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The Study Of Perinatal Outcome In Late Intrauterine Growth Restriction Of Fetus.

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Abstract -
Background:
Late-onset intrauterine growth restriction happens when a baby grows more slowly inside the womb after the 32nd week of pregnancy.
This happens because the placenta, which provides nourishment to the baby, isn't working properly. Although this type of IUGR causes less severe problems with blood flow compared to earlier cases, it can still cause issues before and after the baby is born, like difficulty during labor and health problems after birth. It's important to find this condition early and keep a close watch to help keep the baby healthy.
Aim:
This study looked at the effects on babies born to mothers who had late-onset IUGR.
The researchers used ultrasound and Doppler velocimetry to check blood flow in the baby and the placenta.
Methods:
The study lasted two years and took place at a large hospital.
It included 70 pregnancies where the baby was diagnosed with IUGR after the 32nd week. Researchers looked at several factors that might have led to the problem, such as the mother's age and medical history, the baby's size, and blood flow in the umbilical artery, the middle cerebral artery, and between the brain and the placenta. They also measured the baby's estimated weight and the amount of amniotic fluid. The study looked at several outcomes, such as how the baby was delivered, the baby's weight, the APGAR scores, any health problems after birth, whether the baby needed to stay in the NICU, and any deaths before or after birth. They used statistical tests to find which factors were important. Results were considered significant if the p-value was less than 0.05.
Results:
The average age of the mothers was 26.84 years, and most had given birth before.
Nearly all the babies were born before 37 weeks. The most common health issues during pregnancy were high blood pressure and anemia. Over two-thirds of the babies had severe IUGR, meaning their estimated weight was below the third percentile. About 43% of the babies had abnormal blood flow in the umbilical artery, while 36% had normal blood flow even though they were growing slowly. Most of the babies were delivered by caesarean section, mainly because the baby was in distress. Over 98% of the babies weighed less than 2.5 kg. About 30% of the babies had an APGAR score of 7 or lower at 1 minute, but this dropped to 5.7% by 5 minutes. Common health problems for the babies included breathing difficulties, infections, and low blood sugar. Nearly half of the babies had to stay in the NICU, and this was even more common for babies with the most severe IUGR. Sepsis was also linked to severe IUGR. The overall rate of perinatal death was 5.7%, including one stillbirth and three deaths shortly after birth.
Conclusion:
Late-onset IUGR is still a big health problem that leads to many challenges, such as early birth, the need for caesarean sections, and health problems for the baby.
The strongest sign that a baby might have poor outcomes was when the baby's estimated weight was below the third percentile, especially for sepsis and the need for NICU care. Doppler velocimetry, especially the cerebroplacental ratio, can help predict which babies are at higher risk. However, even if the Doppler results are normal, the baby can still face problems. Finding this condition early, keeping close watch, and delivering the baby at the right time are key to improving outcomes for babies with late-onset IUGR.

Keywords - *Late-onset IUGR, Doppler velocimetry, estimated fetal weight, cerebroplacental ratio, NICU admission, perinatal outcome, placental insufficiency.*

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I. Introduction

Foetal Growth Restriction, or Intrauterine Growth Restriction (IUGR), denotes a fetus that has not attained its genetically predetermined development potential, representing a significant problem in maternity care [1]. It is characterised by an estimated birth weight below the 10th percentile of that gestation [2]. An ultrasound reading below the 10th percentile implies either constitutional smallness or genuine foetal growth restriction (FGR) in infants. Doppler aids in distinguishing between the two situations. Approximately 50-70% of undersized-for-Gestation Age (SGA) foetuses are fundamentally undersized yet healthy. Approximately 10-15% of SGA foetuses are categorised as 'genuine' FGR [3]. True FGR infants exhibit higher rates of perinatal morbidities and death, necessitating Further surveillance.

Foetal growth restriction has lately been classified as early or late FGR. The two entities differ not only in gestational age at diagnosis, traditionally set at 32 weeks, but also in clinical characteristics, degree of placental malfunction, and maternal morbidity. Early-onset IUGR (E- IUGR) is more indicative of placental insufficiency compared to late-onset IUGR (L-IUGR), which occurs later in gestation. [4–6].

In cases of Early-onset Intrauterine Growth Restriction (E-IUGR), the initial deterioration typically begins with abnormalities in the uteroplacental and fetoplacental blood flow, subsequently affecting the fetal biophysical profile. The severity of Doppler changes governs the overall trajectory of decline and often necessitates early delivery. E-IUGR frequently coexists with early-onset pre-eclampsia, occurring in approximately 50% of such cases, and is commonly noted among patients with autoimmune disorders or other conditions that impair placental vasculature. In severe forms, E-IUGR carries a heightened risk of significant fetal injury or intrauterine demise before term. Conversely, Late-onset IUGR (L-IUGR). Typically reflects suboptimal fetal growth potential, usually resulting from placental dysfunction and constitutes nearly 70% of IUGR cases. L-IUGR is less strongly linked with late pre-eclampsia, and placental pathology tends to be subtle or absent. Numerous studies have indicated a lower frequency of uteroplacental abnormalities, with the majority of placental evaluations appearing normal [7,8].

Notwithstanding the relatively benign characteristics of the route, the late-onset of IUGR in the cohort may experience a fast decline, resulting in significant harm or stillbirth in the absence of observable late-stage indicators [7]. Timely identification may enhance the prognoses of these foetuses by determining follow-up schedules and ideal delivery time [9]. Regrettably, late-onset foetal growth restriction frequently remains unrecognised, resulting in increased incidences of caesarean birth due to foetal distress, neonatal acidosis, and subsequent admission to the neonatal intensive care unit [10].

