"A PROSPECTIVE COHORT STUDY ON CHARACTERISTICS OF EXTRAUTERINE GROWTH RESTRICTION IN LOW BIRTH WEIGHT NEONATES"

By

Dr. MATHUMITHA T

DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH CENTER, KOLAR, KARNATAKA

In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE

IN

PAEDIATRICS

Under the Guidance of

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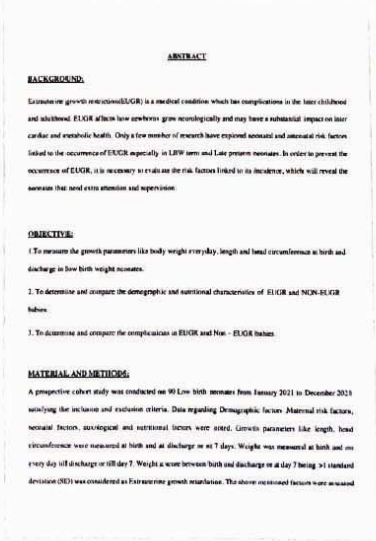

ABSTRACT

BACKGROUND:

Extrauterine growth restriction(EUGR) is a medical condition which has complications in the later childhood and adulthood. EUGR affects how newborns grow neurologically and may have a substantial impact on later cardiac and metabolic health. Only a few number of research have explored neonatal and antenatal risk factors linked to the occurrence of EUGR especially in LBW term and Late preterm neonates. In order to prevent the occurrence of EUGR, it is necessary to evaluate the risk factors linked to its incidence, which will reveal the neonates that need extra attention and supervision.

OBJECTIVE:

1.To measure the growth parameters like body weight everyday, length and head circumference at birth and discharge in low birth weight neonates.

2. To determine and compare the demographic and nutritional characteristics of EUGR and NON-EUGR babies.

3. To determine and compare the complications in EUGR and Non - EUGR babies.

MATERIAL AND METHODS:

A prospective cohort study was conducted on 90 Low birth neonates from January 2021 to December 2021 satisfying the inclusion and exclusion criteria. Data regarding Demographic factors ,Maternal risk factors, neonatal factors, anthropocial and nutritional factors were noted. Growth parameters like length, head circumference were measured at birth and at discharge or at 7 days. Weight was measured at birth and on every day till discharge or till day 7. Weight at score between birth and discharge or at day 7 being >1 standard deviation (SD) was considered as Extrauterine growth retardation. The above mentioned factors were measured

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ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
EUGR	Extra Uterine Growth Restriction
NICU	Neonatal Intensive Care Unit
LBW	Low Birth Weight
EDC	Expected Date of Delivery
ASD	Autism spectrum Disorder
ADHD	Attention Deficit Hyperactive Disorder
SGA	Small for Gestational Age
NEC	Necrotizing Enterocolitis
EBM	Expressed Breast Milk
VLBW	Very Low Birth Weight
SD	Standard Deviation
IVH	Intra ventricular Hemorrhage
PVL	Peri Ventricular Leukomalacia
AGA	Appropriate for Gestational Age
IUGR	Intra Uterine Growth Retardation
WHO	World Health Organization
HMF	Human Milk Fortifiers
Hb	Hemoglobin
RCT	Randomized Control Trial
EN	Enteral Nutrition
PN	Parenteral Nutrition
TPN	Total Parenteral Nutrition

CPN	Central Parenteral Nutrition
PPN	Peripheral Parenteral Nutrition
BPD	Broncho Pulmonary Dysplasia
PDA	Patent Ductus Arteriosus
MP	Moderate Preterm
GDQ	Griffith's Development Quotient
NDI	Neurodevelopment Impairment
VLBWIs	Very Low Birth Weight Infants
ROP	Retinopathy Of Prematurity
MDI	Mental Developmental Index
SDS	Standard Deviation Score
BMI	Body Mass Index
CI	Confidence Interval

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ABSTRACT

BACKGROUND:

Extrauterine growth restriction(EUGR) is a medical condition which has complications in the later childhood and adulthood. EUGR affects the way newborns grow neurologically and may have a substantial impact on later cardiac and metabolic health. Only a few number of research have explored neonatal and antenatal risk factors linked to the occurrence of EUGR especially in LBW term and Late preterm neonates. In order to prevent the occurrence of EUGR, it is necessary to evaluate the risk factors linked to its incidence, which will reveal the neonates that need extra attention and supervision.

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EUGR and Non-EUGR babies and a p value of ≤0.05 was considered to be significant with EUGR. Neonatal complications between the EUGR and Non- EUGR babies were studied and explored.

RESULTS:

This study included 90 Low birth weight neonates who met the inclusion criteria. Among the study population 53(58.9%) were EUGR and 47(41.1%) were Non-EUGR neonates. Among the EUGR neonates 27(50.9%) were male and 26(49.1%) were female. Mean of Discharge weight was more among EUGR neonates with significant p value of <0.001. Maternal anemia and maternal hypertension were common in mothers of EUGR neonates with significant p values of <0.001. Neonates who were small for gestational age(SGA) had statistically significant association with EUGR with p value of 0.042. With a statistically significant p value(0.001), nutritional factors such as delay in enteral feed commencement and delay in reaching full enteral feeds were strongly related to EUGR. With a p value of 0.001, the use of human milk fortifiers were protective against EUGR.

CONCLUSION:

The study concluded that among neonatal factors small for gestational age, maternal anemia and maternal hypertension among maternal risk factors, discharge weight among auxological risk factors, delay in initiation of enteral feeds and delay in reaching full enteral feeds had significant association with incidence of Extrauterine growth restriction. Use of Human milk fortifiers in Late preterm and Low birth weight neonates judiciously decreased the occurence of EUGR.

Neonatal respiratory distress was the only complication which was higher in EUGR neonates. Hence the neonates with above risk factors should be additionally monitored with modified nutritional protocol to prevent the occurence of EUGR.

INTRODUCTION

Extra-uterine growth restriction (EUGR) is still a major problem that needs to be addressed as soon as after birth, especially in premature and low birth weight (LBW) neonates since it can lead to a number of recent and future issues. When measured at corrected gestational age of 36 completed weeks or at discharge using reference postnatal growth curves, EUGR is a sign of a significant nutritional deficiency in the first few weeks of life. [1] It is possible to categorise the standard definitions of EUGR as longitudinal (if the reduction in weight between birth and a specified t-time >1SD) or cross-sectional (weight at a specific t-time being less than 10th centile).[2,3]Inspite of efforts in Neonatal Intensive care unit(NICU), EUGR occurs to an extent of 43 to 97% and most of them are iatrogenic.[1]

Growth monitoring in Premature and LBW neonates is important and challenging. They should be growing as per normal intrauterine growth curves and their birth centile should be noted. Postnatally these babies should maintain the same centile for weight till they cross the expected date of delivery(EDC) / 40 weeks of post menstrual age. A down crossing of birth centile till EDC result in EUGR.[4]

Nutritional quality and quantity throughout the pregnancy or newborn period is crucial. Both the environmental factors and the genetics have been shown to affect growth and development. Three crucial phases affect the development of metabolic capacity and their adjustments in early life: 1.Foetal growth throughout pregnancy 2. A sudden fetal-to-neonatal change that occurs at birth 3. A postnatal weaning transition that is progressive. Rapid changes in enzyme activity take place during these phases in response to the type of foods that are available. These metabolic

changes are regarded as a necessary component of maturation during the early stages of life. Such periods changing dietary environments result in aberrant metabolic adaptations that can have detrimental long-term effects.[5]

LBW newborns' ability to grow their brains depends in significant part on receiving the right amount of nutrients in the first few days after birth. These newborns' nutritional status, physical development, and brain maturation throughout the initial weeks of life have a significant impact on their cognition.[6,7] All neonates usually have an acceptable amount of weight loss in their immediate postnatal period which is physiological. But this weight loss becomes pathological and is labelled as EUGR when the amount of weight loss fits in to the criteria for EUGR based on growth charts or the definitions(cross sectional or Longitudinal).

Prenatal and postnatal growth rates have a significant role in long term results of the neonates.[8] The long term outcomes that occur in EUGR neonates include short stature due to growth impairment in child hood. It can cause diabetes in adulthood due to insulin resistance. Adult onset cardio-metabolic diseases like adolescent hypertension, Coronary artery disease can occur as a result of EUGR in neonatal period. More importantly EUGR neonates are at risk of serious neurological problems like cerebral palsy, cognitive impairment, academic and behavioural abnormalities like Autism spectrum disorder(ASD) and Attention Deficit hyperactive disorder(ADHD).Visual and hearing abnormalities can also be associated with EUGR neonates.[9,10] The severity of EUGR had a role in neurological development of neonates. Neonates with severe EUGR had low MDI(Mental development Index) indicating the intellectual disability in these neonates.

There is growing proof that neonates who experience a temporary phase of restraint in growth experience many consequences that are unrelated to whether the restraint took place in fetal life (resulting in SGA) or ex utero (resulting poor postnatal growth), or in both these periods.[2]Identifying infants at risk of EUGR by checking the anthropometry and nutrition is an important factor that serves as a guide to improve nutritional plan and support that is individualised according to the need of the infants.[8] Antenatal growth factors, postnatal nutrition, co-morbidities, genetic and epigenetic variables, and others have all been proven to play a role in EUGR. According to research, the risk of EUGR rises with a decrease in weight at birth and gestational age and is particularly pronounced in SGA infants who are older at birth. The time period of the loss in weight that happens in the initial period in the newborn is another element that influences the risk of EUGR. Infants which take longer to reach the Birth weight have more chance for developing EUGR and slowing development as they age.[8] In addition to these factors sudden exposure to extrauterine environment with sparse nutrient from nutrient rich intra uterine environment causes stress in the neonates especially LBW and Preterm neonates and hence optimal nutrition in this immediate postnatal period is must to prevent Postnatal growth failure.

The aggressive nutritional plan to prevent EUGR is available in level 2 or 3 NICU with its own complications. The mode of nutrition in Preterm babies who are not on enteral nutrition is Parenteral nutrition which however is not available in majority of the Special care nursery, Level 1 and 2 NICUs in developing countries where only Intravenous fluids are provided to the neonates. Hence there is a necessity to identify the neonates at risk for EUGR and provide aggressive nutrition by which EUGR can be prevented. There are studies on EUGR in very Low birth weight(VLBW) and very

preterm(VP) neonates however there are insufficient evidences regarding EUGR in Term SGA and Late preterm neonates.

In this prospective study, the characteristics and risk factors associated with development of EUGR in LBW neonates will be explored and studied and this in turn will help to provide optimal postnatal nutrition, supportive care and additional monitoring for the neonates with these characteristics causing EUGR.A nutrition protocol can be framed for these babies and followed for better nutrition and growth outcome.

OBJECTIVES

1. To measure the growth parameters like body weight everyday, length and head circumference at birth and discharge in low birth weight neonates.
2. To determine and compare the demographic and nutritional characteristics of EUGR and NON-EUGR babies.
3. To determine and compare the complications in EUGR and Non – EUGR babies.

REVIEW OF LITERATURE:

Extrauterine Growth Restriction (EUGR), which occurs after preterm delivery and birth with VLBW (birthweight under 1500 g), has frequently been discussed in the literature.[11,12] The term "EUGR" means insufficient growth that takes place when a neonate is hospitalised. At discharge, preterm and VLBW neonates often underperform in terms of gain in weight compared to predictions based on growth charts used for intrauterine life; their weight is frequently below the 10th percentile of anticipated development and at lower birth percentiles. [13,14] Weight, head circumference, and length are all indicators for growth deficit. [15] According to z-scores at hospital release, EUGR can be divided into three categories depending on how severe the growth restriction is: weight of z 2.0, z 2.5, or z 3.0.

Post-discharge EUGR can be described as a weight below the third percentile on the growth curves for the infants at the visits during follow-up.[17] At the time of follow up, the evaluation of growth was documented as categorised data that was separated into percentile ranges (3, 3-10, and so on). EUGR is impacted by a variety of factors. Its partial explanation may include periods of insufficient nutrition, feeding resistance (common in premature neonates), and a variety of mild to severe complications related to premature delivery. [18,19] Growth rates during and after pregnancy were found to have a significant impact on future results. [20-22] It is currently uncertain how much EUGR affects future growth, mostly because of ambiguous literature-based statistics and a paucity of a uniform definition of EUGR.

There are currently two types of definitions: (1) longitudinal, which refers to a decrease in weight z score of more than one standard deviation (SD) between birth weight and a time (t), and (2) cross-sectional, which refers to a weight below the 10th centile at a time (t), regardless of weight at birth. In this study longitudinal definition was used. Three t-times have been suggested in literature: Age at discharge(discharge age or day 7 in this study), gestational age, and postnatal age are all 36 weeks. [23] In newborns with VLBW, EUGR is a major clinical issue that frequently arises. [24]

Multiple causes, including digestive problems, endocrine issues, central nervous system dysfunction, and morbidities impacting dietary requirements, might contribute to growth failure in VLBW infants. The main cause of EUGR is inadequate nutrition, especially in the initial few days or weeks after birth. [25]

Gestational age is unquestionably a factor associated with EUGR. As babies grow, organ function should increase naturally, and the likelihood of acquiring food intolerance and underlying disorders should decrease. Over the past 20 years, improved prenatal care has led to a reduction in the rate of mortality of premature neonates with VLBW.[26] Preterm infants still frequently have postnatal growth retardation, with EUGR having incidence rate of 30–50%.[27,28] Developmental challenges are regarded as a risk factor for preterm infants later in life[29, 30] and EUGR has been linked to the prevalence of the aforementioned developmental impairments. [32-35] Numerous additional factors, including periventricular leukomalacia (PVL), necrotizing enterocolitis (NEC), SGA, intraventricular haemorrhage (IVH), prolonged artificial breathing, and infant seizures, have been shown to affect preterm neonates' neurodevelopmental outcomes. [36,37]. Though EUGR is thought to be one

among the factors for neurological impairment, there are few known fact about the severity and length of EUGR's potential impact on VLBW infants' neurodevelopmental outcomes. [32,34]

Early enteral feeding increases digestive tract growth and gastrointestinal tolerance. In order for premature and LBW infants to receive the essential and needed nourishment, Along with enteral feeding, parenteral feeding is also crucial . It is advised to begin enteral feeding as soon as possible, ideally within the first three days after delivery. Body weight gain was hindered by feeding intolerance brought on by a delayed enteral feeding. [38-40] The rapid administration of amino acids causes body weight increase and shields LBW newborns from developing EUGR. Aggressive nutritional therapy reduced the prevalence of EUGR in VLBWIs, according to a local multicenter study.[23]The 2013 revision of the Chinese recommendations for neonatal feeding supplementation suggests 120 calories per day.The recommended total daily caloric intake is more for preterm and VLBWIs compared to the term neonates with normal birth weight. In the first week of postnatal period, the EUGR group's body weight was noticeably lower. On the 14th day, however, this distinction between the two groups vanished, demonstrating a beneficial impact of early dietary supplementation on body weight. The overall intake of calories in the EUGR group dropped due to the rise in calorie requirements brought on by metabolic abnormalities or disease, which led to reduced body weight on comparison with neonates without EUGR. [41,43,44]

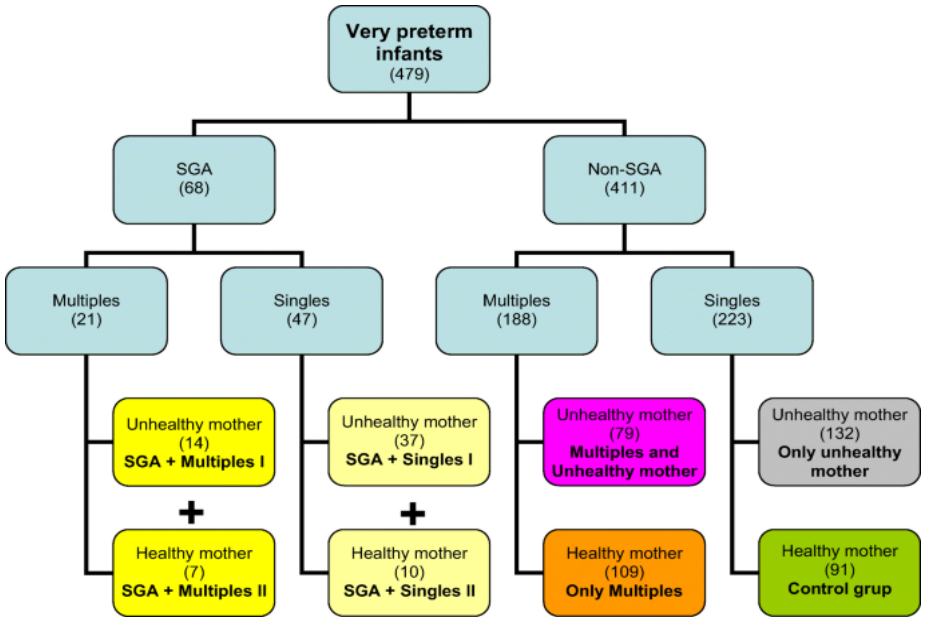

Figure 1: Extrauterine growth restriction in very preterm infants: causes, diagnosis, and follow-up for 2 years[42]

Both newborns born SGA and newborns born appropriate for gestational age (AGA) may have EUGR.

