RISK FACTORS OF IUGR AND PERINATAL OUTCOME

ABSTRACT

Aim: To evaluate the risk factors of IUGR and to determine the impact of risk factors on perinatal outcome in women having IUGR fetus

Methods: Investigations were done for the women who have IUGR fetus suspected clinically and confirmed by ultrasonogram. About 142 cases were attended KGH with the diagnosis of IUGR. All 142 patients were evaluated for risk factors under study. Only 100 cases came for regular antenatal visits and antenatal surveillance of the fetus. 22 cases were excluded according the exclusion criteria. Among the 120 cases, 20 patients were excluded because 12 cases didn't come for regular antenatal visits after some initial visits, came only at the time of delivery, and remaining 8 patients didn't come for delivery for the purpose of evaluation of perinatal outcome. Among patients who didn't come for regular antenatal visits (12 cases) after initial visits, and came only for delivery, 5 patients had risk factors. Among this five patients one woman had IUD compared to 1 IUD in 65 patients had risk factors and also regular antenatal visits. Remaining all 4 cases had adverse neonatal outcome. Among patients who didn't come for regular antenatal visits and had no risk factors (7 cases) only 1 patient had good neonatal outcome.

Results: The incidence of LSCS in women having risk factors is 71% compared to 28% not having risk factors. The incidence of Doppler CPR reversal is 18% among the risk group compared to 14% among non risk group. Risk factors are high among the low socioeconomic group. Adverse neonatal outcome has strong association with maternal risk factors.

Conclusion: IUGR fetus born to mothers having maternal risk factors has high likelihood of developing adverse neonatal outcome. So evaluation to identify the risk factors at the early gestational age at clinical suspicion of IUGR can help to reduce neonatal complications and perinatal mortality and morbidity.

Keywords: Intrauterine growth restriction, Doppler CPR reversal, maternal risk factors, perinatal outcome, preeclampsia.

CONTENT

INTRODUCTION

IUGR is defined as birth weight less than tenth percentile of average birth weight for the gestational age, and also where the fetus fails to achieve its genetic potential and is at risk of increased perinatal mortality and morbidity. The term growth retardation is no longer used because it implies defective mental function. Definition of IUGR, SGA, FGR is same. FGR, IUGR are used during intrauterine life, SGA is used after birth. Incidence of IUGR in term babies is 5% and in preterm babies it is 15%.

In the year 1963 Lubchenco and coworkers gave comparison of gestational age and birth weight .Then in 1967 Battalgia and Lubchenco defined small for gestational age as whose birth weight is less than 10th percentile for their gestational age. Brenner et al, Arbuckle et al, Meintire et al, Alexandar et al were set nomograms to determine birth weight percentile distribution at different gestational ages. To estimate fetal weight using BPD, HC, FL, AC Shepard et al, Hadlock et al gave some equations and nomograms.Ultrasound machines will have one or both of these nomograms.

In 1991 Maning and Holder and in 1992 Gordosi and colleques suggested that 25 to 60% of SGA infants were proportionately grown when ethnicity, race, parity, height, weight considered. Some investigators used AC <2.5 SD below mean or H/A ratio >2 SD from mean for their gestational age or F/A ratio >2 SD

from mean .The concept behind this is fetal abdomen is most affected organ in IUGR..Diagnostic accuracy of EFW and AC is similar. Some investigators defined IUGR using 5^{th} (seeds), 3rd (Usher and Mclean), 2.5th percentile in addition to 10^{th} percentile. The concept behind this is lower the percentile, higher the probability of occurrence of PFGR.Usher and Mclean suggested that fetal growth standards should be derived from mean weight for age with normal limits defined by ±2 SD. According to this SGA definition will be less than 3^{rd} percentile instead of 10th percentile .Adverse neonatal outcome are common in infants whose EFW is below third percentile.

Physiology of growth:

The control of fetal growth is confounded by lot of variables such as Race, socioeconomic status, maternal height; weight. Fetal growth depends on two components:

- ✓ Genetic potential which depends on parents, insulin like growth factor.
- ✓ Substrate supply which in turn depends on placenta and uterine vascularity.

Substrates used for fetal growth includes the following:

- ➢ Oxygen which crosses the placenta by simple diffusion
- ➢ Glucose reaches the fetus by facilitated diffusion
- ➢ Aminoacids crosses the placenta by active transport

Various stages of fetal development

Upto 16 weeks cell hyperplasia

Upto 16 to 32 weeks cell hyperplasia +cell hypertrophy

>32 weeks cell hypertrophy

Fetal weight gain approximates

5 gm/day during 14 to 15 wks of gestation

10 gm /day during 20 wks of gestation

30 to 35 gm/day during 32 to 34 wks of gestation.

Types of IUGR

1.Symmetrical IUGR (type I)

2.Asymmetrical IUGR (type II)

3.Intermediate IUGR (type III)

1.symmetrical IUGR (20%)

These fetuses are affected in very early developmental phase of cellular hyperplasia. The etiology is mainly genetic disease or infection. These fetuses have

normal H/A and F/A ratio. The ponderal index also normal for these fetuses. These fetuses will have adverse neonatal outcome.

2.Asymmetrical IUGR(80%)

The fetus is affected in later months of developmental phase of cellular hypertrophy. The etiology is usually chronic placental insufficiency. They will have elevated H/A and F/A ratio. The fetus will have low ponderal index. They will have good prognosis usually.

3.Intermediate IUGR

These fetuses are initially symmetric but become asymmetric in later half of pregnancy.

Pregnancies associated with specific risk factors have high likelihood of complicating into IUGR. Most of the maternal risk factors are modifiable. With decreasing trend of maternal mortality and morbidity, now a days our main concern is about perinatal mortality and morbidity.

One study showed that inclusion of maternal characteristics in birth weight customization model for IUGR increases the detection of SGA infants at risk of perinatal death .(BJOG - 2012).

So aim of this study is to investigate for various maternal risk factors in mothers having IUGR babies and to determine the impact of risk factors on perinatal outcome.

REVIEW OF LITERATURE

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IMPACT OF MATERNAL ANAEMIA ON PERINATAL OUTCOME:

Risk of IUGR was 2.2 times greater in anaemia than non anaemic groups. Risk of perinatal mortality was 3 times greater in anaemic group than non anaemic group. Risk of IUD is 2.6 times greater for anaemic women. Risk of preterm delivery and low birth weight were 3.92 & 2.2 times more in anaemic women than non anaemic women.

2. Keren Mammon, Rotem Keshet, Shoshana Savion, Olga Pekar, Zeev Zaslavsky, Amos Fein,Vladimir Toder, and Arkady Torchinsky

Diabetes induced fetal growth retardation is associated with suppression of NF-Ķb activity in embryos:

Diabetes-induced fetal growth retardation may be accompanied by the suppression of NF-kb activity in embryos.

3. F.W. Lone,1 R.N. Qureshi1 and F. Emmanuel

Maternal anaemia and its impact on perinatal outcome in a tertiary care hospital:

IUGR risk among anaemic antenatal mothers is 1.9 times greater than non anaemic mothers. Perinatal mortality 3.2 times greater in anaemic mothers having IUGR fetus.

4. Sherri A. Longo, MD, Chi P. Dola, MD, Gabriella Pridjian, MD

Preeclampsia and Eclampsia Revisited :

Perinatal morbidity and mortality in preeclamptic women is high. Preeclampsia similar to chronic hypertension in pregnancy is a risk factor for IUGR, placental abruption. If preeclampsia is severe preterm deliveries are common.

5. Andrea L Conroy, Chloe R McDonald, Kevin C Kain

Malaria in Pregnancy

This study showed strong association between malaria and low birth weight, IUGR and preterm delivery. Elevated sEng was associated with low birth weight resulting from IUGR.

6. Abigail Norris Turner, PhD, Sammy Tabbah, MD, Victor Mwapasa, MBBS, PhD, Stephen J. Rogerson, FRACP, PhD, Steven R. Meshnick, MD, PhD, William E. Ackerman, IV, MD, Jesse J. Kwiek, PhD

Severity of Maternal HIV-1 Disease Is Associated With Adverse Birth Outcomes:

Maternal HIV-1 disease was significantly associated with increased prevalence of low birth weight; one of the causes is IUGR.

7. Tuija Mannisto

Thyroid Disease During Pregnancy:

Adverse neonatal outcomes are strongly associated with maternal thyroid disease.

8. Jennifer Altamura Namazy, Michael Schatz

Pregnancy and Asthma: Recent Developments:

Recent evidence shows that pregnant women complicated by bronchial asthma have increased risk of adverse perinatal outcome.

9. Afshan Hameed, MD; Ilyas S Karaalp, MD; Padmini P Tummala, MD; Omar R Wani, MD; Menahem Canetti, MD; Mohammed W Akhter, MD; Murphy Goodwin, MD; Natalia Zapadinsky, BS; Uri Elkayam, MD

The effect of valvular heart disease on maternal and fetal outcome of pregnancy:

Pregnancy with heart disease complication has increased incidence of IUGR and adverse fetal outcome.

10. Vega J, Sáez G, Smith M, Agurto M, Morris NM

Risk factors for low birth weight and intrauterine growth retardation in Santiago, Chile :

Antenatal care related factors and maternal adverse obstetric factors were significantly associated with IUGR and low birth weight.

11. Ferraz EM, Gray RH, Cunha TM

Determinants of preterm delivery and intrauterine growth retardation:

Risk factors for IUGR include low socio economic status, smoking, low maternal weight, primiparity and medical disease during pregnancy.

12. Sclowitz IK, Santos Ida S

Risk factors for repetition of low birth weight, intrauterine growth retardation, and prematurity in subsequent pregnancies: a systematic review:

Important risk factors causing recurrent IUGR are maternal age < 20 or > 35 years, low socio economic status, hypertensive disorders of pregnancy, inter pregnancy interval less than 12 months.

13. Fikree FF, Berendes HW, Midhet F, D'Souza RM, Hussain R.

Risk factors for intrauterine growth retardation: Results of a community-based study from Karachi:

Major risk factors causing IUGR are low socio economic status, primiparity, low maternal weight and non vegetarian diet.

14. Ananda P. Dasanayake

Poor Periodontal Health of the Pregnant Woman as a Risk Factor for Low Birth Weight :

LBW babies are common in women having less healthy areas of gingival and more areas of bleeding with calculus.

15. Gilbert WM, Danielsen B, Am J Obstet Gynecol. 2003

Pregnancy Outcomes Associated With Intrauterine Growth Restriction:

IUGR was increased in women who presented with preterm labor. IUGR is associated with adverse neonatal outcome in third trimester.

16. Kelly E. Fitzgerald, SNM, MSN

Use of phenytoin in pregnancy for epileptic seizure Prevention :

Use of AEDs is associated with high incidence of IUGR and perinatal mortality.

The term FGR is used to define fetuses with ultrasonic estimated weight less than 10^{th} percentile for their gestational age.

Maternal risk factors

(A)Extremes of maternal age,nulliparity or grand multiparity,history of IUGR in previous pregnancy, and h/o previous low birth weight , BOH,h/o bleeding p/v in present pregnancy, h/o uterine anomaly, shorter interpregnancy interval, low maternal weight.

