30 years. IUGR was common in Multigravida (75%), rural area (78.3%), lower socioeconomic status (63.3%) and in manual worker (56.7%). Maternal (41.66%) was the commonest followed by Placental (16.66%) and Fetal (1.66%) causes. IUGR was observed in 43.3% with normal AFI and severe oligohydraminos<5 cm was observed in 21.7%. Doppler velocimetry showed abnormal umbilical S/D ratio in 2 (15.38%)[4].

A case-control study was conducted at a tertiary care Hospital in the year 2009 at GOA India. Ninety eight cases of intrauterine growth restriction were compared to 98 controls, matched for newborns sex and type of delivery. Maternal age, education, socioeconomic status and number of

antenatal visits were found to be the significant socio-demographic factors associated with Intrauterine growth restriction while, maternal height, parity, previous spontaneous abortion, direct obstetric morbidity, indirect obstetric morbidity and anemia were the maternal biological factors found to be significantly associated on bivariate analysis. Multiple logistic regression analysis identified parity, previous spontaneous abortion, direct obstetric morbidity, indirect obstetric morbidity and antenatal visits as significant maternal determinants of intrauterine growth restriction[24].

A prospective study was done on 60 women with IUGR pregnancies from January 2013 to January 2014, at Pushpagiri Medical College Hospital, Thiruvalla India. Statistical analysis shows that maternal risk factors like chronic hypertension, pre-eclampsia, low socioeconomic status of mother, overt diabetes; anemia, gestational diabetes mellitus, low prepregnancy body mass index and hypothyroidism were significantly associated with IUGR. In this study, placental factors like chorangiomatosis, increased syncytial knotting, villous infarction, increased perivillousfibrinoid deposition, accelerated villous maturation, retroplacental hemorrhage and acute chorioamnionitis were significantly associated with IUGR[25].

Study conducted at Malawi, Significantly associated with increased IUGR risk were, short maternal stature, anemia (Hb<8g=dl) and malaria at delivery. Prematurity risk was associated with primiparity, number of antenatal visits and arm circumference <23cm .HIV infection was not associated with IUGR or prematurity[22].

According to Stanford Medical Center researchers a comparison study in two cohorts of SGA and AGA showed that the placenta from SGA newborn infants was more likely to have smaller weight and thinner umbilical cords than those from AGA neonates, farther more this smaller placentas had a significant increase in uteroplacental malformation [26]

A study done at Nigeria showed IUGR-LBW was significantly associated with teenage mothers , lack of antenatal care and female gender[27].

Study conducted at south Gondar Ethiopia , Women who was unable to read and write, total family size ≥7 , maternal mid-upper arm circumference (MUAC) < 23 cm ,body mass index (BMI) < 18.5 kg/m2 , altitude > 3000 m , small placental size (< 350 g) and small-for-gestational-age were the most predictors of IUGR[3].

