Research Article

The Two Faces of IUGR: Deciphering the Spectrum of Symmetrical and Asymmetrical IUGR and Mapping Incidence of Causal Dynamics and their Echo on Tracing the Roots of Growth

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Background: Intrauterine growth restriction (IUGR) is a major cause of perinatal morbidity and mortality, particularly in developing countries. It results from a complex interplay of maternal, fetal, placental, and environmental factors. Clinically, IUGR is classified as symmetrical or asymmetrical, each with distinct etiopathological mechanisms and perinatal implications. This study aimed to determine the incidence and causal factors of symmetrical and asymmetrical IUGR and to correlate these with fetal and perinatal outcomes.

Methods: This cross-sectional observational study was conducted at the Department of Obstetrics and Gynaecology, C.R. Gardi Hospital, Ujjain, from 2023 to 2025. A total of 335 pregnant women diagnosed with IUGR were evaluated, 208 asymmetrical and 127 symmetrical. Detailed maternal history, clinical assessment, ultrasonography and Doppler studies were performed. Data were analyzed during SPSS version 25.0, with $p < 0.05$ considered statistically significant.

Results: Asymmetrical IUGR was more prevalent (62.1%) than symmetrical (37.9%). The majority of cases occurred in women aged 21–30 years. Symmetrical IUGR was more associated with early-onset maternal conditions such as hypertension (28.3%), anemia (30.7%), and nutritional deficiencies (24.4%), while asymmetrical IUGR correlated more with diabetes mellitus (18.8%). Fetal Doppler and biometric parameters showed no statistically significant differences between groups. Neonatal outcomes were comparable, with survival rates exceeding 95% in both subtypes.

Conclusion: Both types of IUGR present distinct etiological patterns but similar perinatal outcomes. Early detection, targeted antenatal surveillance, and individualized management are essential to optimize fetal growth and improve neonatal prognosis.

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Introduction

Intrauterine growth restriction (IUGR) refers to a condition in which the fetal growth rate is below the expected potential for its gestational age, race, and gender. It represents a deviation from the normal growth trajectory, often resulting from an interplay of maternal, fetal, placental, and environmental factors.[1] The term "IUGR" is frequently used interchangeably with "small for gestational age" (SGA), although IUGR reflects a pathological restriction of fetal growth, whereas SGA is defined statistically as birth weight below the 10th percentile for gestational age.[2,3] Identifying IUGR is crucial for minimizing perinatal morbidity and mortality through early detection, monitoring, and intervention.

Approximately one-third of birth weight variability is attributed to genetic factors, while two-third share influenced by environmental and maternal conditions.[4] The principal etiologies include maternal disorders such as pre-eclampsia, chronic hypertension, renal disease, malnutrition, and substance use; placental abnormalities like infarction or circumvallate placenta; and fetal causes such as chromosomal anomalies and congenital malformations.[5,6] Early-onset IUGR (E-IUGR), often associated with placental insufficiency, carries a higher risk of adverse outcomes than late-onset IUGR (L-IUGR), which develops in the later stages of gestation.[7]

Clinically, IUGR is further classified into symmetrical and asymmetrical types. Symmetrical IUGR occurs when all fetal biometric parameters, including head circumference, are proportionally reduced, typically resulting from early intrauterine insults such as chromosomal anomalies or intrauterine infections. In

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contrast, asymmetrical IUGR presents with relative head sparing and disproportionately smaller abdominal circumference, often arising from late gestational placental insufficiency.[8,9] Patients with an estimated fetal weight (EFW) below the 10th percentile without head sparing (BPD <10th percentile) are classified as symmetrical IUGR, while those with head sparing (BPD >10th percentile) are categorized as asymmetrical IUGR.[10]

IUGR significantly contributes to perinatal morbidity and mortality, including complications such as meconium aspiration, asphyxia, hypoglycemia, and neonatal sepsis. The risk of stillbirth is five to ten times higher in IUGR fetuses compared to normally grown fetuses.[11] Studies from Indian tertiary care centers, such as Singh *et al*.(2021) and Rathod *et al*. (2014), reported stillbirth rates of 16.2 and 17.5%, respectively, in IUGR pregnancies, mainly due to maternal hypertension and poor fetal surveillance.[12] Neonatal mortality among IUGR infants remains high, often linked to prematurity, hypoxia, and sepsis.[13]

The long-term effects of IUGR extend beyond infancy, predisposing individuals to metabolic syndrome, obesity, hypertension, and cardiovascular disease in adulthood.[14] Understanding the incidence and causal factors of symmetrical and asymmetrical IUGR, and their correlation with fetal outcomes, is essential to guide early diagnosis, targeted management, and preventive strategies aimed at improving perinatal health outcomes.