(B)Associated with placental vascular insufficiency

- Hypertensive disorders
- Diabetes
- Anaemia (nutritional , sickle cell anaemia- less common)
- Thyroid disorders
- Maternal infections like HIV,viral hepatitis,syphilis,malaria,UTI,LRI,vaginal infections,
- Chronic respiratory diseases like TB, Bronchial asthma, bronchiectasis, cystic fibrosis, and kyphoscoliosis.
- Heart diseases (congenital or acquired)
- Chronic liver disorders
- Seizure disorders
- Chronic renal diseases
- Rh incompatibility
- Autoimmune disorders like SLE,APLA syndrome etc,
- Thrombophilias
- Connective tissue disorders like rheumatoid arthritis

(C) Not associated with placental vascular insufficiency

- Severe malnutrition

- Smoking
- Alcohol ingestion
- Drug abuse like cocaine,morphine,tobacco,
- Excess caffeine intake
- Therapeutic medications such as anticonvulsants(phenytoin),antineoplastic agents,warfarin

Placental risk factors

- Massive perivillous fibrin deposition
- Maternal floor infarcts
- Placenta previa,abruptio placenta
- Placental haemangioma
- Haemorrhagic endovasculitis
- Placental mosaicism
- Chronic villitis

Fetal risk factors

- Chromosomal abnormalities like trisomy 13,18 and 21
- Structural anomalies involving CNS,CVS,GIT,musculo skeletal systems
- Multifactorial causation

- Inborn errors of metabolism
- Infections like rubella,cytomegalo virus

Prenatal Exposure to Polycyclic Aromatic Hydrocarbons has high risk of developing IUGR in mothers. Exposure to lead through air pollution has also high risk of developing IUGR. Low level of leptin in mother who has preeclampsia has significant difference for developing IUGR. Recent study showed that placental mesenchymal dysplasia is also strongly associated with IUGR and IUFD.

Maternal risk factors

Maternal risk factors cause PFGR by interfering with growth of the fetus by anyone the following pathways

- Decreasing the availability of the substrates needed for the fetal growth
- Transferring of the substances (toxins) to the fetus that affects the growth.
- Causing placental insufficiency

The mechanism of impairment of placental vascularity by maternal risk factors like chronic hypertension, diabetes, autoimmune disorders, and chronic renal diseases is unknown. The common mechanism may be alteration of fetal or maternal haemostatic systems or vasoconstriction leading to ischemic infarcts and decreased perfusion. Since the association between the maternal risk factors and

placental insufficiency and PFGR is resilient antepartum fetal surveillance is an important aspect of antenatal care. Since the women with risk factors won't develop PFGR in all pregnancies there must be association between several risk factors. Abuzzahab et all supports this by suggesting alteration in genes like point mutation in IGF-I receptor inpatients having unexplained PFGR..Another important factor is placental and fetal response to altered maternal environment in women having thrombophilia.Severe malnutrition may affect mother in turn affects fetal growth and ultimately cause PFGR.In one series of study 76 babies with fetal alcohol syndrome PFGR associated with 91% of babies.Phenytoin, chemotherapeutic agents,warfarin which are associated with PFGR but not commonly used during pregnancy.

PLACENTAL ABNORMALITIES

In 1994 Fuke et all showed massive perivillous fibrin deposition association with 62.9% of PFGR fetus. This indicates possibility of association of maternal thrombophilia also with PFGR. Another feature which is useful for identification of maternal thrombophilia is hemorrhagic endovasculitis and maternal floor infarction of the placenta. Other placental lesions like chronic villitis (Althabe and labarrere, 1985) placental mosaicism, hemorrhagic endovasculitis were also found to be associated with PFGR.Arias et al (1998) showed presence of fetal thrombotic

vasculopathy along with placental lesions above mentioned had a strong association with adverse perinatal outcome.

FETAL ABNORMALITIES

Most common abnormalities causing PFGR were chromosomal specifically trisomy 18.Infections won't cause PFGR commonly. If at all viral infections only will cause PFGR usually .Common causes are cytomegalovirus, congenital rubella, varicella, HIV, herpes simplex.

FETALAL AND NEONATAL COMPLICATIONS

1. Antepartum complications

(A) oligohydramnios

Chamberlain et al showed that incidence of PFGR is 40% if oligohydramnios compared to 5% when liquor is normal.

(B)Fetal hypoxia and acidosis

Lin et al showed that abnormal fetal heart rate pattern was seen in PFGR fetuses more frequently than normal fetuses. Acidosis occurs in 40% of PFGR fetuses. So incidence of cesarean section also increases in those women.

(C)Manara study showed that there is strong association between PFGR and stillbirth.20% of all stillbirths shows features of PFGR.Stillbirth in PFGR occurs after 35 years of gestation.

2. Intrapartum complications

Non reassuring FHR pattern is most common complication during intrapartum period.

3.Neonatal complications

a.Meconium aspiration syndrome : It is the most common complication causing neonatal morbidity and mortality.Amnio infusion is also not effective for this condition(ACOG 2006).

b.Respiratory distress syndrome: It is the major cause of neonatal mortality in preterm infants .Recent study showed that there is no stress induced protective effect for IUGR infants against RDS.

c.Persistent fetal circulation: It is the sequela caused by perinatal hypoxia which leads to pulmonary vasoconstriction with persistent flow of blood through the ductus arteriosus.

d).Hypoxic ischemic encephalopathy: It occurs more frequently in PFGR infants than AGA infants, which is caused by birth asphyxia and causes seizures, irritability.

e).Intraventricular bleeding: Most common lesions in CNS are IVH (Grade III, IV), leucomalacia.Spinillo et al showed higher incidence of IVH in preterm PFGR than AGA infants.

f).Hypoglycemia: It is defined as blood glucose less than 45 mg/dl.This is because of decreased glycogen stores in liver and muscle and relative deficiency of hepatic gluconeogenic enzymes, and minimal subcutaneous fat.

g).Hyperviscocity syndrome: 18% of PFGR infants were affected by hyperviscocity syndrome. Important finding is polycythemia. It is diagnosed when Hct is 65% and Hb is >22g/dl.

h) Necrotizing enterocolitis: It is caused by ischemia because of birth asphyxia.

I) Hypothermia: It is due to decreased subcutaneous fat and poor temperature control.

LONG TERM COMPLICATIONS:

Poor postnatal growth:

Fancourt et al showed that those infants whose PFGR started before 34 weeks will more likely gain weight less than10th percentile at 4 yrs of age than babies whose growth disturbances started after 34 weeks of gestation.

Cerebral palsy:

Follow up studies in Robertson et al and kok et al showed that impairment of intelligence, speech, reading ebility, motor skills occurs most commonly in PFGR

Adult disease:

Several studies showed strong relationship between PFGR and chronic hypertension (Law and shell), Non insulin dependent diabetes (Hales et al) in adult life.

Important risk factors during antenatal care:

Disparity between Uterine size and gestational age, Poor weight gain, early preeclampsia, difficulty in assessing uterine height in obese woman.

High risk woman followup:

It is done with uterine artery Doppler. If that is positive serial USG done every 3 to 4 wks.woman is diagnosed to be having PFGR if EFW is<than 10^{th} percentile. If Doppler is negative NPV is 97 to 99%.

DIAGNOSIS:

It needs accurate gestational age of the pregnancy which in turn depends on following factors:

a) History of regular menstrual periods, known LMP, no history of OC pills, and conformation of EDD by USG before 24 weeks.

b). Negative pregnancy test followed by positive UPT at adequate times after a known LMP

c). Availability of documented date of conception or date of artificial insemination, in woman who conceived after infertility treatment.

d).EDD determined by two USG examinations 3 to 4 wks apart in first and second trimester in whom the LMP is not reliable.

METHODS OF DIAGNOSIS WHEN GESTATIONAL AGE IS CERTAIN:

- Abdominal circumference: when AC less than 10th percentile NPV is 93% PPV is 47%.When AC less than 5th percentile NPV is same but PPV raises to 67%.when AC is more than 25th percentile NPV is 95%(David et al)
- Head /Abdomen ratio: when H/A ratio are more than 95th percentile PFGR is usually present.
- EFW :Chervenak et al showed that when EFW<0.5% confidence limit ,the chance of fetus to be small is 82%.if EFW is between 5 to 20% confidence limits the chance of fetus to be small is 24%.

METHODES OF DIAGNOSIS WHEN GESTATIONAL AGE IS UNCERTAIN:

- Transcerebellar diameter/Abdominal circumference: Normal TCD/AC ratio is 0.137±0.012
- Femur length /abdominal circumference ratio: Normal is 22±2 .If more than 23.5 sensitivity is 63.3% and specificity is 90% for the diagnosis of PFGR.
- FETAL PONDERAL INDEX: It is the ratio between EFW/FL^3.Normal value is 8.325±2.5.When it is ≤7 diagnosis of PFGR is certain.

ROLE OF DOPPLER IN IUGR:

For the diagnosis of PFGR following are important sites for Doppler measurements uterine artery ,Umbilical artery(UA) ,middle cerebral artery (MCA) ,ductus venosus (DV).

- Uterine artery Doppler: It indicates presence or absence of abnormal resistance to utero placental circulation.
- UA artery Doppler: It indicates index of resistance to flow in feto placental circulation.
- MCA Doppler: It indicates whether the fetus is compensating for decreased oxygen supply by preferentially diverting the blood flow to brain or not.
- DV Doppler: It indicates whether cardiac failure is present or absent in response to fetal hypoxia.

The measurements used to indicate resistance to blood flow are S/D Ratio, PI index, RI index.

- ✓ S/D Ratio: It is obtained by dividing peak systolic velocity to peak diastolic velocity.
- ✓ PI index: It is the ratio between peak systolic velocity and end diastolic velocity/mean systolic velocity.

- ✓ RI index: It is the ratio between peak systolic velocity and end diastolic velocity /peak systolic velocity.

METHODS OF ANTEPARTUM FETAL SURVEILLANCE:

- FHR monitoring
- Biophysical profile
- Umbilical and middle cerebral artery Doppler
- Venous Doppler
- Amniotic fluid volume
- Amniocentesis
- Umbilical cord blood sampling

Last two procedures not usually performed.

Management of PFGR fetuses: it depends on gestational age

- Before 24 weeks
- Between 24 and 32 weeks
- Between 32 and 36 weeks
- After 36 weeks

Before 24 weeks of gestation: The risk factors causing IUGR mainly are placental or genetic origin. Growth is asymmetric with elevated F/A ratio and H/A

ratio. Doppler usually shows ADF or RDF or centralization. Monitoring of the fetus is usually includes UA Doppler, DV Doppler. FHR monitoring can't be used because of Absence of variability and accelerations.

- If umbilical artery diastolic flow is present DV has uninterrupted flow expectant management is done.
- If UA has RDF or DV has interrupted forward flow fetus is acidotic death is imminent.
- If UA has absent diastolic flow, the time needed for further changes to occur is usually 1 wk.So expectant management can be done upto this period.

Between 24 and 32 wks of gestation: The cause is usually placental and genetic (in 20 % of cases).Monitoring usually includes FHR pattern, UA, DV Doppler. Biophysical profile is also useful. Most commonly used methods for monitoring are UA, MCA, and DV Doppler.

- If UA has diastolic flow without centralization UA Doppler is done once in every week.
- If UA has diastolic flow with centralization FHR monitoring twice in a week, and UA Doppler done weekly.

- If UA has absent diastolic flow and FHR is not showing any decelerations DV Doppler is useful for deciding termination of pregnancy.
- If DV shows interruption or reversed forward flow or PI >3 .0 SD from mean prognosis is poor, and delivery is recommended.
- If none of these alterations are present continue the pregnancy with daily monitoring until spontaneous decelerations of FHR, RDF in UA, interrupted forward flow in DV.But this concept is usually not accepted by all.

Between 32 to 36 weeks: Main cause is placental insufficiency. Management is done according to the following situations.

- If uterine artery Doppler is abnormal and UA is normal the fetus is followed with weekly NST and UA/MCA.If UA/MCA and NST remains normal delivery is planned at 38 weeks.
- If normal uterine artery and abnormal UA Doppler ,fetus is followed with bi-weekly NST and weekly UA/MCA .And then if UA/MCA decreases. But >1.0 deliver at 36 weeks.If UA/MCA <1.0 and normal DV fetus is followed with bi-weekly NST,weekly UA/MCA/DV.Then delivery is done if the fetus develops acidosis or at 34 weeks.

- If the fetus is having abnormal uterine artery and UA Doppler ,follow up done by bi-weekly NST and weekly UA/MCA/DV.If at anytime the fetus develops RDF in UA or Interrupted flow in DV ,ominous NST delivery is done immediately.

AIM OF STUDY

To identify various risk factors causing IUGR

To determine the impact of risk factors on perinatal outcome

MATERIALS AND METHODS

Type of study:

A prospective cohort study among antenatal women having IUGR babies.

