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Original Research Article

An observational study of intrauterine death in high-risk pregnancy at a tertiary care hospital

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ABSTRACT

Background: Intrauterine death (IUD) is a major obstetric complication and a distressing event for both families and caregivers. Identifying the causes and associated obstetric conditions is important for developing preventive strategies and improving the quality of antenatal care. This study aimed to characterize the clinical and obstetric profile of IUD cases at a tertiary care hospital and to evaluate the associated maternal risk factors.
Methods: An observational study was conducted at LLRM, a tertiary care centre. Out of 5000 total deliveries during the study period, 149 cases of intrauterine death were identified and included in the analysis. Maternal demographic details, gestational age, obstetric complications, booking status, residence, mode of delivery and associated clinical conditions were recorded and analyzed.
Results: The IUD rate in this study was 29.8 per 1000 deliveries (2.98%). Most cases were in the age group of 21–25 years (51.0%), with a mean maternal age of 25.8 years. Multigravida women made up 64.4% of the cases. A large number of patients were unbooked (79.2%) and from rural areas (71.1%). Preterm labour was the most common associated complication (63.1%), followed by severe pre-eclampsia (27.5%), antepartum eclampsia (17.4%), antepartum haemorrhage (14.1%) and gestational diabetes mellitus (14.1%). Most patients (71.1%) had vaginal delivery, while 28.9% underwent caesarean section. Meconium-stained liquor was seen in 38.3% of cases.
Conclusions: Hypertensive disorders of pregnancy and preterm labour were the most common conditions associated with IUD in this setting. The high number of unbooked and rural patients highlights the importance of proper antenatal care. Early registration, regular antenatal check-ups and timely referral to higher centres remain the cornerstone for prevention of IUD.

Keywords: Antepartum fetal demise, Antepartum haemorrhage, Antenatal care, Intrauterine death, Pre-eclampsia, Preterm labour, Perinatal mortality, Stillbirth

INTRODUCTION

IUD also referred to as stillbirth or antepartum fetal demise, is defined as the death of a fetus at or beyond 28 weeks of gestation according to the WHO definition or at or beyond 20 weeks of gestation or a fetal weight of 500 grams or more as per the broader clinical definition used in many tertiary care settings. IUD constitutes a major component of perinatal mortality worldwide and includes both antepartum and intrapartum fetal deaths.[1,2] Globally, an estimated 2.0 million stillbirths occur annually, with a global stillbirth rate of 13.9 per 1000 total births in 2019.

Over 84% of this burden is concentrated in South Asia and sub-Saharan Africa. In developed countries, the incidence of IUD is around 3 per 1000 pregnancies, whereas in low- and middle-income countries it may reach 20–45 per 1000 pregnancies. India bears the highest absolute number of stillbirths in the world. A systematic review and meta-analysis on the burden and causes of stillbirths in India (Indian Journal of Pediatrics, 2023) synthesizing data from

46 studies across 21 Indian states confirmed that maternal conditions constitute the leading cause (25%), followed by fetal (14%) and placental causes (13%). The national stillbirth rate has declined from 29.5 in 2010, reflecting increasing gains from improved institutional delivery coverage and ASHA-based community outreach, however, progress remains uneven and largely bypasses remote rural populations, reflecting critical gaps in antenatal care, maternal nutrition and access to emergency obstetric services.[3,4]

The etiology of IUD is multifactorial. Fetal causes such as chromosomal abnormalities, congenital malformations and fetal growth restriction account for 25–40% of cases globally. Placental causes, including abruption, placenta previa, cord abnormalities and uteroplacental insufficiency, contribute to 25–35%. Maternal conditions such as hypertensive disorders, diabetes mellitus, severe anaemia, infections (particularly urinary tract infections) and antiphospholipid syndrome account for 5–10%, while 25–35% of cases remain unexplained even after thorough evaluation.

