



Intrauterine Growth Restriction Risk Factor And Neonatal Out Come Among Mother Who Gave Birth At Sphmmc, 2023, Addis Ababa, Ethiopia

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Requirements For Specialization In Gynecology And Obstetrics.**



INTRAUTERINE GROWTH RESTRICTION RISK FACTOR AND NEONATAL OUTCOME AMONG MOTHER WHO GAVE BIRTH AT SPHMMC 2023, ADDIS ABABA ETHIOPIA

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Table of Contents

AAcknowledgement	3
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Summary	7
1. INTRODUCTION	1
1.1 BACKGROUND	1
1.2 STATEMENT OF PROBLEM.....	2
1.3 LITRATURE REVIEW	4
1.4 SIGNIFICANCE OF THE STUDY.....	6
1.5 Conceptual frame work.....	7
.....	8
OBJECTIVE	9
2.1 General objective:	9
2.1 Specific objective:.....	9
METHODS AND MATERIALS.....	9
3.1 Study area and period:	9
3.2 Study design.....	9
3.3 Source Population	10
3.4 Study population:	10
3.5 Sample size:	10
3.6 Study Variable	10
3.6.1 Dependent variable	10
3.6.1 Independent variable.....	10
3.7 Inclusion and exclusion criteria	11
3.7.1 Inclusion criteria:	11
3.8.1 Exclusion criteria:	11
3.7 Operational Definitions.....	11
3.8 Sampling procedure	12
3.9 Data collection procedures:	12
3.10 Data quality control:	12
3.11 Data Analysis procedures	13

3.12 Ethical consideration:	13
3.13 Dissemination of finding:.....	13
4. Result	14
4.1 Sociodemographic characteristics of respondent	14
4.2 Obstetric characteristics of respondent	15
4.3 Ultrasonography characteristics of respondent	16
4.4 Neonatal characteristics of the respondent	16
4.5 IUGR /FGR.....	18
4.6 Factor associated IUGR	18
4.6.1 Socio-demographic determinant	18
4.6.2 Maternal and obstetrics determinate	19
4.6.3 Ultrasound determinant of IUGR.....	21
4.6.4 New born determinant of IUGR.....	22
4.6 Obstetric, maternal and new born related determinant of IUGR: Result of multi variable analysis using background binary logistics regression model	23
4 Discussion	24
5. Limitation of the study	27
6. Recommendation	27
7. REFERENCES	27
8. APPENDICES	29

Summary

Background: IUGR is the failure of the fetus to reach its growth potential. Fetal growth is regulated at multiple levels. Besides maternal disorder, fetal structural and chromosomal anomalies are the added factors. The morbidities associated with IUGR could have long term implications in adult life which predisposes in a development of a number of chronic diseases.

Objective:

To identify the various risk factors for IUGR and its neonatal outcome.

Method:

An institutional based prospective based cross sectional study was conducted on mother who was diagnose with IUGR and delivered at SPHMMC form July1-Aug 30 2023. . Data was collected by face to face interview using a structured questionnaire.

Result: The study revealed maximum number of cases (77%) belonged to age between 20 to 34years. IUGR was common in primipara (55%), rural area (67%), and in manual worker (56.7%). House wife (66%). Maternal (59%) was the commonest, from which preeclampsia account (45%) and Fetal (1.66%) causes. IUGR was observed in 43.3% with normal AFI and most women requires C-section70%. Preeclampsia, previous history of IUGR , AFI , BPP and neonatal outcome variables are significantly associated with IUGR,.

CONCLUSION: Preeclampsia and previous history of IUGR major risk factor.

Oligohydraminose hand non as a strong significant correlation and end and jaundice is the major complication

1. INTRODUCTION

1.1 BACKGROUND

Intrauterine growth retardation (IUGR) is defined as a rate of growth of a fetus that is less than normal for the growth potential of a fetus (for that particular gestational age)(1). It is diagnosed by two direct intrauterine growth assessments (ultrasonographically) or when the fetal length (height) is less than two standard deviations (or third percentile) below the mean for gestational age (1,2). In the literature IUGR and SGA (Small for Gestational Age) has been used interchangeably, although related they are not synonymous.

FGR is normally used to refer to small fetuses with higher risk for fetal in utero deterioration, stillbirth and overall poorer perinatal outcome as compared with normally grown fetuses(3). These fetuses are thought to have 'true' growth restriction. In general, FGR is associated with Doppler signs suggesting hemodynamic redistribution as a reflection of fetal adaptation to under nutrition/ hypoxia, histological and biochemical signs of placental disease and a higher risk of preeclampsia(4,5).

The term SGA has been used to differentiate a subgroup of small fetuses that do not present the changes described above, so that there appears to be no fetal adaptation to an abnormal environment and with perinatal outcomes similar to those of normally grown fetuses(6). SGA describes an Infant whose weight is lower than population norms or lower than a predetermined cut of weight(5).

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 (trisomy 13/18/21) or Congenital malformations (cardiovascular disease, renal disease)(7,8)

Fetal growth restriction increases the risks of intrauterine demise, neonatal morbidity, and neonatal death. Growth-restricted fetuses with absent or reversed end-diastolic flow of the umbilical artery are at particular increased risk of adverse outcomes and have an increased frequency of neonatal mortality and morbidity(9,10). Small-for-gestational-age newborns are predisposed to complications, including hypoglycemia, hyper bilirubinemia, hypothermia, intraventricular hemorrhage, necrotizing enter colitis, seizures, sepsis, respiratory distress syndrome, and neonatal death (3,9).

Previously IUGR categorized as Symmetrical or Asymmetrical depending upon the onset or etiology of a particular fetal insult. Symmetrical growth restriction (20-30%) in which fetus is symmetrically small and have normal Head to Abdomen and Femur to Abdomen ratio(10). Asymmetrical growth restriction (70-80%) in which Head and Long Bones are spared compared with their Abdomen and Viscera. Currently IUGR is classified as early onset and late onset depending if the GA of diagnose, before 32week of gestation its called early onset and diagnosis after 32week is late onset IUGR(5,7,11).