SMALL FOR GESTATIONAL AGE (SGA)

SGA refers to a condition in which a foetus or newborn infant weighs less than average for their gestational age and/or sex or has a shorter crown-to-heel length (SGA). [45,46] SGA newborns have weights below the 10th percentile, which is a classic indicator of SGA. A World Health Organization (WHO) group developed this classification in 1995, and the definition is based on a comparison of birthweight for gestational age to a group of newborns of a specific gender.SGA is frequently utilised as a substitute for serial ultrasonography, especially in situations when it is not conveniently available. However, SGA foetuses may actually be constitutionally

small rather than having growth restrictions. The phrase "SGA associated with IUGR" is used if IUGR has been found on SGA infants.[47,48]

Causes for SGA fetus may include

- Genetic disorders
- Inherited metabolic diseases
- Chromosomal disorders
- Multiple gestations (twins, triplets, and more)
- Congenital TORCH infections
- Placental insufficiency due to maternal disorders involving the small blood vessels Multiple gestation causing placental insufficiency
- Placental involution accompanying postmaturity
- Maternal hypoxemia
- Malnourished mother
- Using assisted reproductive techniques [48]

The aberrant foetal development pattern known as intrauterine growth restriction (IUGR), which affects 8% to 10% of pregnancies, is linked to neonatal complications.[49] The term "impaired foetal growth rate" (IUGR) refers to a foetal growth that is underdeveloped due to maternal, foetal, or placental problems. These problems include decreased oxygenation and nutritional deficiencies, which cause cardiovascular decline, extremely high resistance to flow of blood and delayed foetal growth. [50] The foetus slows its growth and reduces the gestational period in IUGR pregnancies in an effort to avoid harm.[51] The adaptive mechanisms to deal with in

utero starvation, however, have future effects linked to unfavourable developmental and health outcomes over the course of life.[52]

When compared to people who were born AGA, people with IUGR had a variety of worse developmental outcomes in the cognitive, socioemotional, and behavioural domains. The relationship between IUGR and these cognitive outcomes has been examined in earlier systematic reviews and meta-analyses. Some important concerns, nevertheless, such as possible distinctions between children with IUGR and SGA and between term and preterm births, remain unresolved. Most IUGR foetuses give birth to SGAs. [53] Inspite of the fact that SGA and IUGR are significantly comorbid, there is a need to define and distinguish between the two diseases. IUGR reveals foetal suffering, whereas SGA gives a clue about metric of size and does not directly reflect the nature of prenatal growth. In other words, SGA status by itself does not suggest a restriction on foetal growth. In contrast, previous fundamentally undersized foetuses are the more common term used to describe SGA newborns. Because it could be difficult to distinguish between IUGR and SGA after birth, a number of antenatal criteria, such as Doppler testing, have been suggested to boost antenatal diagnosis. [54]

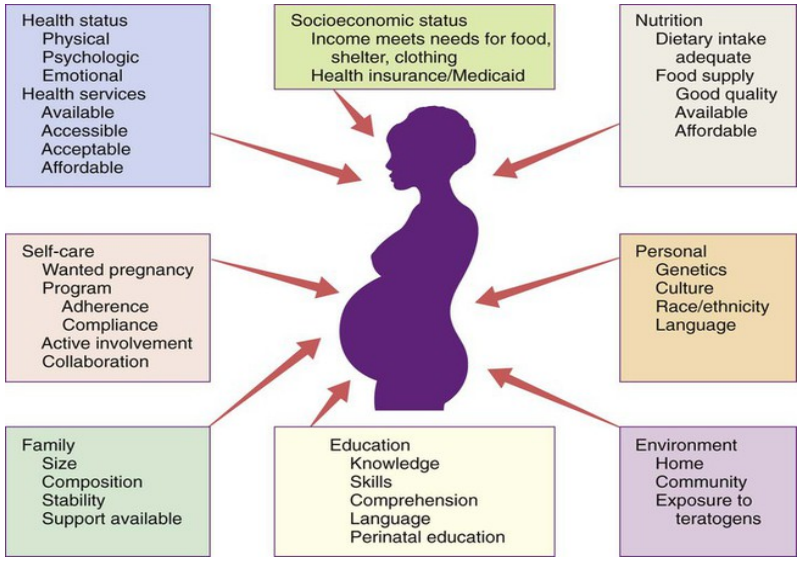

Figure 2: Factors that influence the outcome of pregnancy[55]

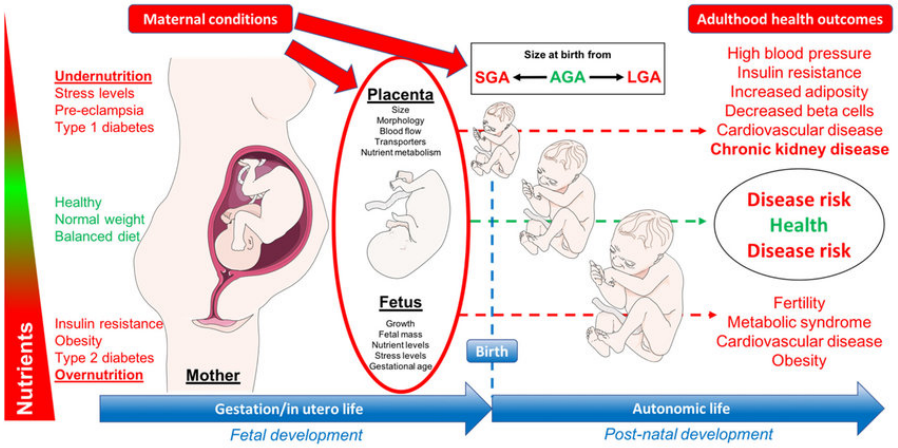

Figure 3: Effect of maternal nutrition during pregnancy on offspring.[56]

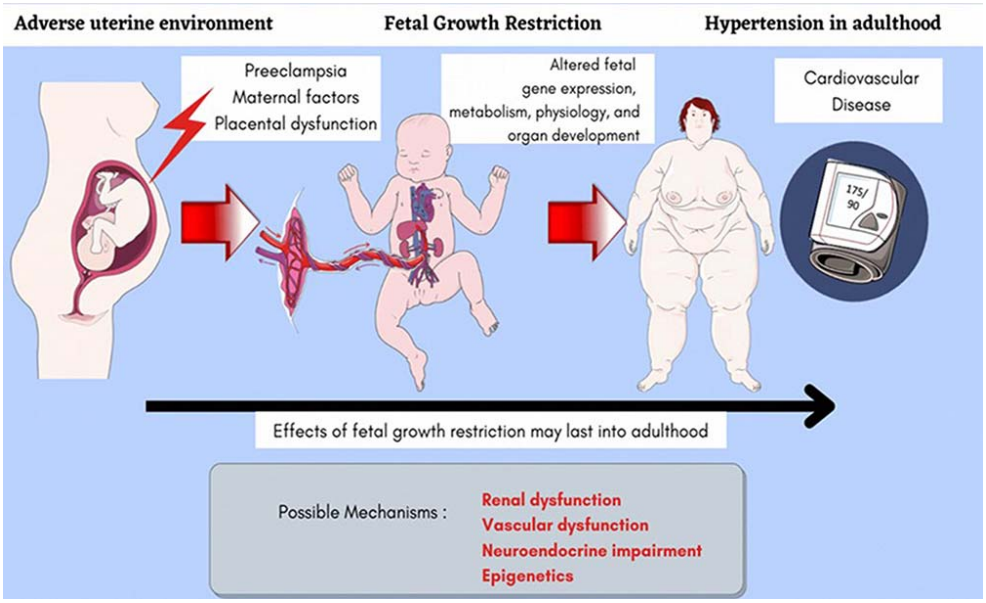

Figure 4: Mechanisms of fetal programming of hypertension

Several recent studies came to a conclusion that fetal growth restriction serves as a contribution to hypertension in adulthood .There is now a theory which is widely accepted (DOHaD)Developmental origins of health and disease.[57]

FACTORS STUDIED AND ASSOCIATED WITH EUGR IN THIS STUDY:

Human milk fortifiers(HMF)

Numerous immune-stimulating elements included in human milk shield the premature baby from sepsis and necrotizing enterocolitis. Due to its protective qualities, human milk is the ideal nutrition for premature and LBW newborns. However, human milk must fortified with nutrients because it does not provide enough of the majority needs of these infants. Commercially available fortifiers include significant amounts of energy and the majority of nutrients. The only exception is protein, which is present in expressed milk in wildly varying amounts and isn't enough given by most fortifiers. There are certain liquid fortifiers that have larger protein contents than powder fortifiers and appropriate quantities of protein.[58] Fortification tries to raise the concentrations of specific nutrients in response to energy levels in order to address nutrient needs as soon as they arise. Even though a nutrient's content in milk should be low, it is okay to add high amounts of the majority of nutrients to guarantee that intakes are always appropriate. This is the basis for fortifiers. Additionally, fortification increases the calorie density of milk, which helps reduce feeding rates. This is achieved by fortifiers by including lipids and/or carbs. In consequence, protein intakes are frequently inadequate. Protein intakes are still suitable even when milk's protein concentration is low if the generalising technique uses a fortifier with a high enough protein content. A customised strategy, on the other hand, makes use of the infant's metabolic feedback or milk analysis with nutrient content adjustments to make sure that each infant's protein intake is optimal and closely satisfies their nutritional demands. Commercial fortifiers have seen substantial improvements since their introduction in the 1980s. The easily accessible fortifiers have a very diverse range of ingredients. [58]

Maternal anaemia and its effect on the baby

A sizable portion of the population in India has anaemia. Anemia in pregnancy is widely reported in India. According to one study that looked at a broad population, 87% of pregnant women in India are anaemic. [59] Among the Southeast Asian neighbours, this number is the highest. [60] It's interesting how pregnancy and foetal growth are impacted by anaemia in pregnant women in different ways. It is a well-known fact that haemoglobin (Hb) physiologically decreases around the middle of the third trimester. This physiological decline is explained by a rise in plasma volume and a corresponding fall in blood viscosity. The placenta's circulation is improved as a result. There was a need for criteria for identifying anaemia in pregnancy because the nadir of this decline is unpredictable.Anemia in pregnancy is defined by the WHO as haemoglobin less than 11 g/l. [61] It has been believed that anaemia during pregnancy is bad for the development of the foetus and the success of the pregnancy. The presence of anaemia during pregnancy has been found to result in low birth weight and premature delivery. [62] Over the past few decades, researchers have looked at the effects of iron and anaemia on developing foetuses. These studies' findings are either ambiguous or, at the very least, consistent with current popular beliefs about anaemia and pregnancy outcomes. Therefore, the majority of nations have adopted the practise of providing iron and folic acid supplements to expectant mothers in the hopes that raising Hb levels will have some positive effects. [63] Researchers have attempted to rethink the fundamental idea of raising the Hb during pregnancy by taking iron supplements in order to have a healthier pregnancy outcome in the present era of study technique. Numerous studies have shown that routine iron supplementation is not very advantageous. Some research have proven that an increase in Hb above a specific threshold may actually have negative effects. [64] This

has prompted clinicians and researchers to search for the Hb concentration that will produce the optimum results. Despite the fact that there are established standards for anaemia in pregnancy, it is still not clear which trimester's Hb should be used as the benchmark for evaluation. This feature has not been thoroughly examined in studies conducted thus far. The majority of micronutrient-related problems arise in the 3rd trimester of pregnancy. Fetal growth happens in numerous phases. Therefore, researching the effects of anaemia of various trimesters on fetal outcome would be more helpful.

Impact of iron deficiency anemia on EUGR

The health of the mother and foetus is negatively impacted by iron deficiency anaemia during pregnancy, which is also linked to greater rates of morbidity and foetal mortality. Involved mothers have breatlessness, fainting, easy fatiguability, palpitations, and sleep problems. [65] They are also more likely to experience haemorrhage, pre-eclampsia, and perinatal infections. Additionally, behavioural problems and cognitive impairment following childbirth were noted.[66]Negative perinatal outcomes include things like IUGR, preterm birth, and low birth weight, all of which have a significant mortality risk, especially in developing nations. Anemia that develops later in pregnancy is less harmful to foetal growth than iron deficiency during the first trimester. It is also true that early labour is dangerous. [67] All parts of these interconnected issues, which are more prevalent in developing countries, are significantly impacted by lower socioeconomic class. All these contributing and related elements should be taken into account in any effective public preventive or treatment programme. One of the main causes of anaemia in infants and children is iron deficiency during pregnancy. The aforementioned elements may cause EUGR in newborns.

Feeding strategies:

When contrasting enteral nutrition (EN) with parenteral nourishment (PN), there is a strong consensus and the perception that there is no disagreement, and the majority of professionals report that EN is always preferred to PN. It's challenging to meaningfully compare EN with PN. Control is difficult due to physiological variations between parenteral and enteral nutrition delivery. A nutrition support study cannot really be blinded. Mortality, morbidity of life, and care costs are appropriate nutritional clinical outcomes. [68,69] which call for large investigations to have sufficient power. Serum proteins and anthropometrics, which are simple to measure substitutes, are no longer regarded as trustworthy indications of adequate nutrient intake in sick people. These substitutes are very accurate outcome predictors. However, the main determinant of alterations in these surrogates is systemic inflammation rather than artificial nutriment. Data on the rates of complications related to the insertion of both an intravenous catheter and a feeding device are needed to support the claim that EN is "safer" than PN.

The term "EN" has different definitions, but generally speaking, it refers to anything that feeds the intestine, including food, oral supplements, and tube feeding. PN covers both central and peripheral vein nutrition. It might be confusing when the phrase "total" parenteral nutrition (TPN) is used to refer to central parenteral nutrition (CPN). If the patient can tolerate the requisite volume, peripheral PN, also known as PPN, can meet all nutritional requirements. All references to PN in this study pertain to CPN because the route, rather than the sufficiency of sustenance, was the defining factor for inclusion of research.[70]

Babies who are more than 34 weeks gestation and 1.8 kg in weight can be breastfed.

It is recommended to start with gavage feeds in newborns under 34 weeks of gestation and with birth weights of less than 1500–1800 grammes before gradually transitioning to oral feeding. The preferred form of breast milk is expressed (EBM). To promote gut maturation, very preterm newborns can receive up to 0.5 to 1 ml each hour. Within two hours of birth, feeding can begin in large preterms. On the first four days in a row, you can administer 60, 90, 120, or 150 ml per kg each day. On days 10 and 14, it is possible to attain up to 180 and 200 ml per kilogramme per day, respectively. The feeding plan for babies with low birth weight.[4]

Table 1: Feeding in Low birth weight infants[4]

Birth weight(kg)	Quantity(mL)	Frequency(Hours)	Increments
<1kg	1	1-2	1mL/day
1-1.5kg	2-3	2-3	1Ml/alternate feed
1.5-2kg	5-6	2-3	1-5mL/feed
2-2.5	8-10	2-3	5-10mL/feed

The treatment of patients getting EN and PN has significantly improved. To comprehend the effects of these on the complication rates in both PN and EN, more analyses are necessary. Although PN safe practise recommendations have been issued, there is little compliance. The acceptable incidence for central venous catheter infections has been decreased to zero in hospitalised patients as a result of safety actions. [71]. Contrarily, Casaer and colleagues recently revealed in their study that when EN proved insufficient for critically ill ICU patients, early PN beginning was compared with delayed commencement. [72] However, due to improvements in safety, circumstances in which use of EN is acceptable, and improved access, the idea of a "functional gut" into which EN can be injected has been expanded. [73] For patients

with gastric dysfunction, small bowel access can now be carried out blindly at the bedside. Nasojejunal tubes, gastrojejunostomies with multiple tubes, and percutaneous jejunostomies have all been successfully placed using endoscopic techniques.[74,75]

According to reports, other illnesses that were typically PN indicators have begun to respond to EN. For instance, an oral meal was quickly resumed after anastomosis leaks with severe intraperitoneal sepsis were successfully treated with stents. Others have demonstrated that patients with anastomotic leakage following gastrectomy for malignancy can be successfully treated by feeding through a fluoroscopically inserted nasointestinal tube. Several papers describe the use of EN to treat some chyle leak patients. Additionally, it has been recommended that low long-chain fat diet be tried on patients with chyle leaks before starting PN if the leak cannot be sealed. [76]

RELEVANT STUDIES CONCERNED WITH THIS CURRENT STUDY:

Sun M et al (2022) This study demonstrated that there was a sizable incidence of EUGR in premature neonates at discharge. Effective ways to reduce the prevalence of EUGR at discharge include improving care for expectant mothers, taking measures to reduce intrauterine growth retardation and premature birth, providing enteral feeding early after birth, and actively taking part in the prevention and treatment of complications after birth.[77]

Shen W et al(2022) undertook a study to look into the risk factors for the prevalence of extrauterine growth retardation (EUGR) in very preterm newborns. This study suggests that in extremely preterm neonates, it is best to start full enteral feeding as soon as feasible, support breastfeeding, increase calorie intake during the first week of life, speed weight gain, and prevent moderate-to-severe bronchopulmonary dysplasia.[78]

Wang L et al(2022) did a study on the risk factors for bronchopulmonary dysplasia in very preterm infants with extrauterine growth restriction. Nutritional undernutrition after birth can be a contributing factor for bronchopulmonary dysplasia or chronic lung disease (BPD). Additionally, infants with the disease are more prone to grow poorly while hospitalised (extrauterine growth restriction, EUGR).This study specifically looked into contributing factors for EUGR in very PT infants with BPD and came to the conclusion that the risk of EUGR was more in these infants the lower their birth weight or the more severe their BPD was. It is particularly crucial to prevent EUGR in patients with Patent Ductus Arteriosus (PDA) or moderate-to-severe BPD using perinatal treatment, enteral nutrition, and nutritional methods.[22]

Zhao T et al(2022) in his study showed that gestational age and birth weight were lower in neonates with EUGR than those with Non-EUGR. The components that had association with EUGR were lesser age of gestation, Lower birth weight, IUGR, hypertension in mother, more days on ventilator, respiratory and digestive problems, sepsis and PDA.