2.3. Conceptual frame work

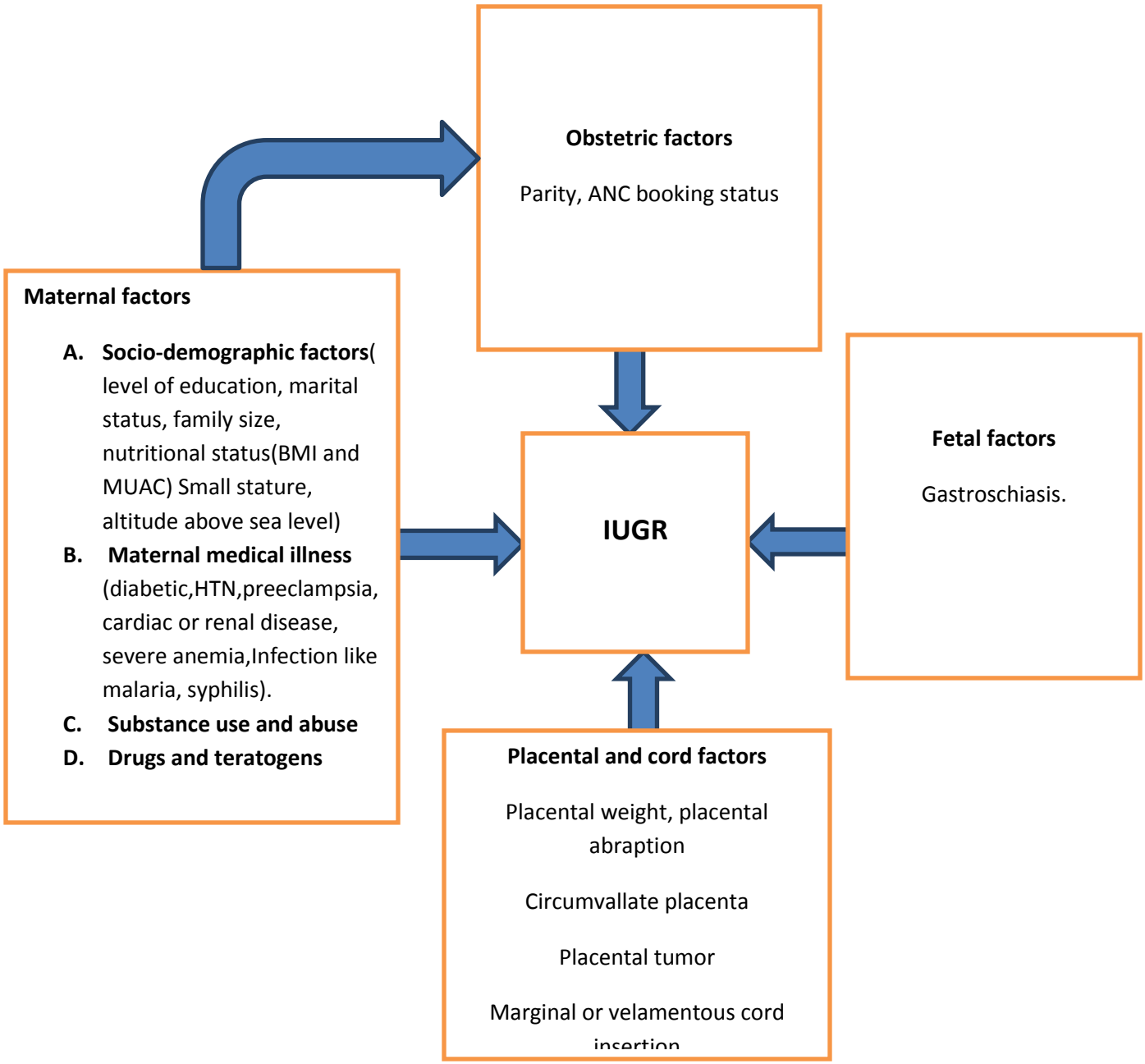

Figure 1: Conceptual framework for IUGR and its associated factorsamong women who gave birth at TibebeGhion Specialized hospital North West Ethiopia, 2024GC. [3, 5, 15]

3. OBJECTIVE OF THE STUDY

3.1 General objectives

To determine proportion of IUGR and its associated factors among women who give birth at TibebeGhion Specialized hospital 2024GC.

3.2 Specific objectives

1. To determine proportion of IUGR among women who give birth at TibebeGhion Specialized hospital.

2. Todetermine associated factors for IUGR among women who give birth at TibebeGhion Specialized hospital

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted from August 1/2024toOctober 30/2024GC in Bahir Dar city at TibebeGhion Specialized Hospital (TGSH). Bahir Dar is the capital city of Amhara National Regional State, located 565 km Northwest of Addis Ababa with an estimated population of441,149 as per the 2022Bahir Dar city population review[28]. TGSH is one of the three governmental hospitals in the town with an estimated catchment population of seven million. TGSH is a teaching hospital of Bahir Dar University located in ``Sebatamit‟‟ 7 km to the south of Bahir Dar. The hospital started its activity in November, 2018 and is working in different departments of which Obstetrics and Gynecology is one. There are four wards and 8 OPDs in the department. Regarding human power, there are 4 Subspecialist (2 were on gynecology oncologist and the other 2 on fetal-maternal medicine) 8 fellow in three different Subspecialty programs (3 fetal maternal medicine, 3 urogynyecology and 2 gynyecology oncology)14 general obstetrician and gynecologists, 49 residents, and 73 midwifes.There were around 10-20 on average 15 pregnant women who gave birth at TGSH each day.

4.2. Study design

An Institution-based cross-sectional study design was used.

4.3. Source population

All pregnant women who visit TGSH during the study period for delivery service.

4.4. Study population

All pregnant women who gave birth at TGSH during the study period and fulfill the inclusion criteria.

Inclusion criteria

Birth above the gestational age of 28 weeks.

Exclusion criteria

Women who couldn't answer the intended questions because of illness and mental problems, not willing to give consent, mother who were referred to other health institutions, had a birth with incomplete placenta, undated pregnancy

4.5 Study unite

Each selected woman who gave birth at TGSH.

4.6. Sample size and sampling procedure

4.6.1 Sample size determination

The sample size is calculated using a single population proportion formula based on the following assumptions:

The proportion of IUGR is taken at 23.5% [3], Significant level at $\alpha = 0.05$, at a 95% confidence interval, Margin of error is 5% and 5% non-response rate.

Where: P= 23.5% (proportion of IUGR at south Gondar Ethiopia)[3], Therefore (p=0.235 and q=0.765) Level of significance to be 5% ($\alpha = 0.05$), $Z\ \alpha/2 = 1.96$ with 95% CI and, absolute precision or margin of error to be 5% (d = 0.05). The formula for calculating the sample size is

$$n = Z_{\frac{\alpha}{2}}^{2} \frac{P(1-P)}{d^2}$$

The minimum sample size became,

n= (1.96)2*(0.235)(0.765)/(0.05)2

n= 277

And also additionally use 5% for non-respondents. Finally the sample size became 291 pregnant women who fulfill the inclusion criteria(n=291)

Table 3 sample size determination for associated factors for IUGR at TGSH

Variables	COR	Sample size(FleissW/cc)	Reference
Wight of placenta	2.42	176	[3]
Educational status	2.46	126	[3]
MUAC(mid upper arm circumference)	2.10	71	[3]

4.6.2. Sampling techniques

A systematic random sampling technique was used to obtain the study sample unit and select one by lottery method.

4.7. Sampling procedures

All patient card was labeled (1-N) and 291 card was selected every fifth card using systematic random sampling and the first card was selected by lottery method. i.e.(6,11,16,…).sampling interval K =total number of card / Sample size K = N/n, K=1350/291 = 4.6~5 where N=1350, the number of all pregnant women who was attend TGSH for delivery service, which is taken from the monthly report of delivery service in TGSH last year on the same month. There were around 10-20 in average 15 pregnant women gave birth at TGSH on each day. The data collected for three months, (N=15x90 days=1350).

4.8. Variable of the study

4.8.1 Dependent variable

Intrauterine growth restriction(IUGR)

4.8.2 Independent Variable

1. Maternal factors

A.Socio-demographic factors :age, level of education, marital status, occupation, family size, nutritional status(BMI and MUAC) , altitude above sea level.