Duration of study:

December 2012 to December 2013.

MATERIALS AND METHODS:

This is a hospital based prospective cohort study conducted at Institute of social obstetrics and Government Kasturba Gandhi hospital For women and children, Triplicane, Chennai-5 from December 2012 to December 2013.

This study includes 100 antenatal women having IUGR babies suspected clinically and confirmed by USG who were evaluated for maternal risk factors after getting written informed consent.

INCLUSION CRITERIA:

- Women who had regular menstrual periods prior to conception and sure of their LMP or whose EDD had been established by 1st trimester ultrasonogram
- Singleton pregnancy
- 2nd and 3rd trimester
- Cephalic presentation
- IUGR with high risk pregnancies like hypertensive disorders of pregnancy, anaemia, maternal infections.

EXCLUSION CRITERIA:

- Anomalous babies.
- Abnormal presentation(non cephalic)
- Preterm labour,PPROM(who is presenting for the first time with IUGR and labour pains)
- Small mother <45 kg
- Multiple pregnancy

After selection of patients a detailed history is elicited regarding regularity of menstruation ,last menstrual period, obstetric history ,and also

as to the presence of symptoms of risk factors causing IUGR like low socio economic status,preeclampsia,anaemia,systemic illnesses,etc

General examination of the mother including height, weight, BMI, pallor, blood pressure, and cardiovascular, respiratory, nervous system was done including obstetric examination.

Investigations done are based on the tests available in government hospital.

Blood sample taken and sent for following investigations.

- Renal function tests, liver function tests, complete blood count with peripheral smear, bleeding time, clotting time, clot retraction time,
- Blood grouping typing ,ICT,
- Glucose challenge test, glucose tolerance test if GCT is abnormal
- Thyroid function tests
- HIV,Hbsag,VDRL

Urine sample collected and sent for following investigations.

- For albumin,sugar,deposits
- Culture sensitivity
- 24 hours urine protein

High vaginal swab was taken

ECG, Echocardiogram was done

USG Doppler was done

Dental opinion obtained to get report on chronic dental caries and gum disease.

Chest physician opinion was obtained to rule out chronic respiratory diseases like tuberculosis, bronchial asthma, cystic fibrosis, kyphoscoliosis, and bronchiectasis if the patient is having chronic respiratory symptoms. Likewise sputum AFB, sputum culture sensitivity is done if the woman is having symptoms and signs of tuberculosis.

Rheumatology opinion obtained to rule out Connective tissue disorders, APLA syndrome, SLE, etc, causing IUGR.

Hematologist opinion was obtained if the patient is having abnormal peripheral smear, coagulation profile.

Women were evaluated further if they are having abnormal basic investigations accordingly.

Normal reference values:

RENAL FUNCTION TESTS:

Blood urea-20 to 25 mg%

Serum creatinine-0.6 to 0.8mg/dl(First trimester)

- 0.5 to 0.7(second trimester)

-0.6 to 0.8(third trimester)

LIVER FUNCTION TESTS:

Total bilirubin (mg/dl)-o.15 to0.8 mg/dl (first trimester)

-0.12 to 0.7(second trimester)

-0.15 to 0.9(Third trimester)

Albumin-38 to 49 g/dl (first trimester)

-36 to 44(second trimester)

-3 to 48(third trimester)

ALT-5 TO 56 IU/dl (no significant change in each trimester)

AST-5 TO 43 IU/dl (no significant change in each trimester)

Alkaline phosphatase- 9 to 60IU/L (first trimester)

-17 to 78 IU/L (second trimester)

-32 to 156(third trimester)

SERUM URIC ACID

Units	First Trimester	Second Trimester	Third Trimester
mg/dL	2 to 4.2	2.4 to 4.9	3.1 to 6.3
µmol/L	119 to 250	143 to 292	184 to 375

Serum fibrinogen-300 to 600 mg%

HAEMATOLOGICAL TESTS:

Haemoglobin (g/dl)-≥11 gm/dl

White cell count-4000 to 11000 $\times 10^6$/L

Haematocrit -11 to 13.5(first trimester)

-10 to 11.8(second trimester)

-10 to 11.9(third trimester)

Platelets-1.5 lakhs to 4.5 lakhs

Bleeding time-1 to 3 mins

Clotting time –3 to 7 mins

Clot Retraction Time-30 mins

Prothrombin time and further coagulation profile are done when above last 4 parameters were abnormal.

Definitions used for diagnosing various risk factors:

- Hypertensive disorders of pregnancy (According to ACOG Guideline)

Hypertension in pregnancy is defined as systolic blood pressure of 140 mmHg (or) higher or diastolic blood pressure of 90 mmHg or higher after 20 weeks of pregnancy in a woman with previously normal blood pressure.Korotkof Phase 5 is taken for measuring diastolic blood pressure. Hypertension also diagnosed when absolute rise in systolic BP of 30 mmHg or diastolic BP of atleast 15 mmHg over the baseline value on atleast two times 6 hours apart within seven days.

A) Gestational hypertension: Hypertension after 20 weeks of gestation or during labour or puerperium without proteinuria in a normotensive, non proteinuric woman previously.

B) Preeclampsia: Hypertension associated with protein excretion greater than 0.3 g/L in 24 Hours urine output or 1+ by qualitative urine tests after 20 weeks of gestational age.

C) Imminent eclampsia: Rapid worsening of symptoms and signs in an established patient of preeclampsia, in whom the threat of eclampsia is also prominent, and intervention must be taken to avoid mortality and morbidity. Imminent symptoms include restlessness, nausea, vomiting, epigastric pain, decreased urine output, giddiness, and visual disturbances.

D) Eclampsia: Convulsons in a preeclampsia patient is called as eclampsia.

E) HELLP syndrome: Severe form of preeclampsia characterized by Hemolysis, Elevated liver enzymes (AST>70 IU/L, LDH >600 U/L) Thrombocytopenia ($<100000/mm^3$)

F) Chronic hypertension: This is diagnosed when hypertension started before pregnancy or before 20 weeks of pregnancy .Hypertension should be recorded atleast two times 4 hours apart.

G) Chronic hypertension with superimposed preeclampsia: This condition is diagnosed when proteinuria developing for the first time in a patient having hypertension already.

ANAEMIA IN PREGNANCY :(WHO classification)

A) Moderate anaemia: Hb - 7 to 10.9 gm/dl

B) Severe anaemia: Hb 4 to 6.9 g/dl

C) Very severe anaemia :< 4 g/dl

DIABETES IN PREGNANCY:

A) Diabetes mellitus: If fasting blood sugar ≥126mg/dl or random blood sugar ≥200 mg/dl.If there is doubt the test should be repeated on next day.

Type 1: started from childhood requiring insulin for management

Type 2; started later in adult requiring oral hypoglycemic drugs or Insulin for management

B) Gestational diabetes mellitus: This is diagnosed when carbohydrate intolerance developed for the first time in pregnancy.

GCT-50 gm glucose was given to the patient irrespective of last meal time and plasma glucose measured after 1 hour. Woman with a level of ≥140 mg/dl is tested by 100 gm oral glucose tolerance test. The procedure for this test is as follows:

For atleast three days before test, the woman should consume normal unrestricted diet, having minimum of 150 gm carbohydrate. After an overnight fasting (8 to 14

hours) fasting blood sugar is taken, following which she drinks100 gm glucose in 300 ml of water to which juice of half lemon can be added. Then plasma glucose measured every hour for three hours. She should be in rest and free from smoking for the entire duration of test.

Cut off values :(Carpenter and coustan)

Fasting-95mg/dl

1 hour-180 mg/dl

2 hour-155 mg/dl

3 hour-140 mg/dl

GTT is considered abnormal when two values are abnormal. If anyone value is abnormal they are diagnosed as gestational impaired glucose tolerance.

The target blood sugar for all diabetic pregnancies is 70 to 110 mg /dl .If this level is achieved in patients having gestational diabetes mellitus, with meal plan alone they are classified as GDM on meal plan. If not achieved they need insulin and classified as GDM on Insulin.

THYROID DISORDERS OF PREGNANCY:

Thyroid Function Tests during Pregnancy

Serum	**1st trimester**	**2nd trimester**	**3rd trimester**
Free T3(pmol/L)	3 to5.7	2.8 to 4.2	2.4 to 4.1
Free T4(ng/dl)	0.86 to1.87	0.64 to 1.92	0.64 to1.92
Free T4(pmol/L)	11.1 to 24.1	8.2 to 24.7	8.2 to 24.7
Thyroid stimulating hormone (TSH) (µU/mL OR mU/L)	0.2 to 3.5	0.2 to 3.5	0.2 to 3.5

The diagnosis of hyperthyroidism in pregnant women when a Thyroid Stimulating Hormone (TSH) value of less than 0.01 mU/L and also a high free T4 value.

Diagnostic criteria for antiphospholipid syndrome:

Clinical criteria

A. Vascular thrombosis

One or more clinical episodes of arterial, venous or small vessel thrombosis

B. Pregnancy morbidity

(1) One or more unexplained deaths of a morphologically normal fetus at or beyond the 10th week of pregnancy.

(2) One or more pre-term births of a morphologically normal neonate before the 34th week of gestation because of: (i) recognized features of placental insufficiency (ii) eclampsia or Severe pre-eclampsia

(3) Three or more unexplained consecutive spontaneous miscarriages before the 10th week of pregnancy, with maternal anatomic or hormonal abnormalities maternal and paternal and chromosomal causes excluded.

Laboratory criteria

A. Anti-b2–glycoprotein I antibody of IgG and/or IgM isotype in serum or plasma (in titre >the 99th centile), present on two or more occasions at least 12 weeks apart

B. Anticardiolipin (aCL) antibody of immunoglobulin (Ig) G and/or IgM isotype in serum or plasma present in medium or high titre.

C. Lupus anticoagulant (LA) present in plasma, on 2 or more occasions at least 12 wks apart.

(i.e. >40GPL units or MPL units, or > the 99th centile), on 2 or more occasions, at least 12 weeks apart.

In the presence of at least one of the clinical criteria and one of the laboratory criteria Antiphospholipid antibody syndrome (APS) is diagnosed.

Diagnostic criteria for SLE

A person with four of these eleven conditions can be diagnosed as having lupus.

- Skin rashes that result from exposure to sunlight or ultraviolet light (photosensitivity)
- Butterfly (malar) rash on cheeks
- Rash on face, arms, neck, torso (discoid rash)
- Mouth or nasal sores (ulcers), usually painless
- Inflammation of the membranes surrounding the lungs (pleuritis) or heart (pericarditis).
- Joint swelling, stiffness, pain involving two or more joints (arthritis)
- Nervous system problems, such as seizures or psychosis, without known cause
- Problems with the blood, such as reduced numbers of red blood cells (anemia), platelets, or white blood cells
- Laboratory tests indicating increased autoimmune activity (antibodies against normal tissue)
- Positive antinuclear antibody (ANA) test

- Abnormalities in urine, such as increased protein or clumps of red blood cells or kidney cells, called cell casts, in the urine.

Positive indirect coombs test

A critical titre is significant risk of hydrops fetalis which is between 1:8 and 1:32 or when antibody level above 15 IU /L is called as positive coombs test. If the test is negative in first trimester it is to be repeated at 20, 24, 28th weeks of pregnancy.

Dental caries:

Dental caries was defined as presence of any teeth with dental caries (treated or untreated) and also as presence of at least two teeth with dental caries.

RESULTS

Analysis of cases studied

Table 1: Age Distribution

Age group (years)	**Cases**	
	No.	Percentage
< 20	6	6.0
20-34	89	89.0
≥ 35	5	5.0
total	100	100
Range Mean S.D	18 – 37 years 25 3.9	

Age of the women in the study ranged from 18 years to 37 years. The mean age was 26 years and S.D 3.9 year. Most of the women belonged to 20 to 34 years age group (89%). Women aged less than 20 years contributed to 6%.Women aged 35 years and above contributed to 5%.