Makker K et al (**2021)** included 1063 PT infants in their research. It was a prospective cohort study where At birth, 6.1% of babies had IUGR and 21.7% had EUGR. According to this study, the birth weight, GA at birth, NEC, and day of life that complete feeds were achieved were all significantly impacted by EUGR status. This study reveals crucial elements connected to EUGR. Further research is required to acquire more understanding.[80]

Xiang Y et al (2021). Growth restriction was reported by weight by 18.1% at birth and 75.4% at discharge. Contrary to recommendations, enteral nutrition (EN) was started later than expected. Particularly in the EUGR group, the total cumulative EN interruption duration was lengthy. When patients were discharged, cumulative deficits in these nutrients were not made up since it was typical to ingest insufficient amounts of energy and amino acids. A low Z-score and a long cumulative interruption time were risk factors for EUGR. Constricted enteral feeding was the main contributor to the general lacklustre nutritional support for VLBWIs.[81]

Baillat M et al(2021) conducted a prospective cohort study on moderately preterm(MP) neonates (32 to 34 weeks) and concluded that compared to adequate growth infants, At day seven of life, overall calorie intake was 15% and protein consumption was 35% lower for EUGR newborns (DoL7). This study showed that the following nutritional practises should be used to prevent EUGR:The best possible support for moms who are nursing due to the advantages of human milk on present challenges like sepsis and feed intolerance and future challenges like adult diseases, Use of fortification, preterm formula as a supplement during changing to suckling, and, if necessary, parenteral nutrition usage with protein and fats from birth onwards in accordance with contemporary international guidelines.[82]

De Rose et al(2021) In this study, 254 preterm newborns who met the study criteria were included. Griffith's Development Quotient (GDQ) and neurodevelopmental impairment were both substantially predicted by 19 out of 48 criteria of EUGR (NDI). Among these, longitudinal definitions rather than cross-sectional ones seemed to have a greater ability to predict poor outcomes in NDI. Additionally, neonates with

EUGR were discovered to have a lesser cognition score when compared to their contemporaries without EUGR.[83]

Khasawneh W et al(2020), The analysis comprised 247 VLBW newborns. 30 (12%) of the 112 (45%) boys were under ELBW, and 72 (29%) of them were undersized for gestational age (SGA). At discharge, EUGR was identified in 80% of cases. Infants with SGA and infants without SGA both had rates of EUGR of 97% and 73%, respectively. The newborns of the EUGR group had longer hospital stays, lower birth weights, longer ventilatory supports, greater rates of sepsis, and higher gestational ages. Small-for-gestational-age, more than 14 days delay in obtaining full feeds, 3 gram/kg of protein intake on the eighth day, hundred kilocaries per kg per day of total calorie intake on the fifteenth day, and sepsis incidence were the factors related with EUGR in the multilogistic regression model. It has been determined that their unit had a high rate of EUGR.Sepsis, inadequate protein and calorie intake during the first two weeks of life, and being SGA at birth were all substantially related with this problem. To reduce postnatal growth delay, a more aggressive nutritional strategy is required and should be formulated.[8]

Zhao X et al(2020) carried out a study to explore the traits and risk factors for EUGR in VLBWIs**.**The medical files of 137 VLBWIs admitted to the NICU unit throughout the study period were retrospectively examined. The investigation comprised 45 non-EUGR patients and a total of 92 EUGR patients. This investigation looked at risk factors for EUGR and gathered information on demographic and clinical variables. To assist VLBWIs in avoiding delayed extrauterine growth, it was concluded that feeding intolerance reduction and nutrition assistance for amino acids should be adopted.[84]

Tozzi MG et al (2018) did a study and found that a number of factors were more commonly related with EUGR among the prenatal and neonatal covariates evaluated, even if the difference was not significant on analysis. A higher protein intake lowers the risk of EUGR among all nutritional parameters taken into account, according to an examination regarding nutrition in the first week of life. Study revealed that babies with EUGR received less protein than those without EUGR. Additionally, a reduced lipid intake played a significant part in the postnatal growth restriction.[3]

Chien HC et al(2018) conducted a study on VLBW infants. According to the study, the severity of EUGR for weight at hospital discharge was correlated with a Mental Developmental Index (MDI) at the corrected gestation of 24 months. Furthermore, the link between EUGR and gestational age was unaffected by either gender or age. Additionally, it was discovered that EUGR had hemodynamic significance against patent ductus arteriosus and was a stand-alone predictor of neurodevelopmental outcomes in the stratified analysis. Above mentioned scores were low at a corrected age of 24 months and were allegedly highly linked to EUGR in VLBW preterm infants. In providing care for preterm newborns, it is crucial to emphasise early EUGR evaluation and recognition.[85]

Pampanini V et al (2015), A total of 103 PT infants who were discharged from the hospital with growth parameters below the "intrauterine" growth expectation were included in the study. 12.6% of the youngsters in the EUGR group had heights under 2 SDS, while 7.7% had heights under 2.5 SDS. 18.4% of the study population had BMI (body mass index) values under 2 SDS (12% of women and 22.7% of men).

Early childhood head circumference did not catch up for the 19.6% of EUGR youngsters. It has been found that a significant proportion of prematurely born children with severe EUGR show growth issues when they are young, emphasising the need for thorough healthcare follow-up to evaluate their developmental potential and implement effective intervention strategies. [10]

MATERIALS AND METHODS

- **Source of data:** All neonates delivered at RL Jalappa hospital with Low birth weight during the period of study and consented to be a part of the study.
- **Study design:** A Prospective cohort study**.**
- **Study period:** One year from January 2021 to December 2021.
- **Sample size**:

  Proportion of neonates reporting elevated incidence of EUGR for weight is 71% in a study conducted on EUGR by Tozzi M et al on Extra Uterine Growth Restriction (EUGR): Growth Patterns, Nutrition and Epigenetic Markers .With absolute precision of 10% the estimated sample size for this prospective study was 81.Expecting a drop out rate of 10% during the study, final sample size calculated was 90 neonates satisfying inclusion and exclusion criteria.[3]

METHOD OF COLLECTION OF DATA

Inclusion Criteria

- All neonates delivered at RL Jalappa Hospital with Low birth weight who had consented to be a part of the study.

Exclusion Criteria

- Neonates having an underlying disease such as congenital heart disease or any congenital malformation.
- Neonates requiring mechanical ventilator support.
- Neonates less than 35 weeks of gestation.
- Neonates less than 1.5 kg at birth.

METHODOLOGY

This study was started after obtaining consent from the parents.All neonates who fulfilled the inclusion criteria were included in the study.

Maternal history which includes maternal age, obstetric score, maternal risk factors like Anemia, Maternal Hypertension,Maternal heart disease, Twin gestation, Doses of antenatal steroids, drug history and personal history were noted from the obstetric record.

Neonatal characteristics like gestational age, mode of delivery, gender, weight, length and head circumference at birth were noted and plotted on Fenton's growth chart and centiles were noted. Auxological factors like weight at birth, weight on every day till 7 days or discharge, time of minimum weight, Mean weight(mean of all the weights of the neonate in 7 days) were noted.

Nutritional parameters such as the start of breastfeeding, the start of enteral feedings, the completion of enteral feedings, feeding intolerance, the use of human milk fortifiers, and the daily intake of calories during the first week of life were documented. Between the EUGR and Non-EUGR groups, complications like neonatal hypoglycemia, neonatal hyperbilirubinemia, neonatal sepsis, necrotizing enterocolitis, and neonatal respiratory distress were compared.

WEIGHT- Weight was measured using a basket or pan type of weighing machine. Infants were placed on the tray which was digitally calibrated for measuring a minimum of 10g increment. It was done without clothing or diapers.[86]

LENGTH: The length was measured using an infantometer made by Harpenden. It was made out of a horizontal hardwood board and two vertical planks that were parallel to each other's ends. The wooden board had a plank attached to one end (head piece). The infant's length could be adjusted at the other end by moving a vertical plank (foot piece). The centre of the board had a calibrated reading strip that could be used to directly read the baby's length.

HEAD CIRCUMFERENCE- is the maximum circumference of the head with the measuring tape overlying the occiput located posteriorly and supraorbital ridges located anteriorly on the head. It was measured using a non stretchable measuring tape.

Postnatal weight loss (%) was calculated using the formula:(birth weight - minimum weight) / birth weight × 100%.[86]

Weight was measured at birth and every day afterwards till discharge. Extrauterine growth retardation was defined as a weight loss of more than one standard deviation (SD) between delivery and discharge or time t.

Standard deviation of the given population was calculated using the following formula:

$$\sigma = \sqrt{\frac{\sum (x - \text{mean})^2}{n}}$$

x is a set of numbers

mean is the average of the set of numbers

n is the size of the set

σ is the standard deviation

Z scores were calculated for all the babies individually using the following formula

$$Z=\frac{X-MEAN}{SD}$$

Where x is the individual value (birth weight), Mean is the mean of weights of a single baby on all days till the followup (7 days) and SD is the standard deviation

When this weight z score value was more than 1 standard deviation then it was termed as Extrauterine growth retardation.

The above mentioned maternal, neonatal and auxiological factors were assessed in EUGR and Non-EUGR babies. Neonatal complications were compared between EUGR and Non-EUGR babies.

Statistical analysis:

The data was entered into a Microsoft Excel data sheet, and the SPSS 22 version of software was used to analyse it. To ascertain whether the continuous data were normal, the Shapiro-Wilk test and the Kolmogorov-Smirnov test were applied. Continuous data were represented using the mean and standard deviation. The significance of the mean difference between two quantitative variables was assessed using the independent t test. Winslow Mann, The U test was used as a test of significance to find the median difference between two quantitative variables having skewed distributions. The chi-square test was used to determine whether the qualitative data were statistically significant.For qualitative data that didn't meet the requirements for the Chi-square test, Fischer's exact test was utilised as a test of significance (2x2 tables only). When chi-square tests weren't necessary, Yates

correction was used (for 2x2 tables only).Data visualisation: MS Word and Excel were used to create a variety of graphs, including scatter plots, pie charts, bar graphs, and line graphs. A p value (Probability that the result is true) of 0.05 or lower was declared statistically significant after accounting for all statistical testing rules.[87,88]

Statistical software: Data analysis was done using statistical software: MS Excel and IBM SPSS Statistics, Somers, NY, USA. The study's sample size, odds ratio, and reference management were estimated using Medley's desktop, Open Epi, EPI Info (CDC Atlanta), Medcalc, and Open Epi.

RESULTS

Table 2: Distribution of study neonates based on growth retardation

Parameters		Number(N=90)	Percentage (100%)
Growth Retardation	**EUGR**	53	58.9%
	Non-EUGR	37	41.1%

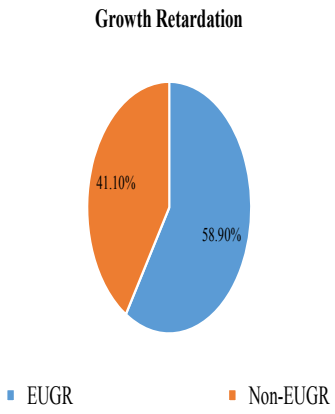

Figure 5: Pie chart showing distribution of study neonates based on Growth Retardation

Table 2 and Figure 5 depict the distribution of study neonates based on growth retardation. In the present study,58.9% neonates were diagnosed with Extra-uterine growth retardation (EUGR) and 41.1% were Observed to be non-EUGR.

Table 3: Comparison of study neonates based on gender

Parameters		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non-EUGR(N=37)		
Gender	Male	27	50.9%	20	54.1%	0.771
	Female	26	49.1%	17	45.9%	

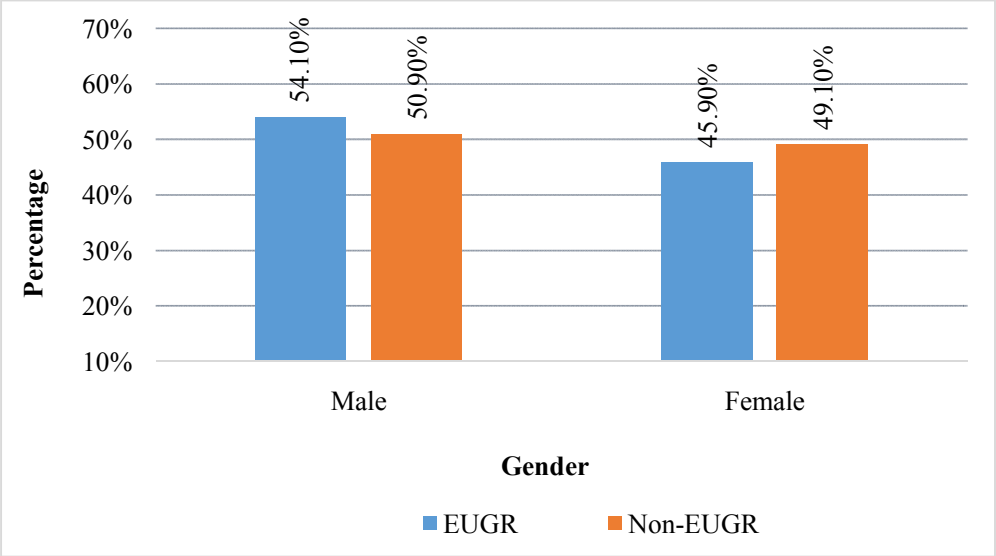

Figure 6: Bar diagram showing Comparison of study neonates based on gender

Table 3 and Figure 6 depict the comparison of study neonates based on gender. In the present study, 27(50.9%) EUGR and 20(54.1%) Non-EUGR neonates were males whereas 26(49.1%) EUGR and 17(45.9%) Non-EUGR neonates were females with a p value of 0.771 which had no statistical significance. However majority of the neonates included in the study were males.

Table 4: Comparison of study neonates based on birth weight, Discharge weight and Mean weight(Mean weight of the 7 days of the subjects)

Parameters		Growth Retardation(N=90)		p-value #
		EUGR (N=53)	Non-EUGR (N=37)	
Birth Weight (in kg)	Mean	1.97	2.01	0.522
	Standard Deviation	.24	.28	
Discharge Weight (in kg)	Mean	1.83	2.01	<0.001*
	Standard Deviation	.19	.27	
Mean Weight (in kg)	Mean	1.87	1.92	0.377
	Standard Deviation	.23	.27	

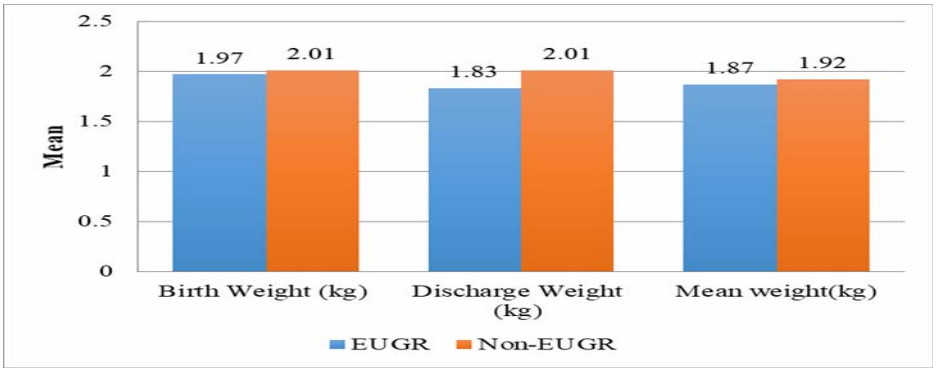

Figure 7: Bar diagram showing comparison of study neonates based on birth weight, Discharge weight and Mean weight

Table 4 and Figure 7 depict the comparison of study neonates based on birth weight, discharge weight and mean weight. In the present study, The mean birth weights were 1.97 ± 0.24 kg and 2.01 ± 0.28 kg among EUGR and non-EUGR children with a p value of 0.522 whereas the mean of mean weights were 1.87 ± 0.23 kg and 1.92 ± 0.27 kg among EUGR and non-EUGR children with a p value of 0.377 both of which were not statistically significant. The study established significant association between the groups in terms of discharge weight with a p value of 0.001(<0.05), where the mean discharge weight in EUGR was 1.83 ± 0.19 kg which was more compared to that of non-EUGR neonates with mean discharge weight of 2.01 ± 0.27 kg.

Table 5: Comparison of study neonates based on the Day of minimum weight

Parameters		Growth Retardation(N=90)		p-value[#]
		EUGR(N=53)	Non-EUGR(N=37)	
Day of Minimum Weight among the 7 days	Mean(Days)	3.92	3.97	0.839
	Standard Deviation(Days)	1.09	1.14	

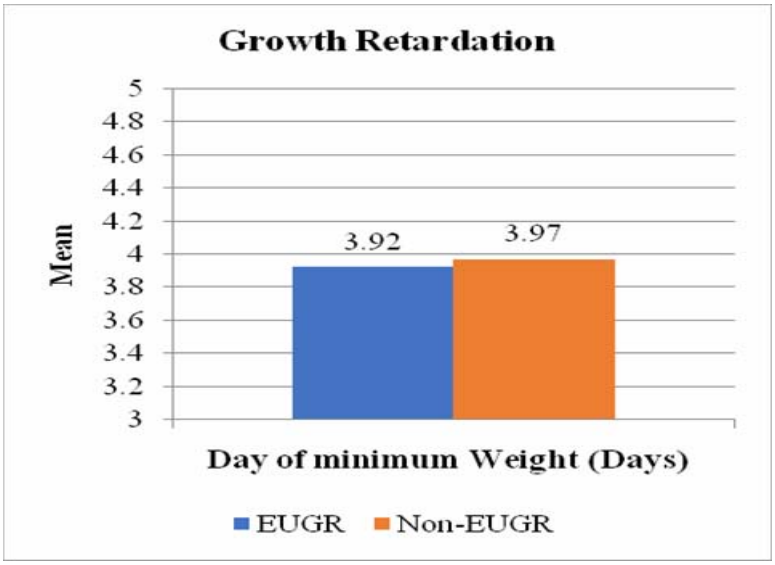

Figure 8:Bar diagram showing comparison of study neonates based on Day of minimum weight

Table 5 and Figure 8 depict the comparison of study neonates based on the day of minimum weight. In the present study, The Mean(days) of day of minimum weight were 3.92 ± 1.09 days in EUGR and 3.97 ± 1.14 in non-EUGR neonates respectively with a p value of 0.839 which was statistically insignificant.

Table 6: Comparison of study neonates based on Length and Head circumference(at birth)

Parameters		Growth Retardation(N=90)		p-value#
		EUGR (N=53)	Non-EUGR (N=37)	
Length (in cm)	Mean	46.19	46.41	0.348
	Standard Deviation	1.08	1.07	
Head Circumference (in cm)	Mean	32.11	32.38	0.202
	Standard Deviation	.93	1.00	

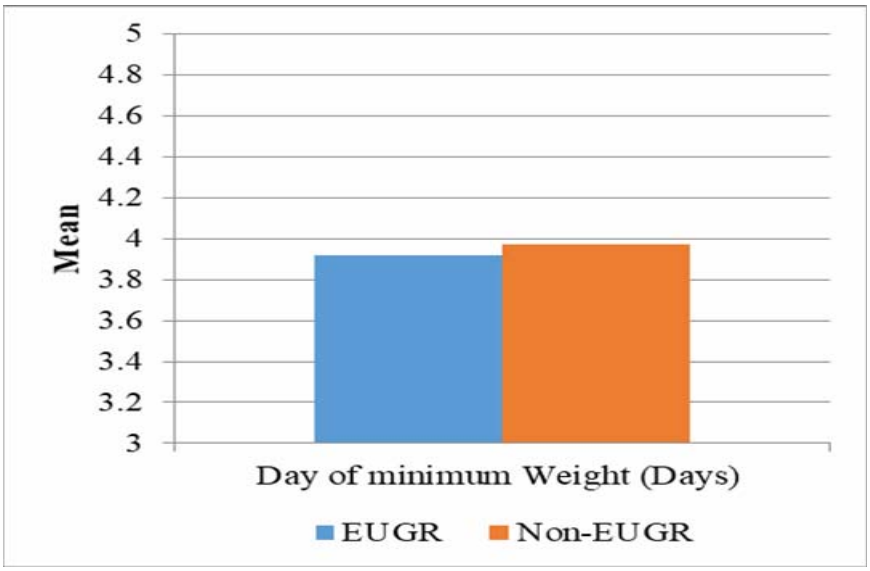

Figure 9: Bar diagram showing comparison of study neonates based on Length and Head circumference at birth

Table 6 and Figure 9 depict the comparison of study neonates on the basis of Length and Head circumference at birth. Between EUGR and non-EUGR neonates, the mean lengths at delivery were 46.19 1.08 cm and 46.41 1.07 cm, while the mean head circumferences at delivery were 32.11 0.93 cm and 32.38 1.00cm, respectively. These p values were 0.348 and 0.202 respectively, and neither of them were statistically significant.