Material And Methods

After obtaining approval from the Institutional Ethics Committee, this cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at C.R. Gardi Hospital, Ujjain, from 2023 to 2025. Pregnant women aged 18 to 45 years, attending the outpatient department (OPD) or admitted to the inpatient department (IPD) with a clinical or ultrasonographic diagnosis of intrauterine growth restriction (IUGR) and nutritional assessment, were enrolled after providing written informed consent. The study was carried out in accordance with ethical standards for human research, ensuring voluntary participation, confidentiality of patient data, and transparency regarding study objectives and procedures.

The sample size was estimated using a 95% confidence level, assuming a 32% prevalence of hypertension among IUGR cases with a 5% precision. Based on this, the required sample size was calculated to be approximately 335.

Inclusion Criteria

Singleton pregnancies.

Gestational age ≥28 weeks.

IUGR confirmed on ultrasonography (estimated fetal weight below the 10th percentile for gestational age).

Exclusion Criteria

Multiple gestations.

Congenital fetal anomalies.

Requires at least 1 Phenotypic criterion and 1 etiologic criterion

To determine the severity of malnutrition, the phenotypic criterion is used.

Assessment criteria

- Phenotypic
- Non-volitional weight loss
- Low body mass index
- Reduced muscle mass
- Etiologic
- Reduced food intake
- Inflammatory condition

Definitions

Clinical suspicion of IUGR was raised when the fundal height measured at least 4 cm less than expected for gestational age, accompanied by reduced maternal weight gain, decreased abdominal girth, and low amniotic fluid volume. Diagnosis was confirmed by obstetric ultrasonography when the estimated fetal weight was below the 10th percentile for gestational age.

Symmetrical IUGR

Uniform reduction in fetal biometric parameters, including head circumference (HC), abdominal circumference (AC), biparietal diameter (BPD), and femur length (FL).

Asymmetrical IUGR

Disproportion at reduction in AC with relatively preserved HC or BPD, suggestive of "head sparing."

Methodology

Detailed maternal history, including sociodemographic data, obstetric history, nutritional status, medical disorders, and lifestyle habits, was recorded. Clinical examination included general, systemic, and obstetric assessment. Ultrasonography and relevant laboratory investigations were performed to confirm the diagnosis and assess fetal growth parameters.

Outcome Variables

Maternal, fetal, placental, and environmental factors contributing to IUGR.

Correlation between causal factors and the type of IUGR (symmetrical or asymmetrical).

Fetal outcomes in pregnancies complicated by IUGR, including stillbirth, preterm birth, and neonatal morbidity.

Statistical Analysis

All collected data were recorded in a structured proforma and entered into Microsoft Excel for processing. Statistical analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. The chi-square test and other relevant statistical tests were applied to identify associations between causal factors and IUGR subtypes. A *p-value* of <0.05 was considered statistically significant.

Results

A total of 335 pregnant women diagnosed with intrauterine growth restriction (IUGR) were analyzed, comprising 208 (62.1%) asymmetrical and 127 (37.9%) symmetrical IUGR cases. The analysis of maternal and obstetric parameters demonstrated that asymmetrical IUGR was more prevalent across all age, parity, and gestational groups compared to symmetrical IUGR. With respect to maternal age, the majority of cases were observed among women aged 21 to 25 years, comprising 38.0% of asymmetrical and 40.2% of symmetrical IUGR cases. Although asymmetrical IUGR was more frequent across all age categories, the association between maternal age and type of IUGR was not statistically significant (*p* = 0.197). When parity was considered, the highest number of IUGR cases occurred among third -parity (P3) mothers, accounting for 37.5% of asymmetrical and 33.1% of symmetrical IUGR cases. Primigravida and second-parity mothers also showed a comparable distribution pattern. However, the difference in parity between the two groups was not statistically significant (*p* = 0.719). Regarding gestational age, most IUGR cases were seen in term pregnancies (≥37 weeks), with 76.0% in the asymmetrical group and 83.5% in the symmetrical group, whereas preterm pregnancies (<37 weeks) accounted for 24.0 and 16.5% of cases, respectively. The difference in gestational age distribution between the two IUGR types was not statistically significant (*p* = 0.103) (Table 1).

