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Comparing neonatal outcome of late preterm: Intrauterine growth restricted (IUGR) average for gestational age infants

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Abstract
Comparing Neonatal outcome of late preterm -Intrauterine growth restricted (IUGR) vs Average for Gestational age (AGA) infants.
Background: Individuals who had IUGR experience a range of poorer developmental outcomes, encompassing cognitive, socioemotional, and behavioral domains, compared with individuals who were born appropriate for gestational age (AGA).The primary aim was to evaluate neonatal outcome in late preterm IUGR and SGA infants and comparing them.
Methods: Out of 3256 total live births, late preterm births are 341(10.4%). Incidence of IUGR in late preterm infants is 71/341(2.15%) and AGA is 170/341(8.25%). We analysed 100 singleton pregnancies, 50 infants with birth weight less than 10th percentile, control group with 50 infants with birth weight between 11-89 percentile at 34-36+6 weeks gestational age. The control group consisted of spontaneous preterm delivery at the same gestational age.Birth weight percentiles were based on the standard growth curve of Alexander et al.
Results: There was a significant difference in mean birth weight between the two groups (IUGR: 1720g and AGA: 2495g). The frequency of cesarean sections was 64% in the IUGR group and 26% in the AGA group. 3 neonates of the IUGR group and one of the AGA infants presented Apgar scores <7 at 5 minutes. The length of stay of the newborn in the nursery, as well as the need for and duration of hospitalization in the NICU, differed significantly between the two groups. TTN, Neonatal sepsis and hyperbilirubinemia didnot differ between groups but phototherapy required for IUGR group is more.
Conclusion: Late-preterm IUGR infants present a significantly higher risk of neonatal complications and a significantly longer NICU and hospital stay when compared to late-preterm AGA infants.

Keywords: IUGR, AGA, SGA, NICU admission, prematurity

1. Introduction
In India out of 27 million babies born every year, 3.5 million are born premature. The neonatal death rate due to prematurity accounts for 43%.There has been an increase in preterm births due to increase in maternal age, underlying maternal health problems, increased rate of assisted reproductive treatment. Late preterm births are defined as birth between 34 and 36+6 weeks gestational age. Incidence of late preterm births among total preterm births is 70%. Late preterm births include Intrauterine growth restriction (IUGR) and average for gestational age (AGA) infants. IUGR is high in high risk pregnancies. As a consequence, this condition is commonly seen in elective preterm deliveries. There are conflicting findings regarding outcomes of preterm IUGR and AGA infants. Neonatal morbidity and mortality have been reported to be decreased, unchanged and increased in IUGR infants compared to average for gestational age (AGA) infants.
It is well known that in late preterm infants the mortality and the morbidity are higher than in term neonates. The rate of complications decreases with the progression of gestational age through the late preterm period. Intrauterine growth restriction (IUGR) is one of the cause for late preterm delivery and it occurs more often in late preterm infants than terms ones. It self constitutes a risk factor for morbidity and mortality. IUGR, as well as associated peri-natal morbidities, contributes to increase the risk, in these infants, of postnatal growth impairment, metabolic diseases and poor neuro-developmental outcome. Late preterm small for gestational age (SGA) infants were 44 times more likely to die in the first month and 22 times more likely to die in their first year than term adequate for gestational age (AGA) newborns.

This increased risk cannot be fully explained by an increasing prevalence of lethal congenital conditions among SGA late preterm new borns.

The terms SGA and IUGR are often used as synonyms, however they reflect two different concepts. SGA refers to a statistical definition, based on an auxological cross-sectional evaluation (prenatal or neonatal), and denotes a fetus or a neonate whose anthropometric variables (usually weight) are lower than a given threshold value computed on a set of infants having the same gestational age. IUGR instead refers to a clinical and functional condition and denotes fetuses unable to achieve their own growth potential. Such a condition can be assessed by ultrasonography during pregnancy by a longitudinal evaluation of fetal growth rate.

2. Study population: A total of 3,256 total live births, 341late preterm births from total live births were study population.