Diagnosis of IUGR is start from proper dating of GA by reliable LNMP or early US before 24wk, fundal height measurement discrepancies with >3cm, or EFW Less than 10th centile for GA, further evaluation should be considered, such as, AFI and umbilical artery Doppler. Targeted anatomically scanning also done to exclude fetal congenital anomalies(7,12). Umbilical Doppler study is studied extensively and AEDF/REDF is associated with high perinatal mortalities and morbidities. By doing umbilical artery Doppler there is 29% of reduction on neonatal mortalities(5,13–15).

The objective of this study was to assess the factors associated with IUGR and its neonatal outcome

1.2 STATEMENT OF PROBLEM

In low and middle-income countries (LMICs) there are more than 27% of infants are born weight <10th percentiles, which represents around 32.4 million SGA infants more than 22% of them were dying

annually, Ethiopia also contributes about 838 thousand cases which is a serious public health problem(3). SGA is associated with increased fetal and neonatal mortality and morbidity, being linked to immediate perinatal adverse events (prematurity, ,cerebral palsy, intrauterine fetal death, etc.) and also to adult pathologic conditions like obesity, hypertension, type-2 diabetes, cardiovascular diseases as well as emotional, ,behavioral and social problems in later life(16). It is clear that growth-restricted fetuses remain a high-risk group for many adverse outcomes, but the potential contribution to the burden of global prenatal mortality was under-recognized.

The risk of SGA in developing countries was about six times higher than in developed countries(17) . There are multiple factors associated with high incidence of FGR and there is a strong positive correlation exists between fetal, placental and maternal factors, but maternal factors per se seen significant cause of IUGR (2). Poor maternal nutrition, poor maternal weight gain, maternal anemia, inadequate prenatal care, short inter pregnancy interval, pregnancy-induced hypertension (PIH), pre gestational diabetes, maternal infection, and maternal chronic illness are major maternal risk factors (17,18) Healthy dietary habit, avoidance of unhealthy lifestyles, receiving proper prenatal care, and close antenatal surveillance of high risk pregnancy may help in declining the risk for IUGR delivery.

Based on Child Health Epidemiology Reference Group Analysis, an estimated 21.9% of neonatal deaths in LMIC were attributable to being born SGA in 2012. In total, 67.7% were among term SGA infants, about 82% of term SGA weighing <2500 grams and an estimated 32.3% of neonatal deaths were among preterm SGA infants(19). Neonatal mortality due to SGA in Ethiopia was 29 per 1000 live birth in general, but among preterm SGA was 1.6 per 1000 live births and 20.8per 1000 live births due to term SGA. Neonatal deaths due to SGA were also 25.5%at population level.

A multi-country analysis of mortality risk for SGA births in LMICs determined that the relative risk for neonatal mortality was 2.44 for term-SGA births, and 15.4 for preterm SGA births compared to babies born term-AGA(19).. A study conducted in Tigray shows that low birth weight for gestational age was attributed for 35% of very low birth weight and 54% of low birth weight, therefore neonatal mortality was higher among low birth weight than normal birth weight and have also economic and environmental stress to the community and health facility.

Small for gestational age is a serious health problem in low and middle-income countries ; especially sub-Saharan Africa where Ethiopia is no exception due to not only during the fetal, neonatal and infancy period, but also later in life affect by non-communicable diseases, such as, neurological, metabolic, respiratory and cardiovascular morbidities.

So far, there is lack of study which clearly shows incidence rate of IUGR among singleton pregnant women and other independent predictors of IUGR among pregnant women, there is only one published article in the study area which focuses on the neonatal outcome of neonate born from IUGR . So there is a knowledge gap in the area of IUGR research in our context.

1.3 SIGNIFICANCE OF THE STUDY

SPHMMC is the largest referral and center of excellence for maternal and child health (MCH) and this study will share with the scientific world our experiences related risk factor of IUGR and the neonatal outcome

The study will also help identify risk factor and predict its impact on maternal and fetal outcome.

This study also served as an intervention and example to raise public and health care provider awareness of the risk and its short and long term complication of IUGR.

This study will also help mobilize health care update to develop a standard treatment protocol.

1.3 LITERATURE REVIEW

IUGR is observed in 23.8% of newborns around the world; and significant global burden approximate 75% of occurred SGA are contributed by the Asian continent(19) According to different studies, socio-demographic characteristics, obstetrics, behavioral and medical factors are found some of the predisposing factors of small for gestational age(18,20). The age of mothers less than 20 years was 21% increase risk has born SGA than those between 25 to 29 years old mothers(21). But some studies reflected that neither maternal age nor marital status had a significant effect on the SGA, but suggested that increased severity of outcome might be an important contributing factor (20).

Belongings to poor social strata were associated with more than two times higher risk of IUGR compared to a middle or high-income society(17,22). A study conducted in Ireland place of residence of a mother has no significant effect on SGA but employment status has a significant

effect on fetal growth, mothers who have not worked were two times more risk to develop SGA than mothers in work.

Smoking, alcohol consumption and the uses of illicit drugs during pregnancy has an effect on fetal growth based on some research but have a conflict of ideas between results (13).

The inter-pregnancy interval has been stated to influence pregnancy outcome and birth: short inter-pregnancy intervals have been linked to increased risk for SGA, but there is a controversial issue related to the risk of birth interval on SGA in a different study. A study conducted in North Carolina with sample size of 1958 found that birth interval and SGA have not any statistically significant association [43], but a study conducted in Canada with cohort of 98,330 live birth found that inter-pregnancy intervals shorter than 6 months and greater than 60months, were significantly increased risks of SGA which modified by unmarried mothers in contrast to 12 - 23months interval [50].

A study conducted in Italy shows that pregnant mothers with diabetes mellitus have two times more likely to develop large for gestational age than those mothers who have no cases[24], but some studies show that diabetes mellitus has no statistically significant effect on SGA[. A study conducted in Pakistan reported that the odds of developing fetuses with SGA among anemic pregnant mothers were 3 times higher compared to normal pregnant women[6]. A study conducted in the USA shows that weight gain more than 40 pounds was protective for SGA, but weight gain less than 28 pounds increases the risk for SGA when compared to weight gain between 28-40 pounds for those underweight women[51]. But a study conducted in North Carolina gestational weight gain was insignificant related to SGA[43].