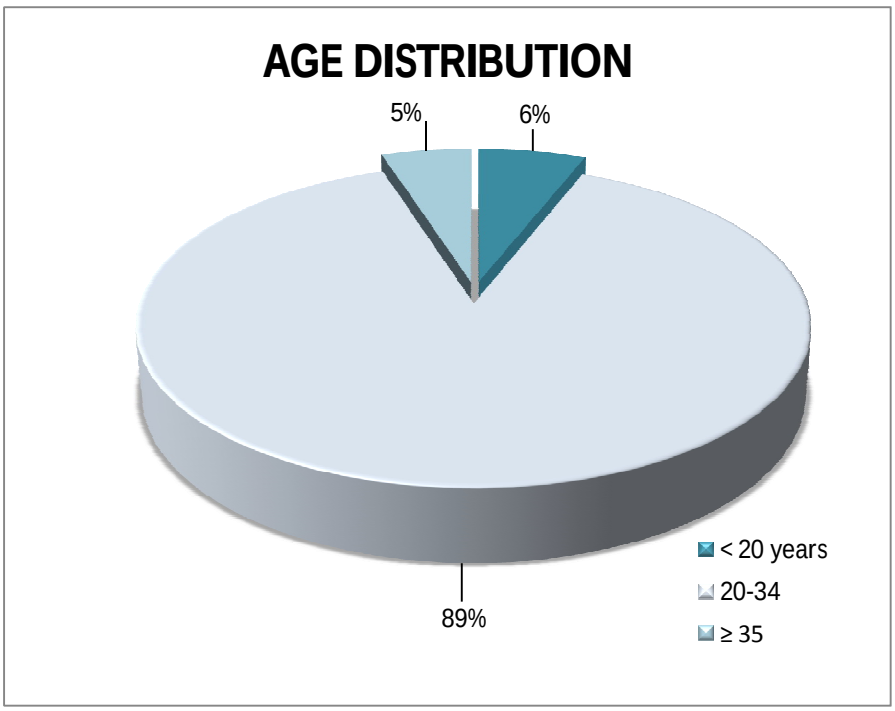

Table 2 : obstetric score

Obstetric score	**Cases**	
	No.	Percentage
Primi gravida	54	54
Multi gravida		
G2	30	30
G3	11	11
G4	4	4
G5 & above	1	1
Multi gravida total	46	46
Total	100	100

54% of cases were primigravida and remaining 46% were multigravida.

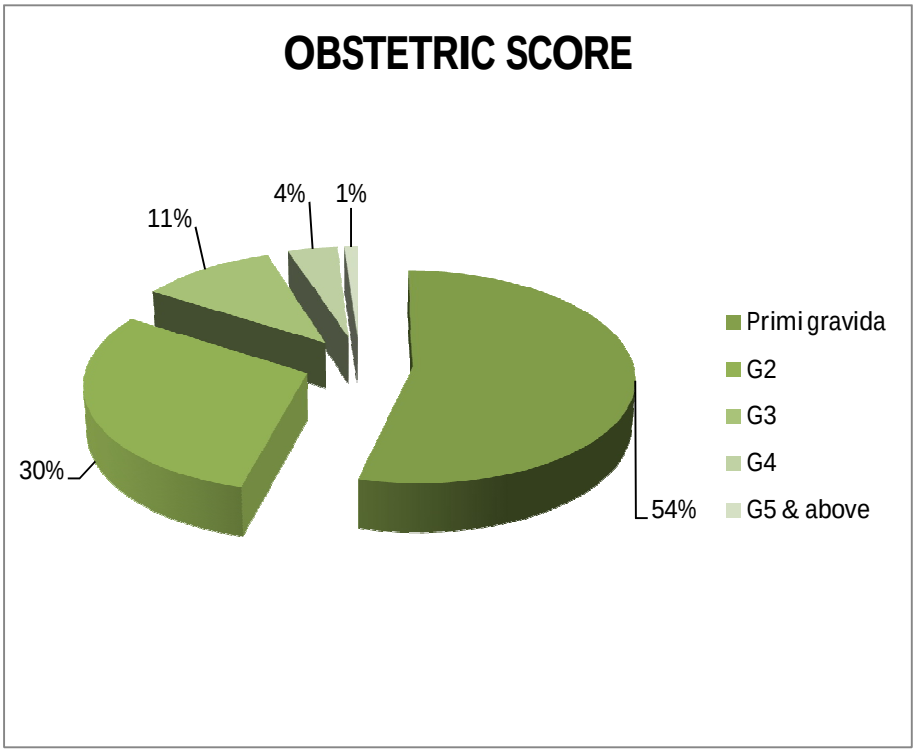

Table3: Gestational age at delivery

Gestational age	Cases	
	No	percentage
	36	36
Term	64	64
Total	100	100

36% of the babies were preterm 64% were term.

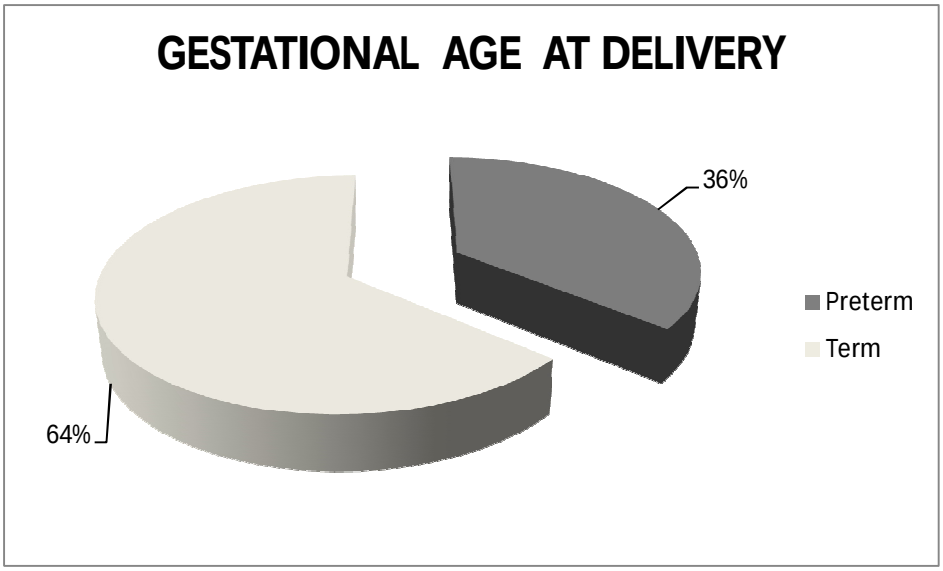

Table 4 : BMI of mother/weight of the baby (kgs)

Variables	Range	Mean	S.D
Mother BMI	17-27	21.21	2.47
Baby weight (kgs)	1.2-2.3	1.78	.24

Table 5 : Doppler CPR reversal

Doppler CPR reversal	Cases	
	No	percentage
Present	17	17
absent	83	83
total	100	100

17% of the women had Doppler CPR reversal and 83% of the women had no Doppler CPR reversal.

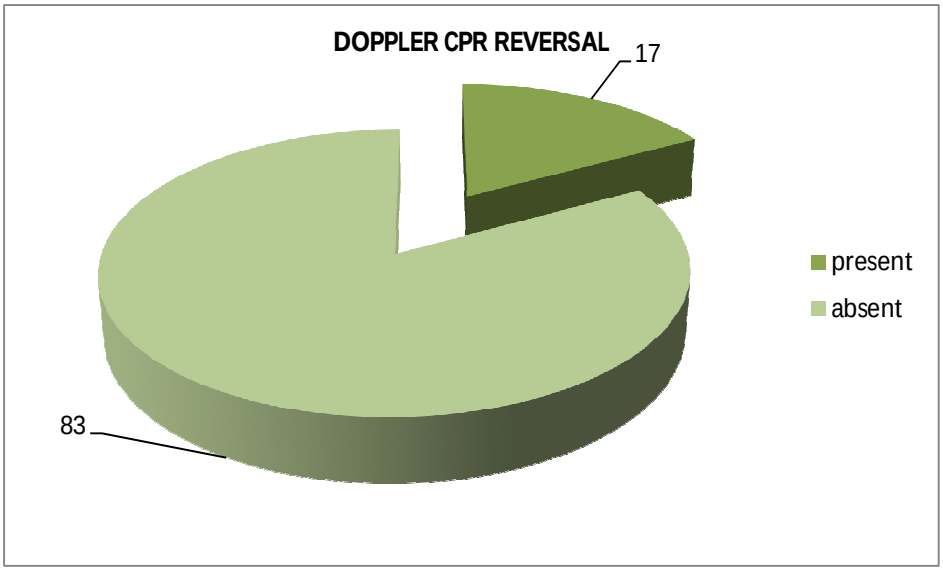

Table 6 : Maternal risk factors

Maternal risk factors	Cases	
	No	Percentage
Hypertensive disorders of pregnancy	32	32
Diabetes in pregnancy	13	13
Anemia	21	21
Hypothyroidism	3	3
Maternal infections	4	4
Systemic Illnesses	3	3
Dental Caries and Gum disease	12	12

Some cases had more than one risk factor

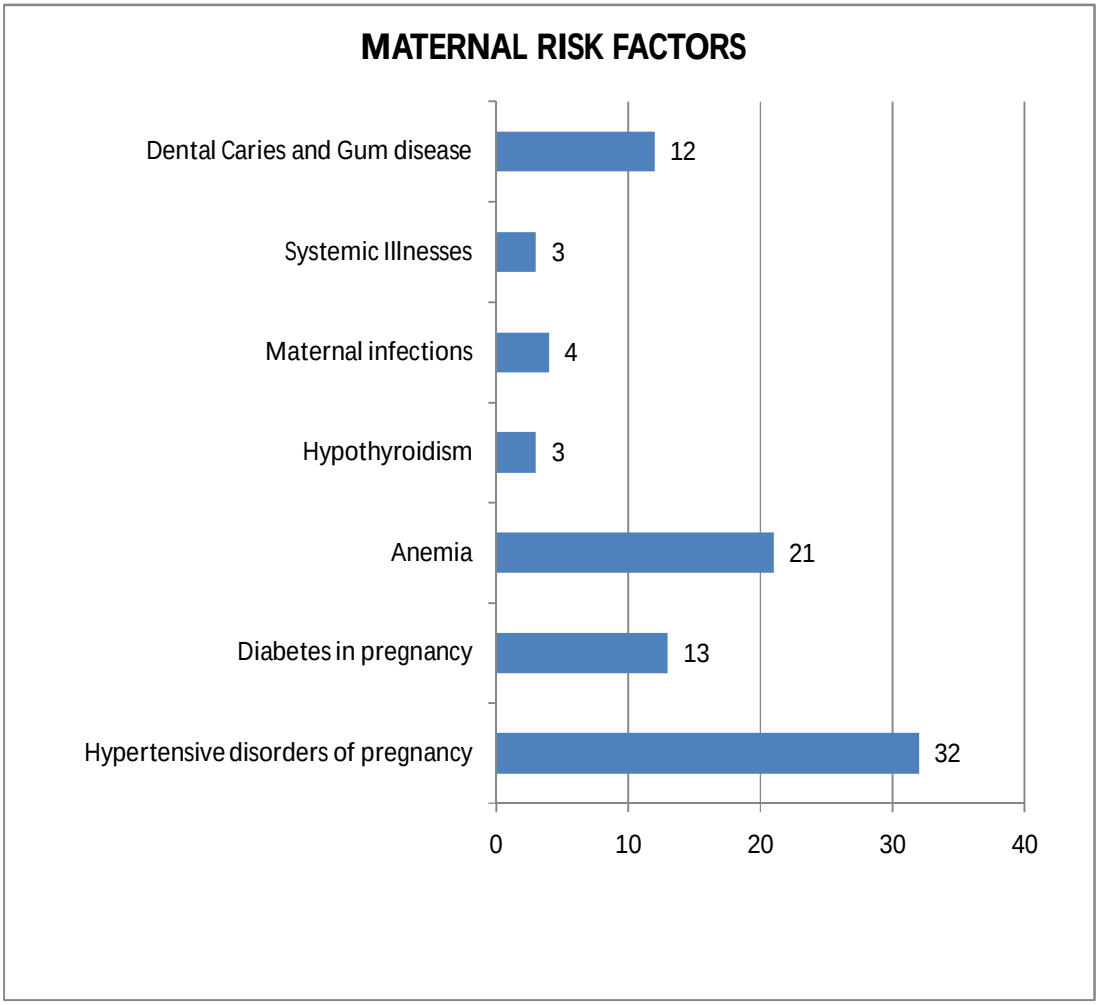
MATERNAL RISK FACTORS
Dental Caries and Gum disease
12
Systemic Illnesses
3
Maternal infections
4
Hypothyroidism
3
Anemia
21
Diabetes in pregnancy
13
Hypertensive disorders of pregnancy
32
0
10
20
30
40

Table 7 : Hypertensive disorders of pregnancy

Hypertensive disorders of pregnancy	Cases	
	No	Percentage
Gestational hypertension	14	44
Mild preeclampsia	6	19
Severe preeclampsia	6	19
Imminent eclampsia	5	16
Eclampsia	1	3
HELLP Syndromte	0	0
Chronic hypertension	0	0
Total	32	100

Among 32 cases of hypertensive disorders 44% had Gestational hypertension. 19% had Mild preeclampsia, 19% had Severe preeclampsia, 16% had Imminent eclampsia, 3% had Eclampsia.