This hospital-based observational study was designed to examine the perinatal outcomes of cases with intrauterine growth restriction at >32 weeks of gestation.

II. Objectives

To study the perinatal outcome of Intrauterine Growth Restriction in >32 weeks of gestation in terms of:

1. Mode of Delivery
2. Birth Weight
3. APGAR
4. Fetal distress
5. Fetal complications
6. NICU stay
7. Perinatal Mortality

III. Materials And Methods

Study Population

All patients registered for ANC are subjected to screening for Intrauterine growth restriction by ultrasonography

Study Design

A Prospective, observational, Clinical study

Sample Size Calculation:

The sample size was calculated using the following formulae: n= (Zα/2) 2 * (PQ) / E2

n- Sample size

Zα/2 – Z value at 5% error (1.96) P – Taken as 64%

Q- 1-P

E – Absolute error (taken as 10%) n –(1.96)2 * (0.64*0.36) 23(0.01)2

n- 70 (approx.)

References for prevalence

1. The total sample size for the study is approximately 64. Hay WW, Thureen PJ, Anderson MS. Intrauterine growth restriction. NeoReviews. 2001;2:129.doi: 10.1542/neo.2-6-e129. [CrossRef] [Google Scholar]
2. Chatelain P. Children born with intra-uterine growth retardation (IUGR) or small for gestational age (SGA): long-term growth and metabolic consequences. Endocr Regul. 2000. pp. 33–6. [PubMedPubMed]

Study Duration

Two years (JULY 2023 – APRIL 2025)

Inclusion Criteria

1. Women with a single live fetus. diagnosed gestation as an IUGR pregnancy after 32 weeks of gestation
2. Patients who are willing to participate in the study and give written informed consent.

Exclusion Criteria

1. Patients with a twin pregnancy
2. Patient with Congenital anomaly
3. Patients with Intrauterine fetal death
4. Patient not willing to take part in the study
5. Patients below 18 years of age

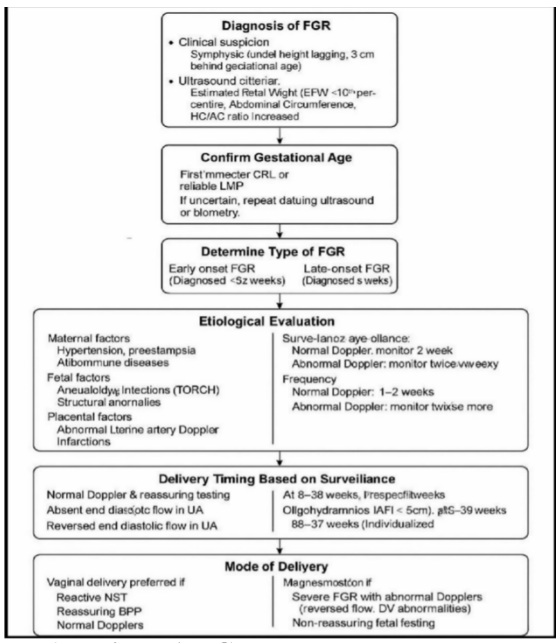
Ethical considerations

The study was conducted after obtaining permission from the Institutional Ethics Committee (IEC). All the data collected were kept strictly confidential and used solely for the study as described below. Written informed consent (in English/Hindi/Marathi) was obtained from the subjects and/or their attendants before their recruitment into the study. Any deviations from the methods/procedures described below were reported to the IEC, and changes were implemented only after receiving the IEC's approval. The proforma for the written informed consents was submitted herewith.

Methodology

This study included 70 women having singleton pregnancies who received routine antenatal check-ups and ultrasound scans. The study group included all patients registered for ANC subjected to screening for Intrauterine growth restriction by ultrasonography. All the cases also underwent a Doppler ultrasound examination.

Algorithm 1 shows the stage-based management followed in our institute for FGR cases. Cases were followed till delivery and maternal and neonatal outcome was noted in every case.



Algorithm 1. FGR Management Protocol

[Ref - Cunningham FG, Leveno KJ, Bloom SL, et al. Williams Obstetrics, 25th Edition. McGraw- Hill, 2018. Chapter 44: Fetal Growth Disorders].

Ultrasound measurements

- Fetal weight less than its POG
- Reduced amniotic fluid index/volume
- Reduced AC
- Increased HC: AC ratio
- Increased FL: AC ratio
- Late flattening growth chart in asymmetrical FGR

Normal and Abnormal Ranges of Doppler Parameters in Late IUGR Cases

Umbilical Artery (UA)

Used to assess placental resistance.

Parameters	Normal range (after 28 weeks)	Abnormal (IUGR associated)
RI	<0.70	>0.70
PI	<1.10-1.20	>1.20
S/D	<3.0	>3.0 (especially >3.5 in late 3rd trimester)

Note: Absent or reversed end-diastolic flow is a severe abnormality indicating high perinatal risk.

Middle Cerebral Artery (MCA)

Assesses brain-sparing effect.

Parameters	**Normal range**	**Abnormal (brain sparing)**
RI	**~0.70-0.80**	**<0.70**
PI	**1.4-1.8**	**<1.0**
S/D	**~4.0**	**<3.5**

Note: Low PI/RI indicates cerebral vasodilation as an adaptive response to hypoxia.

Uterine Artery (UtA)

Maternal vessel – predicts uteroplacental insufficiency.