2.1. Inclusion criteria

1. Pregnant women delivered at Government maternity hospital, Tirupati.
2. Gives informed consent
3. All the singleton pregnancies.
4. Late preterm deliveries.

2.2. Exclusion criteria

1. Women unable to give written and informed consent.
2. Multi fetal pregnancies.
3. Pregnancies with conflicting dates
4. Diabetic mothers
5. Congenital anomalies

Materials and Methods

Place of study: The present study is conducted at Government maternity hospital, Tirupati.

Study design: The present study is a prospective comparative study conducted among the total live births taken place in Government maternity hospital.

Methodology

This prospective study was carried out from 1st April 2022 -30 June 2022 in Government Maternity Hospital, Sri Venkateswara medical college, Tirupati. Out of 3256 total live births, late preterm births are 341(10.4%). Incidence of IUGR in late preterm infants is 71/341(2.15%) and AGA is 170/341(8.25%). We analysed 100 singleton pregnancies, 50 infants with birth weight less than 10th percentile, control group with 50 infants with birth weight between 11-89 percentile at 34-36+6 weeks gestational age. The control group consisted of spontaneous preterm delivery at the same gestational age. Birth weight percentiles were based on standard growth curve of Alexander et al. Pregnancies with unknown or conflicting dates, fetal anomalies and diabetes are excluded from the study.

Brief history of the mother including age, pre-existing medical problems, and pregnancy complications, delivery characteristics about gestational age at delivery, birth weight, route of delivery, indication of elective birth, and APGAR scores was taken. Neonatal data included Respiratory distress, transient tachypnoea of new-born (TTN), neonatal sepsis, hypoglycaemia, jaundice, total number of days the infant was in neonatal intensive care unit (NICU), length of hospital stay. Gestational age at delivery was defined based on the mother's last menstrual period and confirmed by early ultrasound examination.

Pre-existing medical problems included anemia, hypertensive disorders of pregnancy, heart disease etc., antepartum complications included oligohydramnios and fetal distress. Possible signs of fetal distress are a constant decrease in fetal heart rate variability, the occurrence of late or variable decelerations upon cardiotocography, a high systolic / diastolic ratio in umbilical artery.

Table 1: Maternal characteristics and indications for elective preterm delivery in the IUGR group.

Maternal Conditions	Out of 50 (n-36)	Indications for elective delivery	out of 50 (n=39)
Anemia	9	Oligohydramnios	20
Hypertension	24	Severe Maternal disease	8
Heart disease	3	Fetal distress	11

Results

Of the 100 neonates included in the study, 50 belonged to the IUGR group and 50 neonates to the AGA group. There was no significant difference in maternal age which ranged from 16 to 45 years. Among mothers of the IUGR group, 36 (72%) presented some underlying disease or obstetric complication in addition to IUGR, whereas 13 (26%) did not. Hypertensive syndromes were the most frequent condition and were observed in 24 (48%) women of the IUGR group, Anemia is seen in 9 (18%), heart disease was observed in 3 (6%) mothers of this group. Gestational age at delivery ranged from 34 to 36+6 weeks and did not differ between groups. Preterm induction and preterm cesarean delivery were observed in 32 women (64%) women of the IUGR group, 07 patients (14%) had induced labour and delivered vaginally, whereas 11(22%) patients went into spontaneous preterm labour. The indications for elective preterm delivery in the 39 patients of the IUGR group included oligohydramnios in 20 cases (51.3%), severe maternal disease in 8 (20.5%), and abnormalities upon cardiotocography, fetal biophysical profile or umbilical artery Doppler in 11(28.2%) (Table 1).

There was a significant difference in mean birth weight between the two groups (IUGR: 1720g and AGA:2495g). The frequency of cesarean sections was 64% in the IUGR group and 26% in the AGA group. 3 neonates of the IUGR group and one of the AGA infants presented Apgar scores <7 at 5 minutes.

