Maternal Characteristics and Perinatal Outcomes in Survivor Twins Following Single Intrauterine Fetal Demise in Monochorionic Twin Pregnancies during The Third Trimester: A Retrospective Observational Study

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Abstract

Background: Monochorionic twin pregnancies are associated with unique complications, including single intrauterine death (sIUD) of one twin, particularly in the late trimester. This poses significant risks to the surviving co-twin and challenges maternal management.

Objective: To evaluate maternal demographic characteristics and perinatal outcomes of the surviving twin following sIUD in monochorionic twin pregnancies during the late trimester at a tertiary care center in Uttar Pradesh.

Methods: A retrospective observational study was conducted at a tertiary care center in Uttar Pradesh. Maternal demographic data, obstetric history, and perinatal outcomes of monochorionic twin pregnancies with sIUD in the late trimester were analyzed. Outcomes measured included maternal complications, mode of delivery, neonatal morbidity, and survival rates of the co-twin.

Results: The study included 10 cases of monochorionic twin pregnancies with single intrauterine death in the late trimester. Maternal demographic characteristics such as age, parity, and obstetric history were recorded.

Perinatal outcomes of the surviving twin, including birth weight, Apgar score, neonatal intensive care unit (NICU) admission, and neurological sequelae, were assessed. Factors influencing perinatal morbidity and mortality were identified.

Conclusion: Maternal demographics and perinatal outcomes in surviving co-twins after sIUD in monochorionic twin pregnancies vary based on several clinical factors. Early identification and management can potentially improve neonatal outcomes. Further research and standardized protocols are recommended to optimize care in such high-risk pregnancies.

Keywords: Single intrauterine death (sIUD), Maternal demographics, Survivor twin

Introduction

In recent years, the incidence of multifetal gestations has significantly increased due to the widespread use of assisted reproductive techniques and advanced maternal age. Monochorionic twin pregnancies, characterized by a shared placenta, present unique challenges and risks, particularly when single intrauterine death (sIUD) occurs. At any point during pregnancy, one or more fetuses may die. When fetal death occurs during the first trimester, the relative risk to the surviving twin is negligible. However, if death occurs in the later trimesters, the surviving twin faces a considerably higher risk of severe feto-maternal complications. [3]

Compared to dichorionic twin pregnancies, spontaneous death of one fetus occurs more commonly in monochorionic twins, [1,2] primarily due to abnormal vascular anastomoses. According to the Fetal Medicine Foundation, ²spontaneous death of one fetus occurs in approximately 1% of monochorionic twins [2], posing a substantial threat to the surviving co-twin. The Royal College of Obstetricians and Gynaecologists (RCOG) reports that the risks associated with the survivor twin include preterm birth (50-60%), death of the survivor twin (15%), and neurological injury (greater than 25%).[1]

In addition to fetal risks, maternal complications are also of significant concern. These may include pre-eclampsia, preterm labor, and preterm premature rupture of membranes (PPROM), anemia, placenta previa, placenta megaly with rare occurrences of coagulation defects triggered by the demise of one twin. These challenges necessitate close monitoring and strategic management to optimize outcomes for both the surviving twin and the mother.

Given the complexity and the high risk involved, this study aims to evaluate the maternal demographic characteristics and perinatal outcomes of the surviving twin following sIUD in monochorionic twin pregnancies during the late trimester at a tertiary care center in Uttar Pradesh. By analyzing maternal and fetal outcomes, we aim to identify factors that may guide clinical management and improve prognostic predictions.

The primary aim of this study is to evaluate the maternal demographic characteristics and perinatal outcomes in the surviving twin following single intrauterine fetal death (sIUD) in monochorionic twin pregnancies during the late trimester at a tertiary care center in Uttar Pradesh.

Objectives

1. To analyze maternal demographic characteristics, including age, parity, obstetric history, and associated risk factors.

2. To assess perinatal outcomes of the surviving twin, including birth weight, Apgar score, NICU admission, neonatal morbidity, and mortality rates.

3. To identify maternal complications associated with sIUD, such as pre-eclampsia, preterm labor, and coagulation abnormalities.

4. To evaluate factors influencing the prognosis of the survivor twin and identify potential predictors of adverse outcomes.

5. To provide insights for better management and care strategies for monochorionic twin pregnancies complicated by single fetal death in the late trimester.