Table 7: Comparison of study neonates based on Length and head circumference (at discharge or at Day 7)

Parameters		Growth Retardation(N=90)		p-value[#]
		EUGR(N=53)	Non-EUGR(N=37)	
Length (in cm)	Mean	46.30	46.62	0.350
	Standard Deviation	1.08	1.07	
Head Circumference (in cm)	Mean	32.66	32.56	0.220
	Standard Deviation	.93	1.00	

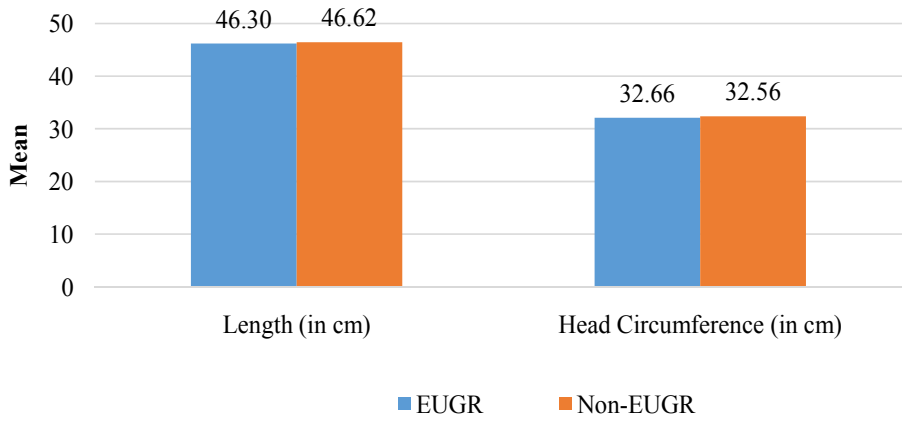

Figure 10: Bar diagram showing comparison of study neonates based on Length and Head circumference at discharge or at Day 7

Table 7 and Figure 10 depict the comparison of study neonates on the basis of Length and Head circumference at discharge or at Day 7).The mean lengths at discharge were 46.30 ± 1.1 cm in EUGR and 46.62 ± 1.07 cm in Non-EUGR with a p value of 0.350, mean head circumferences at discharge were 32.66 ± 0.93 cm in EUGR and 32.56 ± 1.00cm in Non-EUGR with a p value of 0.220 both of which were statistically not significant with incidence of EUGR.

Table 8: Comparison of study neonates based on Gestation and obstetric score

Parameters		Growth Retardation(N=90)				p-value[#]
		EUGR(N=53)		Non-EUGR(N=37)		
Gestation	Preterm (35 to 36+6 weeks)	29	54.7%	26	70.3%	0.136
	Term (≥37 weeks)	24	45.3%	11	29.7%	
Obstetric Score	Primi(G1)	20	37.7%	19	51.4%	0.200
	Multi(>G1)	33	62.3%	18	48.6%	

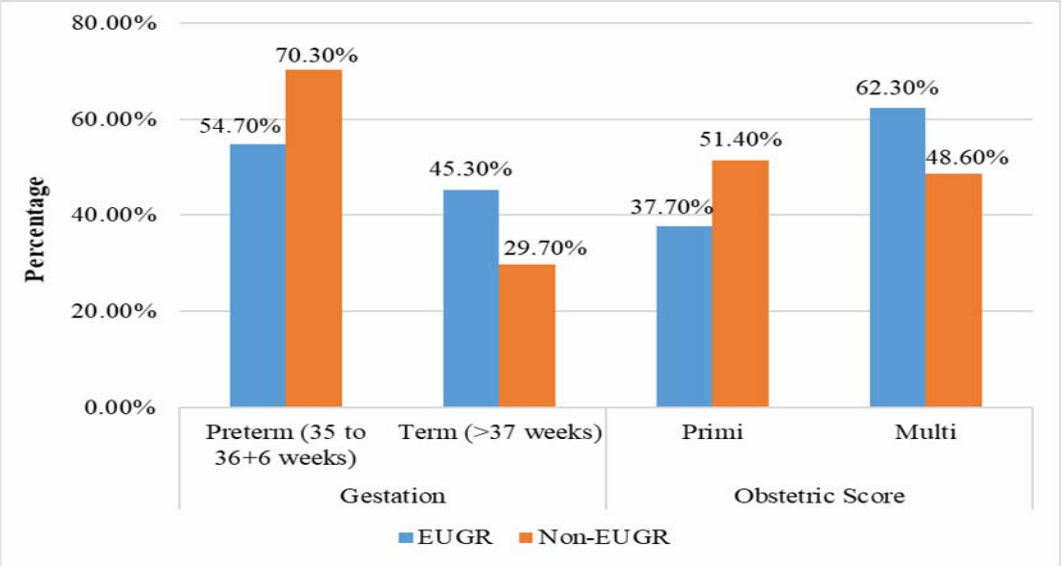

Figure 11: Bar diagram showing comparison of study neonates based on Gestation and obstetric Score

Table 8 and Figure 11 depict the comparison of study neonates based on Gestation and Obstetric score. Majority of the mothers in the study had delivered preterm neonates, both among those diagnosed with EUGR (54.7%) and Non- EUGR (70.3%). Term neonates were 45.3% in EUGR and 29.7% in Non-EUGR group.Majority of EUGR were born to multigravida (62.3%). On the contrary, majority of the non-EUGR were born to Primigravida (51.4%). However there was no significant between the two study groups with respect to gestation and obstetric score.

Table 9: Distribution of study neonates based on Maternal age

Parameter		Growth Retardation(N=90)			
		EUGR(N=53)		Non-EUGR(N=37)	
Maternal age(in years)	18 to 28 years	45	85%	30	81%
	29 to 40 years	8	15%	7	9%

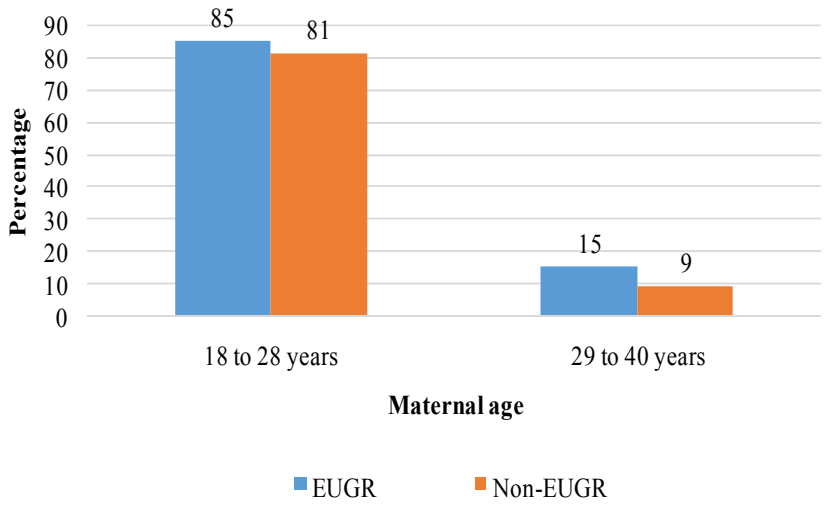

Figure 12: Distribution of the study neonates based on Maternal age

Table 9 and Figure 12 depict the distribution of study neonates based on maternal age. 45(85%) EUGR neonates and 30(81%) Non-EUGR neonates were born to mothers between 18 to 28 years of age whereas 8(15%) EUGR and 7(9%) Non-EUGR neonates were born to mothers between 29 to 40 years of age.

Table 10: Comparison of study neonates based on Maternal Anemia and Maternal Hypertension

Parameters		Growth Retardation(N=90)				p-value[#]
		EUGR(N=53)		Non-EUGR(N=37)		
Maternal Anemia(Hb<10g/dl)	**Present**	36	67.9%	2	5.4%	<0.001*
	Absent	17	32.1%	35	94.6%	
Maternal Hypertension (<140/90mmHg)	**Present**	38	71.7%	2	5.4%	<0.001*
	Absent	15	28.3%	35	94.6%	

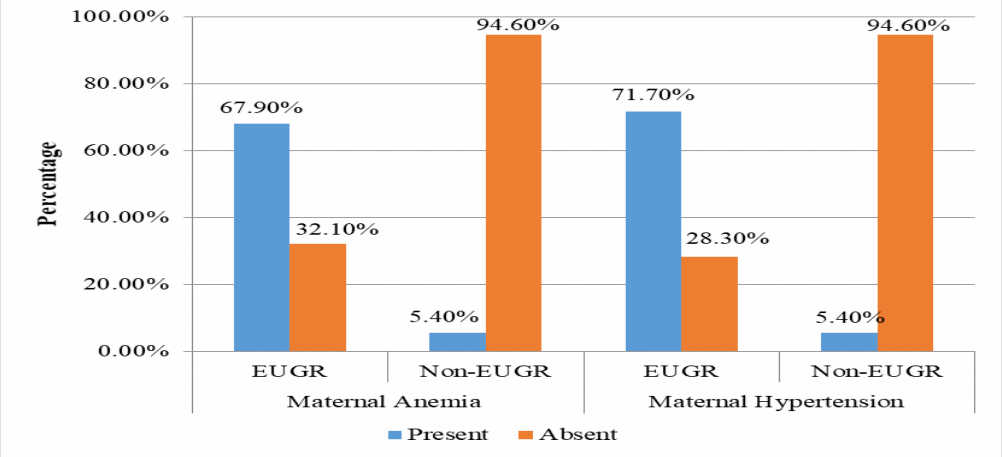

Figure 13:Bar diagram showing comparison of study neonates based on Maternal Anemia and Maternal Hypertension

Table 10 and Figure 13 depict the comparison of study neonates based on Maternal anemia and Maternal Hypertension. The study found statistically significant association in terms of Maternal Anemia which was present in mothers of 36(67.4%) neonates in EUGR group and 2(5.4%) in Non-EUGR group. Mothers with Maternal Hypertension were 38(71.7%) in EUGR group and 2(5.4%) in Non-EUGR group with a p value of <0.001(<0.05) which was significant.

Table 11: Comparison of study neonates based on Maternal heart disease, Twin gestation and Doses of antenatal steroids

Parameters		Growth retardation(N=90)				p value
		EUGR(N=53)		Non-EUGR(N=37)		
Maternal Heart Disease	Present	2	3.8%	1	2.7%	0.781
	Absent	51	96.2%	36	97.3%	
Twin Gestation	Present	3	5.7%	2	5.4%	0.959
	Absent	50	94.3%	35	94.6%	
Doses of Antenatal Steroids	No	47	88.7%	27	73.0%	0.104
	Yes	6	11.3%	10	27%	

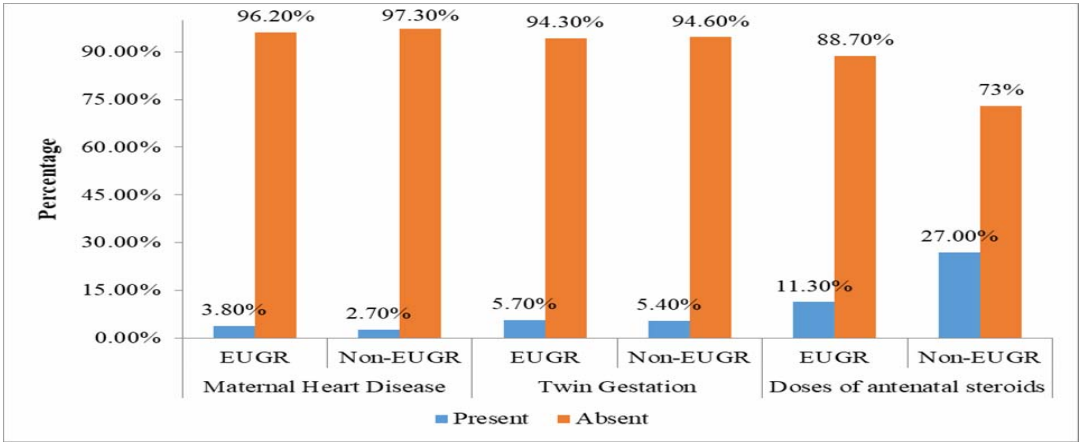

Figure 14:Bar diagram showing comparison of study neonates based on Maternal heart disease, Twin gestation and Doses of antenatal steroids

Table 11 and Figure 14 depict the comparison of study neonates based on Maternal Heart disease, Twin gestation and Doses of antenatal steroids. Maternal heart disease was present in 2(3.8%) EUGR neonates and 1(2.7%) Non-EUGR neonates. 3(5.7%) EUGR neonates and 2(5.4%) Non-EUGR neonates were twin gestation. Antenatal steroids were given in 6(11.3%) EUGR neonates and 10(27%) Non-EUGR neonates. There was no statistical significance in all the above three parameters with p values of 0.781, 0.959 and 0.104 respectively.

Table 12: Comparison of study neonates based on IUGR and Weight for gestation

Parameters		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non-EUGR(N=37)		
Antenatal scan suggestive of Intra-Uterine Growth Retardation	Present	38	71.7%	21	56.8%	0.142
	Absent	15	28.3%	16	43.2%	
Weight for Gestation Age	Small	42	79.2%	22	59.5%	0.042
	Appropriate	11	20.8%	15	40.5%	

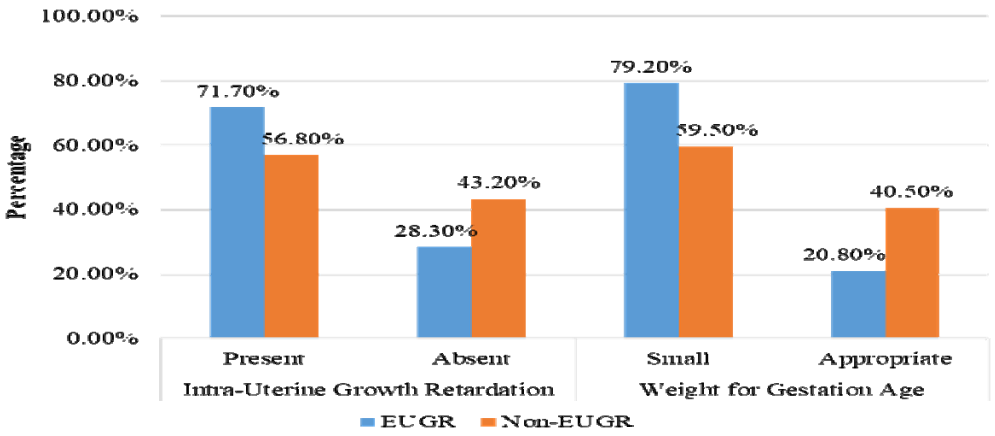

Figure 15: Bar diagram showing comparison of study neonates based on IUGR and weight for gestation

Table 12 and Figure 15 depict the Comparison of study neonates based on IUGR and Weight for gestation. In the present study, IUGR was present in 38(71.7%) EUGR neonates and 21(56.85%) Non-EUGR neonates with an insignificant p value of 0.142. 42(79.2%) EUGR neonates and 22(59.5%) Non-EUGR neonates were born SGA with significant p value of 0.042(<0.005).

Table 13: Comparison of study neonates based on mode of delivery

Parameters		Growth Retardation(N=90)				p-value[#]
		EUGR(N=53)		Non-EUGR(N=37)		
Mode of Delivery	Normal Vaginal	10	18.9%	13	35.1%	0.216
	Cesarean Section	43	81.1%	24	64.9%	

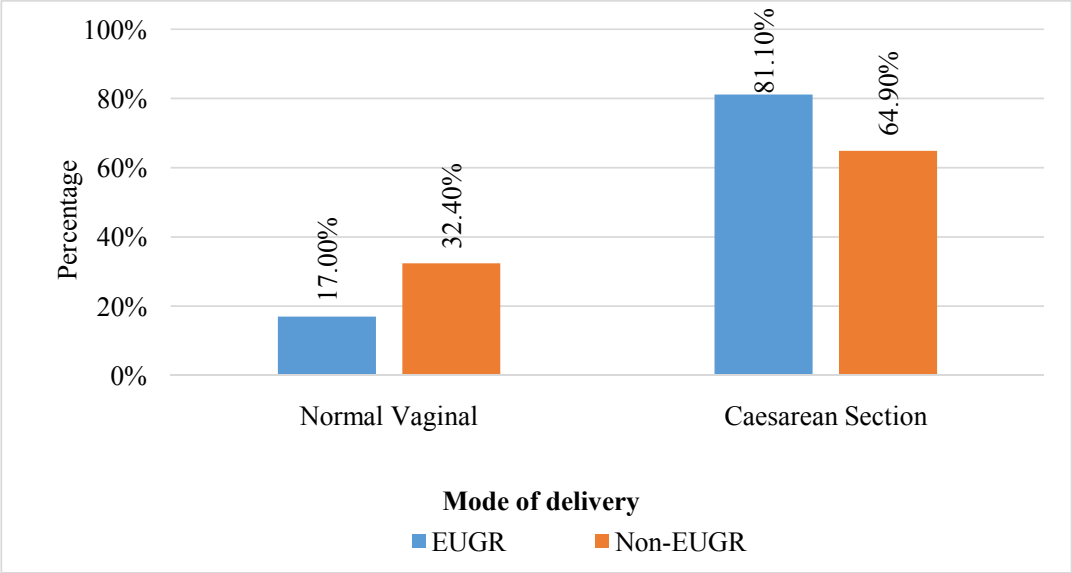

Figure 16: Bar diagram showing comparison of study neonates based on mode of delivery

Table 13 and Figure 16 depict the comparison of study neonates on the basis of mode of delivery. The most common mode by which neonates were delivered was found to be caesarean section in this study, both among those diagnosed with EUGR and without EUGR. 10(18.9%) EUGR and 13(35.1%)% Non-EUGR neonates were delivered by Normal vaginal delivery whereas 43(81.1%) EUGR and 24(64.9%) Non-EUGR neonates were delivered by Cesarean section with an insignificant p value of 0.216.