The length of stay of the newborn in the nursery, as well as the need for and duration of hospitalization in the NICU, differed significantly between the two groups (Table 2).

TTN or apnea rates did not differ significantly between IUGR and AGA infants. The frequency of neonatal sepsis did not differ between groups. Hypoglycemia was more frequent in the IUGR group. The presence of hyperbilirubinemia was similar in the two groups (88% in the IUGR group versus 80% in the AGA group). However, there was a difference in the number of days the newborn required phototherapy between the IUGR and AGA groups, which was higher in the former (Table 2).

Table 2: Comparison of Neonatal complications and outcomes between IUGR and AGA groups.

Neonatal complications	IUGR Group	AGA Group
Respiratory distress	27 (54%)	22 (44%)
Neonatal sepsis	2 (4%)	-
Hypoglycemia	12 (24%)	2 (4%)
Hyperbilirubinemia	44 (88%)	40 (80%)
Lengthy of NICU stay in days	5 days	2 Days
Neonatal death	1 (2%)	-

Discussion

Late-preterm births account for 70% of all preterm births [21]. Since the number of late-preterm births is increasing, it is important to understand the unique problems that this growing population of infants may experience. In this respect, a higher incidence of neonatal morbidity and mortality has been reported for births that occur between 34 weeks and 36 weeks and 6 days [22].

IUGR is a frequent complication in preterm infants and is the cause of most elective late-preterm deliveries. IUGR may also contribute to the increased morbidity and mortality observed among late-preterm infants. These infants are at risk for hypoglycemia, prolonged hospital stay and increased need for NICU treatment when compared to AGA infants, thus demonstrating the greater severity of these cases.

The cause of neonatal death in the present sample is neonatal sepsis in IUGR group and no neonatal death in AGA infants. The mortality rate late preterm infants is approximately 7.7 per 1000 live births [21].

Late-preterm birth poses various risks to the newborn and the obstetrician should always weigh the risks and benefits in each case and the priority of the obstetrician is to strive for delivery as close to term as possible.

Respiratory distress

The development of RDS was independent of antenatal complications, though these risk factors contributed to indicated deliveries and mode of delivery. However, when we analysed common risk factors like hypertensive disorders of pregnancy and, diabetes, these were more often associated with RDS.

Neonatal Sepsis

Sepsis is the second major cause of mortality among neonates, killing more than one million neonates annually. Neonatal sepsis, pneumonia and meningitis together result in up to a quarter of all new born deaths. Globally, of the three million annual neonatal sepsis cases, India has the highest incidence of clinical sepsis. The case fatality rate of sepsis among neonates ranges between 25% to 65% in India. Neonatal sepsis includes septicaemia, pneumonia, meningitis, osteomyelitis, arthritis and urinary tract infections. Clinical features are non-specific and are inefficient for identifying neonates with early-onset sepsis (EOS). Culture results take up to 48 hours; have been found to be positive in 25% to 45% of cases;

Hypoglycemia

Neonatal hypoglycemia, defined as a plasma glucose level of less than 30 mg/dL (1.65 mmol/L) in the first 24 hours of life and less than 45 mg/dL (2.5 mmol/L) thereafter, is the most common metabolic problem in new-borns. Major long-term sequelae include neurologic damage resulting in mental retardation, recurrent seizure activity, developmental delay, and personality disorders. Some evidence suggests that severe hypoglycemia may impair cardiovascular function.

Hyperbilirubinemia

Although it is generally believed that preterm infants are at greater risk for the development of bilirubin-associated brain damage than term infants, quantification of the magnitude of this risk has proven elusive, as has a consensus among experts on the level of total serum bilirubin at which therapy should be initiated.

Conclusion

In conclusion, our study showed that late-preterm IUGR infants present a significantly higher risk of neonatal complications and a significantly longer NICU and hospital stay when compared to late-preterm AGA infants. Hence, evaluation of birth weight by percentile for GA provide us deal with outcome among late preterm infants.

Conflict of Interest

Not available

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Author's Contribution

Not available

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