

**FETAL GROWTH RESTRICTION IN TWIN PREGNANCY: INCIDENCE, RISK FACTORS AND PERINATAL OUTCOME A ONE-YEAR OBSERVATIONAL ANALYTICAL STUDY****Dr. Anindita Vaishnavi Jha***

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ABSTRACT

Background: Twin pregnancy is associated with increased risks of fetal growth abnormalities, preterm birth and neonatal morbidity. Fetal growth restriction (FGR), particularly selective fetal growth restriction (sFGR), is an important complication of twin pregnancy. Chorionicity, unequal placental sharing, maternal hypertensive disorders and inter-twin growth discordance may influence fetal growth and perinatal outcome. **Aim:** To determine the incidence, risk factors and perinatal outcomes of fetal growth restriction in twin pregnancies over a period of one year. **Methods:** A one-year observational analytical study was designed involving 100 twin pregnancies, corresponding to 200 fetuses. Maternal demographic characteristics, chorionicity, obstetric risk factors, ultrasound parameters, estimated fetal weight (EFW), inter-twin EFW discordance and Doppler findings were evaluated. Pregnancy-level outcomes included gestational age at delivery and mode of delivery. Fetal-level outcomes included birth weight, NICU admission, respiratory morbidity, neonatal sepsis, hypoglycemia, stillbirth and neonatal death. Inter-twin EFW discordance was calculated as: $(\text{EFW of larger twin} - \text{EFW of smaller twin}) / \text{EFW of larger twin} \times 100$. Selective FGR was assessed using prespecified twin-specific criteria with consideration of chorionicity. **Results:** In the simulated dataset, 20 of 100 twin pregnancies were classified as having FGR, giving an illustrative incidence of 20%. DCDA pregnancies constituted 70%, MCDA pregnancies 28% and MCMA pregnancies 2%. Hypertensive disorders and preeclampsia were more frequent in the FGR group. EFW discordance $\geq 25\%$ was observed more frequently among FGR pregnancies. Abnormal umbilical artery Doppler was observed in 40% of FGR pregnancies. Preterm delivery and NICU admission were also more frequent in the simulated FGR group. **Conclusion:** The simulated analysis demonstrates how FGR in twin pregnancy may be associated with maternal risk factors, increased inter-twin growth discordance, abnormal Doppler findings and adverse neonatal outcomes. In an actual study, these associations must be confirmed using the original patient-level dataset and appropriate statistical analysis.

KEYWORDS : Twin Pregnancy; Fetal Growth Restriction; Selective FGR; Chorionicity; Inter-Twin Discordance; Doppler; Perinatal Outcome.**INTRODUCTION**

Twin pregnancy is associated with increased maternal, fetal and neonatal morbidity compared with singleton pregnancy. The clinical course differs considerably according to chorionicity and amnionicity.

Fetal growth restriction is an important complication of twin pregnancy. Assessment is more complex than in singleton pregnancy because two fetuses develop within the same pregnancy but may have different placental territories and unequal access to placental resources.

Selective fetal growth restriction refers to growth restriction predominantly affecting one twin. In monochorionic pregnancies, unequal sharing of placental mass and vascular connections is an important mechanism.

Inter-twin estimated fetal weight discordance is an important component of antenatal surveillance. Current ISUOG guidance recommends calculation and documentation of EFW discordance during surveillance. A discordance of 20% is a pragmatic threshold for identifying increased-risk pregnancies, while $\geq 25\%$ should prompt specialist assessment and increased surveillance.

The consensus definition of selective FGR also differs according to chorionicity. Doppler velocimetry, particularly assessment of the umbilical artery, middle cerebral artery and cerebroplacental ratio, can provide additional information regarding fetal adaptation and placental function.

Therefore, the present study was designed to assess the incidence of FGR, associated maternal and pregnancy-related factors, inter-twin growth discordance, Doppler abnormalities and perinatal outcome in twin pregnancies.

Aim

To determine the incidence, risk factors and perinatal outcomes of fetal growth restriction in twin pregnancies over a period of one year.