B. Maternal medical illness: vascular and renal disease (pregnancy induced hypertensionpregestational diabetic mellitus with vasculopathy), cyanotic cardiac disease, infection like malaria, syphilis.

C. Drugs and substance use and abuse (Use of certain antineoplastic medications (eg, cyclophosphamide), antiepileptic drugs (eg, valproic acid), and antithrombotic drugs (eg, warfarin) smoking, alcohol...).

2. Obstetric factors: parity, ANC booking status,

3. Fetal factors: fetal malformationlike gastrosciasis.

4. Placental and cord factors: placental weight, placental infarction or abruption, marginal or velamentous cord insertion, single umbilical artery.

4.9. Operational definitions

IUGR: is defined by CAN score below 25. Clinical Assessment of Nutrition (CAN score): is a scoring system based on nine superficial readily detectable signs of malnutrition in the newborn baby (table 2)

SGA:defined as newborns whose birth weight is less than the 10th percentile for gestational age.

Booked: Those with at least one ANC contact.

4.10. Data collection tools and data collection procedures

Data was collected through face to face interviewand document review using a structural questionnaire and checklists, respectively at TGSH. The questionnaire was first be prepared in English then translated to local language (Amharic) then translated back to English to ensure its consistency and to collect relevant information to achieve the stated research objective. One supervisor, year threeand two trained year onegynecology and obstetrics resident data collectors has participated in the data collection process. Thorough information was given to the data collectors on how to conduct the data collection.

4.11 Data quality control

Data collectors and supervisors were given a full course of training regarding the basic principles of data collection procedure. The principal investigator and supervisors made day to day onsite supervision during the whole period of data collection. Data collectors were checking completeness of the each questionnaire before going to others. At the end of each day, questionnaires were reviewed and checked for completeness, accuracy and consistency by the supervisor and principal investigator and corrective measure are taken together with the data collectors.

4.12 Data processing and analysis

After all the necessary data collected, the data was coded on pre-arranged coding sheet by the principal investigator. Data entry was done using Epi info version 7 and analysis was done using SPSS 25 version statistical software. Descriptive statistics was computed in percent and presented in the form of texts and tables. Simple binary logistic regression, was used to identify the candidate variables for multivariable logistic regression and we use cutoff point of <0.25. Multivariable logistic regression was used to identify the relative importance of each predictor variable to the dependent variable by controlling for the effects of other variables. In the multiple logistic regression, those variables with P-value <0.05 were found to be statistically significant. The association between dependent and independent variables was determined using odds ratio (OR) with 95% confidence interval (CI).

4.13 Ethical clearance

Ethical clearance was assured before data collection from the institution review board; Institute of Public Health College of Medicine and Health Science, Bahir Dar University. Permission was obtained from the administrators of TGSH. Each study participants was informed about the purpose, methods of collection, anticipated benefits and risks of the study by the data collector. Informed consent was obtained from each participant.All information during data collection was confidential; there were no any personal identification which is left on the questionnaire.

4.14. Dissemination of results

The findings of the study will be forwarded to BDU, the College of Medicine and Health Science, department of Public Health and GYNY/OBS, to TGSH, Amhara regional health bureau. An attempt will be made to present the findings in different conferences and workshops and will be sent to publication on scientific journal.

4.15. LIMITATIONS

This study shares the limitation of cross sectional study that may not indicate the real association. As the study is done only in tertiary hospitals which are referral centers, the prevalence in the study may not be indicative.

5. RESULTS

5.1 Socio-demographic characteristics of respondents

A total of 291 maternity women participated in this study and obtained a response rate of 100%. In this study, around two-thirds 185 (63.6%) of the mothers were found in the age category of 20–29 years and 98 (33.7%) of them did not have formal education. Almost all 277 (95.2%) of the mothers were living in union with their husbands and around two-thirds 198 (68%) of the mothers were living with a total family size of five and less. More than three-fourth of respondents were orthodox religion followers and more than half 166(57%) of respondents were housewife (table 4)

Table 4 Socio-demographic characteristics of maternity women visiting labor ward, TGSH in Bahir Dar city, 2024(n=291)

Characteristics	Frequency	Percent
Age category of respondent in years(n=291)		
<=19	10	3.4
20-29	185	63.6
30-39	88	30.2
≥ 40	8	2.7
Total	291	100
Marital status(n=291)		
Single	6	2.1
Married	277	95.2
Divorced	8	2.7
Total	291	100
Religion (n=291)		
Orthodox	264	90.7
Muslim	22	7.6
Protestant	5	1.7
Total	291	100

Educational status(n=291)		
No formal school	98	33.7
Primary education	78	26.8
Secondary	67	23
College and above	48	16.5
Total	291	100
Occupation(n=291)		
House wife	166	57
Farmer	48	16.5
Private work	47	16.2
Government employee	30	10.3
Total	291	100%
Residency(n=291)		
Rural	142	48.8
Urban	149	51.2
Total	291	100%
Total family size(n=291)		
Less than 5	198	68
5 and above	93	32
Total	291	100

5.2 Maternal, newborn, placental and obstetric factors

Almost all 289 (99.3%) of the mother's heights were ≥150 cm and greater than three-forth 230 (79%) of their BMI was found > 18.5 kg/m2.Less than one-third 82(28.2)of mother has chronic medical or new illness during pregnancy,among these malaria 40(13.7%) is the commonest

followed by pregnancy induced hypertension 19(6.5%) and all respondents were no history of substance use or abuse before or during pregnancy. The majority 200 (68.7%) of the newborn weight was > 2500 g , more than two-third 204(70.1%) of them were appropriate to the gestational age and all most all 276(94.8%) having 5th minute APGAR score of 7 and above. The majority 226(77.7%) of the placenta weight was more than 350gm, and placental abnormality was found in only 10(3.4%), which is placental abrasion. All umbilical cords were having two umbilical artery and all were centrally inserted.The majority of mother's parity were less than five 273(93.8%), more than three-fourth 245(84.2%) of mother gave birth at term, and having at least one ANC contact 263(90.4) (table 5).