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Table 1: Maternal demographic and clinical characteristics in asymmetrical and symmetrical IUGR cases (n = 335)

Parameter	*Category*	*Asymmetrical IUGR (n=208)*	*%*	*Symmetrica IUGR(n=127)*	*%*	*ChiSquare*	*p-value*
Age group (years)	≤20	37	17.8	14	11.0	3.03	0.197
	21–25	79	38.0	51	40.2		
	26–30	64	30.8	41	32.3		
	>30	28	13.5	21	16.5		
Parity	P1	50	24.0	35	27.6	1.34	0.719
	P2	56	26.9	32	25.2		
	P3	78	37.5	42	33.1		
	P4	24	11.5	18	14.2		
Gestational age (weeks)	<37	50	24.0	21	16.5	2.65	0.103
	≥37	158	76.0	106	83.5		

Table2: Maternal comorbidities in asymmetrical and symmetrical IUGR cases (n=335)

Comorbidity	*Category*	*Asymmetrical IUGR (n=208)*	*%*	*Symmetrical IUGR (n=127)*	*%*	*Chi- square value*	*p- value*
Hypertension (HTN)	Yes	49	23.6	36	28.3	0.955	0.328
	No	159	76.4	91	71.7		
Diabetes mellitus(DM)	Yes	39	18.8	16	12.6	2.17	0.140
	No	169	81.3	111	87.4		
Anemia	Yes	57	27.4	39	30.7	0.421	0.516
	No	151	72.6	88	69.3		
Nutritional deficiency	Yes	35	16.8	31	24.4	2.866	0.090
	No	173	83.2	96	75.6		

Table 3: Comparison of mean ultrasonographic (USG) parameters in asymmetrical and symmetrical IUGR cases

USG parameter	*Asymmetrical IUGR (n=208)*	*Symmetrical IUGR (n=127)*	*p-value*
	Mean ± SD	Mean ± SD	
Biparietal diameter (BPD, mm)	75.14 ± 8.72	75.21 ± 8.87	0.94
Head circumference (HC, mm)	269.74 ± 29.23	265.19 ± 28.42	0.16
Abdominal circumference (AC, mm)	239.44 ± 35.75	230.62 ± 34.46	0.06
Femur length (FL, mm)	49.08 ± 8.68	49.17 ± 8.52	0.93
FL/AC ratio	0.21 ± 0.05	0.22 ± 0.05	0.17
Estimated fetal weight (g)	1706.13 ± 476.88	1664.80 ± 427.40	0.41
MCA pulsatility index (PI)	1.52 ± 0.31	1.52 ± 0.30	0.97

Statistical Test: Independent samplet-test; Significance Level : p<0.05

The difference in gestational age distribution between the two IUGR types was not statistically significant (p = 0.103) (Table 2).

The comparison of fetal biometric parameters between asymmetrical and symmetrical IUGR groups showed no statistically significant differences across any of them easure indices. The mean biparietal diameter (BPD) was similar in both groups (75.14 ± 8.72 mm *vs.*75.21 ± 8.87 mm; p = 0.94). The head circumference (HC) and abdominal circumference (AC) were marginally higher in asymmetrical IUGR, but the differences were not significant (p = 0.16 and p = 0.06, respectively). Similarly, femur length (FL) and FL/AC ratio did not differ significantly between groups (p = 0.93 and p = 0.17). The estimated fetal weight (EFW) was slightly higher in asymmetrical IUGR (1706.13 ± 476.88 g) compared to symmetrical IUGR (1664.80 ± 427.40 g), though the difference was statistically insignificant (p = 0.41). The middle cerebral artery pulsatility index (MCAPI) values were identical in both groups (1.52 ± 0.31 *vs.* 1.52 ± 0.30; p = 0.97), indicating no difference in fetal hemodynamic adaptation between the two IUGR types (Table 3).