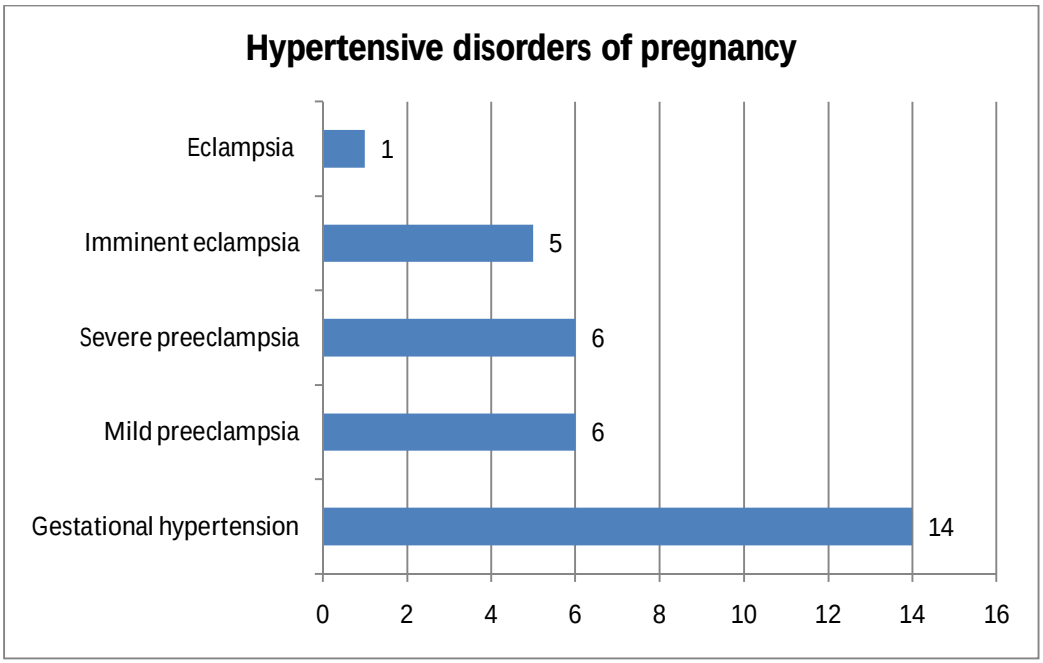

Table 8 : Diabetes in pregnancy

Diabetes in pregnancy	Cases	
	No	Percentage
Diabetes mellitus on insulin	5	38
GDM on meal plan	6	46
GDM on insulin	2	15
Total	13	100

Table 9 : Anemia in pregnancy

Anemia	Cases	
	No	Percentage
Mild anemia	12	57
Moderate anemia	8	38
Severe anemia	1	5
Total	21	100

Table 10 : Type of labour

Type of labour	Cases	
	No	Percentage
Spontaneous	25	25
Induced	22	22
Operative	53	53
Total	100	100

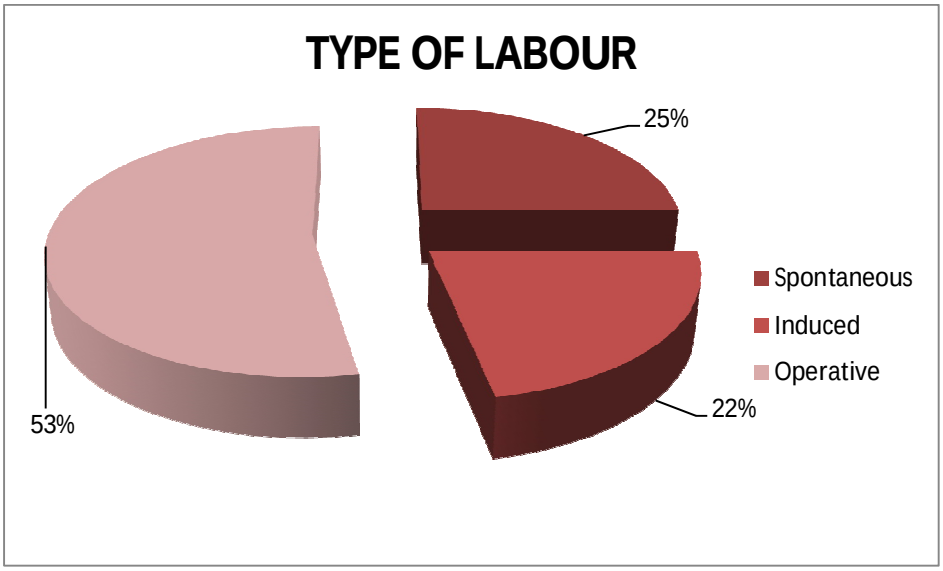

Table 11 : mode of delivery

Mode of Delivery	Cases	
	No	percentage
Labour naturale	35	35
Outlet forceps	2	2
LSCS	63	63
Total	100	100

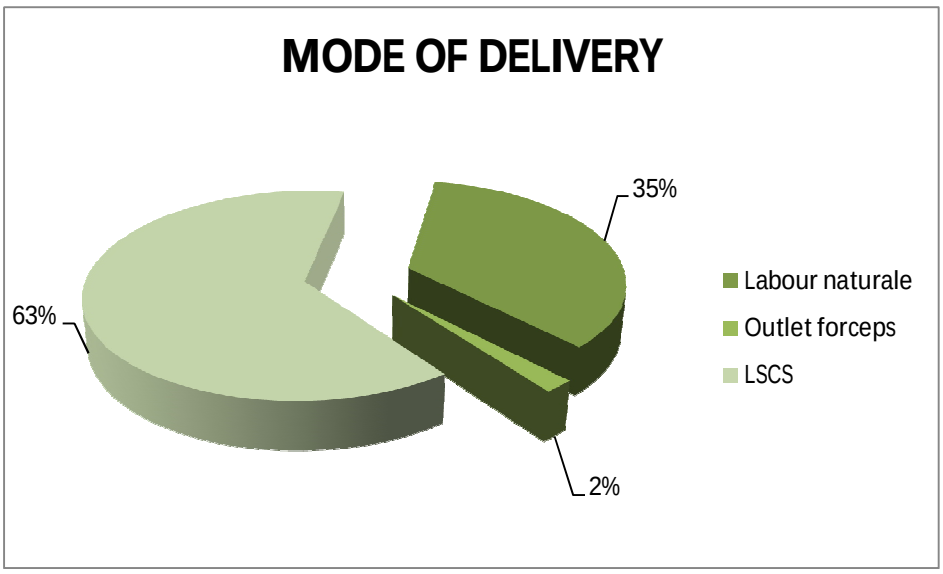

Table 12 : Liquor status

AFI	Meconium Staining Liquor		P value
	Present	Absent	0.482
Normal (59)	19	40	(not
Reduced (41)	16	25	significant)

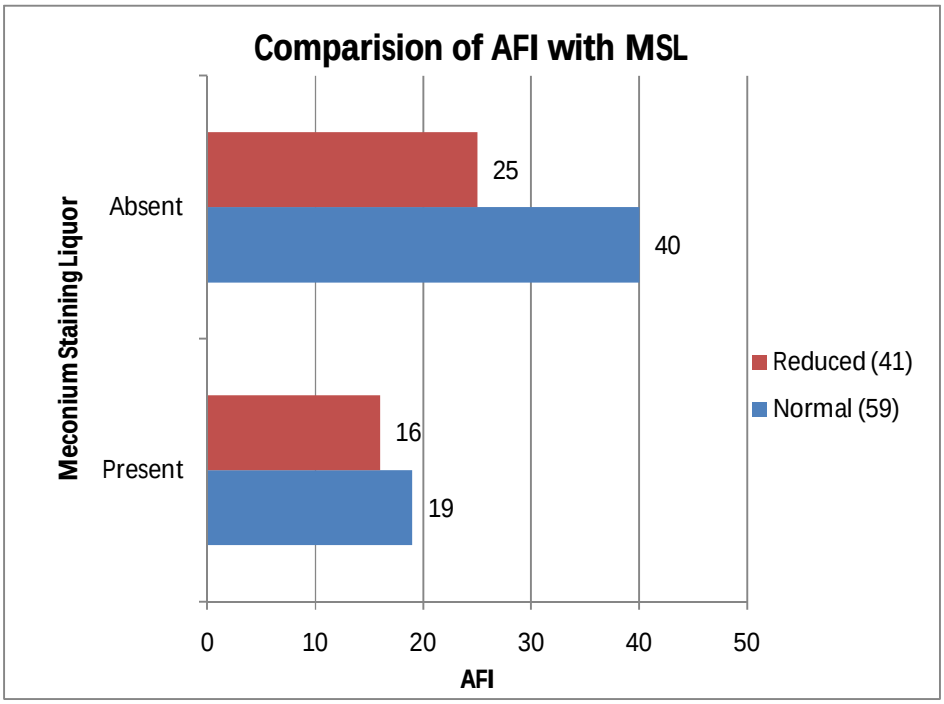

Table 13 : APGAR score at 5 minutes

Apgar score at 5 minutes	Cases	
	No.	percentage
IUD	1	1
<7	12	12
≥7	87	87
Total	100	100

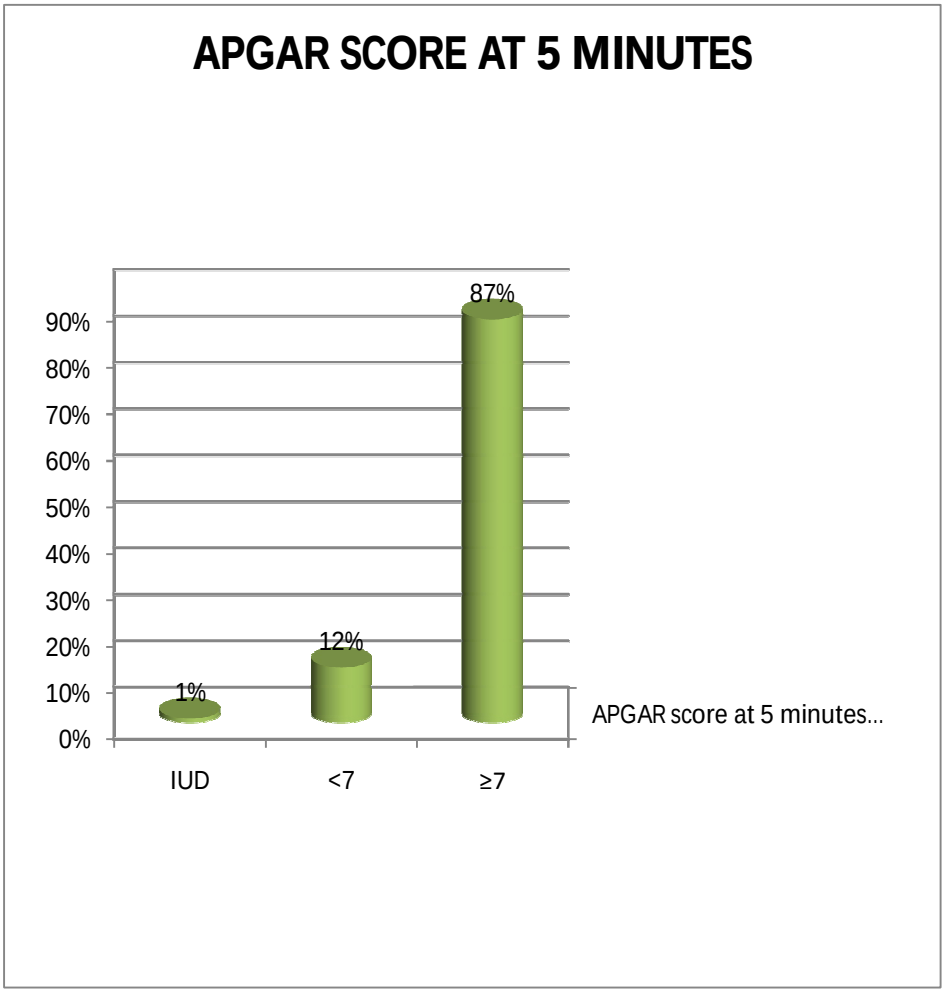
APGAR SCORE AT 5 MINUTES
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
87%
12%
1%
IUD
<7
≥7
APGAR score at 5 minutes...