Parameters	**Normal range (after 22 weeks)**	**Abnormal**
RI	**<0.58**	**>0.58**
PI	**<1.30**	**>1.45**
S/D	**Not routinely used**	**>2.6**

Note: Persistence of the early diastolic notch after 24 weeks is considered abnormal.

Ductus Venosus (DV)

Late-stage indicator of fetal compromise.

Parameters	**Normal**	**Abnormal (Late IUGR)**
PI	**<0.8**	**>1.0**
S/D	**Variable, less commonly used**	**Reversed or absent a wave**

Note: Absent or reversed 'a-wave' in DV is a very poor prognostic marker.

6. Cerebroplacental ratio [87] -

CPR is a Doppler-derived index that combines a placental Doppler measure (UA pulsatility index (PI)) and a fetal measure (MCA- PI) to assess fetal well-being.

CPR = Umbilical Artery Pulsatility Index (UA-PI) Middle Cerebral Artery Pulsatility Index (MCA-PI)

CPR Value	Interpretation	Clinical implication
>1.08 (or > 1.1)	Normal	Adequate feral perfusion
<1.08 (or <5th percentile)	Abnormal / low CPR	Suggests feral hypoxia, needs close monitoring
< 1.0	Markedly abnormal	Often indicates **brain sparing effect,** elevated risk

Statistical Analysis

All the data was noted down in a pre-designed study proforma. Qualitative data were represented in the form of frequency and percentage. The association between qualitative variables was assessed by the Chi-Square test. Quantitative data were represented using Mean ± SD. Analysis of Quantitative data between the two groups was done using an unpaired t-test if the data passed the 'Normality test' and by the Mann-Whitney Test if the data failed the 'Normality test'. A p-value < 0.05 was taken as the level of significance. Results were graphically represented where deemed necessary. SPSS Version 26.0 was used for most analyses and Microsoft Excel 2021 for graphical representation.

IV. Results

Table 1. Distribution of study groups as per age

Age groups	N	%
20-25	28	40.0%
26-30	26	37.1%
31-35	12	17.1%
>35	4	5.7%
TOTAL	70	100.0%
MEAN AGE -26.84 +/- 4.61 years		

The study population predominantly comprised women aged 20–30 years, with the mean age being 26.84 ± 4.61 years. A majority (77.1%) were in the 20–30 years bracket, reflecting the typical reproductive age range for pregnancies.

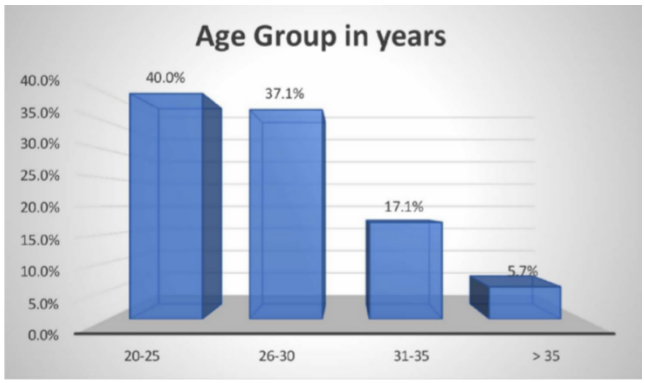


Table 2. Distribution of study groups as per obstetric history

Obstetric History	N	%
Primi	14	20.0%
Multi	56	80.0%
Total	70	100.0%

Among 70 participants, 80% were multigravida, while only 20% were primigravida, indicating that IUGR in this cohort was more commonly seen in women with previous pregnancies.

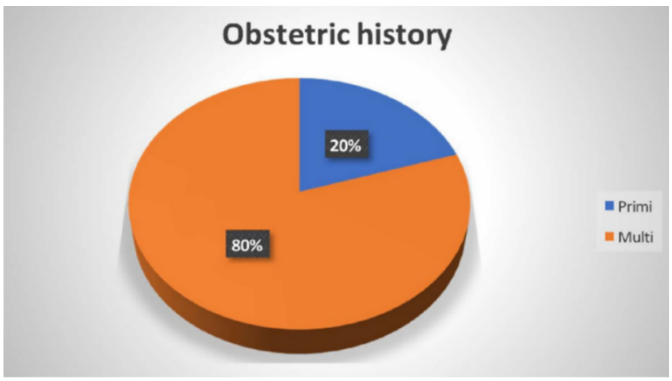


Table 3. Distribution of study groups as per gestation age

Gestation age at delivery	N	%

<37	56	80.0%
37-40	14	20.0%
TOTAL	70	100.0%

A significant proportion, 80% of pregnancies, were delivered preterm (<37 weeks), underscoring the association of IUGR with preterm delivery.

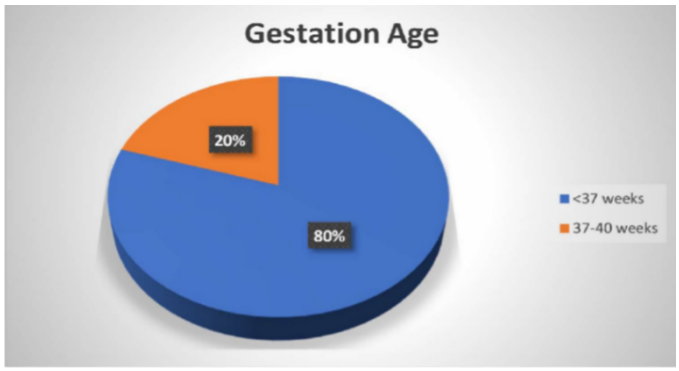


Table 4. Distribution of study groups as per risk factors

Risk Factors	N	%
Anemia	26	37.1%
PIH	33	47.1%
GDM	9	12.9%
Hypothyroidism	5	7.1%
APH	6	8.6%
Chronic Hypertension	3	4.3%
APLA	2	2.9%
None	7	10.0%

The most common risk factor identified was pregnancy-induced hypertension (PIH) (47.1%), followed by anaemia (37.1%), GDM (12.9%), and hypothyroidism (7.1%). Only 10% of the participants had no identifiable risk factor.