Discussion

Intrauterine growth restriction (IUGR) remains a leading cause of perinatal morbidity and mortality, particularly in developing countries where it poses major challenges to maternal and neonatal health. It is linked with adverse neonatal outcomes such as hypoglycemia, respiratory distress, metabolic instability, and sepsis, as well as long-term risks including hypertension, diabetes, and cardiovascular disease in adulthood. Globally, nearly 30 million newborns about 23.8% of all live births—are affected by IUGR each year, with the incidence being nearly six times higher in developing regions.

These figures underline the importance of early diagnosis, surveillance, and targeted intervention to improve perinatal outcomes.

The present hospital-based observational study aimed to identify the causal factors of symmetrical and asymmetrical IUGR and to evaluate the relationship with fetal outcomes. By comparing maternal risk factors, ultrasonographic parameters, and neonatal outcomes, the study sought to differentiate between the two main IUGR subtypes and provide insights into their distinct pathophysiological mechanisms.

In the present study, the majority of IUGR cases, both symmetrical and asymmetrical, occurred among women aged 21 to 30 years, the peak reproductive age group in India. Asymmetrical IUGR was slightly more frequent across all age categories. Women aged 21 to 25 years accounted for 38.0% of asymmetrical and 40.2% of symmetrical IUGR cases, followed by those aged 26–30 years (30.8 and 32.3%, respectively). Although extreme maternal age (<20 and >30 years) is traditionally associated with increased IUGR risk, this trend mainly reflects higher fertility rates rather than biological susceptibility. Sinha S *et al*.[15] and Seal A. *et al*.[16] reported similar age-related patterns, while Alsadi and Alwqatii *et al*.[17] found no significant difference between IUGR subtypes. Connor *et al*.[18], however, noted a higher mean age among symmetrical IUGR cases, linking older maternal age to early placental dysfunction. Collectively, these findings indicate that maternal age influences IUGR risk indirectly through its association with parity and co-morbidities rather than being an independent determinant.

Regarding parity, para 2 women were most frequently affected in both asymmetrical (37.5%) and symmetrical (33.1%) IUGR, followed by para 1 and primigravida mothers. This suggests that multiparity does not protect against IUGR and may, in some cases, increase risk due to maternal nutritional depletion or short inter-pregnancy intervals. Alsadi and Alwqatii *et al*.[17] similarly reported no significant correlation between parity and IUGR subtype ($p = 0.282$), while Seal A *et al*.[16] and Oluwafemi *et al*.[19] identified primigravida and teenage mothers as higher-risk groups. Connor *et al*.[18] also found nulliparity significantly associated with asymmetrical IUGR ($p = 0.003$), possibly due to suboptimal placental adaptation in first pregnancies. Overall, parity influences IUGR risk through maternal health and nutritional status rather than direct physiological mechanisms.

Gestational age distribution shows that most IUGR cases were delivered at term (≥37 weeks), 76.0% of asymmetrical and 83.5% of symmetrical cases. Preterm deliveries were more common in asymmetrical IUGR (24.0%) than symmetrical (16.5%). This supports the concept that asymmetrical IUGR often results from late-onset placental insufficiency, leading to accelerated fetal compromise and earlier delivery. Symmetrical IUGR, conversely, results from early gestational insults and progresses more gradually, allowing continuation to term. Alsadi and Alwqati*et al*.[17] andConnor *et al*.[18] reported similar patterns, while Bocca-Tjeertes *et al*.[20] observed a higher proportion of symmetrical IUGR in early preterm births, reflecting its earlier onset.

Maternal comorbidities were important determinants of IUGR type. In the present study, hypertension, anemia, and nutritional deficiencies were more frequent in symmetrical IUGR, whereas diabetes was more common in asymmetrical cases. Hypertension was presentin 28.3% of symmetrical and 23.6% of asymmetrical cases, anemia in 30.7 and 27.4%, and nutritional deficiency in 24.4 and 16.8%, respectively. Diabetes was noted in 18.8% of asymmetrical and 12.6% of symmetrical IUGR. These trends suggest that early pregnancy disorders, such as hypertension and anemia, lead to symmetrical IUGR due to early impairment of cellular growth and placentation, while late-gestation metabolic and placental insufficiency associated with diabetes contributes to asymmetrical IUGR. These findings are in agreement with previous studies by Sinha S*et al*.[15], Mogri S *et al*.[16,] and Oluwa Femi *et al*.[19,] emphasizing the timing of maternal insult as a key determinant of IUGR type and severity.