Objectives

- To determine the incidence of FGR among twin pregnancies.
- To evaluate maternal risk factors associated with FGR.
- To compare FGR according to chorionicity.
- To assess inter-twin EFW discordance.

- To evaluate fetal Doppler abnormalities in pregnancies complicated by FGR.
- To compare gestational age and mode of delivery.
- To compare neonatal morbidity and mortality between FGR and non-FGR pregnancies.

MATERIALS AND METHODS**Study Design**

Observational analytical study.

Study Duration

One year. Proposed study period: October 2025 to September 2026.

Study Setting

Department of Obstetrics and Gynaecology, Guru Gobind Singh Govt. Hospital, Jamnagar.

Study Population

Women with confirmed twin pregnancy presenting to the study centre during the study period.

Sample Size

100 twin pregnancies, corresponding to 200 fetuses. This distinction was maintained throughout the analysis.

Inclusion Criteria

- Confirmed twin pregnancy.
- Known chorionicity.
- Pregnancy with documented antenatal and delivery outcome.
- Availability of adequate ultrasound assessment.
- Delivery at or through the study institution.

Exclusion Criteria

- Higher-order multiple pregnancy.
- Conjoined twins.
- Major fetal congenital anomaly.
- Incomplete records.
- Cases in which fetal growth assessment could not be adequately performed.

Study Parameters

Maternal: age, gravidity, parity, BMI, socioeconomic status, hypertensive disorders, preeclampsia, GDM, anemia, ART conception, previous FGR and previous preterm birth.

Pregnancy: gestational age, chorionicity, amnionicity, placental characteristics and pregnancy complications.

Ultrasound: EFW of Twin 1 and Twin 2, AC, HC, FL, EFW percentile, growth trajectory, amniotic fluid and inter-twin EFW discordance.

Doppler: umbilical artery PI, MCA PI, CPR, ductus venosus where indicated and UA end-diastolic flow.

Outcomes: gestational age at delivery, mode of delivery, birth weight, birth-weight discordance, NICU admission, respiratory distress, neonatal sepsis, hypoglycemia, stillbirth, neonatal death and perinatal mortality.

Definition of Inter-Twin Discordance

Inter-twin EFW discordance was calculated as:

EFW discordance (%) = [(EFW of larger twin - EFW of smaller twin) / EFW of larger twin] x 100.

Discordance was categorized as <10%, 10-19.9%, 20-24.9% and ≥25%.

Definition of Selective FGR

For this model study, selective FGR was classified using a chorionicity-specific approach based on the international Delphi consensus and current ISUOG guidance. An EFW <3rd percentile in one twin can independently fulfill a consensus criterion for sFGR.

For monochorionic twins, at least two of the following were considered: EFW of one twin <10th percentile; AC of one twin <10th percentile; EFW discordance ≥25%; UA PI of the smaller twin >95th percentile. For dichorionic twins, at least two of: EFW of one twin <10th percentile; EFW discordance ≥25%; UA PI of the smaller twin >95th percentile were considered.

Statistical Analysis

Categorical variables were expressed as frequency and percentage. Continuous variables were expressed as mean +/- standard deviation when normally distributed. Chi-square test or Fisher exact test was used for categorical comparisons. Student t-test or Mann-Whitney U test was used for continuous variables depending on distribution. Binary logistic regression was proposed to identify independent factors associated with FGR. A p-value <0.05 was considered statistically significant. Because each twin pregnancy contributes two fetuses, fetal-level outcomes require statistical methods that account for clustering within pregnancy.

RESULTS

Note: The following results are a simulated dataset created for paper-development/presentation purposes. They are not actual patient findings.

Table 1. Distribution According to Chorionicity

Chorionicity	Number	Percentage
DCDA	70	70%
MCDA	28	28%
MCMA	2	2%
Total	100	100%

DCDA was the predominant chorionicity in the simulated cohort.

Table 2. Incidence of FGR

FGR status	Pregnancies	Percentage
FGR present	20	20%
FGR absent	80	80%
Total	100	100%

Illustrative incidence = 20/100 x 100 = 20%.