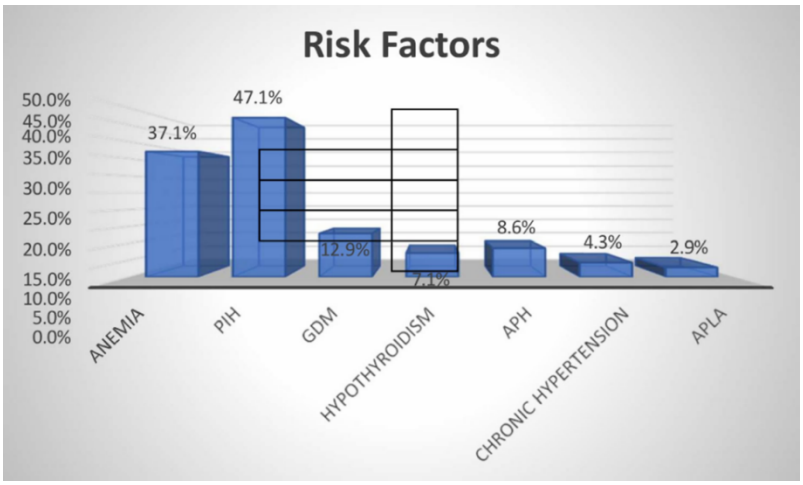


Table 5. Distribution of study groups as per estimated fetal weight percentile

EFW Percentile	N	%

<3rd	50	71.4%
3-10th	20	28.6%
TOTAL	70	100.0%

A large majority, 71.4% of the fetuses, had estimated fetal weights below the 3rd percentile, suggesting severe growth restriction in most cases.

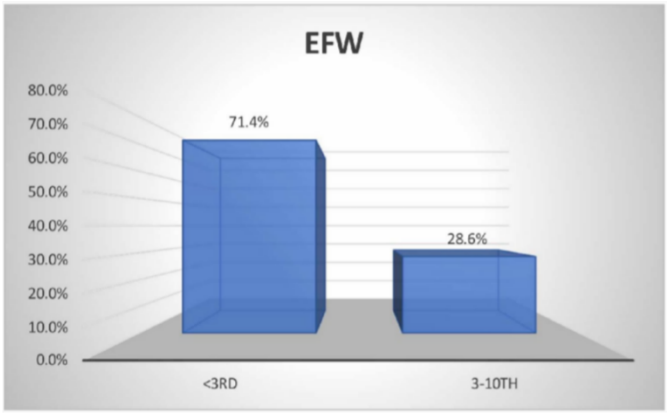


Table 6. Distribution of study groups as per Doppler findings

Doppler Findings	N	%
Reversal of diastolic flow	3	4.3%
Absent diastolic flow	3	4.3%
Abnormal umbilical artery flow	30	42.9%
CPR ratio pathological	5	7.1%
Brain sparing effect	4	5.7%
Normal	25	35.7%
Total	70	100.0%

Abnormal Doppler findings were prevalent. 42.9% exhibited abnormal umbilical artery flow, while 35.7% had normal Doppler results. Severe patterns such as reversal or absence of diastolic flow were each seen in 4.3% of cases.

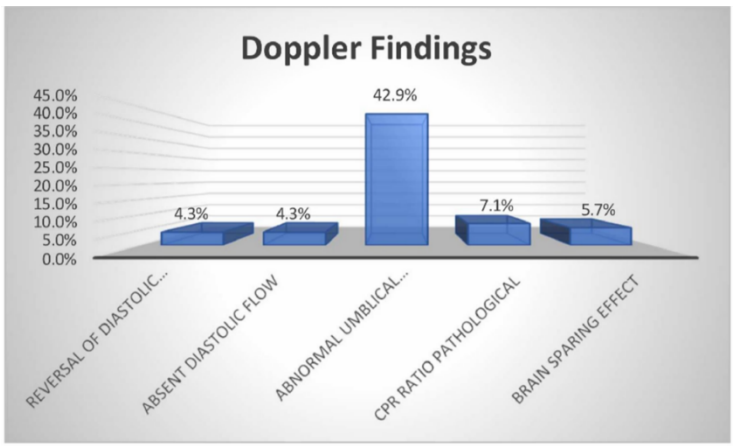


Table 7. Distribution of study groups as per mode of delivery

Mode of delivery	N	%

Caesarean	41	58.6
Vaginal	29	41.4
Total	70	100.0

Caesarean section was the more frequent mode of delivery (58.6%), indicating increased obstetric interventions in IUGR cases, likely due to fetal distress or failed induction.