Table 5maternal, newborn, placental and obstetrics factors among mothers who visit TGSH in Bahir Dar city for delivery service, 2024(n=291)

Characteristics	Number	Percent
Maternal height in cm (n=291)		
<150	2	0.70%
≥ 150	289	99.3%
Maternal BMI kg/m2(n=291)		
< 18.5	61	21%
≥ 18.5	230	79%
MUAC in cm(n=291)		
<23	63	21.6%
≥ 23	228	78.4%
Altitude above sea level in meter		
<2000	250	85.9
≥200	41	14.1
Chronic medical or new illness during pregnancy (n=291)		
Malaria	40	13.7
Chronic hypertension	4	1.4
Pregnancy induced hypertension(PIH)	19	6.5

Diabetes mellitus(DM)	2	0.7
Gestational DM	2	0.7
Anemia	10	3.4
Cardiac disease	6	2.1
None	208	71.5
Substance use or abuse (n=291)		
No	291	100
Sex of new born(n=291)		
Male	151	51.9
Female	140	48.1
5th minute APGAR score(n=291)		
< 7	15	5.2%
≥ 7	276	94.8%
Weight of newborn in gm(n=291)		
<2500	91	31.3
≥ 2500	200	68.7
Birth weight to the gestational age(n=291)		
SGA	87	29.9
AGA	204	70.1
Congenital anomaly (n=291)		
No	291	100%
Placental weight gm(n=291)	78	26.8
<350	65	22.3
≥ 350	226	77.7
placental abnormality(n=291)		
Yes (abruption placenta)	10	3.4

No	281	96.6
Cord insertion(n=291)		
Central	291	100
No. of umbilical artery(n-291)		
Two	291	100
route of delivery(n=291)		
Vaginal	200	68.7
Cesarean section	91	31.3
Parity (n=291)		
Primipara	115	39.5
2-4	158	54.3
≥ 5	18	6.2
Gestational age (n=291)		
Preterm	40	13.7
Term	245	84.2
post term	6	2.1
ANC follow up (n=291)		
Yes	263	90.4
No	28	9.6

5.3 Overall minimum, maximum, and mean of some maternal and newborn characteristics

The minimum age of the respondent in this study was 18 years; whereas the maximum was 42 with a mean ± standard deviation (SD) of 27.66 ± 5.65 years. The minimum and maximum heights of the mothers were 148 and 172 cm respectively, with a mean ± SD of 160.82 ± 5.75 cm. The minimum mid upper arm circumference (MUAC) of the respondent in this study was 18cm; whereas the maximum was 30cm with a mean ± standard deviation (SD) of 25.48 ± 2.51cm. The minimum and maximum altitude in meter in which the respondents live in this study was 1840cm and 2560cm respectively, with a mean ± SD of 1905 ±161.92cm.

Table 6Minimum, Maximum and Mean and SD value of Maternal Newborn and Placental Parameters in TGSH, Bahir Dar 2024

Variable	Minimum	Maximum	mean	Std. deviation
Current maternal age in years	18	42	27.66	5.65
Maternal weight in kg	46	86	55.70	6.20
Maternal height in centimeter	148	172	160.82	5.75
Maternal body mass index (BMI) in kg/m2	17.80	31.6	21.58	2.65
Maternal mid upper arm circumference(MUAC) in meter	18	30	25.48	2.51
Maternal hemoglobin level in gm/dl	7	15	11.90	1.27
Altitude in meter above sea level	1840	2560	1905.88	161.92
Placental weight in gm	200	680	400.50	93.06

5.4 Prevalence of intra uterine growth restriction

In this study IUGR is defined by clinical assessment of nutrition (CAN) score less than 25. The data from this study revealed that the prevalence of intrauterine growth restriction was 25.1% with 95% CI:20-30

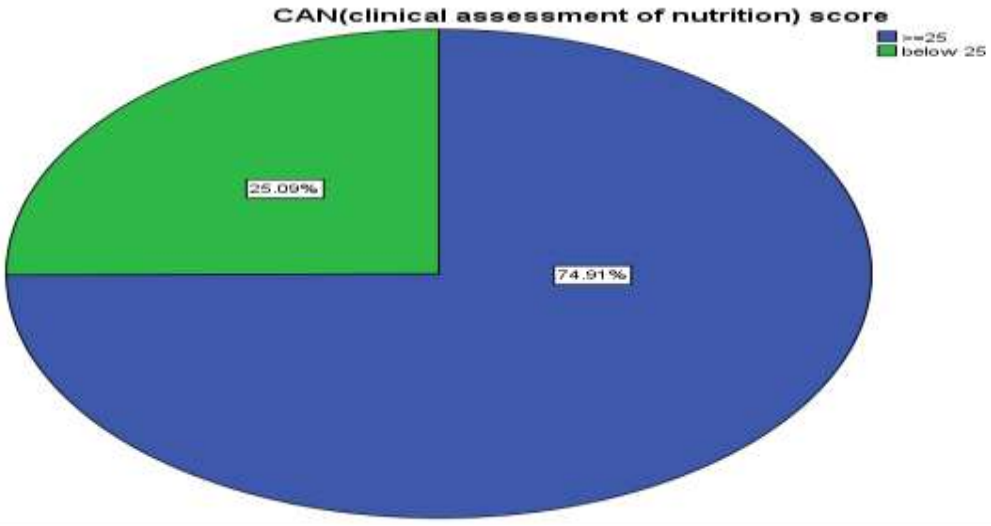

Figure 2 prevalence of intra uterine growth restriction among newborn delivered at TGSH in BahirDar city, 2024.

