



FETOMATERNAL OUTCOMES IN COUVELAIRE UTERUS: A TERTIARY CARE HOSPITAL–BASED OBSERVATIONAL STUDY FROM SOUTHERN RAJASTHAN

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ABSTRACT

Background: Couvelaire uterus, also known as uteroplacental apoplexy, is a rare but severe complication of placental abruption characterized by extravasation of blood into the myometrium. It is often associated with significant maternal morbidity and adverse perinatal outcomes. Due to its intraoperative diagnosis and rarity, regional data on fetomaternal outcomes remain limited.

Objectives: To evaluate the maternal and fetal outcomes in cases of Couvelaire uterus and to assess associated risk factors at a tertiary care hospital in southern Rajasthan.

Materials and Methods: This hospital-based observational study was conducted in the Department of Obstetrics and Gynecology at a tertiary care center in southern Rajasthan over a six-month period from April 2025 to September 2025. All pregnant women diagnosed intraoperatively with Couvelaire uterus at gestational age ≥ 28 weeks were included. A total of 35 cases were analyzed. Data regarding maternal demographics, risk factors, mode of delivery, intraoperative findings, maternal complications, and fetal outcomes were collected from hospital records. Statistical analysis was performed using SPSS version 25. Categorical variables were expressed as frequencies and percentages, and associations were analyzed using Chi-square or Fisher's exact test, with $p < 0.05$ considered statistically significant.

Results: Most women were aged 25–34 years (60%) and multiparous (71.4%), with a majority being unbooked (65.7%). Hypertensive disorders of pregnancy were the most common associated risk factor (51.4%), followed by anemia (40%). Emergency cesarean section was required in 88.6% of cases. Maternal complications included postpartum hemorrhage (45.7%), blood transfusion requirement (60%), disseminated intravascular coagulation (17.1%), and ICU admission (22.9%). Obstetric hysterectomy was required in 5.7% of cases, with no maternal mortality. Perinatal outcomes were poor, with a stillbirth rate of 40% and NICU admission in 37.1% of live births. Hypertensive

disorders were significantly associated with postpartum hemorrhage, ICU admission, and stillbirth ($p < 0.05$).

Conclusion: Couvelaire uterus is a marker of severe placental abruption associated with high maternal morbidity and adverse perinatal outcomes. Early recognition, prompt intervention, and comprehensive tertiary care are crucial to improving fetomaternal outcomes.

Keywords: Couvelaire uterus; Placental abruption; Fetomaternal outcome; Postpartum hemorrhage; Hypertensive disorders of pregnancy; Stillbirth

INTRODUCTION

Placental abruption (abruptio placentae) is defined as the premature separation of a normally implanted placenta prior to delivery of the fetus and represents one of the most critical obstetric emergencies worldwide [1]. Although its reported incidence ranges between 0.4% and 1.5% of all pregnancies, placental abruption contributes disproportionately to severe maternal morbidity, perinatal mortality, and long-term neonatal complications [2]. The clinical presentation varies from mild vaginal bleeding to catastrophic hemorrhage with maternal shock and fetal demise, depending on the extent and rapidity of placental separation [3].

One of the most severe pathological manifestations of placental abruption is Couvelaire uterus, also known as uteroplacental apoplexy. This condition is characterized by extravasation of blood from the retroplacental space into the myometrium, leading to diffuse uterine ecchymosis and a bluish-purple discoloration of the uterine surface [4]. First described by Alexandre Couvelaire in 1911, this entity remains rare and is most often identified incidentally during cesarean section or laparotomy performed for severe abruption [5]. Because the diagnosis is primarily intraoperative, the true incidence of Couvelaire uterus is likely underestimated, especially in cases managed vaginally or in resource-limited settings.

The pathophysiology of Couvelaire uterus is directly linked to concealed or severe placental abruption. A sudden rupture of decidual spiral arteries leads to formation of a retroplacental hematoma. When bleeding is rapid and extensive, blood dissects through the decidua basalis and infiltrates the myometrium, sometimes extending to the uterine serosa, broad ligament, and rarely into the peritoneal cavity [4,6]. Despite the dramatic macroscopic appearance, uterine contractility is often preserved, and the condition itself does not invariably necessitate hysterectomy. Instead, Couvelaire uterus is now considered a marker of severe placental abruption rather than an independent indication for uterine removal [5].