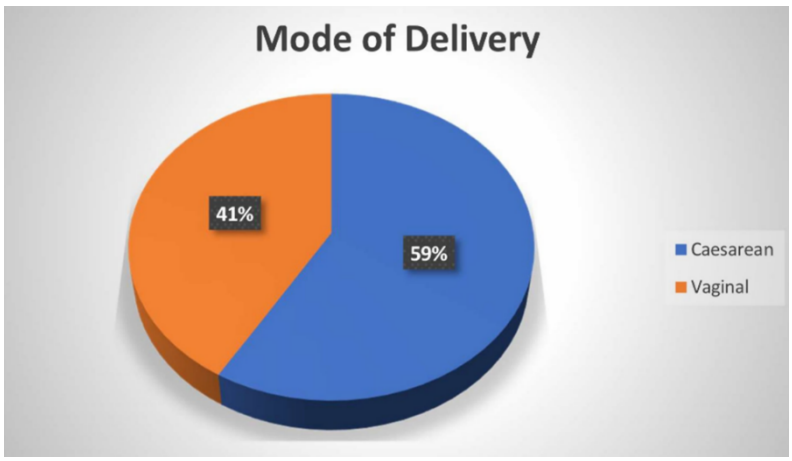


Table 8. Distribution of study groups as per birth weight

Birth Weight	N	%
1.0 - 1.49 Kg	6	8.6%
1.5- 1.99 Kg	19	27.1%
2.0 - 2.5 Kg	44	62.9%
> 2.5 Kg	1	1.4%
Total	70	100.0%

Most neonates (62.9%) had birth weights between 2.0–2.5 kg, and nearly 36% were <2.0 kg, reflecting the impact of growth restriction.

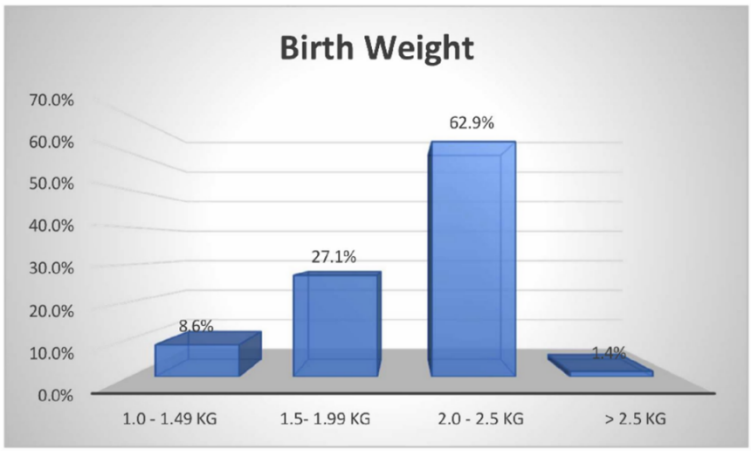


Table 9. Distribution of study groups as per APGAR score

APGAR <7	N	%
at 1 mins	21	30.0%
at 5 mins	4	5.7%

Low APGAR scores (<7) were noted in 30% at 1 minute and 5.7% at 5 minutes, suggesting transient neonatal compromise.

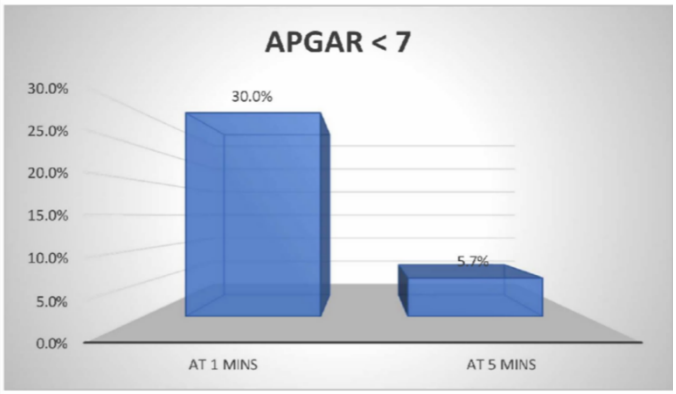


Table 10. Distribution of study groups as per fetal complications

Fetal Complications	N	%
Hypoglycemia	7	10.0%
MSL	5	7.1%
Respiratory distress	12	17.1%
Sepsis	8	11.4%
None	38	54.3%

The most common complications were respiratory distress (17.1%), sepsis (11.4%), and hypoglycemia (10%). Over half (54.3%) of the neonates had no complications.

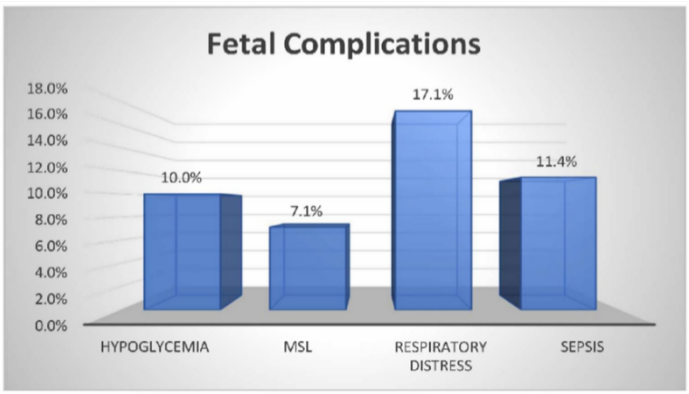


Table 11. Distribution of study groups as per NICU stay

NICU Stay	N	%
No	33	47.1%
Yes	37	52.9%
a) <5 days	25	35.7%
b) 5-10 days	7	10.0%
c) >10 days	5	7.1%
Total	70	100.0%

52.9% of neonates required NICU admission, with the majority staying <5 days (35.7%). This indicates a moderate level of neonatal morbidity.