5.5 Factors associated with intrauterine growth restriction

In simple bivariable logistic regression analysis : maternal educational status, BMI, MUAC, family size, weight to gestational age, weight of the placenta, chronic disease or new illness during pregnancy, and residency were statistically associated with IUGR with a P value less than 0.25 at 95% confidence interval. Since risk factors for IUGR are interrelated, multivariable logistic regression analysis gives more meaningful results: maternal educational status, BMI, MUAC, weight to gestational age, chronic disease or new illness during pregnancy and weight of the placenta were significantly associated with IUGR in multivariable logistic analysis with P value less than 0.05.

Accordingly, the odds of having IUGR were 10 times higher among mothers who have no formal education than mothers who achieve their education college and above (AOR; 10.455, 95% CI: 1.056-103.521).

Mothers MUAC < 23 cm were 8 times more likely to deliver IUGR newborn compared to mother who had MUAC≥ 23centimetrs (AOR; 8.193, 95% CI: 1.818-36.923)Mothers BMI < 18.5 kg/ m2 were 9 times more likely to deliver IUGR newborn compared to mother who had BMI ≥ 18.5 kg/m2 (AOR; 9.065, 95% CI: 1.641-50.059)Newborn babies exposed to SGA were experienced IUGR 8 times than babies had AGA (AOR; 8.527, 95% CI: 3.066-23.719). The odds of developing IUGR from placental weight < 350 g were 3 times as compared with the placental weight ≥ 350 g (AOR; 3.745, 95% CI: 1.307-10.742).mothers having malaria or pregnancy induced hypertension during pregnancy were 6 times and 8 times more likely to deliver IUGR new born compared to mother who have no illness during pregnancy(AOR; 6.206, 95% CI: 1.952-19.729), (AOR; 7.913, 95% CI: 1.437-43.582) respectively(Table7).

Table 7 Binary and Multivariable Logistic Regression Analyses of IUGR among Women who Give Birth in TGSH, Bahir Dar city, 2024

Variable categories	IUGR N / %		COR (95%cl)	AOR (95%cl)	P -value
	Yes	No			
Maternal educational status					
No formal education	43 43.9%	55 56.1%	6.724(2.453-18.430)	10.455(1.056-103.521)	0.045*
Primary(1-80 school	13 16.7%	65 83.3%	1.720(0.572-5.172)	1.766(0.177-17.59)	0.628
Secondary(9-12) school	12 17.9%	55 82.1%	1.876(0.614-5.733)	2.766(0.279-27.443)	0.385
College and above	5 10.4%	43 89.6%	1		
Birth weight to gestational age					
SGA	49 56.3%	38 43.7%	9.671(5.304-17.635)	8.527(3.066-23.719)	<0.001*
AGA	24 11.8%	180 88.2%	1		
MUAC					
< 23 cm	36 57.1%	27 42.9%	6.883(3.737-12.676)	8.193(1.818-36.923)	0.006*
≥ 23cm	37 16.2%	191 83.8%	1		
BMI in kg/m2					
< 18.5	36 59.0%	25 41.0%	7.511 (4.042 - 13.960)	9.065(1.641-50.059)	0.011*

≥ 18.5	37 16.1%	193 83.9%	1		
Chronic disease or new illness during pregnancy					
Malaria	24 60%	16 40%	10.500(4.938-22.325)	6.206(1.952-19.729)	0.002*
Chronic hypertension	3 75%	1 25%	21.00(2.105_209.49)	5.603(0.233-134.899)	0.288
Pregnancy induced hypertension(PIH)	13 68.4%	6 31.6%	15.167(5.302-43.384)	7.913(1.437-43.582)	0.017*
Diabetes mellitus(DM)	1 50%	1 50%	7.00(0.425-115.355)	3.241(0.781-9.528)	0.082
Gestational DM	1 50%	1 50%	7.00(0.425-115.355)	2.136(0.372-4.520)	0.074
Anemia	1 10%	9 90%	0.778(0.095-6.393)	8.089(0.712-91.925)	0.092
Cardiac disease	4 66.7%	2 33.3%	14(2.442-80.276)	2.782(0.218-35.442)	0.431
None	26 12.5%	182 87.5%	1		
Family size					
< 5	39 19.7%	159 80.3%	1		

≥ 5	34 36.6%	59 63.4%	2.349(1.358-4.066)	1.137(0.386-3.350)	0.815
Placental weight in gm					
<350	40 61.5%	25 38.5%	9.358(5.027-17.418)	3.745(1.305-10.742)	0.014*
≥350	33 14.6%	193 85.4%	1		
Maternal Residency					
Rural	43 30.3%	99 69.7%	1.723(1.007-2.948)	0.392(0.120-1.281)	0.121
Urban	30 20.1%	119 79.9%	1		

Note: * statistically significant variable
Abbreviations COR- crude odds ratio, AOR – adjusted odds ratio

6. DISCUSSION

As far as my knowledge is concerned, it is the first study in the study area. In this study, therefore, I try to assess the proportion of IUGR and its associated factors in TGSH Bahir Dar City, Ethiopia. The data revealed that the proportion of intrauterine growth restriction was 25.1% with 95% CI:20%-30%.The proportion of IUGR in this study was similar to other studies that were conducted in south Gondar 23.5[3], Karachi 24.4% [21]and Malawi 20.3% [22].