Fetal Doppler evaluation revealed abnormalities in both subtypes, with 34.6% of asymmetrical and 38.6% of symmetrical IUGR cases showing altered flow patterns. The abdominal circumference (AC) was slightly higher in asymmetrical IUGR (239.44 ± 35.75 mm) than in symmetrical IUGR (230.62 ± 34.46 mm; $p = 0.06$), consistent with the classical "head-sparing" pattern of late-onset IUGR, where blood flow redistribution favors brain development. Other biometric indices, including biparietal diameter, femur length, and MCA pulsatility index, showed no significant differences. These findings align with those of Mogri S *et al*.[20], who highlighted the diagnostic importance ofAC andDoppler indices in identifying growth-compromised fetuses.

Neonatal outcomes were comparable between the two IUGR subtypes. Low APGAR scores (<7) at one minute were observed in 37.0% of asymmetrical and 41.7% of symmetrical IUGR cases, but scores improved by five minutes in over 70% of neonates.NICU admission was required in 23.1% and 27.6% of asymmetrical and symmetrical IUGR, respectively, while overall survival exceeded 95% in both groups. These outcomes are consistent with reports by Sinha S *et al*.[15] and Alsadi and Alwqatii *et al*.[17,] who observed similar survival rates. Ahya *et al*.[21], however, noted higher NICU admissions in asymmetrical IUGR, possibly reflecting more acute placental dysfunction.

Strengths and Limitations

This study's major strength lies in its comparative design, which enabled the concurrent evaluation of symmetrical and asymmetrical IUGR within the same cohort, allowing for a clear understanding of their etiological and clinical distinctions. Comprehensive maternal, fetal, and Doppler assessments provided a multidimensional view of IUGR pathophysiology, while a standardized diagnostic protocol ensured consistency and reliability. The inclusion of multiple maternal risk factors and perinatal outcomes enhanced clinical relevance and applicability to similar healthcare settings. However, as a single-center observational study, the findings may not be generalizable to broader populations. The limited sample size and study duration may have restricted the detection of less common risk factors. Recall bias and incomplete maternal histories may have influenced accuracy, particularly for nutritional and environmental factors. Additionally, socioeconomic status, micronutrient deficiencies, and paternal influences were not fully evaluated, and the lack of long-term neonatal follow-up prevented assessment of developmental outcomes.

Conclusion

This study demonstrated that both symmetrical and asymmetrical IUGR have distinct etiological and clinical patterns but share comparable neonatal outcomes. Most cases occurred in women aged 21–30 years and were delivered at term. Symmetrical IUGR was more associated with early-onset maternal conditions such as hypertension, anemia, and malnutrition, whereas asymmetrical IUGR was linked to late-onset placental insufficiency and diabetes. Despite slightly higher NICU admissions and lower APGAR scores in symmetrical IUGR, overall survival exceeded 85%. Early identification, individualized monitoring, and comprehensiveDoppler and ultrasound evaluation are vital for improving perinatal outcomes in IUGR pregnancies.

Ethical Approval and Consent to Participate The study was conducted after obtaining prior approval from the Institutional Ethics Committee, R.D. Gardi Medical College, Ujjain. All participants were informed about the nature, purpose, and methodology of the study, and written informed consent was obtained from each subject before inclusion. Ethical standards were maintained in accordance with the Declaration of Helsinki (2013 revision).

Consent for Publication

Written informed consent for publication of anonymized data was obtained from all participants involved in the study.

Availability of Data and Materials

The data sets generated and/or analyzed during the current study are available from the corresponding author and can be provided upon reasonable request for academic or research purposes.

Competing Interest

The authors declare no conflict of interest related to the public icon of this study.

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Author's Contributions

All authors contributed significantly to the conception, design, data collection, analysis, and interpretation of the study. The manuscript was drafted, revised, and approved by all authors in its final form.