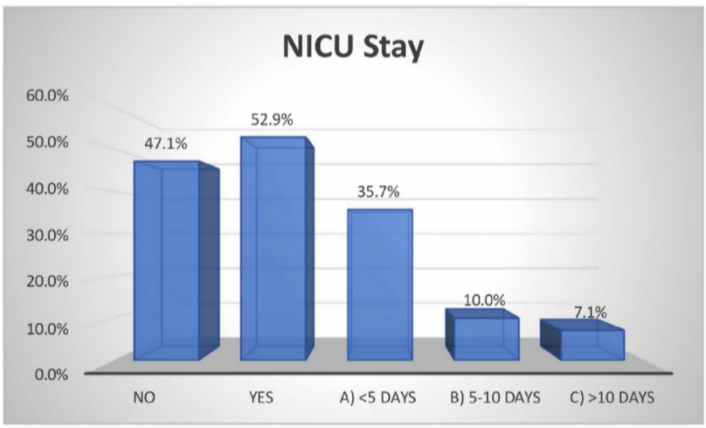


Table 12. Distribution of study groups as per the perinatal and neonatal mortality

Mortality	N	%
No	66	94.3%
Yes	4	5.7%
Total	70	100.0%

The neonatal mortality rate was 5.7%within four weeks, with 2 deaths due to birth asphyxia, while one was a perinatal mortality due to sepsis within one week. We had one case of stillbirth in the present study.

Table 13. Association of estimated fetal weight with mode of delivery

Mode of Delivery	FGR (EFW%)		Total
	< 10th	< 3rd	
LSCS	9	32	41
	45.0%	64.0%	58.6%
Vaginal	11	18	29
	55.0%	36.0%	41.4%
Total	20	50	70
	100.0%	100.0%	100.0%
p- value - 0.48			

Though more caesarean deliveries were seen in the <3rd percentile group (64%), the association between fetal weight percentile and mode of delivery was not statistically significant (p = 0.48).

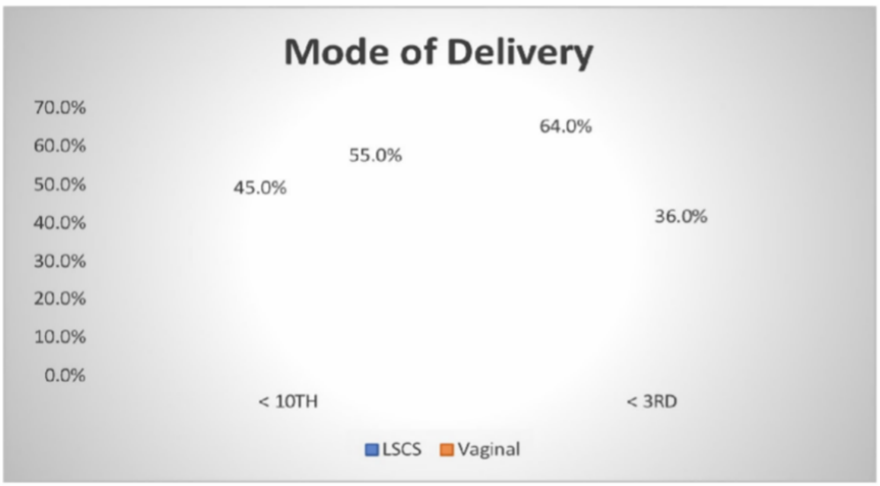


Table 14. Association of effective fetal weight with fetal complications

Fetal Complications	FGR (EFW%)		Total	p-value
	< 10th	< 3rd		
Hypoglycemia	2	5	7	1.00
	10.0%	10.0%	10.0%	
RD	4	8	12	0.48
	20.0%	16.0%	17.1%	
Sepsis	1	7	8	0.04
	5.0%	14.0%	11.4%	

A significant association was observed between lower fetal weight and sepsis (p=0.04), while other complications like hypoglycemia and respiratory distress did not show significant associations.

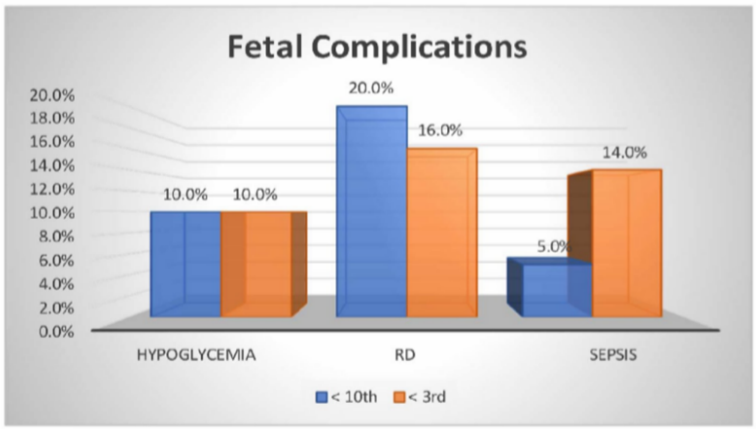


Table 15. Association of effective fetal weight with NICU admission

NICU Admission	FGR (EFW%)		Total
	< 10th	< 3rd	
No	13	22	37
	65.0%	44.0%	52.9%
Yes	7	26	33
	35.0%	52.0%	47.1%
Total	20	50	70
	100.0%	100.0%	100.0%
p- value - 0.04			

There was a statistically significant association (p = 0.04) between lower EFW and increased NICU admissions, indicating greater neonatal compromise in more severely growth-restricted fetuses.