The similarity in south Gondar and Malawi might be due to the study setting which means that both of them conducted in institutions immediately after delivery. However, in this study, south Gondar and Malawi, the studies didn't include deliveries that took place at home. And my study was higher than the studies held in Brazil at different periods 14.8, 9.4, and 12% [23]. Its difference between this study and in Brazil might be due to the study period and may be this study was conducted in tertiary hospital in which a lot of complicated cases including IUGR referred to, evaluated by fetal maternal unit and gave birth here.

Generally, maternal educational status was the most significant predictor variables for maternal and child health in the world, similarly, in this study, it was one of the significant variables of IUGR (AOR; 10.455, 95% CI: 1.056-103.52.1) and it was supported by previous studies conducted in south Gondar(AOR; 2.46,95% CI: 1.02-5.92)[3], Chitwan Nepal[4], India [24], and in Karachi (AOR;1.6,95% CI: 1.0–2.7) [21]. This might be because, when women's educational level increases, she may be motivated to know health and risk factors, might have the interest to read and listen, watch any information sources, and make an informed decision about their health. Besides, women with some basic level of education can discuss more sensitive issues openly and had a better understanding of the complication associated with pregnancy.

Maternal body mass index is a substantial modifiable risk predictor for intrauterine growth restriction including low birth weight, preterm labor, and small for its gestational age. In this study, maternal Low body mass index (BMI) was a variable associated with intrauterine growth restriction (AOR; 9.065,95% CI:1.641-50.059) and it was similar in the study done in south Gondar Ethiopia(AOR; 2.57, 95% ci: 1.72-3.83)[3],Thiruvalla with a P-value< 0.001 [25] and in Karachi (AOR; 2.6, 95% CI: 1.8, 3.7) [21].

In similar to maternal body mass index , maternal mid upper arm circumference(MUAC) is statistically associated to IUGR in my study (AOR; 8.193,95% CI:1.818-36.923) and it was similar in the study done in south Gondar Ethiopia(AOR; 2.10, 95% CI: 1.39-3.01)[3] and in Malawi (AOR; 1.5, 95% CI: 1.1, 1.9)[22]

IUGR was associated with placental weight in this study, infant borne with low placental weight (< 350 g) were experienced IUGR than placental weight > 350 g (AOR; 3.745, 95% CI: 1.305-10.745). Its contribution is not only for IUGR but also for SGA according to Stanford Medical Center researchers [26]and maternal malnutrition and uteroplacental insufficiency during late pregnancy are usual causes for asymmetric IUGR while congenital infections acquired early in pregnancy have an association with symmetrical IUGR . A comparison study in two cohorts of SGA and AGA showed that the placenta from SGA newborn infants was more likely to have smaller weight and thinner umbilical cords than those from AGA neonates, farther more this smaller placentas had a significant increase in uteroplacental malformation [26].

Newborn babies exposed to SGA were experienced IUGR 8 times than babies had AGA (AOR; 8.527, 95% CI: 3.066-23.719). This is supported by a study done at South Gondar in Ethiopia with (AOR; 1.94, 95% CI: 1.86-4.52) [3].

In my study other important risk factors associated with IUGR were malaria and pregnancy induced hypertension with (AOR; 6.206, 95% CI: 1.952-19.729), (AOR; 7.913, 95% CI: 1.437-43.582) respectively (table7), and it was supported by previous studies conducted in Malawi (RR; 1.4; 95% CI: 1.0-1.9) for malaria [22] and in thiruvalla, India with p- valueof 0.000 for pregnancy induced hypertension[25].

In contrast to the findings of a study done at Nigeria which showed IUGR-LBW was significantly associated with teenage mothers, the researcher in this study did not find a significant effect. This may relate to the lower prevalence of extremes of maternal age in this study compared with theirs and hence a reduced power to detect an effect.

Among the other important maternal risk factors, such as anemia, diabetic mellitus, renal disease, altitude above sea level in which the mother live had no significant association with IUGR in this study. The reason for insignificant association of these maternal risk factors in statistical analysis is due to their absence in the majority of the IUGR cases and more than three-fourth of mother live in the same area 1840m(81.4%) above sea level.Similarly fetal factors like

congenital and structural anomalies like gastroschiasis and placental and cord factors like placental tumor or placental mass, cord insertion abnormality and single umbilical artery did not see the effect on IUGR due to rarity of the case.

7. CONCLUSION

As to my knowledge, even though this study was the first study in the study area, the proportion of intrauterine growth restriction is a major Public Health concern. Maternal education, birth weight to gestational age, maternal BMI, maternal mid-upper arm circumference, placental weight, malarial infection and pregnancy induced hypertension were found the most predictor variable. To avert intrauterine growth retardation, decreasing small for gestational age and increasing placental weight is very essential through additional nutritional supplementation during pregnancy. Because, when maternal weight increases, IUGR/ SGA will be substantially decreases.

8. RECOMMENDATIONS

1. To Ethiopian Ministry of Health and regional health bureau/government

Education is the core center of knowledge, so the government should address at least primary education for females.

Nutritional intervention could help to increase maternal weight and thereby reduce the risk attributable to IUGR.

Should give special attention to pregnant women living in high endemic area of malaria to prevent and treat effectively.

2. To TGSH/health professionals

Health professionals shall have to counsel women about the importance of nutrition, and giving health care for women before (preconception care) and during pregnancy (antenatal care follow up) and advice on nutritional intervention to increase maternal weight and thereby reduce the risk attributable to IUGR.

The health care providers should give special attention to pregnant women to prevent pregnancy induced hypertension so as to prevent intrauterine growth restriction.

The health care providers should give special attention to pregnant women living in high endemic area of malaria to prevent and treat effectively.