Table 14: Comparison of study neonates based on time to initiate enteral feeds

Parameter		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non-EUGR(N=37)		
Time to initiate Enteral Feeds	<2 hours	9	17%	11	29.7%	0.016 *
	2 to 12 hours	32	60.4%	11	29.7%	
	13 to 48 hours	12	22.6%	15	40.6%	

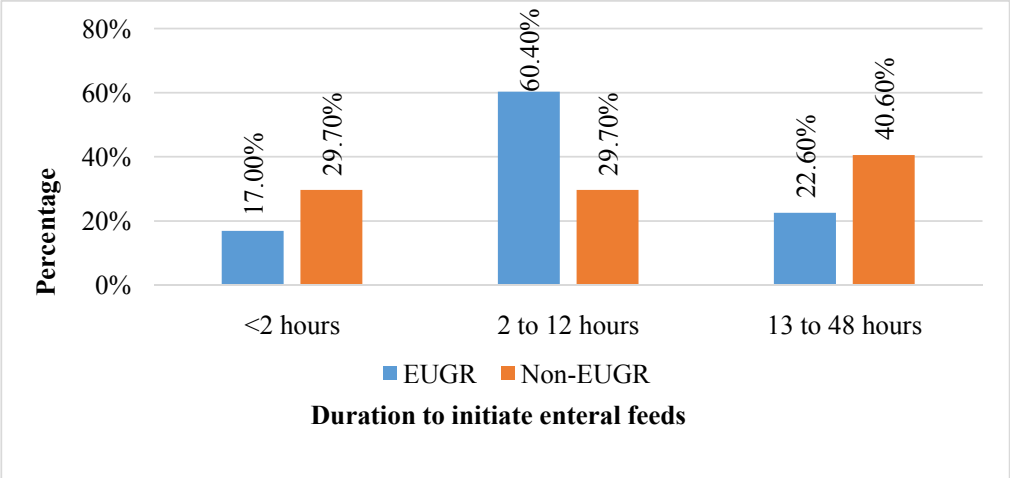

Figure 17:Bar diagram showing comparison of study neonates based on Time to initiate enteral feeds

Table 14 and Figure 17 depict the comparison of study neonates based on time to initiate enteral feeds. Feeds were initiated within 2 hours in 14(26.4%) EUGR and 11(29.7%) Non-EUGR neonates, between 2 and 12 hours in 32(60.4%) EUGR and 11(29.7%) Non-EUGR neonates and between 13 and 48 hours in 12(22.6%) EUGR and 15(40.6%) Non-EUGR neonates with a significant p value of 0.016.

Table 15: Comparison of study neonates based on Time to reach full enteral feeds

Parameters		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non-EUGR(N=37)		
Time to reach Full Enteral Feeds	<4 days	16	30.2%	35	94.6%	<0.001*
	≥4 days	37	69.8%	2	5.4%	

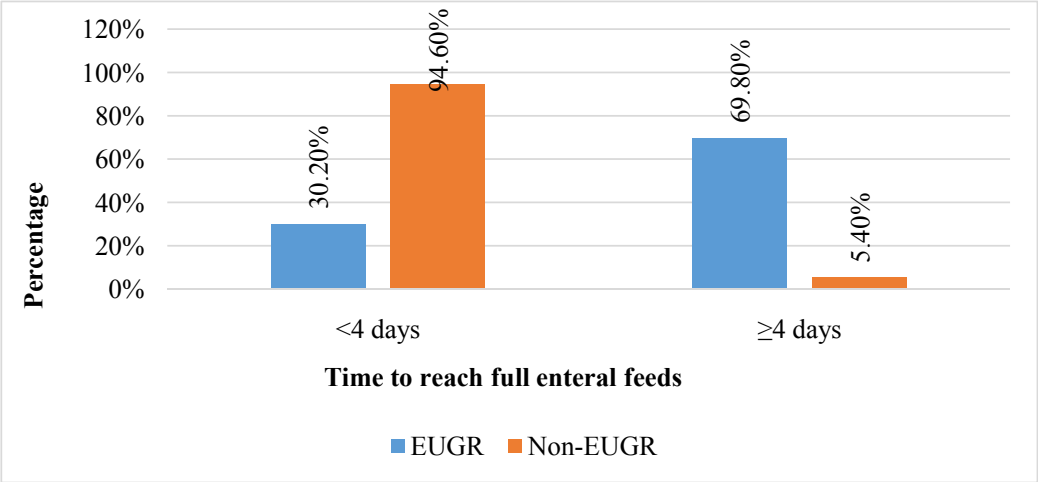

Figure 18: Bar diagram showing comparison of the study neonates based on time to reach full enteral feeds

Table 15 and Figure 18 depict the Comparison of study neonates based on time to reach complete enteral feeds.In the present study, the most common duration for reaching full enteral feeds was more than or equal to 4 days after the delivery among the neonates with EUGR (69.8%), while it was within 4 days of the delivery among those without EUGR (94.6%). Thus, the study established significant association with a p value of <0.001(<0.05).

Table 16: Comparison of study neonates based on fortification of human milk

Parameters		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non-EUGR(N=37)		
Human Milk Fortification	Yes	4	7.5%	28	75.7%	<0.001*
	No	49	92.5%	9	24.3%	

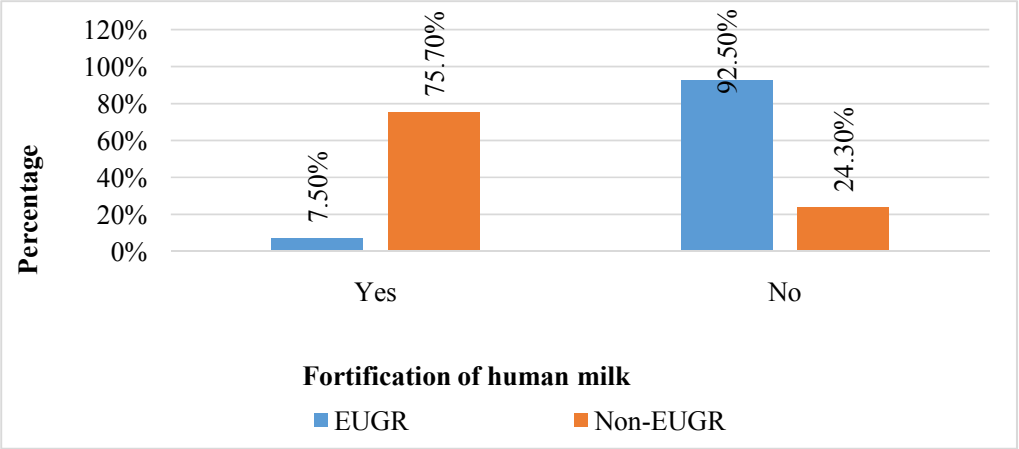

Figure 19: Bar diagram showing comparison of study neonates based on fortification of human milk

Table 16 and Figure 19 depict the Comparison of study neonates based on fortification of human milk. 4(7.5%) EUGR and 28(75.7%) Non-EUGR neonates received Fortified Human milk whereas 49(92.5%) EUGR and 9(24.3%) Non-EUGR neonates received human milk without fortification with a p value of <0.001 which was significant statistically.

Table 17: Comparison of study neonates based on Neonatal complications

Parameters		Growth Retardation(N=90)				p-value #
		EUGR(N=53)		Non EUGR(N=37)		
Neonatal Respiratory distress	Present	33	62.3%	4	10.8%	<0.001*
	Absent	20	37.7%	33	89.2%	
Neonatal Hyperbilirubinemia	Present	24	45.3%	23	62.2%	0.115
	Absent	29	54.7%	14	37.8%	
Neonatal sepsis	Present	15	28.3%	7	18.9%	0.308
	Absent	38	71.7%	30	81.1%	

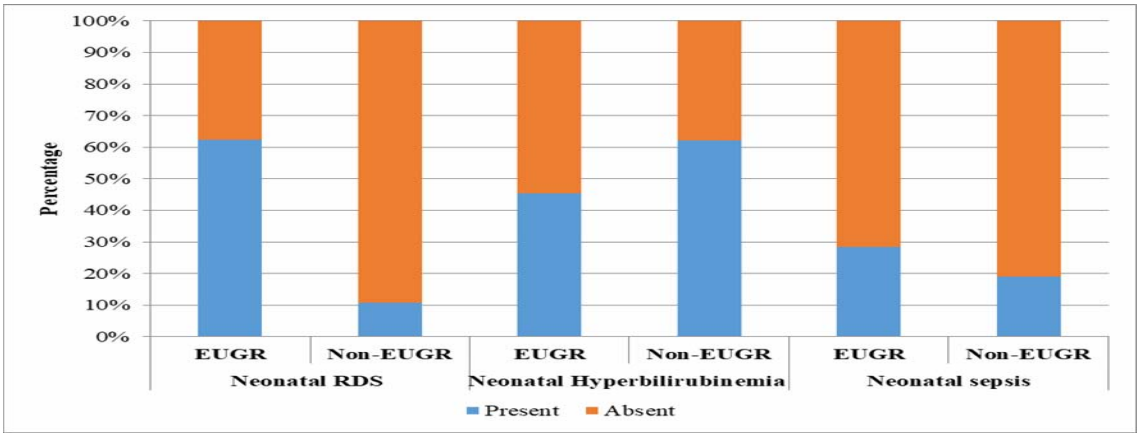

Figure 20:Bar diagram showing comparison of study neonates based on neonatal complications

Table 17 and Figure 20 depict the comparison of study neonates based on neonatal complications. It was found that Neonatal respiratory distress was found in 62.3% of EUGR neonates and 10.8% of Non-EUGR neonates with a p value(<0.001). Neonatal hyperbilirubinemia was described in 45.3% of EUGR and 62.25% of Non EUGR neonates and neonatal sepsis was present in 15(28.3%) of EUGR and 7(18.9%) of Non-EUGR neonates. Complications like Neonatal hypoglycemia and Necrotosing enterocolitis(NEC) were also studied but the incidence was minimal and hence were not statistically analysed. Neonatal hypoglycemia was present in 1(1.9%) EUGR and 2(5.4%) Non-EUGR neonates whereas NEC was present in 1(1.9%) EUGR and none of the Non-EUGR neonates.

Table 18: Comparison of study neonates based on Feed intolerance

Parameters		Growth Retardation(N=90)				p-value[#]
		EUGR(N=53)		Non-EUGR(N=37)		
Feed Intolerance	Present	10	18.9%	3	8.1%	0.153
	Absent	43	81.1%	34	91.9%	

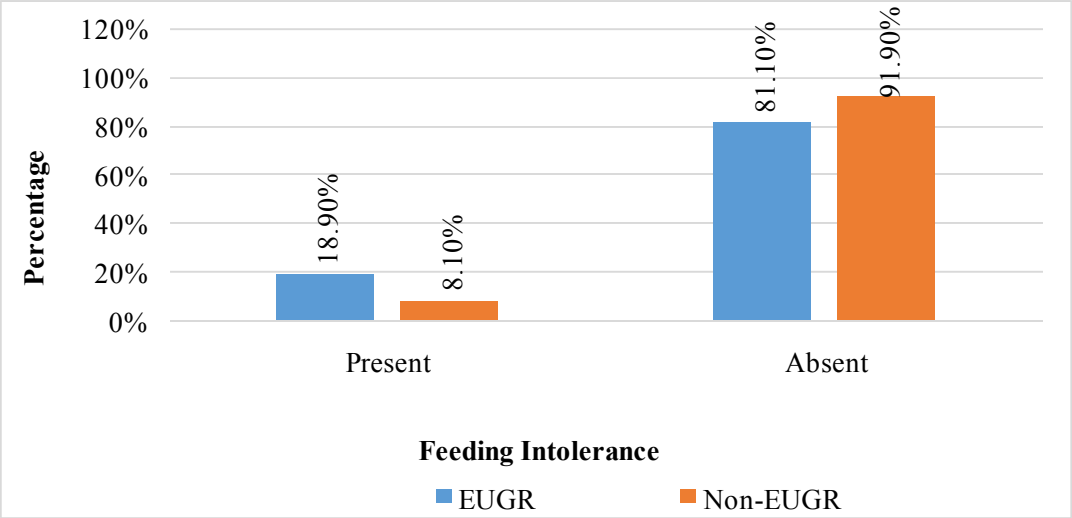

Figure 21: Bar diagram showing comparison of study neonates based on Feed intolerance

Table 18 and Figure 21 depict the comparison of study neonates based on Feed intolerance. It was found that Feed intolerance was found in 10(18.9%) EUGR and 3(8.1%) Non EUGR neonates. However, Overall occurrence of Feed intolerance was minimal (14.4%) and hence the study found no significant association between the Feed intolerance and EUGR with a p value of 0.153.

DISCUSSION

This study, a prospective cohort study was conducted in RL Jalappa Hospital with study period of January 2021 to December 2021. 90 LBW neonates were included who satisfied inclusion and exclusion criteria. Maternal history was was collected from records. Details regarding Demographic factors, neonatal factors and feeding strategies followed in the neonates were studied. Growth parameters like weight at birth, Length and head circumference at the time of birth and at discharge or at day 7, Mean weight and Day of minimum weight were measured. Based on weight Z score neonates were categorised as EUGR and Non-EUGR and the association of various mentioned risk factors with EUGR were studied and explored.

In addition to the short-term physical development and prevalence of associated problems, extra uterine growth retardation has a substantial impact on the future growth and development of neonates, notably the development of their neurological systems.[2] Studies have examined the risk variables for EUGR in neonates who were born Extremely Preterm, Very Preterm, VLBW, and ELBW. This study is one of the few research on LBW and Late preterm(LP) neonates that would be useful in determining the traits and risk factors related with EUGR, which would aid in turn in providing these neonates with the best postnatal nutrition, supportive care, and further monitoring.

Demographic factors

There were 90 neonates in the study's overall sample, of whom 47 were male and 43 were female. When compared to the non-EUGR neonates, 20 (54.1%) males and 17 (45.9%) females made up the 53 EUGR neonates, with 27 (50.9%) males and 26

(49.1%) females. The research found no statistically significant link between gender and the prevalence of EUGR. A research by Khasawneh W et al[8] comprised 247 newborns, of which 135 (55%) were female and 112 (45%) were male which was not significant statistically. 89 of the males were EUGR and 23 were Non-EUGR, while 109 of the females were EUGR and 26 were Non-EUGR. Various other studies by Zhao T et al[79], Makker K et al[80], Xiang Y et al[81] also showed no statistically significant association between gender and incidence of EUGR.

In the current study, among the 90 neonates included, 45(85%) EUGR neonates and 30(81%)Non-EUGR neonates were born to mothers between the age of 18 and 28 years whereas 8(15%) EUGR and 7(9%) Non EUGR neonates were born to mothers between the age of 29 to 40 years which signifies that Elderly mothers were comparatively less in our study.

The current study and various other studies have shown that demographic factors had no association with EUGR.

Auxological factors

In the current study, the Mean of birth weight in EUGR group was 2.01± 0.28 kg which was greater than in Non EUGR group which was 1.97±0.24 but however showed no statistical significance with incidence of EUGR(p value of 0.522). Khasawneh W et al[8] in their study showed that mean birth weight was 1290±213 grams in EUGR and 1300±148 grams in Non-EUGR neonates with a significant p value of 0.005. While a study by Xhao X et al[84] found that the birth weight of the Non-EUGR neonates were substantilly higher than that of the EUGR neonates, the P

value for this difference was just 0.008, which was statistically insignificant. However in this study neonates included were only LBW neonates while VLBW and ELBW neonates were excluded and thus there was no wide variation in birth weight among the neonates. Hence there was no association between weight of the neonate at birth and occurrence of EUGR in our study.

The mean discharge weight was 1.83±0.19 kg in EUGR group and 2.01±0.27kg in Non EUGR group which was substantially greater with a P value of 0.001 which was significant.In a study by Khasawneh W et al[8] mean weight at discharge was 1715(+107) in EUGR group and 1890(+156) with a P value of 0.005.This gives a conclusion that compared to EUGR babies, Non EUGR babies had significantly higher weight at discharge which is not a surprising factor.

In the current study, the mean length of EUGR and Non-EUGR neonates at discharge or at day 7 was 46.3+1.1 cm and 46.62+1.07 cm respectively with a p value of 0.35. The mean length of EUGR and Non-EUGR neonates at birth was 46.19+1.08 cm and 46.41+1.07 cm with a p value of 0.348. Length and EUGR did not have a statistically meaningful relationship. Tozzi M et al[3] also showed that mean length at birth was similar in both EUGR and Non-EUGR neonates with a p value of 0.63 whereas the length at discharge was also comparable between both groups with insignificant p value of 0.008.

The mean of head circumference at birth was 32.11±0.93 in EUGR and 32.38±1.00 in Non EUGR neonates with insignificant p value of 0.202 where as the mean head circumference at discharge or at 7 days was 32.66±0.93cm in EUGR and 32.56±1.00

cm in Non EUGR neonates respectively with insignificant p value of 0.22. Tozzi M et al[3] showed that head circumference at birth was similar in EUGR and Non EUGR neonates whereas Head circumference at discharge was 32.3±0.34cm in EUGR and 33.5±0.37cm in Non-EUGR neonates with a p (0.004) which was significant.In this study the followup was for 7 days and hence had no significant difference between Length and HC at birth and at discharge or day 7.

Other auxological factors like mean weight(mean of all weights of the neonates on 7 days) and Day of minimum weight had no association with EUGR.

This study and various other studies have shown that auxological factors have no strong association with EUGR expect discharge weight which was higher in Non-EUGR neonates and this is a known phenomenon.Another exception is birth weight where lower birth weight had more association with EUGR and this was shown in various studies. It was however not the same in this study due to absence of wide variation in birth weight between the included neonates.

Neonatal factors

In the present study, Among 53 EUGR neonates, 29(54.7%) were Late PT and 26(70.3%) were Term babies and this had no association with EUGR. In a study by Sun M et al[77,] it was found that mean gestational age was lesser in EUGR neonates than Non-EUGR neonates which was a significant association between earlier gestation and EUGR. Similarly studies by Zhao X et al[84], Khasawneh W et al[8] also showed that early gestation was associated with higher incidence of EUGR. However Gestational age in this study did not have the same effect as the neonates included

were only Term and Late Preterm neonates (≥35 weeks) and excluded the preterm neonates (< 35 weeks) and thus there was not much variation in gestational age between the included neonates.