In the Indian context, infection-related causes are likely underdiagnosed due to limited microbiological workup. A multisite hospital-based stillbirth sentinel surveillance study from seven tertiary care government hospitals in Delhi (2016–2020), reported a stillbirth rate of 29.3 per 1000 births and found that nearly 50% of women who experienced stillbirths received no antenatal care, with preterm labour (25.7%) and placental abruption/haemorrhage (15.2%) as the leading antepartum maternal causes.[5,6]

In the Indian setting, additional factors such as low socioeconomic status, chronic pre-pregnancy undernutrition, micronutrient deficiencies (particularly iron and folate), limited awareness about danger signs in pregnancy, poor road access and long distances to facilities further increase the risk. The phenomenon of the 'three delays' in recognizing danger signs, in deciding to seek care and in reaching and receiving care is particularly relevant in rural northern India and contributes to a large proportion of avoidable perinatal deaths. A large number of patients present as unbooked emergencies at tertiary care centres, a pattern consistently associated with poor perinatal outcomes including IUD.

A case-control study on placental pathology and maternal risk factors for stillbirth (2022–2023) conducted at a tertiary centre in Odisha confirmed that absence of antenatal visits carried significantly higher odds of stillbirth (OR 3.87), reinforcing the central role of ANC access in prevention.[7,8] Considering the importance of IUD as an indicator of perinatal health and the limited prospective data available from this region, the present study was conducted to evaluate the incidence, clinical profile, associated obstetric risk factors and mode of delivery in IUD cases at a tertiary care hospital. The findings aim to support better antenatal care practices and help in developing effective preventive strategies.

METHODS

Study design and setting

This was an observational study conducted in the Department of Obstetrics and Gynaecology at Lala Lajpat Rai Medical College, Meerut, a tertiary care hospital. The study was carried out from January 2025 to January 2026. During this period, all deliveries and their perinatal outcomes were observed. Out of a total of 5000 deliveries, 149 cases of intrauterine death were recorded, resulting in an IUD rate of 29.8 per 1000 deliveries.

Inclusion criteria

All pregnant women admitted to our hospital with a confirmed diagnosis of intrauterine death at or beyond 20 weeks of gestation were included in the study. Diagnosis was confirmed by clinical examination and ultrasonography showing absence of fetal cardiac activity.

Exclusion criteria

Cases of induced termination of pregnancy, patients with incomplete clinical records and those referred to other institutions before delivery were excluded from the study.

Data Collection

Data were collected using a structured proforma. Information recorded included maternal age, gravidity, parity, period of gestation (POG), place of residence (rural or urban) and antenatal booking status (booked or unbooked). Clinical details such as body mass index (BMI) at admission and tetanus toxoid (TT) immunization status were also noted.

Obstetric complications recorded included antepartum haemorrhage (APH), antepartum eclampsia, pre-eclampsia (severe and non-severe), severe anaemia, gestational diabetes mellitus (GDM), intrahepatic cholestasis of pregnancy (IHCP), preterm prelabour rupture of membranes (PPROM), congenital anomalies detected on ultrasonography, preterm labour, Rh-negative status, hypothyroidism, intrauterine growth restriction (IUGR), multiple pregnancy and overt diabetes mellitus. Previous obstetric history, including past abortions and previous IUD, was also recorded. The mode of delivery and presence of meconium-stained liquor (MSL) were noted as outcome variables.

Statistical analysis

Data were recorded in Microsoft Excel 2021 format. Descriptive statistics were used for analysis. Categorical variables were expressed as frequencies and percentages and continuous variables were presented as mean with

standard deviation. The IUD rate was calculated per 1000 total deliveries.

RESULTS

During the study period, there were 5000 total deliveries, out of which 149 were intrauterine deaths. The IUD rate was 29.8 per 1000 deliveries (2.98%). The clinical and demographic details of these cases are shown in the Tables. As shown in Table 1, most IUD cases were seen in the 21–25 years age group (51.0%, n=76), followed by the 26–30-year group (43.6%, n=65). The mean maternal age was 25.8 years (range 20–35 years). Women aged 31–35 years accounted for 4.7% of cases. Only one patient (0.7%) was below 20 years of age and no cases were observed above 35 years.