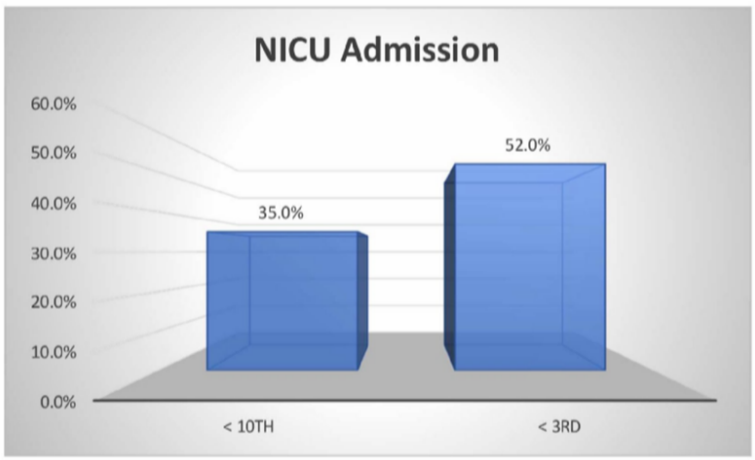
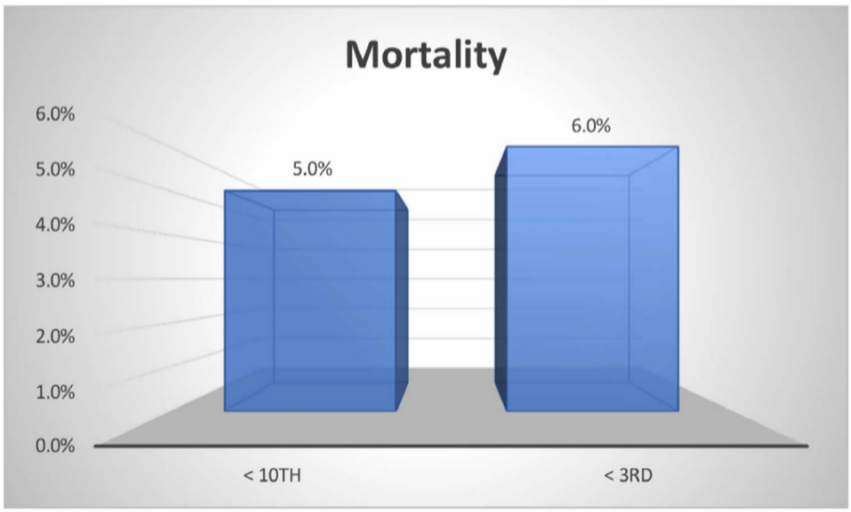


Table 16. Association of effective fetal weight with mortality

Mortality	FGR (EFW%)		Total
	< 10th	< 3rd	
No	19	47	66
	95.0%	94.0%	94.3%
Yes	1	3	4
	5.0%	6.0%	5.7%
Total	20	50	70
	100.0%	100.0%	100.0%
p- value - 0.77			

Although slightly higher mortality was noted in the <3rd percentile group (6%), the association was not statistically significant (p = 0.77).



V. Discussion

This observational study systematically evaluated the perinatal outcomes of late-onset intrauterine growth restriction (L-IUGR), focusing on pregnancies beyond 32 weeks of gestation. A total of 70 antenatal women were included, and outcomes were assessed based on key clinical and ultrasonographic parameters. These included Doppler findings, estimated fetal weight (EFW), birth weight, gestational age at delivery, APGAR scores, fetal complications, NICU admission, and neonatal mortality. The aim was to identify associations between fetal weight percentiles and perinatal morbidity and mortality to guide management of L-IUGR cases.

Gestational Age and Risk Factors

In the present study, 80% of the pregnancies were delivered preterm (<37 weeks).

This finding underscores the common clinical decision to deliver growth-restricted fetuses before term due to concerns of a compromised intrauterine environment. Late-onset IUGR, though typically less severe than early-onset, still poses significant risks when prolonged in utero. Similar observations were made by Parra-Saavedra et al. [80], who noted increased incidence of iatrogenic preterm birth in L-IUGR due to fetal distress and non-reassuring fetal surveillance. The predominant maternal risk factors in our cohort were pregnancy-induced hypertension (47.1%), anaemia (37.1%), and gestational diabetes mellitus (12.9%). These findings mirror those of Cruz-Martinez et al. [82], who also identified hypertensive disorders as the leading contributors to late-onset growth restriction. These comorbidities compromise uteroplacental perfusion and may impair fetal nutrient delivery, thereby accentuating the growth restriction. Notably, a small proportion of women had no identifiable maternal risk factors, highlighting the multifactorial aetiology of L-IUGR.

Doppler Findings

Doppler velocimetry plays a pivotal role in assessing fetoplacental circulation. In our study, 42.9% of fetuses exhibited abnormal umbilical artery (UA) Doppler findings.

Additionally, absent/reversed end-diastolic flow was noted in 8.6% of cases, and brain sparing effect in 5.7%, while 7.1% had a pathological cerebroplacental ratio (CPR). Interestingly, 35.7% of fetuses had normal Doppler indices despite having severe growth restriction. This aligns with the PORTO study by Unterscheider et al. [8], which highlighted that many adverse outcomes in L-IUGR occur even in the absence of abnormal UA Doppler findings. This suggests that UA Doppler alone may not be sufficient, and combined evaluation with CPR, middle cerebral artery (MCA) PI, and uterine artery Doppler may enhance predictive value. The presence of brain sparing is considered a compensatory mechanism, but its presence is associated with a higher risk of acidosis and poor neurodevelopmental outcomes.