In some studies pregnancy-induced hypertension and prim Para of the mothers had an interactive effect on the SGA birth compared to multipara mother with no clear pathological process[44], but a study conducted in Austria shows that being a first time mother was a significantly increased risk of SGA birth independently, however, the model did not have a good ability to predict an SGA birth[41]. A case-control study conducted in Pakistan shows that, the probability of developing SGA fetus among mothers who have placenta previa was 3 times higher than those who have not placenta previa, and inter-villous hemorrhage has also significant effect on fetal growth, but pregnant mothers with abruption placenta and cardiac diseases have conflict of ideas toward the effect of SGA[40,44, 47].

Mothers who have a previous obstetric history like the previous history of preeclampsia/eclampsia, SGA, stillbirth, history of low birth weight and prior miscarriage were increased risk for SGA [24,43,52]. Pregnant women who have a previous history of preeclampsia were 2 times the risk of SGA birth compared to those normotensive nulliparous, women who experienced SGA in the previous pregnancy have at least eight-fold increased risk of recurrence [15]. Other risk factor for term SGA was 2 fold who inadequate prenatal care, and starting in 3rd trimester in Tanzania[30,47].

The study conducted in Indonesia shows that being male sex was a 17% increase in the risk of SGA than the female fetus, but in other studies, male sex was a protective effect, on the other hands also sex has no effect on SGA [40, 53].

There was a risk tendency to SGA newborns in pregnant women with syphilis 2.6-fold more likely compared to VDRL negative women [47]. A study done in southern Africa found that HIV positive women have 1.3 times the risk of SGA birth[54], genitourinary tract infection during the second trimester of pregnancy was risk for SGA, but maternal HIV infection and GUI during the 1st and 3rd trimester of the pregnancy were not statistically Significant association with SGA[55]. Form the GUI, cervicitis, and UTI were a statistically significant risk for the SGA. Other intrauterine infections like syphilis may also lead to fetal growth restriction[56].

1.4 SIGNIFICANCE OF THE STUDY

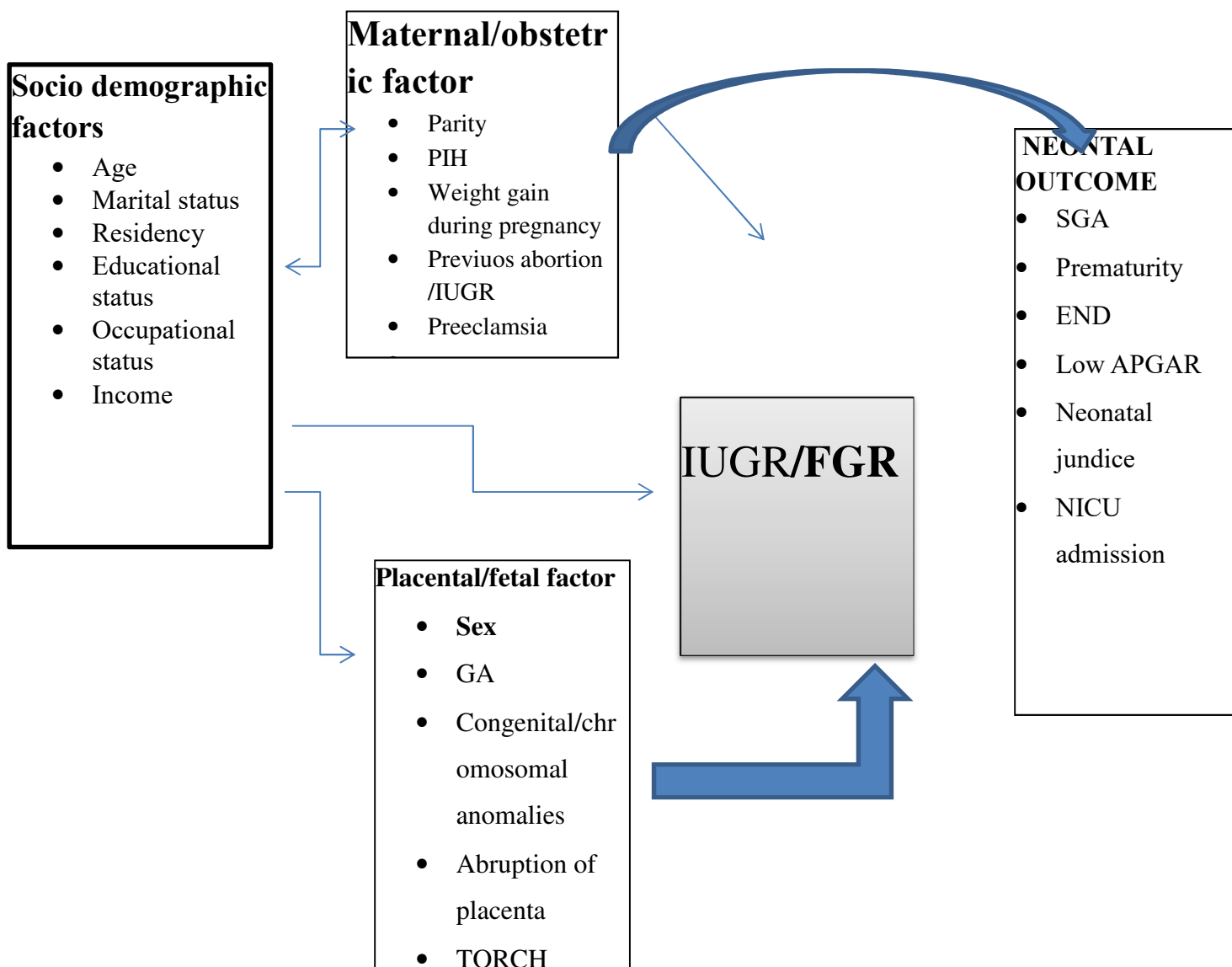
SPHMMC is the largest referral and center of excellence for maternal and child health (MCH) and this study will share with the scientific world our experiences related risk factor of IUGR and the neonatal outcome

The study will also help identify risk factor and predict its impact on maternal and fetal outcome.

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This study will also help mobilize health care providers to develop a standard treatment protocol.