Out of 53 children with EUGR in this study, 42 (79.2%) were born as SGAs and 22 (20.8%) as AGAs, with a p value of 0.042 which was significant. In their study, Khasawneh W et al[8] found that rates of EUGR were 97% and 73%, respectively, in SGA and non-SGA newborns, demonstrating the relationship between SGA and EUGR. Similar findings that SGA was substantially associated with incidence of EUGR were made by Sun M et al[77] in and Zhao T et al[79]. The results of this study and numerous other studies have demonstrated that SGA neonates are more prone to develop EUGR.

In the current study, IUGR was present in 38(71.7%)EUGR and 21(56.8%) Non EUGR neonates with insignificant p value of 0.142 .However Sun M et al[77] in his study showed that IUGR was present in 9(10.71) Non EUGR and 25(52.08) EUGR neonates with a significant p value of <0.001. This is because IUGR in our study was based on antenatal scans and few cases which were brought at the eleventh hour for delivery had no scan reports.

Maternal factors

In the current study, of the 53 neonates with EUGR 20(37.7%) neonates were born to Primigravida mothers and 33(62.3%) were born to Multigravida mothers, whereas of the 47 Non-EUGR neonates 19(51.4%) Non-EUGR neonates were born to Primigravida mothers and 18(48.6%) were born to Multi gravida mothers which was

insignificant with a p value of 0.200.Similar observation was noticed by Khasawneh et al[8] in his study where obstetric score had no association with EUGR.

In the present study, of the total 90 neonates, mode of delivery was by Normal vaginal delivery(NVD) in 10(18.9%) EUGR and 13(35.1%) Non-EUGR neonates and by Cesarean section(CS) in 43(81.1) EUGR and 24(64.9%) Non-EUGR neonates respectively with an insignificant p value of 0.216. In a study by Khasawneh W et al[8],

Among the 198 EUGR neonates, 34(17%) were delivered by NVD and 164(83%) by CS whereas among the Non-EUGR neonates, 3(6%) were delivered by NVD(94%) and 46 by CS with a p value of 0.05 which was significant.However in this study overall Cesarean sections were more in both groups and hence mode of delivery had no effect on occurrence of EUGR.

In the present study among the maternal risk factors, Maternal hypertension was present in 38(71.7%) mothers of EUGR and 2(5.4%) mothers of Non EUGR neonates with a p value($P<0.001$) which was significant.In a study by Zhao T et al[79], maternal gestational hypertension was 113(25.9%) in Non EUGR and 107(42.0%) in EUGR group respectively. This study and other studies show that neonates born to mothers with Hypertension had comparatively more risk for development of EUGR. This can be explained by a fact that these neonates are usually born SGA due to uteroplacental insufficiency and SGA inturn is a factor contributing to EUGR.

Maternal anemia was present in 36(67.9%) mothers of EUGR and 2(5.4%) mothers of Non EUGR neonates which showed statistically significant association($P<0.001$)

with incidence of EUGR. There are no studies comparing maternal anemia with EUGR. This study shows that maternal anemia is associated with EUGR.

Maternal personal history regarding smoking and alcohol were also taken but were not included for analysis as none of the mothers had such personal history.

Other maternal risk factors like maternal heart disease, doses of antenatal steroids in mother and twin gestation had no statistically significant association with incidence of EUGR in this study which was similar in various other studies.

Feeding strategies

In the present study, of the 90 neonates included time to initiate enteral feeds was <2 hours in 9(17%) EUGR and 11(29.7%) Non-EUGR neonates whereas it was between 2 to 12 hours in 32(60.4%) EUGR and 11(29.7) Non-EUGR neonates and 13 to 48 hours in 12(22.6%) EUGR ad 15(40.5%) Non-EUGR neonates with a p value of 0.016 which was significant association. In a study by Sun M et al[77], Age at first enteral feeding was early in EUGR than in Non-EUGR neonates showing that early enteral feeding is protective against EUGR. This notifies that early initiation of enteral feeds is an essential component to prevent EUGR.

In the present study, Duration to reach full enteral feeds was <4 days in 16(30.2%) EUGR and 35(94.6%) Non-EUGR neonates whereas it was ≥ 4 days in 37(69.8%) EUGR and 2(5.4%) Non-EUGR neonates with a p <0.001 which was significant. In a study by Khawasneh W et al[8], delay in initiation of enteral feeds more than 3 days was associated with incidence of EUGR. Similarly In a study by Makker K et al[80],

occurrence of EUGR during the time of discharge from ICU was associated significantly with delay in day of life at reaching full feeds. This implies that early reaching of full enteral feeds plays a key role in prevention of EUGR in LBW neonates.

In this study, use of HMF was evident in 4(7.5%) EUGR and 28(75.7%) Non-EUGR neonates with a p value of <0.001 which was significant. This shows that HMF when added in LBW neonates at recommended quantity of feeds is an acceptable factor that can decrease the incidence of EUGR. This would also encourage the mothers to feed Human milk rather than formula feeds. Fortifying human milk would obviously be a better option than formula feeds. Wang Ys et et al[89] in his study showed that Amount of breast milk(in ml/kg/day) to which HMF was added was 100.0(87.6120.0) in Non-EUGR and 107.9(93.0.128.0) in EUGR neonates with a p value of <0.001 which signifies that timely addition of HMF is needed to prevent EUGR as protein of breastmilk gradually decreases over time and would be insufficient for the normal growth of premature and LBW neonates.

In this study proforma also included that amount of calorie intake of all the neonates on every day 1,3 and 7. But the amount of calories received by babies on direct breast feeds cannot be calculated accurately and hence this factor was not considered for analysis.

Parenteral nutrition is not as effective as enteral nutrition in promoting healthy growth throughout the newborn period. According to this study and the other studies mentioned above, early enteral feed initiation, early reaching of complete enteral

feeds, and prudent administration of HMF at the recommended feeding volume were all linked to better newborn outcomes and the prevention of EUGR. The nutritional protocol in NICU should include these feeding strategies especially in LBW neonates which can prevent EUGR.

Neonatal complications

Neonatal respiratory distress was the neonatal complication in the current study which had a significant association with EUGR with a p value of 0.001.It was present in 33 (62.3%) EUGR and 4 (10.8%) Non-EUGR neonates. Neonatal respiratory distress syndrome was shown to be substantially more common in EUGR [50(20.0)] than Non EUGR group [42(9.86)] in a study by Zhao T et al.[79] Other neonatal issues such Neonatal Hyperbilirubinemia, Neonatal Hypoglycemia, Neonatal Sepsis, Necrotizing Enterocolitis, and Feeding Intolerance showed no discernible variations between the two groups.Similar to this, Zhao X et al[79] observed no significant association between the neonates in two groups(EUGR and Non-EUGR) when comparing the above mentioned complications between the two groups.

This study and various other studies have proven the strong association between Neonatal respiratory distress and EUGR. Need for NICU admission, delay in initiating enteral feeds and delay in reaching complete enteral feeds would be the factors contributing to EUGR in these neonates.

CONCLUSION

- This study turns out to be one of the fewer studies that studied and explored the risk factors associated with EUGR in LBW neonates. Previous such studies were done on EUGR in VLBW and ELBW neonates which arouse an interest to conduct a study on LBW neonates and their association with EUGR.
- Demographic factors like gender of the neonate and maternal age had no association with incidence of EUGR.
- Auxological factors like Mean birth weight, Day of minimum weight, Length and head circumference at birth and at discharge or till day 7 did not have momentous effect on incidence EUGR. However Discharge weight was the only auxological factor which was higher in EUGR neonates but this is a known factor.
- Gestation and obstetric score had no association with EUGR.
- Among the maternal risk factors Maternal hypertension and Maternal Anemia had statistically significant association with incidence of EUGR. Other maternal factors such as maternal heart disease, Use of antenatal steroids and Twin gestation however had no association with EUGR.
- Neonates born small for gestational age were significant determinants of Postnatal growth failure or EUGR. Other neonatal factors which include mode of delivery, IUGR diagnosed on antenatal scan were unrelated to occurrence of EUGR.

- Early initiation of enteral feeds, earlier reaching of full enteral feeds and judicious use of Human milk fortifiers in LBW and preterm neonates were concluded to be protective against EUGR incidence
- Neonatal respiratory distress was the only neonatal complication among the studied complications which had significant association with EUGR and this is inturn would be contributed by delay in initiation of enteral feeds in these neonates and a catabolic state which creates more demand for the required nutrients.
- LBW neonates with above proven risk factors require additional monitoring and nutritional management to prevent the incidence of EUGR. This signifies the importance of formulating structured nutritional guidelines for these neonates with modifications in nutritional protocol to reduce the development of EUGR.

LIMITATIONS:

- Sample size was small to study the risk factors in EUGR neonates and to compare the complications in EUGR and Non-EUGR neonates.

- Follow up of the neonates after discharge was not done and hence the Long term complications of EUGR were not studied.

- Data was collected from a single centre and hence multi centre trials with higher level of evidence is required for validation of results.

SUMMARY:

- This Prospective cohort study was conducted in RL Jalappa hospital from January 2021 to December 2021.
- 90 Low birth weight neonates satisfying the inclusion and exclusion criteria were included in the study.
- The study was conducted in the way as explained in the methodology and the included neonates were divided in to EUGR and Non-EUGR groups. The characteristics and complications of the neonates in the EUGR was studied in this study.

Demographic factors:

- Among the 90 neonates, 53(58.9%) were EUGR and 37(41.1%) were Non-EUGR. Among the 53 EUGR neonates, 27(50.9%) were males and 26(49.1%) were females.Majority of EUGR neonates(85%) were born to mothers between the age of 18 to 28 years while 15% were born to mothers between 29 and 40 years.Both the factors had no association with EUGR.

Auxological factors:

- Among the auxological factors, mean discharge weight was 1.92+0.27 in Non-EUGR neonates and 1.87+0.23kg in EUGR neonates which was higher with a significant p value of <0.001 but it is however an obvious finding that EUGR neonates will have better weight at discharge.However other factors like Mean birth weight, Mean weight(mean of weight of the neonate in all 7days), Length and head circumference at birth and at discharge or at 7 days had no association with EUGR.

Maternal factors:

- Among the maternal factors, majority of EUGR neonates were Preterm (54.7%) while remaining were Term (45.3%). Majority of EUGR neonates were born to Multigravida mothers than Primigravida mothers but both the factors were not statistically significant with EUGR.
- Among the maternal risk factors, Maternal anemia was present in 67.9% EUGR and 5.4% Non EUGR neonates with a significant p value of <0.001 whereas Maternal hypertension was present in 71.7% EUGR and 5.4% Non EUGR neonates with a significant p value of <0.001 both of which had effective association with EUGR.

Neonatal factors:

- 79.2% EUGR and 59.5% Non-EUGR neonates were born SGA with significant p value of 0.042 signifying the factor that SGA neonates had strong association with EUGR. Among the other factors, Mode of delivery and IUGR on antenatal scan were not associated with EUGR.

Feeding strategies:

- Among the feeding strategies, late initiation of enteral feeds, delay in duration to reach complete enteral feeds had association with EUGR with significant p values of 0.016 and <0.001 respectively suggesting their intense association with EUGR.
- Human milk fortification protected the neonates from developing EUGR with significant p value of <0.001. Human milk fortifiers usage in Late preterm and SGA neonates is acceptable as it not only fortifies the human milk but also

uplift the mothers to feed babies with fortified human milk rather than formula feeds.

Neonatal complications:

- On comparing the neonatal complications between EUGR and Non-EUGR neonates, neonatal respiratory distress was higher in EUGR neonates with significant p value of <0.001 signifying the importance of their monitoring.
- This study concludes that modified nutritional protocol with early initiation of enteral feeds, early reaching of full enteral feeds with judicious use of HMF in LBW and Preterm neonates with the established risk factors turned out to be protective factors that can prevent EUGR.

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ANNEXURES

PROFORMA

Name:

IP NO:

Age:

Date of admission:

Address :

Date of delivery:

Place of delivery:

Date of discharge:

Education:

MATERNAL HISTORY:

Age :

Obstetric formula:

LMP:

EDD:

Maternal hypertension:

Pre eclampsia/Eclampsia:

Maternal heart disease:

Abruptio placenta:

Twin gestation:

IUGR:

DRUG HISTORY:

Antenatal steroids intake:

PERSONAL HISTORY:

Alcohol intake:

Smoking :

GENERAL CONDITION:

Height:

Weight:

BMI:

Haemoglobin :

Blood pressure:

NEONATAL FACTORS:

Gender:

Gestataional age:

AGA/SGA/LGA:

Mode of delivery:

Duration of hospital stay:

AUXOLOGICAL FACTORS:

Birth weight:

Time of minimum weight:

Discharge weight:

NUTRITIONAL FACTORS:

Feeding intolerance:

Time of initiation of enteral feeding:

Time to reach full enteral feeds:

TYPE OF FEED:

TYPE OF FEED	**DAY 1**	**DAY 2**	**DAY 3**	**DAY 4**	**DAY 5**	**DAY 6**	**DAY 7**
EXCLUSIVE BREAST FEEDING(DBF)							
EXCLUIVE FORMULA FEEDS							
DIRECT BREAST FEEDING+EBM							
HUMAN MILK FORTIFIERS(HMF)							
PARENTERAL NUTRITION							
PARENTERAL NUTRITION+ENTERAL NUTRITION							

COMPLICATIONS IN EUGR BABIES:

COMPLICATIONS	EUGR	NON-EUGR
Neonatal respiratory distress		
Neonatal hypoglycaemia		
Neonatal jaundice		
Neonatal sepsis		
Necrotising enterocolitis		
Feeding intolerance		

ANNEXURE-II

INFORMED CONSENT FORM

Date:

I, Mr/Mrs _____,have been explained in my own vernacular Language that my child will be included in the **"A PROSPECTIVE COHORT STUDY ON CHARACTERISTICS OF EXTRAUTERINE GROWTH RESTRICTION IN LOW BIRTH WEIGHT NEONATES "** hereby I give my valid written informed consent without any force or prejudice for recording the observations of haematological and clinical parameters. The nature and risks involved have been explained to me, to my satisfaction. I have been explained in detail about the study being conducted. I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, have been answered to my satisfaction. I provide consent voluntarily to allow my child as a participant in this research. I hereby give consent to providehistory, undergo physical examination, undergo the procedure, undergo investigations and provide its results and documents etc to the doctor / institute etc. For academic and scientific purpose, the operation / procedure, etc may be video graphed or photographed. All the data may be published or used for any academic purpose. I will not hold the doctors / institute etc responsible for any untoward consequences during the procedure / study.

_____

(Signature & Name of Pt. Attendant)

_____

(Signature/Thumb impression & Name of Patient/Guardian)

(Relation with patient)

Witness:

_____

(Signature & Name Research person/doctor)

ANNEXURE III

PATIENT INFORMATION SHEET

Principal investigator: **Dr MATHUMITHA T /Dr.K.N.V.PRASAD**

I **Dr. MATHUMITHA T**, Post graduate student in Department of Paediatrics at Sri Devaraj Urs Medical College will be conducting a study titled "**A PROSPECTIVE COHORT STUDY ON CHARACTERISTICS OF EXTRAUTERINE GROWTH RESTRICTION IN LOW BIRTH WEIGHT NEONATES"** for my dissertation under the guidance of Dr. K. N. V. PRASAD , Professor in Department of Paediatrics. The participants of this study include 90 neonates delivered at RLJH with low birth weight.

You will not be paid any financial compensation for the participation of your baby in this research project.

All the data will be kept confidential and will be used only for research purpose by this institution. You are free to provide consent for the participation of your baby in this study. You can also withdraw your baby from the study at any point of time without giving any reasons whatsover. Your refusal to participate will not prejudice you to any present or future care at this institution.

Name and Signature of the Principal Investigator

Contact number : 8220067333

Date-

ANNEXURE-IV

ಮಾಹಿತಿಯುತಸಮ್ಮತಿನಮೂನೆ

ದಿನಾಂಕ

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_____ಈ ಮೂಲಕ ನ ನು ನನನ ಮ ನಯ ಲಿಖಿತ ಮ ಹಿತಿಯುತ ಸಮಮತಿಯನುನ ಯ ವುದೇ ಬಲ ಅಥವ ಪೂವ ಾಗ್ರಹವಿಲಲದ, ಹೆಮ ಟೂಲ ಜಿಕಲ್ ಮತುು ವೈದ್ಯಕೇಯ ಮ ನದ್ಾಂಡಗೃ ಅವಲೂೀಕನಗೃನುನ ದ ಖಲಿಸಲುಅನುಮತಿಸುತಿುದದೇನೆ. ಅದ್ರಲಿಲ ರುವ ಸವಭ ವ ಮತುು ಅಪ ಯಗೃನುನ ನನಗೆ ತೃಪ್ತುಪಡಿಸಲು ವಿವರಿಸಲ ಗಿದ. ಈ ಅಧ್ಯಯನವನುನ ನ ನು ವಿವರವ ಗಿ ವಿವರವ ಗಿ ವಿವರವ ಗಿ ವಿವರವ ಗಿ ವಿವರವ ಗಿ ವಿವರಿಸುತ್ುೀನೆ. ನ ನು ರೂೀಗಿಯ ಮ ಹಿತಿ ಹ ಳೆಯನುನ ಓದಿದದೇನೆ ಮತುು ನನಗೆ ಯ ವುದೇ ಪರಶ್ನನ ಕೇಳಲು ಅವಕ ಶ ಇದ. ನ ನು ಕೇಳಿದ್ ಯ ವುದೇ ಪರಶ್ನನಗೆ ನನನ ತೃಪ್ತುಗೆ ಉತುರ ಸಿಕಿದ. ಈ ಸಾಂಶ್ನೂೀಧ್ನೆಯಲಿಲ ನನನ ಮಗ್ುವು ಭ ಗ್ವಹಿಸಲು ಅನುಮತಿಸಲು ನ ನು ಸವಯಾಂಪ್ರೇರಿತವ ಗಿ ಸಮಮತಿಯನುನ ಒದ್ಗಿಸುತ್ುೀನೆ. ನ ನು ಈ ಮೂಲಕ ಇತಿಹ ಸ ಒದ್ಗಿಸಲು, ದೈಹಿಕ ಪರಿೀಕ್ಷೆಗೆ ಒಳಗ ಗ್ಲು, ಕ ಯಾವಿಧ ನಕಿ ಒಳಪಡಿ, ತನಿಖೆಗೃನುನ ನಡೆಸಲು ಮತುು ಅದ್ರ ಫಲಿತ ಾಂಶಗ್ಳು ಮತುು ದ ಖಲಗೃನುನ ವೈದ್ಯರು/ ಸಾಂಸ್ಥೆಗೆ ಒದ್ಗಿಸಲು ಸಮಮತಿ ನಿೀಡುತ್ುೀನೆ. ಶ್ನೈಕ್ಷಣಿಕ ಮತುು ವೈಜ್ಞ ನಿಕ ಉದದೇಶಕ ೆಗಿ ಕ ಯ ಾಚರಣೆ / ಕ ಯಾವಿಧ ನ, ಇತ ಯದಿಗೃನುನ ವಿೀಡಿಯೊ ಗ ರಫ್ ಅಥವ ಛ ಯ ಚಿತರದ್ಲಿಲ ಸ್ಥರಹಿಡಿಯುವಾಂತ್ ಮ ಡಬಹುದ್ುು. ಎಲ ಲ ದ್ತ ುಾಂಶಗೃನುನ ಪರಕಸಬಸಬಹುದ್ುು ಅಥವ ಯ ವುದೇ ಶ್ನೈಕ್ಷಣಿಕ ಉದದೇಶಕ ೆಗಿ ಬಳಸಬಹುದ್ುು. ಕ ಯಾವಿಧ ನ / ಅಧ್ಯಯನದ್ ಸಮಯದ್ಲಿಲ ಯ ವುದೇ ಅಹಿತಕರ ಪರಿಣ ಮಗ್ಳಿಗೆ ನ ನು ವೈದ್ಯರು / ಸಾಂಸ್ಥೆ ಇತ ಯದಿಗೃನುನ ಜವ ಬ್ ದರರನ ನಗಿ ಮ ಡುವುದಿಲಲ.