Table 2 shows that most IUD cases occurred in multigravida women (64.4%, n=96), while primigravida women accounted for 35.6% (n=53). This suggests that IUD was more common among women with previous pregnancies. As shown in Table 3, most IUD cases occurred between 28–32 weeks of gestation (34.9%), followed by 33–36 weeks (32.2%). Overall, 79.9% of cases occurred before 37 weeks, showing a strong link between preterm gestation and IUD. Full-term cases (37 - 40 weeks) accounted for 17.4%, while post-dated cases were seen in 2.7%. Table 4 shows that 71.1% of IUD cases were from rural areas. Most patients (79.2%) were unbooked at presentation, indicating late referral or emergency admission without prior antenatal care. Only 20.8% were booked cases with documented antenatal follow-up. Table 5 shows the distribution of obstetric risk factors among the 149 IUD cases. Preterm labour was the most common complication, seen in 63.1% of cases. Hypertensive disorders were the next major group, with severe pre-eclampsia in 27.5%, antepartum eclampsia in 17.4% and non-severe pre-eclampsia in 5.4%. APH and gestational diabetes mellitus (GDM) were each present in 14.1% of cases. Severe anaemia was seen in 12.8%.

Congenital anomalies were noted in 7.4% of cases. PPROM was present in 6.7%, intrahepatic cholestasis of pregnancy (IHCP) in 6.0% and multiple pregnancy in 4.7%. A history of previous abortion was found in 16.1% of patients. The mean BMI of the IUD cases was 25.0 kg/m². As shown in table 6, 55.0% of patients had a normal BMI. About 44.3% were overweight and only one patient (0.7%) was obese. No patients were underweighted. Table 7 shows that most IUD cases (71.1%) were delivered vaginally, while 28.9% required caesarean section. MSL was seen in 38.3% of deliveries, suggesting fetal distress in many cases. Tetanus toxoid coverage was high, with 96.0% of patients being immunised.

Table 1: Maternal age distribution in IUD cases.

Maternal age (in years)	Number of IUD cases	(%)
16–20	1	0.7
21–25	76	51.0
26–30	65	43.6
31–35	7	4.7
>35	0	0.0
Total	149	100.0

Table 2: Distribution of IUD cases by gravidity.

Gravidity	Number of IUD cases	(%)
Primigravida	53	35.6
Multigravida	96	64.4
Total	149	100.0

Table 3: IUD cases by period of gestation at presentation.

Period of gestation (in weeks)	Number of IUD cases	(%)
<28	19	12.8
28–32	52	34.9
33–36	48	32.2
37–40	26	17.4
>40 weeks (post-dated)	4	2.7
Total	149	100.0

Table 4: Residence and antenatal booking status of IUD cases.

Parameter	Category	Number	(%)
Residence	Rural	106	71.1
	Urban	43	28.9
Booking Status	Unbooked	118	79.2
	Booked	31	20.8

Table 5: Obstetric complications and associated risk factors in IUD cases.

Associated Condition / Risk Factor	Number of IUD Cases	(%)
Preterm labour	94	63.1
Severe pre-eclamptic toxaemia (severe PET)	41	27.5
Antepartum eclampsia	26	17.4
Previous abortion history	24	16.1
Antepartum haemorrhage (APH)	21	14.1
Gestational diabetes mellitus (GDM)	21	14.1
Severe anaemia	19	12.8
Congenital anomalies of fetus	11	7.4
PPROM	10	6.7
Intrahepatic cholestasis of pregnancy (IHCP)	9	6.0
Non-severe PET	8	5.4
Multiple pregnancy	7	4.7
Overt diabetes mellitus	7	4.7
Rh-negative status	6	4.0
Post-dated pregnancy	4	2.7
Hypothyroidism	3	2.0
IUGR	3	2.0

Table 6: BMI Distribution in IUD cases.

BMI category	BMI range (kg/m²)	Number	(%)
Underweight	<18.5	0	0.0
Normal weight	18.5–24.9	82	55.0
Overweight	25.0–29.9	66	44.3
Obese	≥30.0	1	0.7
Total		149	100.0

Table 7: Mode of delivery in IUD cases.