Several maternal risk factors are associated with placental abruption and consequently with Couvelaire uterus. Hypertensive disorders of pregnancy, including preeclampsia and eclampsia, remain the most consistently reported associations [2,7]. Other risk factors include multiparity, advanced maternal age, smoking, trauma, premature rupture of membranes, and previous history of placental abruption [3]. In low- and middle-income countries, delayed referral, high prevalence of anemia, and limited access to emergency obstetric services further amplify the severity of presentation and associated complications [7].

Maternal morbidity associated with Couvelaire uterus primarily results from the underlying placental abruption rather than from the uterine infiltration itself. Reported complications include postpartum hemorrhage, disseminated intravascular coagulation (DIC), acute renal failure, need for massive blood transfusion, intensive care unit admission, and, in rare cases, obstetric hysterectomy [6,8]. Early diagnosis of abruption, rapid resuscitation, and availability of blood and blood components play a crucial role in preventing maternal mortality. Several studies emphasize that conservative management with uterine preservation is feasible in most cases when bleeding is adequately controlled [5,8].

Fetal and neonatal outcomes in cases complicated by Couvelaire uterus are frequently poor due to sudden and severe compromise of uteroplacental circulation. Extensive placental separation leads to acute fetal hypoxia, metabolic acidosis, low Apgar scores, and high rates of stillbirth [2,3]. Among

live-born neonates, prematurity, low birth weight, need for neonatal resuscitation, and neonatal intensive care unit (NICU) admission are commonly reported [6]. The extent of fetal compromise depends on the degree of placental separation, gestational age at presentation, and timeliness of obstetric intervention.

Despite its clinical significance, literature on Couvelaire uterus largely consists of case reports and small observational studies, with limited data from many regions of India, including southern Rajasthan [4,6,8]. Regional studies are important because demographic characteristics, antenatal care utilization, referral patterns, and resource availability significantly influence both maternal and fetal outcomes. Understanding local trends helps in strengthening preparedness for obstetric emergencies and optimizing management protocols in tertiary care centers.

The present study was therefore undertaken at a tertiary care hospital in southern Rajasthan to evaluate fetomaternal outcomes in cases of Couvelaire uterus over a six-month period (April 2025 to September 2025). By analyzing clinical characteristics and outcomes in 35 cases, and comparing them with previously published literature where findings generally cluster around central tendencies, this study aims to contribute region-specific evidence and reinforce the importance of early recognition and multidisciplinary management of severe placental abruption [9].

MATERIALS AND METHODS

Study Design: This was a hospital-based observational study conducted to evaluate fetomaternal outcomes in cases of Couvelaire uterus.

Study Setting: The study was carried out in the Department of Obstetrics and Gynecology at a tertiary care hospital in southern Rajasthan, which serves as a major referral center for high-risk obstetric cases from both urban and rural areas.

Study Duration: The study was conducted over a period of six months, from April 2025 to September 2025.

Study Population: All pregnant women diagnosed intraoperatively with Couvelaire uterus during the study period were included in the study.

Sample Size: A total of 35 cases of Couvelaire uterus were identified and included during the study period.

Inclusion Criteria

- Pregnant women with intraoperative diagnosis of Couvelaire uterus during cesarean section or laparotomy
- Gestational age ≥ 28 weeks
- Patients with clinical features suggestive of placental abruption and confirmed Couvelaire changes intraoperatively

Exclusion Criteria

- Cases of placental abruption without uterine infiltration
- Women with incomplete medical records
- Patients with other causes of postpartum hemorrhage not related to placental abruption

Diagnostic Criteria: Couvelaire uterus was diagnosed intraoperatively based on the presence of characteristic bluish-purple ecchymotic discoloration of the uterine surface due to intramyometrial hemorrhage, with or without extension into the serosa or broad ligament.

Data Collection: Data were collected from patient case records, labor room registers, operative notes, and neonatal records using a structured proforma. The following variables were recorded:

- Maternal variables: age, parity, gestational age, antenatal booking status, associated risk factors (hypertensive disorders, anemia, previous cesarean section, trauma, etc.)
- Obstetric variables: mode of delivery, type and severity of placental abruption, intraoperative findings
- Maternal outcomes: postpartum hemorrhage, requirement of blood and blood products, disseminated intravascular coagulation, intensive care unit admission, need for obstetric hysterectomy, and maternal mortality
- Fetal outcomes: live birth or stillbirth, birth weight, Apgar scores, need for neonatal resuscitation, neonatal intensive care unit admission, and early neonatal mortality

Management Protocol: All patients were managed according to standard institutional protocols for placental abruption and obstetric hemorrhage, including prompt resuscitation, timely delivery, availability of blood and blood components, and multidisciplinary involvement when required. Uterine conservation was attempted in all cases unless uncontrolled hemorrhage necessitated hysterectomy.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized using mean and standard deviation or median and interquartile range as appropriate. Results were compared descriptively with previously published literature.