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(ಸಹಿ & PT. ಅಟಾಂಡೆಾಂಟ್ ಹೆಸರು) (ಸಹಿ/ಹೆಬ್ಬೆರಳು ಗ್ುರುತು
ರೂೀಗಿ/ಪ ಲಕರ ಹೆಸರು)
(ರೂೀಗಿಯೊಾಂದಿಗಿನ ಸಾಂಬಾಂಧ್)
ಸ ಕ್ಷಿ:

_____
(ಸಹಿ & ಸಾಂಶ್ನೂೀಧ್ನೆ ವಯಕು/ವೈದ್ಯರ ಹೆಸರು)

ANNEXURE V

ರೋಗಿಮಾಹಿತಿಹಾಳೆ

ಶೀರ್ಷಿಕೆ : **ಕಡಿಮೆ ಜನನ ತೂಕದ ನವಜಾತ ಶಶುಗಳಲ್ಲಿನ ಬಾಹ್ಯ ಬೆಳವಣಿಗೆಯ ನಿರ್ಿಂಧದ ಗುಣಲಕ್ಷಣಗಳು ಮತ್ತು ತೊಡಕುಗಳ ರ್ಿ ಒಂದು ಪ್ರಾಯೀಗಿಕ ಸಮನವಯ ಅಧಯಯನ**

ಮುಖ್ಯ ಸಂಶೋಧಕಿ: ಡಾ.ಮಥುಮಿತಾ ಟಿ (ಡಾ.ಕೆ.ಎನ್.ವಿ.ಪ್ರಸಾದ್)

ಡಾ. ಮಥುಮಿತಾ ಟಿ ಮತ್ತು ಶಾ ೀ ದೇವರಾಜ ಅರಸ್ ವೈದಯಕೀಯ ಕಾಲೇಜಿನ ಮಕಕಳ ವಿಭಾಗದ ಸ್ನಾತಕೀತುರ ವಿದ್ಯಯರ್ಥಿ ಮಾಥುಮಿತಾ ಟಿ ಮತ್ತು ಸ್ನಾತಕೀತುರಪದವಿ ವಿದ್ಯಯರ್ಥಿ ಡಾ.ಕೆ.ಎನ್.ವಿ.ಪ್ರಸಾದ್ ಅವರ ಮಾರ್ಗದರ್ಶನದಲ್ಲಿ ನನನ ಪ್ರಬಂಧಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಕಡಿಮೆ ಜನನ ತೂಕದ ನಿಯಾನೇಟ್ ಳ ಗುಣಲಕ್ಷಣಳು ಮತ್ತು ತೊಡಕುಳ ಬಗ್ಗೆ ಅಧಯಯನ ನಡೆಸಿ, ನನನ ಪಾಬಂಧಕೆಕ ಸಂಬಂಧಿಸಿದಂತೆ ಒಂದು ಅಧಯಯನ ವನ್ನನ ನಡೆಸಲಾಗುವುದು. ಈ ಅಧಯಯನದ ಸಪಧಿಗಳು ಆರ್.ಎಲ್.ಜೆ.ಎಚ್ ನಲ್ಲಿ ಹೆರಿಗ್ಗಯಾದ 90 ಶಿಶುಳು ಕಡಿಮೆ ಜನನ ತೂಕದಂದಿಗ್ಗ ವಿತರಿಸಲ್ಪಪತುವೆ.

ಈ ಸಂಶೋಧನಾ ಯೋಜನೆಯಲ್ಲಿ ನಿಮಮ ಮಗುವಿನ ಭಾರ್ವಹಿಸುವಿಕೆಗ್ಗ ನಿಮಗ್ಗ ಯಾವುದೇ ಆರ್ಥಗಕ ಪ್ರಿಹಾರ ನಿೋಡಲಾಗುವುದಿಲಿ.

ಎಲಾ ದತಾುಂರ್ಯನ್ನನ ಗೌಪ್ಯವಾಗಿಇಡಲಾಗುತುದೆ ಮತ್ತು ಈ ಸಂಸ್ಥೆಯು ಕೇವಲ ಸಂಶೋಧನಾ ಉದೆದೋರ್ಕೆಗಿ ಮಾತರ ಬಳಸಲಪಡುತುದೆ. ಈ ಅಧಯಯನದಲ್ಲಿ ನಿಮಮ ಮಗುವಿನ ಪಾಲ್ಗೆಳುುವಿಕೆಗ್ಗ ಸಮಮತಿಯನ್ನನ ಒದಗಿಸಲ್ಪ ನಿೋವು ಸವತಂತರರು. ಯಾವುದೇ ಕ್ಕರಣಳನ್ನನ ನಿೋಡದೆ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನಿೋವು ನಿಮಮ ಮಗುವನ್ನನ ಅಧಯಯನದಿಂದ ಹಿಂದೆಗ್ಗದುಕೊಳುಬಹುದು. ನಿೋವು ಭಾರ್ವಹಿಸಲ್ಪ ನಿರಾಕರಿಸುವುದರಿಂದ ಈ ಸಂಸ್ಥೆಯಲ್ಲಿ ಯಾವುದೇ ವತಗಮಾನ ಅಥವಾ ಭವಿಷ್ಯದ ಆರೈಕೆಗ್ಗ ನಿೋವು ಪೂವಗರ್ರಹಪೋಡಿತರಾಗುವುದಿಲಿ.

ಪ್ರಧಾನ ಪ್ರಿಶೋಧಕರ ಹೆಸರು ಮತ್ತು ಸಹಿ

ದಿನಾಂಕ-

KEY TO MASTER CHART

A- SERIAL NUMBER

B- GENDER

C- GESTATION

D- BIRTH WEIGHT

E- MEAN WEIGHT

F- OBSTETRIC SCORE

G- MATERNAL HYPERTENSION

H- MATERNAL ANEMIA

I- MATERNAL HEART DISEASE

J- IUGR

K- ANTENATAL STEROIDS

L- ALCOHOL OR SMOKING

M- AGA/SGA/LGA

N- MODE OF DELIVERY

O- TIME OF MINIMUM WEIGHT

P- DISCHARGE WEIGHT

Q- TIME OF INITIATION OF ENTERAL FEEDS

R- TIME TO REACH FULL ENTERAL FREEDS

S- EUGR/NON-EUGR

T- NEONATAL RESPIRATORY DISTRESS

U-NEONATAL HYPOGLYCEMIA

V-NEONATAL HYPERBILIRUBINEMIA

W-NEONATAL SEPSIS

X-NEC

Y-FEEDING INTOLERANCE

Z-LENGTH

AA-HEAD CIRCUMFERENCE

AB-HM FORTIFICATION

AC-KCAL/KG/DAY ON DAY 1

AD-KCAL/KG/DAY ON DAY 3

AE-KCAL/KG/DAY ON DAY 7

MASTER CHART

SI NO	Name	GENDER	GESTATIONAL AGE	BIRTH WEIGHT	MEAN WEIGHT	OBSTETRIC SCORE	MATERNAL HYPERTENSION	MATERNAL ANEMIA	MATERNAL HEART DISEASE	IUGR	ANTENATAL STEROIDS	ALCOHOL OR SMOKING	AGA/SGA/LGA	MODE OF DELIVERY	TIME OF MINIMUM WEIGHT	DISCHARGE WEIGHT	TIME OF INITIATION OF ENTERAL FEEDS	TIME TO REACH FULL ENTERAL FEEDS	EUGR/NON EUGR	NEONATAL RDS	NEONATAL HYPOGLYCEMIA	NEONATAL HYPERBILIRUBINEMIA	NEONATAL SEPSIS	NEC	FEEDING INTOLERANCE	LENGTH	HEAD CIRCUMFERENCE	HM FORTIFICATION	KCAL/KG/DAY ON DAY 1	KCAL/KG/DAY ON DAY 3	KCAL/KG/DAY ON DAY 7
1	B/O AYESHA BEGUM	FEMALE	37 WEEKS	1.98KG	1.89	G2P1L1	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.9 KG	DAY 2	DAY 8	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	44CM	31CM	NO	27 KCAL	48 KCAL	85 KCAL
2	B/O KAVYA	MALE	36 WEEKS	1.86KG	1.72	PRIMI	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.82KG	6 HOURS	DAY 2	non EUGR	NO	NO	NO	NO	NO	NO	44CM	30CM	YES	28 KCAL	55 KCAL	128 KCAL
3	B/O NAWAZIYA	FEMALE	36+1	2.46KG	2.31	PRIMI	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 6	2.42KG	6 HOURS	DAY 3	non EUGR	NO	NO	NO	NO	NO	NO	46CM	33CM	NO	33 KCAL	96 KCAL	130 KCAL
4	B/O GANGARATHNA	MALE	35 WEEKS	2.16KG	2.06	G3P1A1	YES	YES	NO	NO	NO	NO	AGA	LSCS	DAY 3	2 KG	Day 2	DAY 7	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	27 KCAL	50 CAL	96 KCAL
5	B/O SRILAKSHMI	MALE	37 WEEKS	2.08KG	1.99	PRIMI	NO	YES	NO	IUGR	NO	NO	SGA	NVD	DAY 4	2 KG	6 HOURS	DAY 2	EUGR	NO	NO	PRESENT	PRESENT	NO	NO	45CM	32CM	NO	33.2 KCAL	75 KCAL	124 KCAL
6	B/O CHAITRA	FEMALE	37+2	2.08KG	1.97	G5A4	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 6	2KG	DAY 2	DAY 5	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	22 KCAL	50 KCAL	85 KCAL
7	B/O SUNANDA	MALE	36+2	2.46KG	2.36	PRIMI	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 5	2.4 KG	30 MIN	30MIN	non EUGR	NO	NO	NO	PRESENT	NO	NO	47CM	33CM	NO	48 KCAL	65 KCAL	112 KCAL
8	B/O ASWINI	MALE	37 WEEKS	1.9KG	1.89	G3P2L1	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.8 KG	DAY 2	DAY 8	EUGR	PRESENT	NO	PRESENT	PRESENT	NO	NO	44CM	31CM	YES	28 KCAL	56 KCAL	88 KCAL
9	B/O KANCHANA	MALE	38 WEEKS	2.14KG	2.05	G2P1L1	YES	YES	NO	NO	NO	NO	SGA	LSCS	DAY 5	2 KG	DAY 2	DAY 7	EUGR	NO	NO	PRESENT	NO	NO	PRESENT	45CM	32CM	NO	30 KCAL	60 KCAL	78 KCAL
10	B/O POOJA	MALE	37+1	1.72 KG	1.66	G3A2	NO	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.6 KG	DAY 2	DAY 7	EUGR	PRESENT	NO	NO	NO	NO	NO	44CM	31CM	NO	27 KCAL	58 KCAL	80 KCAL
11	B/O SHAFIYA	MALE	36+2	1.56KG	1.46	G3P1L1A1	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 6	1.48KG	8 HOURS	DAY 5	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	43CM	29CM	NO	28 KCAL	66 KCAL	128 KCAL
12	B/O RAMADEVI	FEMALE	36+1	2.14KG	1.9	G2P1L1D1	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 5	2.1KG	24 HOURS	DAY 6	non EUGR	NO	NO	NO	PRESENT	NO	PRESENT	45CM	32CM	YES	26 KCAL	51 KCAL	79 KCAL
13	B/O BHARATHI	MALE	37 WEEKS	2.28 KG	2.21	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	VAVD	DAY 1	2.2KG	40MIN	40MIN	non EUGR	NO	NO	NO	NO	NO	NO	46CM	32CM	NO	35 KCAL	52.6 KCAL	71 KCAL
14	B/O AMEENA KOUSER	MALE	36 WEEKS	2.06 KG	2	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 5	2 KG	6 HOURS	DAY 3	EUGR	NO	NO	PRESENT	NO	NO	NO	45CM	30CM	NO	33 KCAL	60 KCAL	110 KCAL
15	B/O ARSHIYA	FEMALE	36+4	2.46 KG	2.3	PRIMI	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 6	2.4 KG	30MIN	30MIN	non EUGR	NO	NO	NO	NO	NO	NO	47CM	33CM	YES	33 KCAL	55 KCAL	101 KCAL
16	B/O HEMA	FEMALE	37 WEEKS	2.4 KG	2.36	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	2.32 KG	30MIN	30MIN	non EUGR	NO	NO	NO	NO	NO	NO	46CM	32CM	NO	30 KCAL	58 KCAL	80 KCAL
17	B/O GANGAMMA	FEMALE	35+6	2.3KG	2.24	G2A1	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 4	2.32 KG	40MIN	40MIN	non EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	NO	40 KCAL	70 KCAL	120 KCAL
18	B/O MALLIKA	MALE	37 WEEKS	2.02 KG	1.94	G5P4L1D3	YES	NO	NO	NO	NO	NO	SGA	LSCS	DAY 4	1.92 KG	7 HOURS	DAY 4	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	46CM	33CM	NO	27 KCAL	62 KCAL	112 KCAL
19	B/O RAMYA	MALE	36 WEEKS	1.74 KG	1.68	G2P1L1	NO	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.68KG	6 HOURS	DAY 6	EUGR	N0	NO	NO	NO	NO	PRESENT	46CM	32CM	NO	33 KCAL	58 KCAL	106 KCAL
20	B/O MUBEENA	FEMALE	36+3	1.8KG	1.7	G2 A1	NO	YES	NO	IUGR	NO	NO	SGA	NVD	DAY 5	1.72KG	6 HOURS	DAY 3	non EUGR	NO	NO	PRESENT	PRESENT	NO	NO	47CM	32CM	YES	28 KCAL	56 KCAL	88 KCAL
21	B/O CHANDRAKALA-1	FEMALE	36+1	1.7KG	1.64	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.7 KG	6 HOURS	24 hours	non EUGR	NO	NO	PRESENT	NO	NO	NO	46CM	33CM	YES	30 KCAL	60 KCAL	78 KCAL
22	B/O CHANDRAKALA-2	FEMALE	36+1	1.6KG	1.56	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.58KG	6 HOURS	DAY 3	non EUGR	NO	NO	NO	NO	NO	NO	45CM	32CM	YES	27 KCAL	58 KCAL	80 KCAL
23	B/O DEEPA-I	MALE	36+6	1.68KG	1.56	PRIMI	YES	YES	YES	IUGR	NO	NO	SGA	LSCS	DAY 4	1.62KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	46CM	31CM	YES	33 KCAL	62 KCAL	122 KCAL
24	B/O DEEPA-2	MALE	36+6	1.98KG	1.86	PRIMI	YES	YES	YES	IUGR	NO	NO	SGA	LSCS	DAY 5	1.82 KG	8 HOURS	DAY 4	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	47CM	32CM	NO	32 KCAL	58 KCAL	114 KCAL
25	B/O AMEENA	FEMALE	42+2	2.2KG	2.12	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	2.1 KG	30MIN	30MIN	EUGR	NO	NO	NO	PRESENT	NO	NO	46CM	33CM	NO	38 KCAL	62 KCAL	124 KCAL
26	B/O PUNIDA	MALE	40+4	2.06KG	1.99	PRIMI	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.9 KG	6 HOURS	DAY 2	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	46CM	32CM	NO	40 KCAL	60 KCAL	110 KCAL
27	B/O KEMPAMMA	FEMALE	35 WEEKS	2.06KG	1.96	G2P1L1	NO	NO	NO	NO	3 DOSES	NO	AGA	LSCS	DAY 4	2KG	14 HOURS	DAY 4	non EUGR	PRESENT	NO	PRESENT	NO	NO	NO	47CM	33CM	YES	28 KCAL	56 KCAL	82 KCAL
28	B/O PRIYANKA	MALE	37 WEEKS	2.2KG	2.04	PRIMI	NO	NO	NO	NO	NO	NO	SGA	NVD	DAY 3	2.16KG	40MIN	40MIN	non EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	YES	30 KCAL	52 KCAL	79 KCAL
29	B/O SHASHIKALA	MALE	36+6	1.52KG	1.45	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.42KG	8 HOURS	DAY 4	EUGR	NO	NO	PRESENT	NO	NO	PRESENT	45CM	31CM	NO	36 KCAL	58 KCAL	112 KCAL
30	B/O SUMA	MALE	36+3	2.22KG	2.1	G2P1L1	NO	YES	NO	NO	NO	NO	AGA	LSCS	DAY 4	2KG	16 HOURS	24 HOURS	EUGR	NO	NO	NO	NO	NO	NO	47CM	32CM	NO	28 KCAL	55 KCAL	102 KCAL
31	B/O MERLIN	FEMALE	37+4	1.98KG	1.9	G2P1L1	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.9 KG	6 HOURS	DAY 3	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	45CM	32CM	NO	30 KCAL	60 KCAL	108 KCAL
32	B/O PRANITHA	FEMALE	38+2	2.08KG	1.99	G5A4	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	2 KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	28 KCAL	58 KCAL	110 KCAL
33	B/O ANITHA	MALE	36+6	1.72KG	1.66	G3P2L2	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.65KG	24 HOURS	DAY 2	non EUGR	NO	NO	NO	NO	NO	PRESENT	46CM	31CM	YES	33 KCAL	49 KCAL	90 KCAL
34	B/O MALLIKA	MALE	37 WEEKS	2.02KG	1.94	G5P4L1D3	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 5	1.88KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	NO	NO	PRESENT	PRESENT	47CM	32CM	NO	35 KCAL	70 KCAL	130 KCAL
35	B/O LASHMIDEVI	MALE	37+5	2.24KG	2.15	G3P3L2	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	2.18KG	30 MIN	30MIN	EUGR	NO	NO	NO	NO	NO	NO	47CM	33CM	NO	38 KCAL	60KCAL	128 KCAL
36	B/O SUDHA	MALE	35 WEEKS	1.74KG	1.7	G2P1L1	NO	NO	NO	NO	2 DOSES	NO	AGA	LSCS	DAY 3	1.8 KG	24 HOURS	DAY 3	non EUGR	NO	NO	PRESENT	NO	NO	NO	46CM	32CM	YES	28 KCAL	52 KCAL	89 KCAL
37	B/O MARY	FEMALE	36+4	1.82KG	1.68	G2P1L1	YES	YES	NO	IUGR	2 DOSES	NO	SGA	NVD	DAY 4	1.72KG	12 HOURS	DAY 4	EUGR	PRESENT	NO	PRESENT	PRESENT	NO	PRESENT	47CM	32CM	NO	30 KCAL	56 KCAL	114 KCAL
38	B/O RAJITHA	FEMALE	37 WEEKS	1.8KG	1.7	G2P1L1	NO	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.74KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	PRESENT	NO	NO	PRESENT	47CM	31CM	NO	28 KCAL	64 KCAL	126 KCAL
39	B/O MADHU	FEMALE	35 WEEKS	1.74KG	1.66	G2A1	YES	NO	NO	NO	NO	NO	AGA	LSCS	DAY 3	1.68KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	29 KCAL	58 KCAL	122 KCAL
40	B/O SINDHU	FEMALE	38+5	2.22KG	2.14	G2P1L1	NO	NO	NO	IUGR	NO	NO	SGA	NVD	DAY 3	2.2 KG	30MIN	30 MIN	non EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	YES	36 KCAL	50 KCAL	80 KCAL
41	B/O SUDHARSHINI	MALE	36 WEEKS	1.62KG	1.56	PRIMI	NO	NO	NO	IUGR	4 DOSES	NO	SGA	LSCS	DAY 4	1.6 KG	24 HOURS	DAY 2	non EUGR	NO	NO	PRESENT	YES	NO	NO	46CM	31CM	YES	37.1 KCAL	57.3 KCAL	96 KCAL
42	B/O FIRDOSE	FEMALE	35 WEEKS	1.74KG	1.68	G2P1L1	NO	YES	NO	NO	NO	NO	AGA	LSCS	DAY 4	1.8 KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	47CM	32CM	NO	42 KCAL	85 KCAL	123 KCAL
43	B/O MUBEENA	FEMALE	37 WEEKS	1.8KG	1.7	G2A1	NO	YES	NO	IUGR	NO	NO	SGA	NVD	DAY 3	1.82 KG	24 HOURS	DAY 3	non EUGR	NO	NO	NO	NO	NO	NO	47CM	32CM	YES	27.2 KCAL	70 KCAL	88 KCAL
44	B/O SHWETHA	FEMALE	35 WEEKS	2.06KG	1.98	PRIMI	YES	NO	NO	NO	NO	NO	AGA	NVD	DAY 6	2.02 KG	24 HOURS	DAY 3	non EUGR	NO	NO	PRESENT	NO	NO	PRESENT	47CM	33CM	NO	33.2 KCAL	30 KCAL	77.8 KCAL
45	B/O SUNANDA	FEMALE	41 WEEKS	2.2KG	2.14	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.98 KG	30 MIN	30 MIN	EUGR	NO	NO	NO	PRESENT	NO	NO	48CM	34CM	NO	36.5 KCAL	60 KCAL	110 KCAL
46	B/O SUCHITRA	MALE	36+6	1.98KG	1.9	PRIMI	NO	NO	YES(SEV T	IUGR	3 DOSES	NO	SGA	LSCS	DAY 5	1.92 KG	22 HOURS	DAY 2	non EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	32CM	YES	40.4 KCAL	60.2 KCAL	80 KCAL
47	B/O POORVIKA	FEMALE	36+1	1.7KG	1.58	PRIMI	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.6 KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	32CM	YES	32 KCAL	56 KCAL	122 KCAL
48	B/O LEKHA	FEMALE	36+3	1.6KG	1.56	G2A1	NO	NO	NO	IUGR	3 DOSES	NO	SGA	LSCS	DAY 4	1.62 KG	24 HOURS	DAY 3	non EUGR	NO	NO	PRESENT	NO	NO	NO	45CM	31CM	YES	30 KCAL	50 KCAL	81 KCAL
49	B/O GEETHA	MALE	36+6	1.68KG	1.58	PRIMI	YES	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.62KG	10 HOURS	DAY 4	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	38 KCAL	68 KCAL	128 KCAL
50	B/O SWATHI	MALE	35+4 DAYS	1.74KG	1.69	G5P3L2A1	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.8KG	6 HOURS	DAY 3	EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	NO	28 KCAL	72 KCAL	114 KCAL