Material and Methods

This retrospective observational study was conducted at the department of obstetrics and gynecology, Sarojini Naidu Medical College, Agra, from july 2024 to january 2025 (a total duration of 6 months). The institutional Ethical Committee approved the study, and informed consent was obtained from all participants. The study included 10 cases of sIUFD in monochorionic twin pregnancies identified during the study period. The cases were enrolled based on the inclusion and exclusion criteria outlined below. The study employed a purposive sampling technique to include all eligible cases of sIUFD in monochorionic twin pregnancies presenting to the hospital during the study period.

Inclusion Criteria

1. **Gestational Age:** Monochorionic twin pregnancies with one twin IUFD diagnosed in the late trimester ($\geq$ 28 weeks of gestation) including booked and registered cases.

2. **Referral Cases:** Patients referred to the center as single IUFD in twin pregnancy.

3. **Chorionicity Confirmation:** Chorionicity of twins confirmed via ultrasound (USG).

4. **Fetal Heart Rate (FHR) Verification:** Confirmation of fetal heart rate for both the surviving twin and the deceased fetus via USG.

5. **Live Birth at Delivery:** Only cases where one twin remained alive at the time of delivery were included.

6. **Follow-Up:** Patients were followed up to 7 days postpartum.

7. **Data Source:** Pregnancy outcomes were recorded from the labor ward register, and neonatal outcomes were retrieved from the Special Newborn Care Unit (SNCU) register.

Exclusion Criteria

1. **Both Twin IUFD at Diagnosis:** Cases where both twins were already dead at the time of diagnosis.

2. **Early Trimester sIUFD:** Cases where sIUFD occurred before the late trimester.

3. **Dichorionic Twin Pregnancies:** All cases identified as dichorionic twins on ultrasound were excluded.

4. **Live Twin Pair at Delivery:** Cases where both twins were alive at delivery were not considered.

5. **Incorrect Diagnosis:** Any case where chorionicity was misclassified initially.

Statistical Analysis

Data were analyzed using descriptive statistics to calculate mean, median, and percentage values for demographic and outcome variables. Comparisons between variables were performed using appropriate statistical tests (e.g., chi-square or t-test). A p-value of <0.05 was considered statistically significant.

Results

Table 1: Delivery distribution table

Delivery category	Total delivery(percentage)
Total deliveries	92(92%)
Twin deliveries	50(5%)
Monochorionic twins	30(3%)

Monochorionic with SIUFD	10(10%)

Out of all deliveries, 5% were twin pregnancies. Among these, 3% were monochorionic twins, and only 1%

involved monochorionic twins with sIUFD. This reflects the rarity but clinical importance of such high-risk cases requiring specialized care. (Table 1)

Table 2: Maternal demographic factors

Maternal demographic factors	Yes(no of patients)	No (no of patients)
Conceived spontaneously	7(70%)	3(30%)
Family h/o twins	1(10%)	9(90%)
primigravida	3(30%)	7(70%)

Among the 10 patients, 70% conceived spontaneously, while only 10% had a family history of twins. Primigravida constituted 30% of the cases, with the majority being multigravida. This indicates that most cases occurred without familial predisposition or assisted reproduction, and were more common in multigravida. (Table 2)

Table 3: Maternal High Risk Condition

Maternal High Risk Condition	No. of Patients	Percentage
Pre-eclampsia with severe features	3	30%
Previous LSCS	1	10%
PPROM > 24 hrs	1	10%
No other high risk condition	5	50%

Half of the patients (50%) had no identifiable high-risk conditions, while the most common complication was severe pre-eclampsia (30%). Previous LSCS and prolonged rupture of membranes (PPROM > 24 hrs) were present in 10% each. This highlights pre-eclampsia as the leading maternal factor contributing to adverse outcomes in cases of sIUFD.

Table 4: mode of delivery and indication

Vaginal Delivery		Indication
Spontaneous	3	
induced	2	1 – term , 1- severe pre-eclampsia
LSCS		
Maternal indication	2	Pre-eclampsia with severe features with poor BISHOPS
	1	Previous LSCS

Fetal indication	1	Fetal distress
	1	REDF

Half of the patients underwent vaginal delivery, with 3 spontaneous and 2 induced—primarily due to term gestation and severe pre-eclampsia. The remaining 5 had LSCS, most commonly for maternal indications like pre-eclampsia with poor Bishop score. Fetal distress and reversed end-diastolic flow (REDF) accounted for the rest. This highlights the tailored obstetric approach based on maternal and fetal status in high-risk pregnancies.