Table 3. FGR According to Chorionicity

Chorionicity	Total	FGR	No FGR
DCDA	70	11	59
MCDA	28	8	20
MCMA	2	1	1
Total	100	20	80

Table 4. Maternal Risk Factors

Risk factor	FGR (n=20)	No FGR (n=80)
Maternal age ≥35 years	5 (25%)	10 (12.5%)
Hypertensive disorder	8 (40%)	10 (12.5%)
Preeclampsia	6 (30%)	7 (8.8%)
GDM	4 (20%)	12 (15%)
Anemia	7 (35%)	15 (18.8%)
ART conception	6 (30%)	14 (17.5%)
Previous FGR	3 (15%)	4 (5%)
Previous preterm birth	4 (20%)	8 (10%)

Table 5. Ultrasound Characteristics

Parameter	FGR (n=20)	No FGR (n=80)
EFW <10th percentile	20 (100%)	8 (10%)
EFW discordance ≥20%	16 (80%)	6 (7.5%)
EFW discordance ≥25%	14 (70%)	2 (2.5%)
Abnormal liquor	7 (35%)	8 (10%)
Abnormal growth trajectory	12 (60%)	5 (6.3%)

Table 6. Inter-Twin Birth-Weight Discordance in FGR Pregnancies

Discordance	Number	Percentage
<10%	2	10%
10-19.9%	3	15%
20-24.9%	5	25%
≥25%	10	50%
Total	20	100%

Table 7. Doppler Findings in FGR Pregnancies

Doppler parameter	Normal	Abnormal
UA PI	12 (60%)	8 (40%)
MCA PI	14 (70%)	6 (30%)
CPR	13 (65%)	7 (35%)
Ductus venosus	17 (85%)	3 (15%)
UA absent/reversed EDF	15 (75%)	5 (25%)

Table 8. Gestational Age at Delivery

Gestational age	FGR	No FGR
<28 weeks	1	1
28-31+6 weeks	3	4
32-33+6 weeks	4	8
34-36+6 weeks	8	27
≥37 weeks	4	40

Illustrative preterm delivery <37 weeks: FGR 16/20 (80%); non-FGR 40/80 (50%).

Table 9. Mode of Delivery

Mode of delivery	FGR	No FGR
Vaginal delivery	3 (15%)	15 (18.8%)
Elective LSCS	8 (40%)	38 (47.5%)
Emergency LSCS	9 (45%)	27 (33.8%)
Total	20	80

Table 10. Birth Weight of Twin 1

Birth weight	FGR	No FGR
<1000 g	1	0
1000-1499 g	4	3
1500-1999 g	7	12
2000-2499 g	6	28
≥2500 g	2	37

Table 11. Birth Weight of Twin 2

Birth weight	FGR	No FGR
<1000 g	1	0
1000-1499 g	5	3
1500-1999 g	8	10
2000-2499 g	5	27
≥2500 g	1	40

Table 12. Neonatal Outcome

Outcome	FGR	No FGR
NICU admission	28/40 (70%)	55/160 (34.4%)
Respiratory distress	15/40 (37.5%)	25/160 (15.6%)
Neonatal sepsis	7/40 (17.5%)	12/160 (7.5%)
Hypoglycemia	8/40 (20%)	10/160 (6.3%)
Low birth weight	30/40 (75%)	60/160 (37.5%)
Stillbirth	3/40 (7.5%)	2/160 (1.3%)
Neonatal death	2/40 (5%)	3/160 (1.9%)

Table 13. Overall Perinatal Outcome

Outcome	FGR	No FGR
Mean birth weight	1740 +/- 420 g	2260 +/- 510 g
Mean gestational age	34.2 +/- 2.8 weeks	35.8 +/- 2.4 weeks
NICU admission	70%	34.4%
Stillbirth	7.5%	1.3%
Neonatal death	5%	1.9%
Perinatal mortality	12.5%	3.1%

Table 14. Summary of Major Findings

Parameter	FGR	No FGR
Number of pregnancies	20	80
Incidence	20%	80%
Preterm delivery	80%	50%
Mean birth weight	1740 g	2260 g
Discordance $\geq 25\%$	70%	2.5%
Abnormal UA Doppler	40%	-
NICU admission	70%	34.4%
Stillbirth	7.5%	1.3%

DISCUSSION

The present model study evaluates fetal growth restriction in twin pregnancies with emphasis on chorionicity, maternal risk factors, inter-twin growth discordance, Doppler findings and neonatal outcome.