Mode of delivery	Number	(%)
Vaginal delivery (TVD)	106	71.1
Lower segment caesarean section (LSCS)	43	28.9
Total	149	100.0

DISCUSSION

The present observational study reports an IUD rate of 29.8 per 1000 deliveries (2.98%), based on 149 fetal deaths among 5000 total deliveries at our tertiary care centre. This rate is substantially higher than the approximately 3 per 1000 reported in developed countries but is comparable to figures from other tertiary centres in northern India, where rates range from 20 to 45 per 1000 deliveries. A multisite stillbirth sentinel surveillance study conducted across seven government tertiary hospitals in Delhi over the period 2016–2020 reported a comparable stillbirth rate of 29.3 per 1000 births, with nearly 50% of affected women receiving no antenatal care mirroring the pattern observed in our study. The higher rate in our study reflects the referral nature of our institution, which receives a large number of high-risk, late-presenting and already compromised cases from rural western Uttar Pradesh. It is important to note that this rate reflects only hospital-based deliveries. Many intrauterine deaths occurring in rural

homes or during transit never reach a facility and therefore go unrecorded. As highlighted by Flenady et al institutional stillbirth rates at tertiary referral centres are influenced by case-mix and referral patterns and cannot be directly compared with community-level figures.[9]

Most IUD cases were seen in the 21–25 years age group (51.0%), followed by 26–30 years (43.6%). The mean maternal age was 25.8 years, which corresponds to the peak reproductive age in this population. Although very young and advanced maternal ages are known risk factors, the clustering of cases within the usual reproductive age group suggests that IUD is not limited to extremes of age. A large population-based cohort study (2020–2022) from the United States published in AJOG (2024) demonstrated that while advanced maternal age is independently associated with increased stillbirth risk at 40+ years, the absolute majority of fetal deaths in any population occur within the normal reproductive age range due to the sheer volume of pregnancies in that group. Similar age distribution findings consistent with the results have been reported by Changede et al from a tertiary centre in Mumbai.[7,10]

Multigravida women accounted for 64.4% of cases, which is consistent with previous studies. This may be due to factors like nutritional depletion from repeated pregnancies, higher chances of anaemia and hypertension and increased risk of placental complications such as abruption and morbidly adherent placenta. In our setting, closely spaced pregnancies (a common feature among rural multigravida patients) further aggravate these risks by limiting maternal recovery between pregnancies. At the same time, the presence of IUD in 35.6% of primigravida women is clinically important, as first pregnancies are more prone to hypertensive disorders and immunological complications, which were major contributors in this study.[11]

A key finding was that 79.2% of patients were unbooked, a proportion higher than the national average and consistent with the referral burden of tertiary hospitals in northern India. The multisite hospital-based sentinel surveillance from Delhi (2016–2020) corroborated that inadequate antenatal care substantially amplifies stillbirth risk, with 50% of women experiencing stillbirths receiving no ANC whatsoever. A case-control study on placental pathology and maternal risk factors for stillbirth from VIMSAR, Odisha (2022–2023) further confirmed that absence of antenatal visits significantly increased odds of stillbirth (OR 3.87, 95% CI: 2.11–5.21). In our experience at this centre, a recurring pattern was observed: unbooked patients arrived with severe pre-eclampsia, absent fetal movements and meconium-stained liquor, suggesting that the IUD had already occurred well before hospital presentation. In addition, 71.1% of patients were from rural areas, where poor road connectivity, dependence on male family members for decision-making and financial constraints further delay timely care. These findings highlight the need for community-level sensitization through ASHA workers, strengthened sub-district referral networks and making at least four antenatal contacts universally accessible.[8,9] Preterm labour was the most commonly documented associated complication, present in 63.1% of cases. This is partly a reflection of the gestational age distribution, as 79.9% of IUDs occurred before 37 weeks, predominantly between 28–32 weeks the period of highest fetal vulnerability. It is important to recognize that preterm labour in many of these cases was likely a consequence rather than an independent cause, being precipitated by conditions such as antepartum haemorrhage, severe pre-eclampsia and PPROM. From a clinical standpoint, this emphasizes the value of treating preterm labour as an important finding that requires urgent fetal surveillance rather than expectant management alone, particularly in high-risk settings.[12]

Hypertensive disorders were the most important maternal conditions associated with IUD. Severe pre-eclampsia was seen in 27.5% of cases, antepartum eclampsia in 17.4% and non-severe pre-eclampsia in 5.4%, together accounting for more than half of the cases. The pathophysiology of preeclampsia, as described in a recent narrative review published in J Clin Med (2026), follows a two-stage model: impaired trophoblast invasion in early pregnancy leads to incomplete spiral artery remodelling and chronic placental hypoperfusion, triggering release of antiangiogenic factors (soluble Flt-1) and causing widespread endothelial dysfunction. This ultimately impairs fetal oxygen delivery, precipitating fetal hypoxia and intrauterine death. Since most of these patients were unbooked, regular blood pressure monitoring and early detection of pre-eclampsia during antenatal visits remain the critical preventive measure.[13]