Table 14 : Neonatal complications

Neonatal complications	Cases	
	No (out of 100 cases)	Percentage
Birth asphyxia	7	7
Respiratory distress	52	52
Hypothermia	8	8
Hypoglycemia	21	21
Hypocalcemia	6	6
HIE	9	9
Seizures	16	16
Jaundice	13	13
Sepsis	13	13
APGAR <7 at 5 minutes	12	12
IUD	1	1
Stillbirth	1	1
Neonatal death	15	15
Adverse perinatal outcome	75	75

Some babies had more than 1 complication

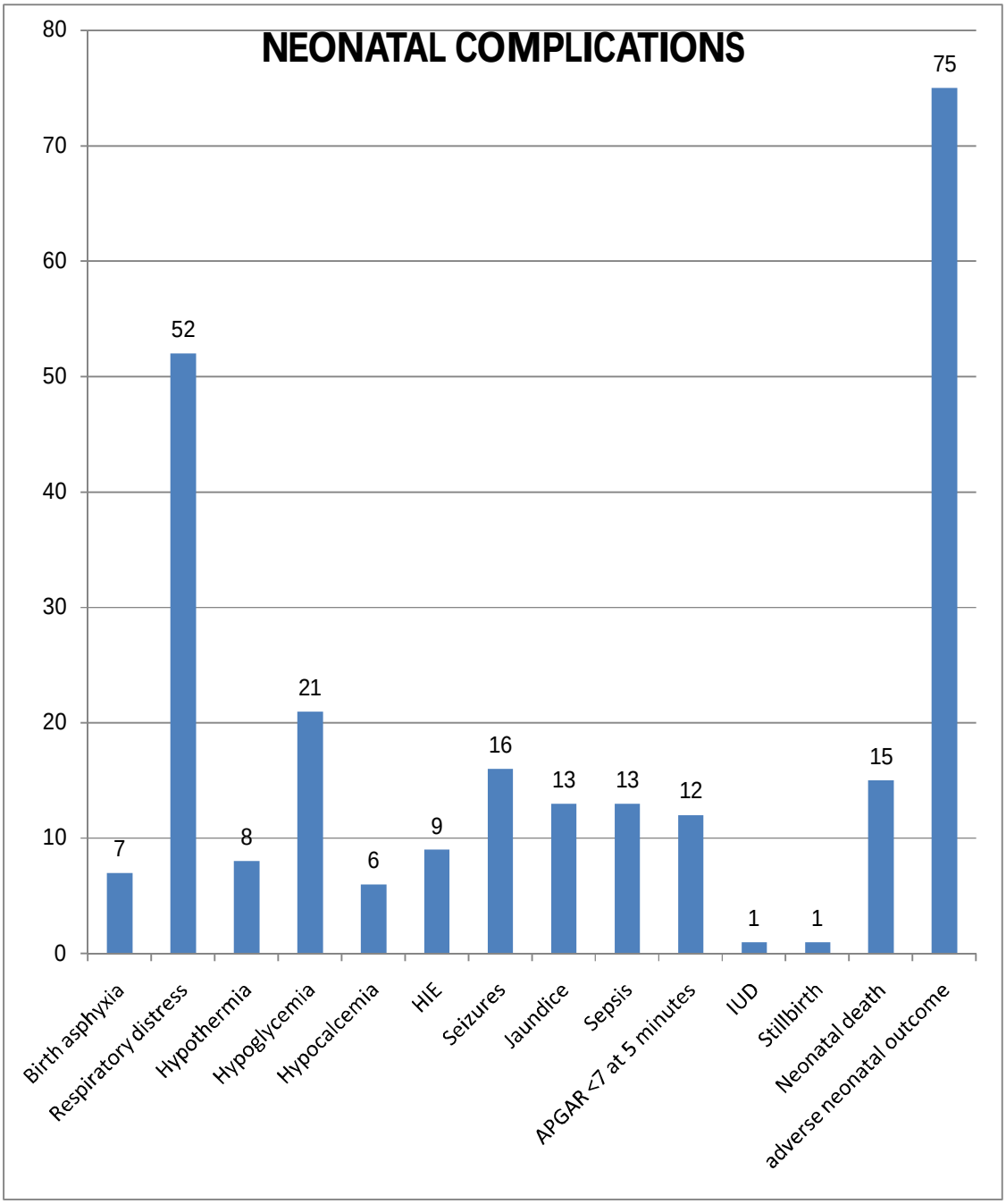
NEONATAL COMPLICATIONS
80
70
60
50
40
30
20
10
0
7
52
8
21
6
9
16
13
13
12
1
1
15
75
Birth asphyxia
Respiratory distress
Hypothermia
Hypoglycemia
Hypocalcemia
HIE
Seizures
Jaundice
Sepsis
APGAR <7 at 5 minutes
IUD
Stillbirth
Neonatal death
adverse neonatal outcome

Table 15:comparison between antenatal risk factors and general characteristics

Variable	Antenatal risk factors				P value
	Present		Absent		
	No	percentage	No	Percentage	
Age (years) <20 (6) ≥20 (94)	 3 62	 50 66	 3 32	 50 34	0.5 (not significant)
Socioeconomic status Group A (Lower)(72) Group B(upper middle)(28)	 13 52	 86 61	 2 33	 13 39	0.05 *(significant)
Parity Primi(54) Multi (46)	 37 28	 68.5 60.8	 17 18	 31 39	0.424 (not significant)
BMI Group A (<18.5)(10) Group B (≥18.5)(90)	 7 3	 70 30	 58 32	 64.4 35.5	0.9 (not significant)

Demographic variables like age,socioeconomic status,parity, BMI were compared among the study patients by dividing them into two groups for each variables . in age <20 years was considered 50% of the patients had risk factors even though it is statistically not significant because of the more patients in age >20 years group. while considering socioeconomic status 66% of the patients had risk factors among lower socioeconomic status group. On comparing parity and BMI there was no statistically significant difference.

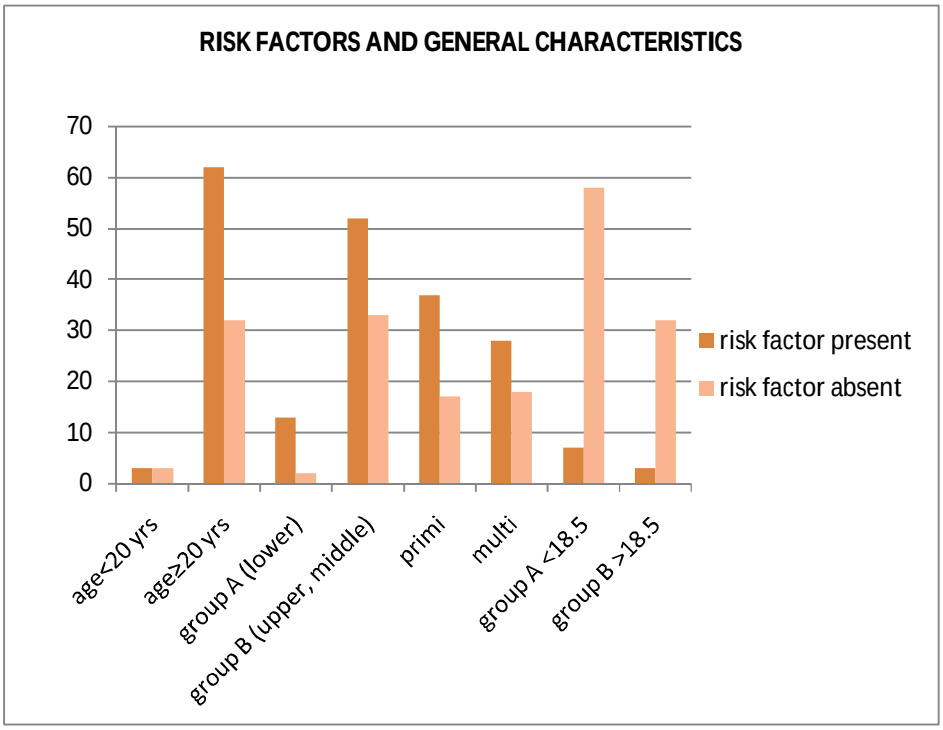

Table 16 : maternal risk factors and Doppler reversal

Risk factors	Doppler cpr reversal				p value
	Present		absent		
	No .	Percentage	No .	Percentage	0.408 (not significant)
Present (65)	12	18	53	81	
Absent	5	14	30	85	

Among the patients who had risk factors 18% of fetus developed Doppler-CPR reversal .Among 35 patients who didn't have risk factors which were evaluated in the study, 18% of the patients had developed Doppler –CPR reversal

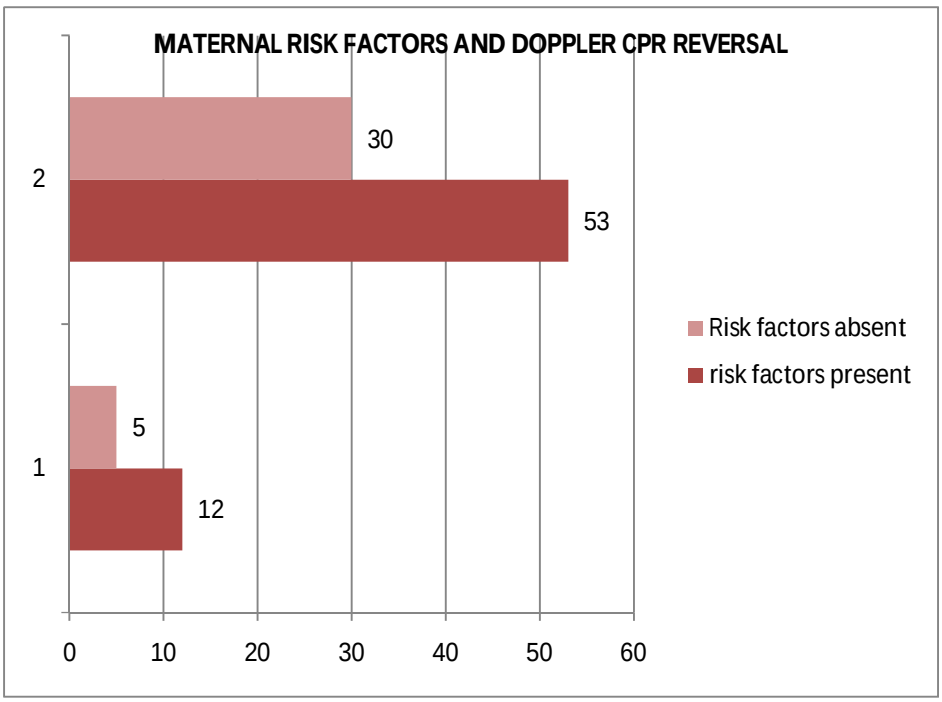

Table 17 : comparison of risk factors and onset of labour

Risk factors	Onset of labour									P value .247 (not significant)
	Spontaneous		Induced		Emergency LSCS		Elective LSCS		Repeat LSCS	
	No.	%	No.	%	No.	%	No.	%	No.	%
Present (65)	13	52	14	64	27	75	-	-	11	69
Absent (35)	12	48	8	36	9	25	1	100	5	31

While considering emergency LSCS among 53 cases of LSCS 71% had risk factors and 28% had no risk factors though it is statistically not significant. There was more number of emergency LSCS among patients who had risk factors. Among the patients whose labour is spontaneous onset there was no significant difference in having risk factors. The most common indication for LSCS is fetal factor includes fetal distress and fetal alarm signal. Indication for induction was term IUGR with no complications, oligohydramnios.