3. To the researchers

Further clinical follow-up research is essential which includes placental, maternal, and fetal gene.

Conducting similar research with large sample size is recommended.

REFERENCES

1. Sharma, D., S. Shastri, and P.J.C.M.I.P. Sharma, *Intrauterine growth restriction: antenatal and postnatal aspects.* 2016. **10**: p. CMPed. S40070.
2. Sharma, D., S. Shastri, and P. Sharma, *Intrauterine Growth Restriction: Antenatal and Postnatal Aspects.* Clin Med Insights Pediatr, 2016. **10**: p. 67-83.
3. Tesfa, D., et al., *Intrauterine growth restriction and its associated factors in South Gondar zone hospitals, Northwest Ethiopia, 2019.* 2020. **78**(1): p. 1-9.
4. Manandhar, T., B. Prashad, and M. Nath Pal, *Risk Factors for Intrauterine Growth Restriction and Its Neonatal Outcome.* Gynecology & Obstetrics, 2018. **08**(02).
5. Restriction, F.G.J.O.G., *ACOG practice bulletin No. 134.* 2019. **121**: p. 1122-1133.
6. *<DC Dutta's Textbook of Obstetrics, 8th Edition.pdf>.*
7. Ounsted, M., et al., *Risk factors associated with small-for-dates and large-for-dates infants.* 1985. **92**(3): p. 226-232.
8. Duvekot, J.J., et al., *Maternal volume homeostasis in early pregnancy in relation to fetal growth restriction.* 1995. **85**(3): p. 361-367.
9. Landon, M.B., et al., *Obstetrics: Normal and Problem Pregnancies E-Book*. 2020: Elsevier Health Sciences.
10. Lees, C., et al., *ISUOG Practice Guidelines: diagnosis and management of small-for-gestational-age fetus and fetal growth restriction.* 2020. **56**(2): p. 298-312.
11. Melamed, N., et al., *FIGO (international Federation of Gynecology and obstetrics) initiative on fetal growth: best practice advice for screening, diagnosis, and management of fetal growth restriction.* 2021. **152**(Suppl 1): p. 3.
12. HC, M.J.P., *Diagnosis of impaired fetal growth in newborn infants.* 1971. **48**: p. 511-522.
13. Meadows, N., et al., *Screening for intrauterine growth retardation using ratio of mid-arm circumference to occipitofrontal circumference.* 1986. **292**(6527): p. 1039-1040.
14. Metcoff, J.J.P.C.o.N.A., *Clinical assessment of nutritional status at birth: Fetal malnutrition and SGA are not synonymous.* 1994. **41**(5): p. 875-891.
15. Cunningham, F.G., *Williams obstetrics*. 2022.
16. Restriction, F.G., *ACOG Practice Bulletin.* 2020.
17. Chen, H.-Y., et al., *Aberrant fetal growth and early, late, and postneonatal mortality: an analysis of Milwaukee births, 1996–2007.* 2011. **204**(3): p. 261. e1-261. e10.
18. Gardosi, J., et al., *The value of customised centiles in assessing perinatal mortality risk associated with parity and maternal size.* 2009. **116**(10): p. 1356-1363.
19. Berghella, V., *Maternal-fetal evidence based guidelines*. 2012: Informa healthcare.

20. Kleijer, M.E., et al., *Risk factors for intrauterine growth restriction in a socio-economically disadvantaged region.* 2005. **18**(1): p. 23-30.
21. Fikree, F.F. and H.W.J.B.o.t.W.H.O. Berendes, *Risk factors for term intrauterine growth retardation: a community-based study in Karachi.* 1994. **72**(4): p. 581.
22. Verhoeff, F.H., et al., *An analysis of intra-uterine growth retardation in rural Malawi.* 2001. **55**(8): p. 682-689.
23. Barros, F.C., et al., *Preterm births, low birth weight, and intrauterine growth restriction in three birth cohorts in Southern Brazil: 1982, 1993 and 2004.* 2008. **24**: p. s390-s398.
24. Motghare, D., et al., *Maternal determinants of intrauterine growth restriction in Goa, India: a case-control study.* 2014. **3**: p. O8.
25. Thekkedathu, V.C.J.J.S.F.O.G., *Maternal and Placental Risk Factors associated with Intrauterine Growth Restriction and the Perinatal Outcomes.* 2015. **7**: p. 176-181.
26. Chisholm, K.M., A.K.J.P. Folkins, and D. Pathology, *Placental and clinical characteristics of term small-for-gestational-age neonates: a case-control study*. 2016. **19**(1): p. 37-46.
27. Olusanya, B.O.J.E.h.d., *Intrauterine growth restriction in a low-income country: Risk factors, adverse perinatal outcomes and correlation with current WHO Multicenter Growth Reference.* 2010. **86**(7): p. 439-444.
28. Adigeh, D.T. and B.G.J.U.S. Abebe, *The practice of peri-urban land acquisition by expropriation for housing purposes and the implications: the case of Bahir Dar, Ethiopia.* 2023. **7**(2): p. 41.

Annex A Consent form

Greeting.

My name is ----------. I am member of research team conducted by Dr. DesalegnAdane ,gyn/obs resident in Bahir Dar University. I am here to gather information about IUGR among mother who gave birth at TGSH. So I want to ask some questions. I believe that this study will help us to know the proportion of IUGR and its associated factors among mother who gave birth at TGSH. Would you mind if I take some time with you? Your name will not be included in the information. I promise to keep the confidentiality of your response. It takes us about 30 minute.

Are you willing to participate in the study?

Yes_____ No_____

I have been briefly informed about the study and I clearly understood the objective. Since it doesn't affect my personal life, I don't need any remedy. Consequently, I here approve my consent to take part in the study as an Interviewee with my signature.