Antepartum haemorrhage was present in 14.1% of cases and is a known cause of fetal hypoxia due to placental separation. It is often associated with hypertensive disorders, which may explain its co-occurrence in this study. A case-control study from VIMSAR (2022–2023) confirmed that retroplacental clots (OR 9.95) and uteroplacental vascular pathology (OR 7.39) were the most significant placental lesions associated with stillbirth, mechanistically linking APH to fetal demise through acute placental insufficiency. Gestational diabetes mellitus was also seen in 14.1% of cases and contributes to IUD by causing chronic fetal hyperglycaemia, leading to fetal hyperinsulinemia and intrauterine hypoxia.[8]

Severe anaemia, found in 12.8% of cases, remains an important preventable factor. Iron deficiency anaemia reduces maternal oxygen-carrying capacity, impairing fetal oxygenation, particularly in the setting of co-existing hypertensive or haemorrhagic complications. Congenital anomalies accounted for 7.4% of cases, while PPROM (6.7%) and intrahepatic cholestasis of pregnancy (6.0%) were also noted contributors. The mean BMI of 25.0 kg/m² and the finding that 44.3% of women were overweight is noteworthy. A large population-based cohort study from Sweden (BMC Pregnancy and Childbirth, 2023) involving

64,632 women demonstrated that overweight women had a double risk of stillbirth from 40 weeks onwards compared to normal-weight women (RR 2.06; 95% CI 1.01–4.21) and a narrative review in Journal of Human Nutrition and Dietetics (2022) confirmed that for every 5 kg/m² increase in BMI above the ideal range, the odds of stillbirth increased by 24% (OR 1.24; 95% CI 1.18–1.30). Traditionally, perinatal studies from rural northern India have highlighted undernutrition as the dominant nutritional concern; however, the co-existence of overweight and metabolic risk in this cohort calls for the integration of pre-conceptional weight counselling and dietary guidance into standard antenatal care protocols, especially at primary health centres serving peri-urban and semi-rural populations.[14,15]

Most patients (71.1%) delivered vaginally, while 28.9% required caesarean section due to complications such as previous caesarean scar, severe abruption or eclampsia. Meconium-stained liquor was seen in 38.3% of cases, indicating fetal distress prior to delivery. Tetanus toxoid coverage was high (96.0%), reflecting good immunization practices even among largely unbooked patients.

Limitations

Being a single-centre observational study conducted at a tertiary referral hospital, the findings may not represent the true community burden of IUD. Referral bias and the absence of a comparison group limit causal interpretation of associated risk factors. However, the study provides valuable insight into the clinical profile and preventable contributors to IUD in a high-risk obstetric population.

CONCLUSION

The intrauterine death rate at our tertiary care centre was 29.8 per 1000 deliveries, derived from 149 IUD cases among 5000 total deliveries. Preterm labour and hypertensive disorders of pregnancy including severe pre-eclampsia and eclampsia were the foremost obstetric conditions associated with IUD in this cohort. The profile of the typical IUD case in this series was a young, multigravida, rural, unbooked woman presenting at a preterm gestational age.

These findings emphasize the importance of early and regular antenatal care, preferably starting in the first trimester. Careful screening during each antenatal visit can help identify high-risk conditions such as anaemia, hypertension and diabetes at an early stage. Strengthening the role of community health workers can improve timely referral of high-risk pregnancies to higher centres. The high rate of meconium-stained deliveries in this study also shows the need for round-the-clock neonatal resuscitation services at centres managing such cases. With improved antenatal surveillance methods such as colour Doppler studies, non-stress testing and fetal karyotyping, many intrauterine deaths may be prevented if these services are made accessible and are properly utilized through continuous public health efforts. Henceforth this study aims to add to the existing literature that may help clinicians, policymakers and public health authorities in planning targeted interventions aimed at reducing preventable fetal deaths and improving overall perinatal outcomes.

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