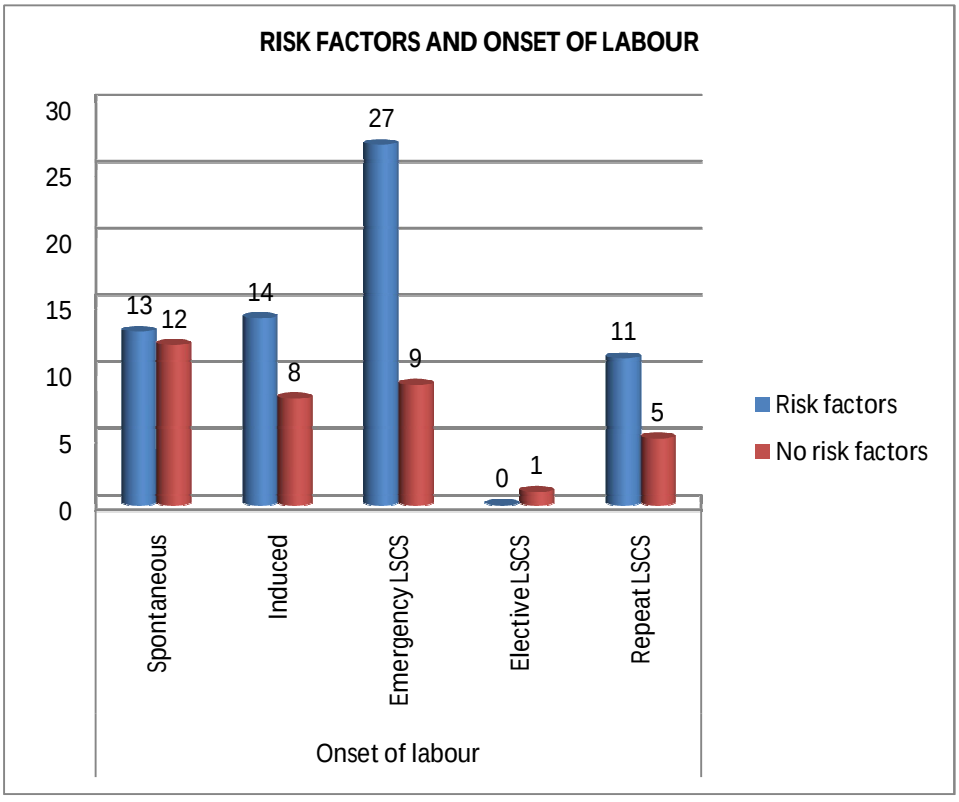

Table 18 :Comparison of risk factors and mode of delivery

Risk factors	Mode of delivery						P value 0.174 (not significant)
	Labour naturale		Forceps		LSCS		
	No.	%	No.	%	No	%	
Present(65)	19	29	2	3	44	67	
Absent (35)	16	46	-	-	19	54	

When mode of delivery was considered there was more number of LSCS in patients who had risk factors. Among 63% of the operative delivery 44% of it was done in patients who had risk factors. Among 32 patients of PIH 68% of them delivered by LSCS.

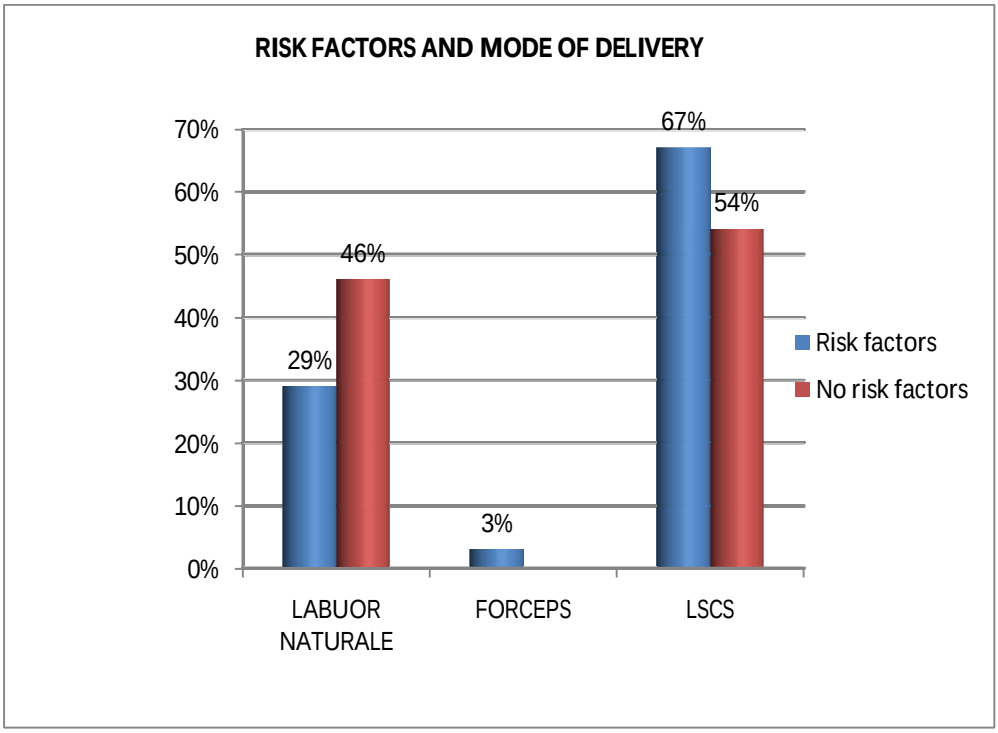

Table 19 : comparison of risk factors and perinatal outcome

Risk factors	Perinatal outcome				P value
	Good		Adverse		
	No.	%	No.	%	
Present(65)	11	17	54	83	0.011*
Absent(35)	14	40	21	60	

Among 65 patients who had risk factors 83% of the mothers had adverse neonatal outcome. It is also statistically significant.

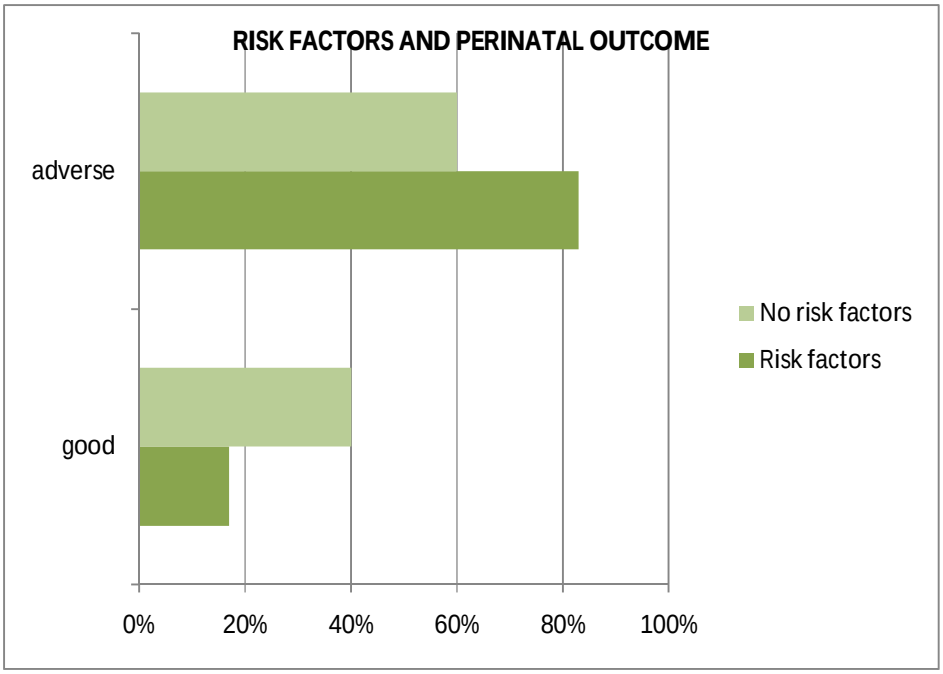

Table 20 : comparison of risk factors and neonatal complications

Risk factors	Neonatal complications				P value
	Present		Absent		
	No.	%	No.	%	0.93(not significant)
Present	61	93.8	4	6.2	
Absent	33	94.3	2	5.7	

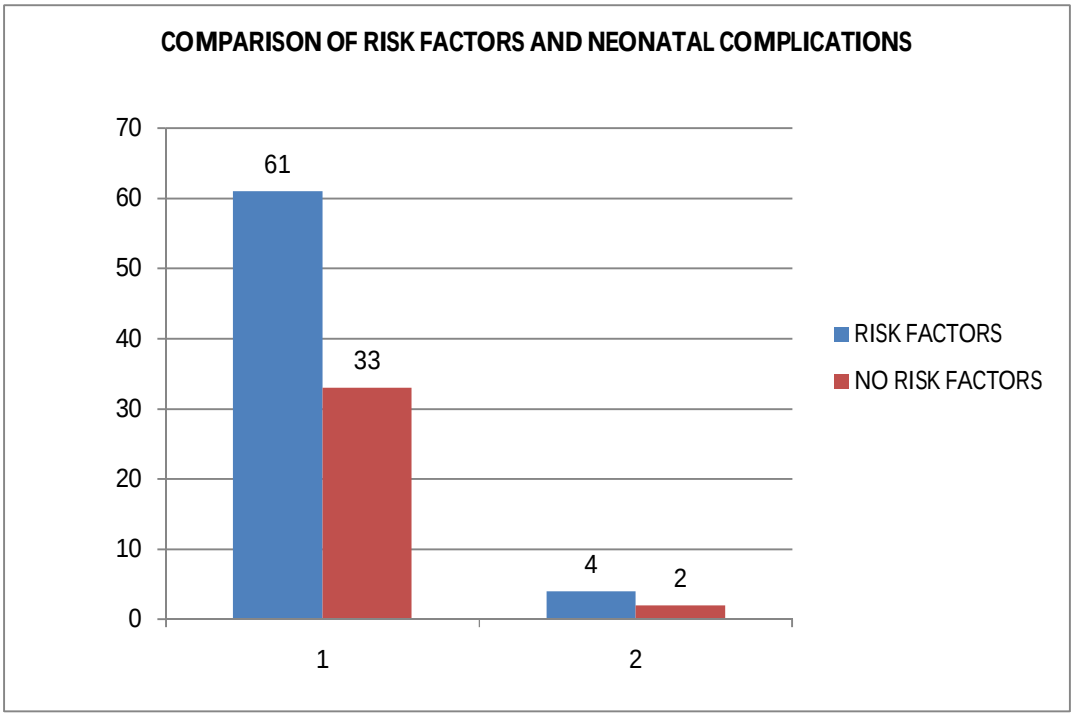

Table 21 :INDICATIONS FOR LSCS

Indications for LSCS	Cases	
	No	Percentage
Fetal distress	15	24
Fetal alarm signal	19	30
Previous LSCS	17	27
Oligohydramnios	5	8
Previous LSCS with preeclampsia	1	2
Preeclampsia or imminent eclampsia or eclampsia	3	5
Failed induction	3	5