Signature_____

Date_____

Name and Signature of interviewer

Name of health institution _____

Name of data collector _____ Signature _____

Name of supervisor_____

Date _____

Start time ----------

Annex B Questionnaire

Socio demographic factor

No.	Questions	Response	skip
01	Age?	_____ years	
02	Residence?	1. Rural 2. Urban	
03	Marital status?	1. Married 2. Single 3. Divorce/ separated 4. Widowed	
04	Religion	1. Orthodox Christian 2. Muslim 3. Protestant 4. Others (specify)	
05	Educational status?	1.no formal schooling 2.primary(1-8) 3.secondary(9-12) 4. college and above	
06	Your occupational status	_____(specify)	
7	Total family size	_____	
Question on maternal factors of IUGR			
8	Any known chronic disease or new illness during pregnancy	1.yes 2. no	if no skip to que. No 10
9	If yes for no 8 mention it		
11	Weight of the mother	_____kg	
12	Height of the mother	_____ cm	
13	BMI(body mass index) of the mother		
14	Mid upper arm circumference(MUAC) of		

	the mother		
15	Parity	A primipara B 2-5 C >=5	
16	Hemoglobin level during delivery	_____gm/dl	
17	ANC follow up	1. Yes. 2.No	
18	Altitude in meter above sea level	_____	
19	Substance use and abuse (eg, tobacco, alcohol, cocaine, or narcotics)	1. Yes. 2.No	if no skip to que. No 21
20	If yes for que. No 19mention it.		
21	Infectious diseases (eg, cytomegalovirus, rubella, toxoplasmosis, syphilis or malaria)	1. Yes. 2.No	if no skip to que. No 23
22	If yes for que. No 21 what was the disease?		
Fetal, placental and cord factors for IUGR			
23	placental weight	_____gm	
24	Placental abnormality	1.placenta previa 2.placenta abraption 3.placental tumor(mass) 4.Circumvallate placenta 5.groslly normal	
25	No of umbilical artery of the cord	1. One 2. two	
26	Cord insertion	1.central 2.marginal 3.velamentous	
27	Does the mother hasobstetric ultrasound with in the past two weeks?	1.Yes 2.No	If no skip to que.No 29

28	If yes for que. No 27 what was the report?	1.EFW_____gm 2.AFI/SDP____cm 3.doupler study A. UmA PI_____ B.MCA PI_____ C. CPR_____	
	Birth Outcome		
29	Gestational age at birth	_____weeks	
30	Neonatal outcome	1. Alive 2. Still birth 3 Early onset neonatal death	
31	Is there any congenital anomaly?	1.yes 2. no	If no skipe to33
32	If yes to ques no 31 what was the congenital anomaly		
33	Birth weight	1.1000gm-1499gm 2.1500-2499gm 3.2500-3999gm 4.≥4000gm	
34	Birth weight to the gestational age	1.SGA 2. AGA 3. LGA	
35	Mode of delivery	1.SVD 2.operative vaginal (vacume) 3.operative vaginal(forceps) 4.cesearian delivery	

36	If caesariandelivery, what was the indication?	_____	
37	Sex of the new born	1. Male 2. Female	
38	5th minute Apgar Score	1 <7 2>=7	

The Nine Signs for Clinical Assessment of Nutritional (CAN) Status in the Newborn

Give mark for each value according to the condition of the neonate

CAN score	1	2	3	4
1. Hair	Straight "staring" hair with depigmented stripe (flag sign)	Still thinner, more straight, "staring" hair which does not respond to brushing	Thinner, some straight, "staring" hair	Large amount, smooth, silky, easily groomed
2. Cheek	significantly reduced bucal fat with narrow, flat face	Flat, poor or small pad of fat	Flat with good pad of fat	Full buccal pads and round face
3. Neck and Chin	No fat fold, neck with loose, wrinkled skin, very evident	some mandibular fat, minimal neck fat	Full mandibular fat, moderate neck fat, no rolls	Double or triple chin fat fold, neck not evident
4. Arms	sub cutaneous tissue minimal,skin very loose, easily grasped and pulled away from elbow	some sub cutaneous tissue present on upper and lower arm, pleats easily, can pick from elbow but not on back of hand and forearm	moderate sub cutaneous tissue present on upper and lower arm , slight pleating of skin, can not pick from elbow or back of hand and forearm	Full, round, cannot elicit "accordion" folds or lift folds of skin from elbow or tricep area

5. Legs	sub cutaneous tissue minimal, skin very loose, easily grasped and pulled away	some sub cutaneous tissue present, pleats easily	moderate sub cutaneous tissue present, slight pleating of skin	Full, round, cannot elicit folds or lift folds
6. Back	skin loose, easily lifted in a thin fold from the interscapular area	Flat (not full) but definite fat present	Round, less full, less firm	Difficult to grasp and lift skin in the interscapular area
7.Buttock	virtually no evident gluteal fat and skin of the buttocks and upper posterior high loose and deeply wrinkled	Skin upper medial thigh loose, skin easily picked up over anterior thigh but not over tibia and knee	Some subcutaneous tissue, can pick up easily but good turgor	Full round gluteal fat pads
8. Chest	progressively prominence of the ribs with obvious loss of intercostal tissues	Prominent ribs, some intercostals tissue	Intercostals space prominent, ribs obvious	Full, round, ribs not seen
9. Abdomen	distended or scaphoid, but with very loose skin, easily lifted,wrinkled	Scaphoid but not very loose skin, easily lifted and with some wrinkles	Round with loose skin, not easily lifted with no wrinkle	Full round with no loose skin
total score out of 36				