1.5 Conceptual frame work



OBJECTIVE

2.1 General objective:

- ✓ To assess IUGR risk factor and neonatal outcome

2.1 Specific objective:

- ✓ To determine the socio-demography characteristics IUGR
- ✓ To determine risk associated with IUGR
- ✓ To assess the birth outcome of IUGR

METHODS AND MATERIALS

3.1 Study area and period:

The study was undertaken labor and delivery at Saint Paul's Hospital Millennium Medical College in Addis Ababa, capital city of Ethiopia under the Federal Ministry of Health (FMOH). This hospital is the largest teaching and referral hospital in Ethiopia. The hospitals receive mainly high risk patients referred from their catchment health centers. The hospital gives service to 200,000 people annually, who are referred from all corners of the country. It has a total bed of 360, and on average 650 patients visit the hospital as outpatient and emergency daily. It gives service under different clinical disciplines which include obstetrics and gynecology which is center of excellence in OBGYN. According to the statistics office of the hospital, around 10,000 deliveries in 2022, and 45 percent of deliveries being by cesarean section.

3.2 Study design

An Institution based cross- sectional descriptive study is be conducted.

3.3 Source Population

- All pregnant women who admitted for delivery service at SPHMMC in study period .

3.4 Study population:

All pregnant women who was be admitted to the hospital for birth after 28 weeks of gestation and who diagnosed with IUGR according to the SPHMMC OBGYN department management protocol prior to delivery, who fulfilled inclusion criteria and to consented to the study during the study period.

3.5 Sample size:

Purposive sampling was used and in all women whose diagnosed IUGR beyond 28 weeks of gestation within the study period those are eligible according to the inclusion criteria will be reviewed.

3.6 Study Variable

3.6.1 Dependent variable

- Onset of FGR
- Neonatal out come

3.6.1 Independent variable

- Socio-demography characters: age, martial statues , educational status, income
- Obstetric factor ; parity, previous history of abortion, previous history of IUGR
- Maternal factor : Preeclampsia, hypertension, DM, renal disease
- Fetal factor; congenital anomalies
- Placental factor; TORCH infection, placental abruption

3.7 Inclusion and exclusion criteria

3.7.1 Inclusion criteria:

- singleton intrauterine pregnancy who will deliver and neonatal care given at SPHMMC whose gestational age was ≥ 28 completed weeks by reliable last normal menstrual period (LNMP) or by early ultrasound of fewer than 24 weeks, diagnosed to have IUGR according to hospital protocol

3.8.1 Exclusion criteria:

- Multiple pregnancy
- Lethal congenital anomalies
- Intrauterine fetal death.
- Mother with altered mentation with severe illness
- Unknown gestational age
- Mother who delivery at other health facility and referred for complication.
- Those unwilling to give consent.

3.7 Operational Definitions

IUGR: EFW < 10 percentile for gestational age or FL/AC > 23.5 with normal or abnormal umbilical Doppler indices

Early inset IUGR: IUGR diagnose before 32week of gestation and terminated till 37 wk.

Late onset IUGR: IUGR diagnose after 32week of gestation

Gestational Age: is the age of the fetus counting from the time of fertilization which estimated by the last normal menstrual period or using first or second-trimester ultrasound (< 24 wk)

Low 5th APGAR: Apgar score < 7

Prematurity: delivery after 28 weeks but before 37 weeks of gestational age. Non-Reassuring

Fetal Heart Rate Pattern (NRFHRP): abnormal fetal heart rate is considered as anon-reassuring fetal heart rate pattern in this study.

Parity: Parity is the number of deliveries a woman had irrespective of the outcome after 28 weeks of gestational age.

- (i) Primipara: those who gave birth only once.

(ii) Multipara: those who gave birth above one time but less or equal to five times.

Early neonatal death: Neonatal death within seven days of post natal life.

Urban: with in Addis Ababa city

Rural: all places outside Addis Ababa

3.8 Sampling procedure

The women are selected from SPHMMC. Women who met the inclusion criteria will consecutively select from the labor ward and maternity ward after delivery who had delivered vaginally and has elective CS during the study period.

3.9 Data collection procedures:

The cases with IUGR/SGA were identified on admission using history, Physical examination and U/S EFW <10 percentile for gestational age or FL/AC >23.5 which performed by Obstetrics and Gynecology residents (above year II)/seniors. The study employs structured and pretest English questions to measure socio-demographic characteristics, obstetric factors, ultrasonography findings, and newborn outcomes. A trained mid-wife interviews mothers and reviews maternal and newborn chart. Data collection begins at labor and delivery and at maternity ward, and includes neonate's transfers to the NICU. All neonates' status will be checked on the seventh day, and those discharged before the seventh days are observed during follow-up appointments. The principal investigator monitors data collecting, assuring the completeness, correctness, and consistency of questionnaires, proper recording and documentation, and assessing discrepancies or missing information to ensure the study's integrity.

3.10 Data quality control:

Data collectors will receive two-day training on patient data gathering, data collection methodologies and tools, and ethical considerations. Before beginning actual data collection, data collectors and supervisors will check a checklist for accuracy by consulting the operation log book, the patient referral book, or by

speaking with a lady. The principal investigators will modify the checklist if any errors are found. Every day the lead investigator will be watched over to make sure all relevant data is correctly gathered. All formats used for data collection will be reviewed again during data processing, and any missing data will be eliminated from analysis.

3.11 Data Analysis procedures

After data collection, each questionnaire had be checked for completeness before entering to software. Data will be entered in to SPSS version 25 statistical package. Coding of individual questionnaires will be checked before data entry in to the software. Further, data cleaning will be performed to check for outliers, missed values and any inconsistencies before the data analysis. To identified independent factor associated with maternal factor and fetal outcome with be used binominal and multinomial logistics regression used. Statistical significant will be determined using odds ratio and 95 % confidence interval, with p value less than 0.05 as a cut-off point for statically significant.

3.12 Ethical consideration:

Ethical clearance and approval was be obtained from ethical review committee, Obstetrics and gynecology department, SPHMMC. Permission to conduct will be obtained from the Hospital. Oral informed consent was obtained from all participants prior to the survey. In addition, participants will be adequately informed of their right to refuse to participate in the study and not to answer questions they do not wish to answer, the benefits of the study, and the risks of participation. To ensure confidentiality, we use a coding system and the respondent's name is not written on the questionnaire. Confidentiality is ensured through the use of identifiers, i.e. sequential numbers assigned during data collection

3.13 Dissemination of finding:

Result was disseminated according to study finding.

3.14 Strength

- The strength of the study is data collection will be from primary source
- Complete data will be collected per patient; participant loss from the study is less likely

4. Result

There were around 1600 deliveries in SPHMMC during the study period from. From these deliveries 90 diagnose with IUGR, among these 74 were included in the study and 16 were excluded via exclusion criteria.