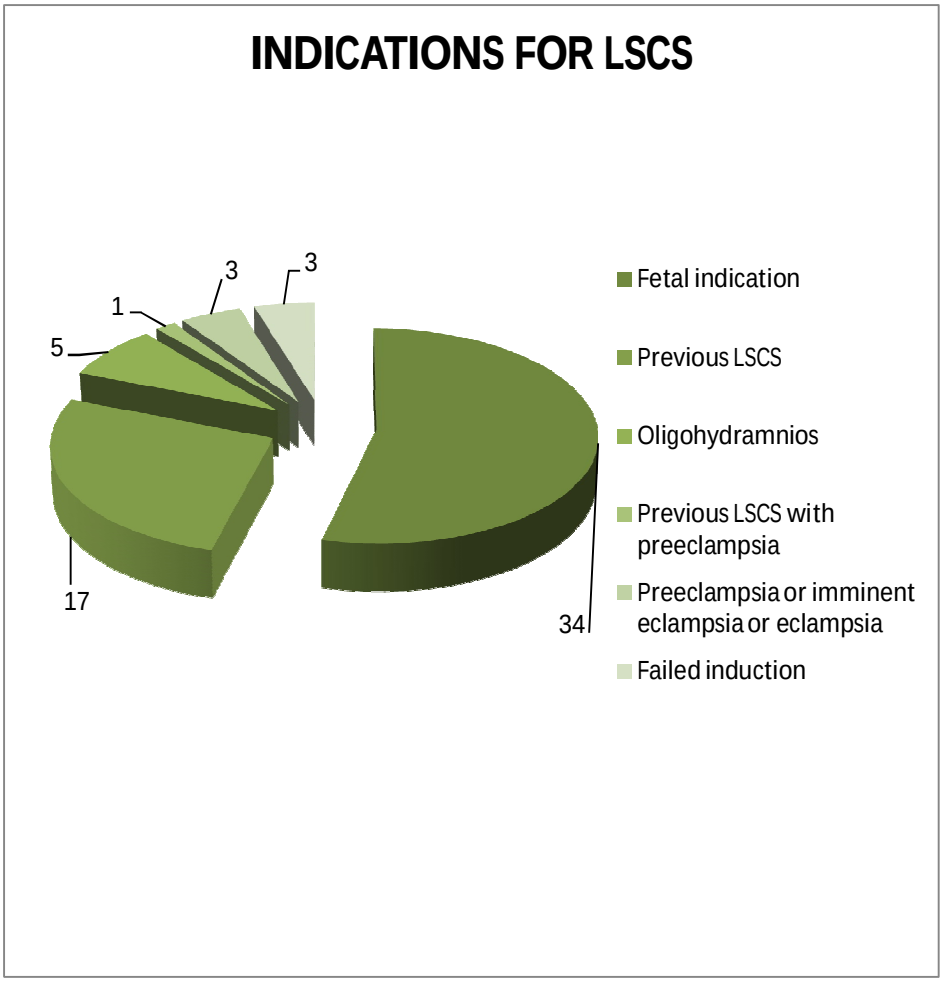

Table 22: comparison of Liquor status and meconium staining of liquor

Liquor status	MSL				P value
	Present		Absent		0.4(not significant)
	No.	Percentage	No.	Percentage	
Normal(59)	19	32	40	67.8	
Oligohydramnios(41)	16	39	25	6	

DISCUSSION

IUGR is associated with increased risk of perinatal morbidity and mortality and impaired neuronal development. The early detection of maternal risk factors and timely intervention thereby improvement of perinatal outcome should be the part of routine antenatal care of pregnancies suspected clinically to be having IUGR babies.

From December 2012 to 2013 group of investigations were done for 100 women who had IUGR suspected clinically and confirmed by ultrasonogram.

This study was done from second trimester to 28 days after delivery. Analysis of various investigations done to identify the risk factors causing IUGR. Maternal risk factors are diagnosed according to the definitions and criteria discussed in methodology. Then follow up study done for obstetric and perinatal outcome. Maternal risk factors diagnosed according to the definition and criteria as discussed in methodology of this study. This result was not revealed to the specialists managing the patients. The women and neonate were followed up to 28 days after delivery.

Among lower socioeconomic group majority of them had maternal risk factors also they had more adverse neonatal outcome. P value is 0.05 (significant) .The ratios of mothers with risk factors and without risk factors 67%versus 33% who

came under lower socio economic status. In a study by Fikree FF et al showed that low socio economic status is an important maternal factor for developing IUGR.

Doppler-CPR reversal occurred mostly in women having risk factors though it is statistically not significant. When there is IUGR and risk factors there is more chance of Doppler-CPR reversal which indicates placental insufficiency caused by pathological influence of risk factors on blood flow to the fetus. Mother having abnormal Doppler will have adverse perinatal outcome. In a study by Rochelson et al showed that the percentage of patients having abnormal Doppler in hypertensive disorder of pregnancy is 50%. Among 17 patients who developed Doppler CPR reversal 18% of them had risk factors.

The fetus with IUGR and maternal risk factors were delivered as preterm in majority of the women in this study. One of the reasons includes termination of the pregnancy to reduce the maternal morbidity and mortality in cases like eclampsia.Other reason for preterm delivery is fetal distress and insufficiency of fetal-placental circulation. In a study by Sherri et al also showed that majority of the mothers with IUGR who have risk factors will deliver preterm babies.

There was more proportion of induced labor and LSCS in mothers having risk factors.Labour was induced in 21% of the women who had risk factors. Among the total number of 63 women delivered by LSCS, 44 women had risk factors.

Indications were fetal factor (fetal distress and fetal alarm signal) and oligohydramnios in most of the cases. In rest of the cases indications were previous LSCS, severe preeclampsia, imminent eclampsia, eclampsia, and failed indication.

While considering labour naturale there was no significant difference regarding presence or absence of risk factors. In the group of patients who had risk factors there was increased percentage of LSCS (Lin et al., 1980)

Among 15 cases of neonatal deaths 8 neonatal deaths occurred in patients who didn't have risk factors. This appears due to IUGR complications, extremely premature babies, influence of other risk factors like fetal, placental or idiopathic .1 intrauterine deaths, 1 stillbirth occurred in women having risk factors.

Among 35 cases of meconium staining of liquor 24 cases had risk factors.

The mean birth weight of the babies for the mothers who is having risk factors is 1.78 kg. Whereas it was 1.74kg for babies whose mothers are not having risk factors. This appears to be because of more number of women having risk factors.

Adverse Perinatal outcome is high among patients who had risk factors. P value is .011(significant). In a study by Sherri et al poor perinatal outcome is associated with IUGR babies whose mothers are having risk factors like preeclampsia and anemia.

Prolonged hospital admission is high in patients who had risk factors. Among total 44 number of babies 29 babies (65%) were born to mothers who had risk factors.

One patient had septate uterus. This patient had VBAC after previous lscs.One neonate had CTEV in mother having oligohydramnios.

SUMMARY

Analysis of Investigations done to identify the maternal risk factors among pregnancies complicated by IUGR and evaluation of impact of the same on perinatal outcome for hundred antenatal women from December 2012 to 2013.

The AIM of the study is to evaluate the impact of maternal risk factors on perinatal outcome in women having IUGR fetus.

Investigations done for the mothers who has IUGR fetus. Various maternal risk factors were diagnosed based on definitions and criteria which are summarized previously in methodology of this study.

Women with IUGR and antenatal risk factors were found to have adverse perinatal outcome in about 83.1% (p value= 0.011).

Doppler reversal occurred most commonly in women who had risk factors. P value is 0.5, even though it is not statistically significant.

In Women with maternal risk factors for IUGR the gestational age at delivery was significantly low. Among 35 patients of preterm delivery 27 of it occurred in women having risk factor.

Women with maternal risk factors were delivered by cesarean in more than 50% of the patients.

The mean birth weight of the babies is significantly low in mothers having risk factors. And also proportion of very low birth weight babies is high in those mothers.

The incidence of the neonatal complications was found to be high in newborns whose mothers had risk factors.

Women without risk factors developed Doppler-CPR reversal in only 14% of the patients. when women is having IUGR and maternal risk factors, they are likely to have significant increase in preterm deliveries, incidence of cesarean section, extremely low birth weight babies ,neonatal complications, adverse perinatal outcome.

CONCLUSION

There is statistically significant difference in adverse neonatal outcome among lower socioeconomic status group.

There is statistically significant difference in adverse neonatal outcome of patients having maternal risk factors.

There is no statistically significant difference among patients having risk factors and age,parity,BMI,Doppler-CPR reversal, mode of delivery, onset of labour and neonatal complications.

Eventhough 35 women had no risk factors only 40% of them had good neonatal outcome when compared to 17% in women who had risk factors. So there are other risk factors also involved in the causation of IUGR like fetal, placental, and previous pregnancy outcome like IUGR and low birthweight.These risk factors also have a significant effect on obstetric and perinatal outcome. Moreover the most common factor contributed to IUGR pregnancies is idiopathic in about 40% of pregnancies. So further studies also needed to evaluate all risk factors causing IUGR in addition to maternal risk factors.

As there is decreased perinatal mortality and morbidity in women who didn't have risk factors, all women having clinical suspicion of IUGR, should be evaluated to identify the risk factors and intervention if needed to control the

disease progression at the early stage of the risk factors thereby minimizing the effect of risk factors on adverse perinatal outcome.

About 142 cases were attended KGH with the diagnosis of IUGR. All 142 patients were evaluated for risk factors under study. Only 100 cases came for regular antenatal visits and antenatal surveillance of the fetus. 22 cases were excluded according the exclusion criteria. Among the 120 cases, 20 patients were excluded because 12 cases didn't come for regular antenatal visits after some initial visits, came only at the time of delivery, and remaining 8 patients didn't come for delivery for the purpose of evaluation of perinatal outcome. Among patients who didn't come for regular antenatal visits (12 cases) after initial visits, and came only for delivery, 5 patients had risk factors. Among this five patients one woman had IUD compared to 1 IUD in 65 patients had risk factors and also regular antenatal visits. Remaining all 4 cases had adverse neonatal outcome. Among patients who didn't come for regular antenatal visits and had no risk factors (7 cases) only 1 patient had good neonatal outcome.

So good perinatal outcome not only depends on booking the pregnancy and identification of risk factors causing IUGR, it also depends on making the patient to undergo regular antenatal visits and regular antepartum fetal surveillance.

ABBREVATIONS

IUGR-Intrauterine growth restriction
SGA-Small for gestational age
FGR-Fetal growth restriction
PFGR-Pathological growth restriction
BPD-Biparietal diameter
HC-Head circumference
AC-Abdominal circumference
FL-Fetal length
SD-Standard deviation
H/A-Head circumference/Abdominal circumference
F/A-Femur length/ Abdominal circumference
EFW-Estimated fetal weight
HIV-Human immunodeficiency virus
SLE-systemiv lupus erythematosis
APLA-Anti phospholipid syndrome
UTI-Urinary tract infection
LRI-Lower respiratory tract infection
IUFD-Intrauterine fetal death
AED-Antiepileptic drugs
IVH-Intraventricular haemorrhage
LMP-Last menstrual period
EDD-Expected date of delivery
CPR-Cerebroplacental ratio
UPT-Urine pregnancy test
IGF-1-Isulin like growth factor-1
UA-Umblical artery

MCA-Middle cerebral artery
DV-Ductus venosus
S/D ratio-peak systolic / end diastolic
PI index-Pulsatility index
RI index-Resistance index
ADF-Absent diastolic flow
RDF-Reverse diastolic flow
NPV-Negative predictive value
PPV-positive predictive value
ICT-Indirect coombs test
GCT-Glucose challenge test
GTT-Glucose tolerance test
PPROM-Preterm premature rupture of membrane
ECG-Electrocardiogram

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