In the simulated cohort of 100 twin pregnancies, FGR was identified in 20 pregnancies, resulting in an illustrative incidence of 20%. The incidence of sFGR varies according to the diagnostic criteria used, and studies using different definitions are therefore not directly comparable.

Chorionicity is an important determinant of outcome in twin pregnancy. Monochorionic pregnancies have a shared placenta, and unequal placental sharing can result in unequal fetal growth.

Inter-twin EFW discordance is a particularly important parameter. Current guidance recommends documentation of discordance during twin surveillance, with $\geq 20\%$ representing an increased-risk threshold and $\geq 25\%$ prompting specialist assessment.

The simulated study showed $\geq 25\%$ discordance in 70% of FGR pregnancies. Weight discordance has been associated with adverse perinatal outcome, although the magnitude of risk varies by chorionicity and gestational age.

Hypertensive disorders and preeclampsia were more frequent in the simulated FGR group. Maternal hypertensive disease is associated with placental dysfunction and can contribute to impaired fetal growth.

Doppler abnormalities were also more frequent among growth-restricted pregnancies. Abnormal umbilical artery Doppler reflects increased placental vascular resistance and is particularly relevant when assessing fetal growth restriction.

In monochorionic pregnancies, the UA Doppler pattern also forms the basis for classification of sFGR into Types I, II and III. Persistent absent/reversed end-diastolic flow is characteristic of Type II disease, while intermittent/cyclical absent/reversed flow is characteristic of Type III disease.

The simulated FGR group had a higher proportion of preterm delivery and NICU admission. These findings are clinically plausible because twin pregnancy itself carries a high risk of preterm birth and FGR may further complicate surveillance and delivery timing.

Gestational age at delivery is an important confounder when comparing neonatal outcomes. Respiratory morbidity and NICU admission may reflect prematurity as well as FGR; therefore, a real study should consider gestational age when interpreting these outcomes.

Limitations

- The model sample size is limited to 100 twin pregnancies.
- The study is proposed as a single-centre study.
- Ultrasound EFW has inherent measurement variability.
- Diagnostic criteria for FGR/sFGR can influence the reported incidence.
- Chorionicity may influence both FGR and perinatal outcome.
- Prematurity is an important confounder for neonatal outcomes.
- Fetal outcomes are clustered within pregnancies and cannot always be analysed as independent observations.
- The numerical results presented in this model are simulated and cannot be interpreted as actual clinical findings.

Strengths

- Includes both dichorionic and monochorionic twin pregnancies.
- Incorporates chorionicity into the assessment.

- Evaluates inter-twin EFW discordance.
- Includes Doppler assessment.
- Evaluates maternal risk factors.
- Includes both pregnancy-level and fetal-level outcomes.
- Provides a framework for future analysis using an actual clinical database.

CONCLUSION

In this model study of 100 twin pregnancies, fetal growth restriction was evaluated in relation to chorionicity, maternal risk factors, inter-twin growth discordance, Doppler abnormalities and perinatal outcome.

The simulated results demonstrate a pattern of increased growth discordance, abnormal Doppler findings, preterm delivery, low birth weight and NICU admission among pregnancies complicated by FGR.

Assessment of chorionicity, serial fetal growth, inter-twin EFW discordance and fetal Doppler parameters is an important component of surveillance of twin pregnancies at risk of FGR. The final conclusions of an actual study should be based exclusively on the original patient-level dataset.

Ethical Considerations

For an actual clinical study, approval from the institutional ethics committee should be obtained or the appropriate institutional waiver documented before analysis and publication. Patient confidentiality should be maintained, and identifying information should not be included in the study database used for publication.

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