4.1 Socio-demographic characteristics of respondents

The age group between 20 and 34 years had the highest percentage of cases fifty seven (77%) followed by the teenage age group nine (12%). Fifty (67%) of respondents resided in an urban region, and 68 (92%) of them were married. Thirty one (41%) identified as orthodox Christians, followed by twenty six (31.1%) of Muslims. Housewives make up the majority forty nine (66%), followed by women who work as employees seventeen (23%), in terms of occupation.(table 1)

Table 1: Socio-demographic characteristics of the participant, SPHMMC, 2023. (n=74)

Socio-demographic variable	Category	Frequency	Percentage
Age (in year)	<20	9	12.2
	20-34	57	77.0
	>34	8	10.8
educational status of the mother	never attained school	19	25.7
	attained school	55	74.3
Religion of the mother	Orthodox	31	41.9
	Protestant	17	23.0
	Muslim	26	35.1
	Other		
Residency of the mother	Rural	24	32.4
	Urban	50	67.6
Martial statues	Un married	6	8.1
	Married	68	91.9

Occupation	Housewife	49	66.2
	Employee	17	23.0
	Merchant	6	8.1
	Student	2	2.7

4.2 Obstetric characteristics of respondent

Forty one (55.4%) of respondents was primiparous and twenty seven mothers (36%) had previous history of abortion. Major risk factors were maternal account forty seven (63%) and preeclampsia found thirty four (45%) mother and on twenty (27 %) mother risk factor were idiopathic. Majority of the respondent were delivered by cesarean section (51%) followed by vaginal delivery (29%). Sixty mothers (21%) diagnose before 32wk of GA and fifty eight mothers were diagnosing after 32 week of GA (table 2). 2.816um were 4week the mean 1wk .The maximum expectantly 4week and with mean week of GA diagnosis was 28wk and maximum of 41wk. the minim GA at delivery was 30 weeks and maximum of 41wk with mean GA of 36wk $\pm$ SD3.2wk. (table 4)

Table 2: Obstetrics characteristics of participant, SPHMMC, 2023(n=74)

Variable	Categories	Frequency	Percentage
Parity	primiparous	41	55.4
	multiparous	33	44.6
previous history of abortion	Yes	27	36.5
	No	47	63.5
Risk factor	idiopathic	20	27.0
	maternal	44	59.5
	placental	3	4.1
	Fetal	7	9.5
Preeclampsia/GHTN	No	40	54.1
	Yes	34	45.9
GA at diagnosis	Early onset FGR	16	21.6
	Late onset FGR	58	78.4

Mode of delivery	Vaginal delivery	22	29.7
	Emergency CS delivery	38	51.4
	Elective CS delivery	14	18.9

4.3 Ultrasonography characteristics of respondents

Majority forty four (59.5%) were less than 3rd centile with thirty five (47%) were oligohydraminose only one (1.4%) were polyhydraminose. fifty eight (78%) were reassuring BPP. Majority umbilical artery Doppler fifty one (68%) were normal followed by twelve (16.2%) AEDF. (Table 3) the minimum BPP were 0/10 with max of 10/10 with the mean of 7 ± 5 (table 4)

Table 3: ultrasound determinant of participant of the participant, SPHMMC, 2023 (n=74)

Variable	Category	Frequency	Percentage
EFW at diagnosis	3rd to 10th centile	30	40.5
	<3rd centile	44	59.5
AFI	oligohydraminous	35	47.3
	normal amniotic fluid	38	51.4
	polyhydraminose	1	1.4
BPP	reassuring	58	78.4
	non reassuring	16	21.6
Umbilical artery Doppler velocimetry	normal Doppler	51	68.9
	raised Doppler	7	9.5
	AEDF	12	16.2
	REDF	4	5.4

4.4 Neonatal characteristics of the respondents

Fifty three (71%) were delivered at term and birth weight after delivery forty seven (63%) mother were SGA according to. Forty two (56.8%) were female neonate and thirty two (43.2%)

were male neonate. Fifty one neonates had normal 5th minute Apgar score and twenty three (31%) had low Apgar score. Forty four (59.9%) neonate admit to NICU. Forty five neonate has (60.8%) has neonatal complication from these neonatal jaundice account and END ten (13%) each. Followed by prematurity and birth asphyxia nine (12.2%) and seven (9.2%). (Table 4) The minimum GA at delivery was 30wk and maximum 41wk with the mean GA is 36wk, and the minimum APGAR score were 2 and maximum of 9 with the mean of $7 \pm SD 1.7$.(table 5)

Table 4: neonatal determinant of the participant SPHMMC, 2023, (n=74)

Variable	Category	Frequency	Percentage
GA at delivery	<37wk	21	28.4
	37wk and above	53	71.6
Birth weight according to GA	SGA	47	63.5
	AGA	27	36.5
Sex	male	32	43.2
	Female	42	56.8
5th min APGAR	Low APGAR score	23	31.1
	Normal APGAR score	51	68.9
NICU admission	yes	44	59.5
	no	30	40.5
Neonatal complication	birth asphyxia	7	9.5
	neonatal jaundice	10	13.5
	MAS	4	5.4
	neonatal sepsis	5	6.8
	prematurity	9	12.2
	END	10	13.5
	NO COMPLICATION	29	39.2

Table 5: Minimum, maximum and mean $\pm$ SD value maternal, newborn and ultrasound parameter in SPMMC, (n=74)

Variable	Minimum	Maximum	Mean $\pm$ SD
Age of the mother in yr	18yr	42yr	26.30 $\pm$ 5.306
Parity of the mother	1	5	1.74 $\pm$.952
GA at the time of diagnosis weeks	28	41	36.19 $\pm$ 3.217
EFW at diagnosis in gram	800	2600	1977.30 $\pm$ 498.49
BPP	0	10	7.65 $\pm$ 2.874
GA at delivery in week	30	41	36.84 $\pm$ 2.816
Birth weight in gram	900	3200	2131.08
5 th min APGAR	2	9	7.30
Time(in week)	0	4	

4.5. IUGR /FGR

According to the operational definition of the study fifty eight (78.4%) late onset IUGR were diagnose after 32wk of gestation and only sixty(21.6 %) early onset IUGR were diagnose af before 32 week of gestation. (Table 6)

Table 6: IUGR /FGR category, SPHMMC, 2023 (n=74)