MASTER CHART

51	B/O PRIYA	MALE	37+5	2.24KG	2.18	G3P2L2	NO	NO	NO	IUGR	NO	NO	SGA	NVD	DAY 5	2.22 KG	30MIN	30MIN	non EUGR	NO	NO	NO	NO	NO	NO	48CM	33CM	YES	35 KCAL	68 KCAL	100 KCAL
52	B/O SUBHIKSHA	FEMALE	36+4	1.92KG	1.86	G2A1	YES	YES	NO	IUGR	NO	NO	SGA	NVD	DAY 5	1.8 KG	8 HOURS	DAY 4	EUGR	NO	NO	NO	NO	NO	PRESENT	47CM	32CM	NO	34 KCAL	70 KCAL	120 KCAL
53	B/O AISHWARYA	MALE	35+2	1.53KG	1.42	G2P1L1	YES	NO	NO	IUGR	4 DOSES	NO	SGA	NVD	DAY 6	1.4 KG	12 HOURS	DAY 10	EUGR	PRESENT	NO	PRESENT	PRESENT	NO	PRESENT	44CM	30CM	NO	26 KCAL	40 KCAL	82 KCAL
54	B/O DEEPIKA	MALE	35+1	1.9KG	1.84	PRIMI	YES	YES	NO	IUGR	2 DOSES	NO	SGA	NVD	DAY 4	1.8 KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	32CM	NO	35 KCAL	64 KCAL	118 KCAL
55	B/O ANJALI	MALE	37+1	2.1KG	1.99	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	2 KG	6 HOURS	DAY 4	EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	NO	33 KCAL	52.4 KCAL	115.3 KCAL
56	B/O KAVERI HBSAG +VE	MALE	36 WEEKS	2.22KG	2.16	G2P1L1	NO	NO	NO	NO	NO	NO	AGA	NVD	DAY 6	2.2 KG	2 HOURS	DAY 2	non EUGR	NO	NO	NO	NO	NO	NO	48CM	34CM	YES	40 KCAL	54 KCAL	85 KCAL
57	B/O MUNILAKSHMI	FEMALE	35 WEEKS	1.82KG	1.72	G2P1L1	YES	NO	NO	NO	2 DOSES	NO	AGA	NVD	DAY 5	1.72 KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	NO	NO	NO	NO	47CM	33CM	NO	34 KCAL	48 KCAL	112 KCAL
58	B/O KAVYASHREE	FEMALE	35+5	1.58KG	1.4	G2P1L1	NO	YES	NO	IUGR	NO	NO	SGA	NVD	DAY 3	1.48KG	DAY 2	DAY 3	EUGR	NO	NO	NO	PRESENT	NO	NO	45CM	31CM	YES	33 KCAL	52 KCAL	108 KCAL
59	B/O BHAVYA	FEMALE	35+2	1.97KG	1.86	G2A1	NO	NO	NO	IUGR	1 DOSE	NO	SGA	LSCS	DAY 6	1.9 KG	24 HOURS	DAY 3	non EUGR	NO	NO	NO	PRESENT	NO	NO	46CM	32CM	YES	33.7 KCAL	51 KCAL	84 KCAL
60	B/O SUKRUTHA	MALE	36 WEEKS	2.26KG	2.1	G2A1	YES	YES	NO	NO	NO	NO	AGA	LSCS	DAY 7	2.1 KG	12 HOURS	DAY 4	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	48CM	34CM	NO	33 KCAL	59 KCAL	89 KCAL
61	B/O SUNITHA	FEMALE	37+2	1.7KG	1.62	G5P2L0A2	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.6 KG	6 HOURS	DAY 3	EUGR	NO	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	27.6 KCAL	82 KCAL	126 KCAL
62	B/O SHAISTA	MALE	38+3	2.08KG	2	G5P3L3A1	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 2	2 KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	47CM	33CM	NO	33.1 KCAL	64 KCAL	115 KCAL
63	B/O MALA-1	MALE	35+4	2.02KG	1.94	PRIMI	NO	NO	NO	NO	4 DOSES	NO	AGA	LSCS	DAY 4	2 KG	24 HOURS	DAY 3	non EUGR	NO	NO	PRESENT	NO	NO	NO	46CM	32CM	YES	33.4 KCAL	50.3 KCAL	79.2 KCAL
64	B/O MALA-2	MALE	35+4	2.1KG	2.02	PRIMI	YES	YES	NO	NO	4 DOSES	NO	AGA	LSCS	DAY 3	1.94 KG	6 HOURS	DAY 4	EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	33CM	NO	39 KCAL	63 KCAL	114.7 KCAL
65	B/O SUMANGALA	MALE	36 WEEKS	2.22KG	2.14	G2P1L1	NO	NO	NO	NO	NO	NO	AGA	NVD	DAY 4	2.16KG	30 MIN	30 MIN	non EUGR	NO	NO	PRESENT	NO	NO	NO	48CM	33CM	NO	54 KCAL	72 KCAL	91 KCAL
66	B/O KEERTHANA	MALE	36+3	2.24KG	2.12	G2P1L1	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 4	2.2 KG	30MIN	DAY 2	non EUGR	NO	NO	NO	NO	NO	NO	48CM	34CM	YES	28.2 KCAL	45 KCAL	75 KCAL
67	B/O JANA	FEMALE	36+6	1.52KG	1.44	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 5	1.4 KG	12 HOURS	DAY 4	EUGR	NO	NO	PRESENT	PRESENT	NO	PRESENT	45CM	31CM	NO	35.3 KCAL	88 KCAL	115 KCAL
68	B/O PAVITHRA	MALE	37 WEEKS	2.2KG	2.14	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	NVD	DAY 3	2.2 KG	30MIN	30 MIN	non EUGR	NO	NO	PRESENT	NO	NO	NO	48CM	33CM	NO	36.5 KCAL	54 KCAL	91.3 KCAL
69	B/O RAMYA	FEMALE	35 WEEKS	2.04KG	1.96	G2P1L1	YES	YES	NO	NO	NO	NO	AGA	LSCS	DAY 4	1.92 KG	24 HOURS	DAY 8	EUGR	PRESENT	NO	PRESENT	NO	NO	YES	46CM	33CM	NO	40 KCAL	41 KCAL	74 KCAL
70	B/O HEMA	FEMALE	36 WEEKS	1.82KG	1.78	G2P1L1	NO	NO	NO	IUGR	2 DOSES	NO	SGA	LSCS	DAY 4	1.8 KG	24 HOURS	DAY 2	non EUGR	NO	NO	NO	NO	NO	NO	46CM	32CM	YES	27.2 KCAL	62 KCAL	90 KCAL
71	B/O MERCY	FEMALE	36 WEEKS	2KG	1.92	G2P1L1	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	2 KG	DAY 2	DAY 3	non EUGR	NO	NO	PRESENT	PRESENT	NO	NO	46CM	33.5CM	YES	27.2 KCAL	76 KCAL	85 KCAL
72	B/O RESHMI	MALE	38 WEEKS	2.34KG	2.28	G2P1L1	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	2.3KG	30 MIN	30 MIN	non EUGR	NO	PRESENT	PRESENT	NO	NO	NO	47CM	33CM	YES	32 KCAL	83 KCAL	122 KCAL
73	B/O MEGHANA	MALE	35+2	1.58KG	1.48	PRIMI	NO	NO	NO	IUGR	4 DOSES	NO	SGA	NVD	DAY 4	1.56 KG	DAY 2	DAY 3	non EUGR	PRESENT	NO	PRESENT	PRESENT	NO	NO	45CM	31CM	YES	27.3 KCAL	58 KCAL	110 KCAL
74	B/O KEERHI	MALE	36 WEEKS	2.2KG	1.96	G2A1	YES	YES	NO	NO	NO	NO	AGA	NVD	DAY 4	1.9 KG	30 MIN	30 MIN	EUGR	NO	NO	NO	NO	NO	NO	47CM	33CM	NO	36 KCAL	97 KCAL	115 KCAL
75	B/O UMA	MALE	37 WEEKS	1.63KG	1.54	PRIMI	NO	NO	NO	NO	4 DOSES	NO	SGA	NVD	DAY 6	1.62 KG	DAY 2	DAY 2	non EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	YES	20 KCAL	65 KCAL	90 KCAL
76	B/O SUGUNA	MALE	38+2	2.26KG	2.2	PRIMI	NO	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	2 KG	30 MIN	30 MIN	EUGR	NO	NO	PRESENT	NO	NO	NO	48CM	33CM	NO	53 KCAL	88 KCAL	108 KCAL
77	B/O VENNILA	FEMALE	40+5	2.28KG	2.2	G2A1	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.92 KG	DAY 2	DAY 6	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	47CM	33.5CM	NO	20 KCAL	40 KCAL	90 KCAL
78	B/O KEERTHANA	MALE	35+1	1.9KG	1.8	G2P1L1	YES	NO	NO	NO	NO	NO	AGA	NVD	DAY 4	1.8 KG	DAY 2	DAY 7	EUGR	PRESENT	NO	PRESENT	NO	NO	NO	46CM	32CM	NO	21 KCAL	50 KCAL	75 KCAL
79	B/O SEETHA	FEMALE	35 WEEKS	1.72KG	1.6	PRIMI	NO	YES	NO	NO	3 DOSES	NO	SGA	NVD	DAY 4	1.62 KG	22 HOURS	DAY 10	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	46CM	31CM	NO	28 KCAL	42 KCAL	69.5 KCAL
80	B/O AARTHI	MALE	36+6	1.98KG	1.89	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 4	1.9 KG	6 HOURS	DAY 2	EUGR	NO	NO	NO	NO	NO	NO	47CM	32CM	NO	28.5 KCAL	74 KCAL	128 KCAL
81	B/O KARTHIGA	FEMALE	41+2	2.2KG	2	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.98 KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	NO	NO	NO	NO	48CM	33CM	NO	54 KCAL	91 KCAL	109 KCAL
82	B/O NAGARANI	FEMALE	39 WEEKS	2.2KG	2.08	G3P2L2	NO	NO	NO	IUGR	NO	NO	SGA	NVD	DAY 3	2 KG	30MIN	30MIN	EUGR	NO	NO	PRESENT	NO	NO	NO	47CM	33CM	NO	54 KCAL	91 KCAL	109 KCAL
83	B/O RAMYA	FEMALE	40+1	2.3KG	2	G3P1L1A1	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 2	2 KG	30MIN	30MIN	EUGR	NO	NO	NO	NO	NO	NO	47CM	32CM	NO	52 KCAL	87 KCAL	106 KCAL
84	B/O REKHA	FEMALE	36+4	1.78KG	1.7	G2P1L1	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.62 KG	8 HOURS	DAY 6	EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	32CM	NO	28 KCAL	47 KCAL	108 KCAL
85	B/O ANJALI-2	MALE	37+4	2.1KG	1.98	PRIMI	YES	YES	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.94 KG	6 HOURS	DAY 5	EUGR	PRESENT	NO	NO	PRESENT	NO	NO	46CM	32CM	NO	32 KCAL	63 KCAL	114 KCAL
86	B/O NANDHINI	MALE	37+5	1.74KG	1.64	PRIMI	NO	NO	NO	IUGR	NO	NO	SGA	LSCS	DAY 3	1.7 KG	1 HOUR	DAY 2	non EUGR	NO	NO	PRESENT	NO	NO	NO	46CM	32CM	YES	28.4 KCAL	77 KCAL	113 KCAL
87	B/O HARSHIYA BANU	FEMALE	37+2	2.48KG	2.4	G2P1L1	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 3	2.26 KG	12 HOURS	DAY 2	non EUGR	NO	NO	PRESENT	PRESENT	NO	NO	48CM	34CM	NO	28.6 KCAL	84 KCAL	126 KCAL
88	B/O NIVEDITA-1	FEMALE	35+2	2KG	1.82	PRIMI	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 5	2.2 KG	6 HOURS	DAY 2	non EUGR	NO	NO	NO	NO	NO	NO	47CM	33CM	YES	28.5 KCAL	74 KCAL	128 KCAL
89	B/O NIVEDITA-2	FEMALE	35+2	2.14KG	1.88	PRIMI	YES	YES	NO	NO	NO	NO	AGA	LSCS	DAY 5	1.94KG	12 HOURS	DAY 6	EUGR	PRESENT	NO	NO	NO	NO	NO	46CM	33CM	NO	28 KCAL	58 KCAL	80 KCAL
90	B/O PUJITHA	MALE	36+5	2.26KG	2.2	PRIMI	NO	NO	NO	NO	NO	NO	AGA	LSCS	DAY 3	2.2KG	30 MIN	30MIN	non EUGR	NO	NO	NO	NO	NO	NO	47CM	33CM	YES	35 KCAL	71 KCAL	88 KCAL