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References

1. Sharma D, Shastri S, Sharma P. Intrauterine growth restriction: antenatal and postnatal aspects. Clin Med Insights Pediatr. 2016;10:67–83.
2. Sharma D, Shastri S, Farahbakhsh N, Sharma P. Intrauterine growth restriction–part 1. J Matern Fetal Neonatal Med. 2016;29(7):1–11.
3. Chauhan SP, Magann EF. Screening for fetal growth restriction. Clin Obstet Gynecol. 2006;49(2):284–294.
4. Wollmann HA. Intrauterine growth restriction: definition and etiology. Horm Res. 1998;49(Suppl 2):1–6.
5. Metcoff J. Clinical assessment of nutritional status at birth: fetal malnutrition and SGA are not synonymous. Pediatr Clin North Am. 1994;41(5):875–891.

6. Waghmare P, Balpande DN, Lakhkar BB. Assessment of fetal malnutrition by CAN score. Pediatr Oncall J. 2012;9:6–8.
7. American College of Obstetricians and Gynecologists. Intrauterine growth restriction. Practice Bulletin No. 12. Washington (DC): ACOG; 2000.
8. Chen HY, Chauhan SP, Ward TC, et al. Aberrant fetal growth and early, late, and postneonatal mortality: an analysis of Milwaukee births, 1996–2007. Am J Obstet Gynecol. 2011;204(3):261.e1–261.e10.
9. Zavlanos A, Tsakiridis I, Chatzikalogiannis I. Early- and late-onset intrauterine growth retardation. Donald Sch J Ultrasound Obstet Gynecol. 2021;15(1):97–108.
10. Manandhar T, Prashad B, Nath Pal M. Risk factors for intrauterine growth restriction and its neonatal outcome. Gynecol Obstet. 2018;8:464.
11. O'Connor H, O'Connor H, et al. Comparison of asymmetric versus symmetric IUGR: results from a national prospective trial. Am J Obstet Gynecol. 2015;212(1 Suppl):S173–S174.
12. Cosmi E, Fanelli T, Visentin S, Trevisanuto D, Zanardo V. Consequences in infants that were intrauterine growth restricted. J Pregnancy. 2011;2011:364381.
13. Peleg D, Kennedy CM, Hunter SK. Intrauterine growth restriction: identification and management. Am Fam Physician. 1998;58(2):453–460, 466–467.
14. World Health Organization. Newborn mortality [Internet]. Geneva: WHO; 2023 [cited 2025 Nov 10]. Available from: https://www.who.int/news-room/fact-sheets/detail/newborn-mortality
15. Sinha S, Kurude VN. Study of obstetric outcome in pregnancies with intrauterine growth retardation. Int J Reprod Contracept Obstet Gynecol. 2018;7(5):1858.
16. Seal A, Dasgupta A, Sengupta M, Dastider R, Sen S. Analysis of fetal growth restriction in pregnancy in subjects attending an obstetric clinic of a tertiary care teaching hospital. Int J Reprod Contracept Obstet Gynecol. 2018;7(3):973.
17. Alsadi E, Alawqatii T. Disparities of clinical features and associated maternal factors among symmetrical and asymmetrical intrauterine growth restriction in NICU at Al-Yarmouk Teaching Hospital in Baghdad, Iraq. Int J Pediatr. 2018;6(6):7815–7822.
18. O'Connor HO, Unterscheider J, Daly S, Geary M, Kennelly M, McAuliffe F, et al. Comparison of asymmetric versus symmetric IUGR: results from a national prospective trial. Am J Obstet Gynecol. 2015;212(1):S173–S174.
19. Oluwafemi OR, Njokanma FO, Disu EA, Ogunlesi TA. Current pattern of ponderal indices of term small-for-gestational age in a population of Nigerian babies. BMC Pediatr. 2013;13(1):110.
20. Mogri S, Samar R, Gupta P, Patel K. Fetomaternal outcome in pregnancy with intrauterine growth restriction. 2023;15(11):1305–1313.
21. Ahya RP, Unni. Cross-sectional study to assess perinatal outcome of intrauterine growth restriction babies delivered in a tertiary care setting. Int J Life Sci. 2023;12(3):1889–1892.