	Category	Frequency	Percent
IUGR	Early onset FGR	16	21.6
	Late onset FGR	58	78.4

4.6 Factor associated IUGR

Socio –demographic, obstetrics and newborn outcome related determinant in relation of IUGR/FGR were analyzed by bivariate analysis using logistics regression to see the presence of association

4.6.1 Socio-demographic determinant

Bivariate analysis shows that there is no significant correlation between IUGR and socio-demographic characteristics. (Table 7)

TABLE 7: Socio-demographic determinant on set of IUGR, SPHMMC, 2023(n=74)

Socio-demographic variable	Category	Onset of FGR		P-VALUE	95% CL
		EARLY	LATE		
Age (in year)	<20	1	8	0.466	0.857
	20-34	13	44		
	>34	2	6		
educational status of the mother	Never attained school	3	16	0.498	0.619(0.155-2.475)
	Attended school	13	55		
Religion of the mother	Orthodox	5	26	0.551	
	Protestant	5	12	0.330	1.690(0.441-6.498)
	Muslim	6	20	0.374	0.656(0.158-2.709)
	Other				
Residency of the mother	Rural	7	17	0.289	2.230
	Urban	9	41		
Marital statuses	Un married	1	5	0.758	
	Married	15	53		
Occupation	Housewife	9	40	0.999	
	Employee	6	11		
	Merchant	1	5		
	Student	0	2		

4.6.2 Maternal and obstetrics determinate

Bivariate analysis showed that preeclampsia [COR: 0.204, 95% CI: (0.05-0.427)], previous history IUGR [COR: 0.254, 95% CI: (0.66-0.983)] were significantly correlated with IUGR. Dexamethasone [COR: 0.167, 95% CI : (0.51-0.550)] magnesium sulfate [COR: 0.228, 95% CI:(0.50-1.048)] significantly correlate with FGR. Otherwise parity, previous abortion, other maternal and fetal risk factor, mode of delivery did not show any association. Preeclampsia was

found to be the most significantly associated risk factor twelve (16.2%) and twenty two (29.7%) were associate with early and late onset IUGR respectively.

Table 8: maternal and obstetrics determinant of IUGR, SPHMMC, 2023, (n=74)

Category	Variable	FGR		P-value	COR (95% CI)
		EARLY	LATE		
Parity	Primiparous	10	31	0.466	1.452 (.466-4.521)
	Multiparous	6	27		
Previous history of abortion	Yes	5	22	0.624	1.233(0.228-02.427)
	No	11	36		
Preeclampsia/GHTN	No	4	36	0.013	0.204(0.05-0.427)
	Yes	12	22		
previous history of IUGR	No	11	52	0.047	0.254(0.66-0.983)
	Yes	5	6		
Diabetic	No	15	57	0.263	0.196(0.11-3.402)
	Yes	1	1		
CHTN	No	12	53	0.54	0.402(0.84-1.928)
	Yes	4	5		
Abruptio placenta	no	14	55	0.760	0.686(0.16-7.749)
	Yes	1	3		
Magnesium sulfate	No	3(4.1%)	36(48.6%)	0.048	0.228(0.50-1.048)
	Yes	13(17.6%)	22(29.7%)		
Dexamethasone	No	3(4.1%)	44(59.5%)	0.003	0.167(0.51-0.550)
	Yes	12(16.2%)	13(17.6%)		
Mode of delivery	Vaginal	3	19	0.118	
	Emergency CS	12	26	0.588	0.197 (0.45)

	Elective CS	1	13	0.86	0.510(0.510-1.312)
Indication for C-section	NRFHP	1	11	0.299	
	NRBPP	5	3	0.999	
	MSAF	0	1	0.999	
	Abnormal Doppler	7	5	1.000	
	Previous uterine scar	0	16	0.999	
	Labor abnormalities	0	3	1.000	

4.6.3 Ultrasound determinant of IUGR

Bivariate analysis showed AFI [COR: 3.310, 95%: (0.973-9.939)], BPP [COR: 1.192, 95 %:(0.997-1.424)] and umbilical artery Doppler are significantly associate with IUGR. (Table 9).

Eleven mothers had oligohydraminose in early onset FGR

Table 9: ultrasound determinant of IUGR

Category	Variable	FGR		P-value	COR (95% CI)
		EARLY	LATE		
EFW at diagnosis	3rd to 10th centile	7	23	.768	1.184(0.3872-3.624)
	<3rd centile	9	35		
AFI	Oligohydraminous	11	24	0.046	3.3108(0.973-9.939)
	Normal amniotic fluid	5	33		
	Polyhydraminose	0	1		
BPP	reassuring	11	47	0.053	1.192(0.997-1.424)
	non reassuring	5	11		
Umbilical Doppler velocimetry	normal Doppler	6	45	0.056	
	raised Doppler	0	7	0.990	
	AEDF	6	6	0.999	

	REDF	4	0	0.999	
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4.6.4 New born determinant of IUGR

Bivariate analysis show that GA at delivery, birth weight , 5th minutes APGAR, NICU admission and neonatal complication such as, birth asphyxia and END has significant correlation to IUGR. Sexes of the new born and neonatal complication like MAS, neonatal jaundice are not significantly associated neonatal outcome.

Table 10: newborn outcome determinant of IUGR, SPHMMC, 2023 (n=74)

Category	Variable	FGR		P-value	COR (95% CI)
		EARLY	LATE		
GA at delivery	<37wk	11	10	0.00	10.568(3.002-37.14)
	37wk and above	5	48		
Birth weight according to GA	SGA	15	32	0.004	12.187(1.508-98.478)
	AGA	1	26		
Sex	male	8	24	0.539	1.417(0.467-4.301)
	Female	8	34		
5th min APGAR	Low APGAR score	10	13	0.04	5.769(1.763-18.87))
	Normal APGAR score	6	45		
NICU admission	yes	12	32	0.160	2.437(0.702-8.459))
	no	4	26		
Neonatal complication	birth asphyxia	1	6	0.035	
	neonatal jaundice	0	10	0.767	0.692(0.6-7.876)
	MAS	0	4	0.999	
	neonatal sepsis	0	5	0.999	
	prematurity	6	3	0.999	
	END	6	4	0.002	0.058(0.360)
	NO	3	26	0.000	8.667