Birth Weight

Analysis of fetal growth revealed that 71.4% of fetuses had an EFW below the 3rd percentile. This indicates a high burden of severe growth restriction among study participants. At birth, 90% of neonates weighed <2.5 kg, with the majority falling in the 2.0–2.5 kg range. Only 1.4% exceeded 2.5 kg. These findings correspond with previous studies like that of Unterscheider et al. [8] and Cruz-Lemini et al. [85], who reported that EFW below the 3rd percentile is associated with a significantly increased risk of perinatal complications and NICU admission. Low birth weight, particularly in the context of placental insufficiency, is associated with altered fetal programming, metabolic disorders, and impaired growth trajectory postnatally Mode of Delivery

The caesarean section rate in this study was 58.6%, and was notably higher in fetuses with EFW <3rd percentile (64%). Caesarean delivery was primarily undertaken for fetal indications, including abnormal Doppler findings and non-reassuring cardiotocography. This pattern has been consistently documented in the literature. Cruz-Martinez et al. [44] and Cruz-Lemini et al.

[85] reported high LSCS rates in growth-restricted fetuses, especially those with Doppler abnormalities. The high caesarean rate reflects the cautious obstetric approach adopted to minimize intrapartum hypoxia and poor neonatal outcomes.

APGAR Scores

Among the neonates, 30% had APGAR scores <7 at 1 minute, which dropped to 5.7% at 5 minutes post-resuscitation. This transient neonatal depression reflects peripartum stress or compromised placental function, often recoverable with timely neonatal support. Similar trends were observed by Chauhan et al., where a majority of IUGR neonates with low initial APGARs responded well to neonatal care and stimulation [75]. Persistent low APGARs, however, are associated with neurodevelopmental concerns and demand close follow-up.

Fetal Complications

Fetal complications observed included respiratory distress (17.1%), sepsis (11.4%), hypoglycemia (10%), and meconium-stained liquor (7.1%). Respiratory distress and sepsis were more common in neonates with EFW <3rd percentile. Statistical analysis confirmed a significant association between lower fetal weight and incidence of neonatal sepsis ($p = 0.04$). These outcomes mirror the findings of Mendez Figueroa et al. [52], who reported elevated rates of infection and respiratory morbidity among growth-restricted infants. The underlying mechanisms include immature immune responses, insufficient surfactant production, and antenatal hypoxia.

NICU Admissions

NICU admission was required for 52.9% of neonates, with a significantly higher rate among those with EFW <3rd percentile ($p = 0.04$). Length of stay was <5 days in most cases, suggesting manageable but acute neonatal issues. These findings resonate with those of Cruz- Lemini M et al. [85], who documented NICU admission as a strong correlate of adverse outcome in late-onset IUGR. NICU requirement also signals the resource burden posed by L- IUGR and highlights the need for appropriate neonatal infrastructure.

Mortality

The neonatal mortality rate was 5.7%, with 2 deaths due to birth asphyxia, while one was due to sepsis. We had one case of stillbirth in the present study. While the mortality difference between the <3rd and 3rd–10th percentile groups was not statistically significant, more deaths occurred in the severely restricted group. This is consistent with Morsing et al., who observed increased mortality in late-onset severe IUGR cases [86]. These deaths emphasize the need for timely delivery planning, especially in cases showing Doppler compromise or poor growth velocity.

Comparison With Other Studies

Parameter	Present Study	PORTO Study [8]	Cruz-Martinez et al. [82]	Mendez Figueroa et al. [52]
Mean GA at Delivery	<37 wks in 80%	36.9 ± 2.1 wks	~37 wks	>37 wks
Abnormal UA Doppler	42.9%	30%	35%	29%
NICU Admission	52.9%	35%	40%	38%
Sepsis	11.4%	NR	13%	12%
Mortality	5.7%	3%	4%	6%

The findings of this study substantiate the significant burden of perinatal morbidity and mortality associated with late-onset IUGR. A large proportion of affected pregnancies required early delivery, experienced increased rates of caesarean section, and encountered neonatal complications including respiratory distress, sepsis, and NICU admission. Doppler findings, while helpful, were not universally abnormal in cases with poor outcomes, indicating the need for a composite approach involving fetal biometry, growth trajectory, and CPR evaluation.

Estimated fetal weight below the 3rd percentile was the most consistent predictor of adverse outcomes. These findings emphasize the need for enhanced surveillance strategies and prompt delivery planning in late-onset IUGR.

VI. Conclusion

The present study evaluated the perinatal outcomes in pregnancies complicated by late-onset intrauterine growth restriction (IUGR) using ultrasonographic parameters, including Doppler studies. The findings underscore the clinical significance of antenatal surveillance in detecting growth-restricted fetuses and their associated complications. A high prevalence of abnormal Doppler findings, preterm delivery, low birth weight, and increased neonatal morbidity was observed. The most common associated risk factors were pregnancy-induced hypertension and anaemia. Neonatal complications such as respiratory distress, sepsis, and hypoglycemia were common, with more than half requiring NICU admission. Although mortality was low (5.7%), the severity of complications increased with lower fetal weight percentiles. Statistically significant associations were noted between lower estimated fetal weight (<3rd percentile) and increased NICU admission and neonatal sepsis.

Ultrasonography, combined with fetal Doppler assessment, proved to be a valuable tool in identifying at-risk fetuses and guiding clinical decision-making. Early detection and timely obstetric intervention can significantly improve outcomes in late-onset IUGR pregnancies.

Limitations

1. The study was limited to a single tertiary care centre, which may affect external validity and generalizability of results.
2. The sample size (n=70) was relatively small, under-powering some statistical comparisons.
3. The study did not include a control group of normal-growth fetuses for comparative analysis.
4. Long-term neonatal outcomes, such as neurodevelopmental status, were not assessed.

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