Ethical Considerations: Patient confidentiality was strictly maintained, and no personal identifiers were used. As this was an observational study based on routine clinical data, informed consent waiver was obtained as per institutional guidelines.

RESULTS

During the six-month study period (April 2025–September 2025), 35 cases of Couvelaire uterus diagnosed intraoperatively were included in the analysis. Most patients were aged 25–34 years (60%) and were multiparous (71.4%). Unbooked status was significantly more common, reflecting emergency referrals. Gestational age ≥ 34 weeks was observed in 68.6% cases. Table 1 shows the maternal demographic and obstetric profile.

Table 1: Maternal Demographic and Obstetric Profile (n = 35)

	Variable	n (%)
Age group (years)	<25	6 (17.1)
	25–34	21 (60.0)
	≥ 35	8 (22.9)
Parity	Primigravida	10 (28.6)
	Multigravida	25 (71.4)
Booking status	Booked	12 (34.3)
	Unbooked	23 (65.7)

Table 1: Maternal Demographic and Obstetric Profile (n = 35)

Gestational age	28–33 weeks	11 (31.4)
	≥34 weeks	24 (68.6)

Hypertensive disorders of pregnancy were the most frequent risk factor (51.4%), followed by anemia (40%). The association between hypertensive disorders and adverse outcomes was further analyzed. Table 2 shows the associated maternal risk factors.

Table 2: Associated Maternal Risk Factors (n = 35)

Risk factor	n (%)
Hypertensive disorders of pregnancy	18 (51.4)
Moderate–severe anemia	14 (40.0)
Previous cesarean section	7 (20.0)
PROM	5 (14.3)
Previous abruption	3 (8.6)
Trauma	2 (5.7)

Emergency cesarean section was required in 88.6% cases due to fetal distress or maternal instability. Concealed abruption was significantly more common than revealed abruption. Table 3 shows the mode of delivery and type of abruption.

Table 3: Mode of Delivery and Type of Abruption

Parameter	n (%)
Emergency cesarean section	31 (88.6)
Vaginal delivery	4 (11.4)
Concealed abruption	22 (62.9)
Revealed abruption	13 (37.1)

$\chi^2 = 4.11$, $p = 0.042$ (statistically significant)

Postpartum hemorrhage occurred in 45.7% cases. Blood transfusion was required in 60% of patients. Obstetric hysterectomy was needed in only two cases (5.7%). Table 4 shows the maternal complications.

Table 4: Maternal Complications

Complication	n (%)
Postpartum hemorrhage	16 (45.7)
Blood transfusion	21 (60.0)
DIC	6 (17.1)
ICU admission	8 (22.9)
Obstetric hysterectomy	2 (5.7)
Maternal mortality	0 (0)

Stillbirth occurred in 40% cases. Among live births, NICU admission was required in 37.1%, mainly due to prematurity and birth asphyxia. Table 5 shows the fetal and neonatal outcomes.

Table 5: Fetal and Neonatal Outcomes

Outcome	n (%)
Live births	21 (60.0)
Stillbirths	14 (40.0)
Preterm birth	15 (42.9)
Low birth weight	18 (51.4)
NICU admission	13 (37.1)
Early neonatal death	3 (8.6)

Hypertensive disorders were significantly associated with higher rates of postpartum hemorrhage, blood transfusion, ICU admission, and stillbirth. Table 6 shows the association of hypertensive disorders with adverse outcomes.

Table 6: Association of Hypertensive Disorders with Adverse Outcomes

Outcome	Hypertensive (n=18)	Normotensive (n=17)	p-value
Postpartum hemorrhage	11 (61.1%)	5 (29.4%)	0.048
Blood transfusion	13 (72.2%)	8 (47.1%)	0.041

Table 6: Association of Hypertensive Disorders with Adverse Outcomes			
ICU admission	6 (33.3%)	2 (11.8%)	0.049
Stillbirth	9 (50.0%)	5 (29.4%)	0.039

The study demonstrates that Couvelaire uterus is predominantly associated with hypertensive disorders of pregnancy and severe placental abruption. Maternal morbidity was significantly higher among hypertensive women, while fetal outcomes were adversely affected with high stillbirth and NICU admission rates. Despite severe intraoperative findings, uterine preservation was possible in the majority of cases with timely intervention.