	COMPLICATION				
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4.6 Obstetric, maternal and new born related determinant of IUGR:

Result of multi variable analysis using background binary logistics regression model

By taking into account the conceptual framework to assess the relative effect of the explanatory variable on the dependent variable, step-wise background logistic regression was performed. The model contained all variables with a p value of 0.25. Risk factors' multiple Logistic Regression Analysis revealed that preeclampsia,

Category	FGR		P-value	AOR (95% CI)
	EARLY	LATE		
Preeclampsia	12(16.2%)	22(29.7)	0.04	0.93(0.10-2.64)
Previous history of IUGR	5(6.8%)	6(8.1%)	0.027	0.162(0.19-1.362)
Oligohydraminos	11(14%)	24(32.4)	0.00	1689(1556-30391)
SGA	15(20.3%)	32(43.2%)	0.043	9.023(1.077-75.68)
Doppler study	8	24	0.000	1.045(1.224-1-2.080)
LOW 5th min APGAR	10(13.5%)	13(17.6%)	0.043	5.769(1.763-18.87))
NICU admission	12(16.2%)	32(43.2%)	0.160	2.437(0.702-8.459))

GA at delivery (preterm delivery)	11(14.9%)	10(13.5%)	0.000	
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4 Discussion

IUGR can be defined as birth of an infant at weight which is less than its genetic potential. It encompasses a heterogeneous group of conditions which result in failure of fetus to achieve its genetic potential for growth prenatally. The presented study was conducted on the risk factor and neonatal outcome of IUGR based on onset of FGR. In our study we had 74 deliveries were complicated with IUGR, 16(21%) were complicated early onset and 58() were late onset IUGR. Discussion

Maternal risk factor

Overall plenty of maternal factors have been identified as underlying cause of IUGR. Among described in literatures vascular disease, hypertensive disease of pregnancy which lead to uteroplacental perfusion deficiency. Mothers who have a previous obstetric history like the previous history of preeclampsia/eclampsia, SGA, stillbirth, history of low birth weight and prior miscarriage were increased risk for SGA [24,43,52]. Pregnant women who have a previous history of preeclampsia were 2 times the risk of SGA birth compared to those normotensive nulliparous, women who experienced SGA in the previous pregnancy have at least eight-fold increased risk of recurrence [15]. There was a risk tendency to SGA newborns in pregnant women with syphilis 2.6-fold more likely compared to VDRL negative women [47]. A study done in southern Africa found that HIV positive women have 1.3 times the risk of SGA birth[54], genitourinary tract infection during the second trimester of pregnancy was risk for SGA, but maternal HIV infection and GUI during the 1st and 3rd trimester of the pregnancy were not statistically Significant association with SGA[55]. From the GUI, cervicitis, and UTI were a statistically significant risk for the SGA. Other intrauterine infections like syphilis may also lead to fetal growth restriction[56]. In this study as compared and concede with other study forty three mothers were hypertensive from which preeclampsia were identified in 34(45.9%) , nine chronic hypertension were detected. Other maternal conditions were 2(2.7%) diabetic , three (4.1%)cardiac , three (4.1%) renal disease identified.

Maternal age

Yang L ... (20) reported that the age of mothers less than 20 years was 21% increase risk has born SGA than those between 25 to 29 years old mothers. Odibo et.al... (21) observed a definitive risk of IUGR in women of above 35 years old only. Our study had shown an incidence of IUGR in women less than 20 years is 9 (12.2%) of cases as compared to 57 (77%) of mother fall in the age range of 20 – 34 years. there were 8 (10.8%) cases of IUGR in a mother more than 34 years of age.

Relation of IUGR with parity

Tara Manandhar et.al (23) describe that from 60 IUGR patients 75% (45) were multiparous and only 15 (25%) were primiparous. In contrast, our study showed forty-one (55.4%) were primiparous and 33 (44.6%) were multiparous.

Placental factors

A case-control study conducted in Pakistan shows that, the probability of developing SGA fetus among mothers who have placenta previa was 3 times higher than those who have not placenta previa, and intervillous hemorrhage has also significant effect on fetal growth, but pregnant mothers with abruption placenta and cardiac diseases have conflict of ideas toward the effect of SGA [40,44, 47]. Tara Manandhar et.al (23) among 60 cases of IUGR 10 (16.6) was caused by placental factor where 7 (70%) were due to placental infarction, 2 (20%) were due to circumvallate placenta and 1 (10%) true umbilical knot. In our study we found 4 (5.1%) abruption placenta and there is no placenta previa identified.

Fetal cause

Amniotic index on ultrasound

The relation between fetal growth restriction and oligohydramnios is caused by decreased fetal urine production in response to hypoxia and reduced renal blood flow. In the Nepal study of 60 IUGR cases 56.7 % showed relation with the amniotic fluid size. Severe oligohydramnios (< 5cm) was seen in 21.7%, AFI (5-8cm) in 20% and 8-12 cm in 15% of cases. In our study we found 35 (47.3%) patients were oligohydramnios and 38 (52.7%) are normal AFI.

Period of gestational delivery

There is no consensus on the time of delivery for premature IUGR fetus caused by fear of compromised maternal – fetal substrate and risk of prematurity. In present study out of 74 cases 21 (28.37%) delivered

before 37 week of gestation and the rest 53(71.63%) gave birth at and after 37 week of gestation. The earliest delivery was at 30 week of gestation and 41 week was the late delivery time.

Mode of delivery

Most of the time operative delivery is the preferred mode of delivery as growth restricted fetus has impaired placental function which would not tolerate the stress and pressure of labor. In this study out of 74 IUGR cases twenty-two (29.7%) delivered vaginal and the majority 52(69.3%) had caesarean delivery.

APGAR score at 5 minute

APGAR score will show us the level of hypoxia in the newborn blood during the stressful labor. It is considered the reliable indicator of placental reserve of fetus. In our study we found there was low APGAR score in 23 (31.1%) and normal score in the rest 51 (68.9%)IUGR pregnancy where the minimum score was 2 and maximum of 9 .

Birth weight during delivery of IUGR

IUGR and SGA are defined as birth weight less than 10th percentile for gestational age. This definition lack in uniformity for different origin and altitude. From the Nepal study out of 60 IUGR pregnancy 36(60%) had weight range of 2500gm to 3000gm . 17(28.33) did not show much improvement in birth weight despite hospital management. There were 7(11.66%) cases who did not showed birth weight beyond 3kg. In our study showed 47 (63.5%) SGA and 27(36.5%) AGA.