Table 5: lab parameters and maternal complications table

Lab Parameters	Value	No. of Patients	Percentage
TLC	< 11000	4	40%
	11000 – 20000	5	50%
	> 20000	1	10%
Coagulation deranged or FFP received	Yes	3	30%
	No	7	70%
Maternal complications	No	8	80%
	PPH	2	20%
	AKI, Sepsis	1	10%

Half of the patients had a normal TLC range (11,000–20,000), while 30% showed coagulation abnormalities requiring FFP. Maternal complications were noted in 20% with PPH and 10% with AKI and sepsis—primarily among those with severe pre-eclampsia or prolonged PPROM. This emphasizes the systemic impact of sIUFD-related maternal risk factors**.**

PPH, AKI and sepsis occurred in severe pre-eclampsia patients.

Deranged coagulation (INR normal but PT, aPTT raised) – received FFP in 3 pts – 2 out of which were severe pre-eclampsia and other 1 had only PPROM > 24 hrs.

Table 6: gestational age, corticosteroid use and duration table

GA at Diagnosis	GA at Delivery	Corticosteroids	Duration
30 wk 5 d	31 wk 2 d	Yes, neuroprotection	4 d
30 wk	31 wk	yes	7 d
31 wks 6 d	32 wk 1 d	1 dose given	1 d

30 wk	30 wk 5 d	Couldn't complete	5 d
32 wk 5 d	34 wk 2 d	yes	11 d
28 wk 5 d	30 wk 5 d	yes	14 d
32 wk	32 wk	No	< 1 d
34 wk 2 d	34 wk 3 d	yes	1 d
35 wk	35 wk 1 d	No	1 d
36 wk 6 d	37 wk 1 d	No	2 d

Most patients were diagnosed between 30–32 weeks and delivered within 1–2 weeks. Corticosteroids were administered in 70% of cases, but only a few completed the full course. Incomplete or absent steroid coverage was mainly due to early deliveries triggered by maternal or fetal complications. This emphasizes the challenge of optimizing antenatal corticosteroid use in high-risk twin pregnancies with sIUFD.

Table 7: neonatal outcome table

Birth Weight	APGAR 1 min	APGAR – 5 min	SNCU admission	Outcome
800	5/10	5/10	2 days	Died (VLBW)
1000	4/10	6/10	2 days	Died (prematurity)
1100	6/10	7/10	5 days	Died (prematurity)
1200	5/10	7/10	4 days	Died (prematurity)
1400	7/10	8/10	No	Living but had Congenital heart disease
1500	7/10	9/10	3 days (REDF antenatally)	Died (ARDS)
1500	2/10	2/10	3 days	Died (hypoxia, sepsis)
1600	6/10	8/10	12 days	Living
2000	7/10	9/10	No	Living
2500	9/10	10/10	No	Living

Low birth weight and prematurity were the primary contributors to neonatal mortality, with 6 out of 10 babies not surviving. Survivors had higher birth weights (>1400 g) and better APGAR scores. One surviving neonate had a congenital heart defect, while deaths were mostly due to ARDS, sepsis, or extreme prematurity. This underscores the importance of gestational maturity and birth weight in determining neonatal outcomes in sIUFD cases.

Table 8: fetal outcome summary table

Fetal outcome	percentage
live	40%
Death- prematurity	50%
Death others	10%

Strengths and Limitations

Strengths

Focused Research Topic: The study addresses a rare but clinically significant scenario—sIUFD in monochorionic twin pregnancies in the late trimester.

Prospective Design: Data was collected prospectively, reducing recall bias and improving data accuracy.

Well-defined Criteria: Strict inclusion and exclusion criteria ensured a homogeneous study population, enhancing result reliability.

Real-world Clinical Insight: Conducted in a tertiary care setting, the findings reflect practical challenges and outcomes relevant to daily obstetric practice.

Limitations

Small Sample Size: Only 10 cases were included, which limits statistical power and generalizability of the findings.

Short Follow-up Period: Neonates were followed for just 7 days, which may not capture late neonatal or long-term neurological outcomes.

Single-center Study: Results may not be applicable to different populations or healthcare settings.

Limited Imaging and Investigations: Advanced fetal imaging (like MRI) and postmortem analyses were not part of the study, which could have provided deeper insight into causes of morbidity and mortality.

Conclusion

Fetal prognosis in survivor twin in case of single intrauterine fetal death in monochorionic twins is poor. It is mostly due to pre-maturity.

Pre-maturity is due to spontaneous onset of labour pre-maturely and induced due to associated maternal risk factor of severe pre-eclampsia.

Secondly, abnormal doppler changes leading to neurologic sequalae [6] or ARDS and hypoxia due to utero-placental insufficiency is also not uncommon.

Maternal morbidity and mortality is rare due to sIUFD but rather its due to the cause of IUFD which is mostly severe pre-eclampsia.

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