Neonatal complication

In the present study total of 74 IUGR newborn , 45 (60.8%) has neonatal complication. Forty four (59.9%) were admitted to NICU where, neonatal jaundice seen in 13% , early neonatal death in 13% , prematurity 12.2% and birth asphyxia in 9.2%. neonatal sepsis in 5 neonate and meconium aspiration syndrome in four newborn seen. Where management per hospital protocol provided and improved.

Conclusion

IUGR is a significant issue of mother and the child, the physician and generally for the health system. The condition is more complicated as it will reflect its sequel during adult hood manifesting in the form of heart disease, hypertension and diabetes. In this study we have found that IUGR had even distribution based on age and parity. Preeclapmsia , chronic hypertension, poor biophysical profile and Amniotic fluid index are significant associated risk factor. We also identified neonatal complication in more than half of the Tara Manandhar et.al [] newborn where jaundice ,prematurity ,MAS , neonatal sepsis, birth asphyxia and early neonatal death were identified. The rest of neonates treated and discharged home with improvement.

5. Limitation of the study

6. Recommendation

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8. APPENDICES

Appendix 1: Questionnaire¹ consent form

Dear participants!

My name is -----, I am currently a member of data collectors for a research which is conducted by **Dr.Yewubnesh Aragie** who is a registered as a resident in the department of Obstetrics and Gynecology at SPHMMC. As part of training towards her specialty requires her to conduct a research study and her research topic is “excessive gestational weight gain and associated factors” which is expected to forward some recommendations and is invaluable being a basis for other researches.

I would like to request your participation in my study and before you to do so I would like for you to fully understand what your participation entails.

- All information gathered from you and your file will be **confidential** and utilized only for the study and publishing purposes.

- All information gathered will not contain names, file number, contact details or any other information/**autonomy** that can identify you as the participant.
- If you participate in this research project, there may **not be direct benefit** to you but your participation is likely help us to meet the research objective.
- At any time that you feel you no longer wish to proceed/**withdraw** with the study please feel free to inform me and I will stop.
- I would like your **permission** to look at your file for information.

Person to contact

This research project was reviewed and approved by the SPHMMC. If you have any question you can contact the following individual and you may ask any time you want.

Yewubnesh Aragie (MD, OBGYN RESIDENT)

Tell: +251923220315

Informed consent

I, _____, hereby confirm that I understand the contents of this document and the nature of the research project and acknowledge my informed consent to partake in this study and give the researcher permission to use all information gathered from my participation. I understand that I am at autonomy to withdraw from the project at any time.

A. I agree

B. I disagree

Participant Signature: _____ **Date:** _____

St. Paul Hospital Millennium Medical College, Department of Obstetrics and gynecology

Date__/__/__

Date__/__/__

Label number / code_____

Part I: Socio-Demographic Data

1. Age_____

2. Sex

S.no	Questions on Socio demographic characteristics	Responses	Remark
101	Age in completed years	__ __	24
102	Educational status of the mother	1. Never attended school 2. Attended school	2
103	Place of residence	1. Rural 2. Urban	1
104	Religion	1. Orthodox Christian 2. Protestant Christian 3. Catholic Christian 4. Muslim 5. Others (Specify).....	4
105	Marital status	1. Single 2. Married 3. Divorced 4. Separated 5. Widowed 6. Others (Specify).....	2
106	Gravidity	__ __ PG	Remark
107	Parity	__ __	1
108	Previous history of abortion	1. Yes 2. No	1
109	Last normal menstrual Period (LNMP)	1. Known IF known	38+

		a. state the date----- b. GA ----- 2. Unknown	
110	Socioeconomic status	1. Upper 2. Middle 3. Lower income	2
110	Occupation	1. House wife 2. Manual worker	1
S.no	Ultrasound finding	Responses	Remark
201	AFI	1. < 5cm 2. 5-8cm 3. > 8cm	1
202	EFW	1. > 3 RD centile 2. Between 3 rd and 10 th centile	2
202	Doppler velocimetry for umbilical artery	1. Normal Doppler 2. RAISED DOPPLER 3. Absent EDF 4. Reversed EDF 5. VENOUSE DOPPLER	2
203	BPP		8/10

S.no		Responses	Remark
301	Analysis of risk factor	1. Idiopathic 2. Maternal 3. Fetal 4. Placental	2
302	In Q 301 the a Answer is maternal	1. Maternal HTN 2. Diabetic 3. Pervious history of IUGR 4. Severe anemia 5. Cardiac disease 6. Chronic renal disease 7. UTI 8. Uterine anomaly 9. Other (specify)	1
303	In Q 301 the answer is fetal	1. Congenital anomalies 2. Chromosomal abnormalities 3. TORCH infection 4. Other specific	

304	TIME DURATION BETWEEN DIAGNOSIS AND DELIVERY	1	24 HR
306	TREATMENT GIVEN	1. MGSO4 2. CORTICOSTERIO D 3. NONE 4. OTHER SPECIFIES	

S.no	Termination of pregnancy	Responses	
401	Gestational age at delivery	1. > 34 week 2. 34-36w+6d 3. >37	3
402	Mode of termination	1. Spontaneous labour 2. Induction of labor 3. Emergency C-section 4. Elective C-section	2
403	Mode of delivery	1. Normal delivery 2. Forceps delivery 3. Vacuum delivery	5

		4. Elective caesarean 5. Emergency caesarean	
405	Q 402 answer is elective caesarean what is the indication	1. Oligohydraminose 2. Pervious caesarean section 3. BOH 4. Malpresentation 5. Maternal request 6. Other(specify)....	
406	If Q 402 answer is emergency caesarean section what is the indication	1. NRBPP 2. Abnormal Doppler flow 3. Poor bishop score 4. Other (specify).....	1

S.no	Fetal out come	Responses	
501	birth weight during delivery of iugr	1. < 2.5 2. 2.5kg -3kg 3. > 3kg	2KG
302	5 TH minutes APGAR score	1. < 4 2. 4- 6	3

		3. >7	
303	Neonatal complication	1. Birth asphyxia 2. Neonatal jaundice 3. MAS 4. SEPSIS 5. NO COMPLICATION	5

Appendix 2: *PATEINT LISTS*