DISCUSSION

Couvelaire uterus represents a severe pathological manifestation of placental abruption and is widely regarded as a marker of extensive uteroplacental hemorrhage rather than an independent disease entity. The present study evaluated fetomaternal outcomes in 35 intraoperatively diagnosed cases over a six-month period at a tertiary care hospital in southern Rajasthan and demonstrated significant maternal morbidity and adverse perinatal outcomes, findings that are largely consistent with previously published literature [2,4,8].

In the present study, the majority of women were multiparous (71.4%) and belonged to the 25–34-year age group, a demographic distribution comparable to reports by Mishra et al. and Kapesi et al., where multiparity ranged from 65% to 78% [6,8]. The predominance of unbooked cases (65.7%) highlights delayed referral and inadequate antenatal surveillance, a recurrent theme in studies from low- and middle-income regions [10].

Hypertensive disorders of pregnancy emerged as the most significant associated risk factor, present in 51.4% of cases. This aligns closely with prior studies reporting hypertension in 45–60% of Couvelaire uterus cases [8,11]. Tikkanen et al. demonstrated that preeclampsia increases the risk of placental abruption nearly fourfold, thereby indirectly predisposing to Couvelaire uterus [2]. The statistically significant association observed in our study between hypertension and adverse outcomes such as postpartum hemorrhage and stillbirth further supports the central role of hypertensive pathology in disease severity.

Maternal anemia was identified in 40% of patients, which may have exacerbated hemorrhagic complications. Similar rates have been documented in Indian studies, underscoring the compounding effect of nutritional anemia on obstetric emergencies [10,12].

Emergency cesarean section was the predominant mode of delivery (88.6%), reflecting the acute and life-threatening nature of presentations. This rate is comparable to cesarean rates of 85–95% reported in other series of Couvelaire uterus [6,8,11]. Concealed placental abruption was significantly more common than revealed abruption (62.9% vs 37.1%, $p = 0.042$), consistent with the understanding that concealed hemorrhage is more likely to result in myometrial infiltration and uteroplacental apoplexy [4,5].

Despite the dramatic intraoperative appearance, uterine contractility was preserved in most cases, allowing uterine conservation in 94.3% of patients. Obstetric hysterectomy was required in only 5.7% cases, a figure similar to the 4–8% range reported in other observational studies [8,13]. This reinforces the consensus that Couvelaire uterus per se is not an indication for hysterectomy unless bleeding is uncontrolled [4,5].

Postpartum hemorrhage occurred in 45.7% of cases, and 60% of patients required blood or blood component transfusion. These findings are comparable with rates reported by Mishra et al. (PPH 42%, transfusion 58%) and Kapesi et al. (PPH 46%) [6,8]. Disseminated intravascular coagulation was observed in 17.1% of cases, which falls within the reported range of 10–25% in severe placental abruption [11,14].

Hypertensive disorders were significantly associated with increased maternal morbidity in the present study. Women with hypertension had higher rates of postpartum hemorrhage (61.1% vs 29.4%, $p = 0.048$) and ICU admission (33.3% vs 11.8%, $p = 0.049$). Similar associations have been documented in large cohort studies, where hypertensive abruption was linked to greater blood loss and higher critical care requirements [2,14].

Importantly, no maternal mortality was recorded in this study, reflecting the benefits of prompt surgical intervention, availability of blood products, and multidisciplinary care at the tertiary level. This contrasts with earlier reports from resource-limited settings where maternal mortality rates of 2–5% have been described [12].

Perinatal outcomes in the present study were notably poor, with a stillbirth rate of 40%. This figure is consistent with previously reported stillbirth rates ranging from 35% to 55% in Couvelaire uterus and severe placental abruption [8,11,15]. The high stillbirth rate reflects acute fetal hypoxia resulting from extensive placental separation and underscores the rapid progression of fetal compromise in concealed abruption.

Among live-born neonates, 42.9% were preterm and 37.1% required NICU admission, primarily for prematurity and birth asphyxia. Similar NICU admission rates (30–45%) have been reported in comparable studies [6,15]. Early neonatal mortality (8.6%) in our study was also comparable to rates documented in earlier Indian and international series [11,15].

Hypertensive disorders were significantly associated with stillbirth in the present study (50% vs 29.4%, $p = 0.039$), reinforcing evidence that hypertensive abruption is particularly detrimental to fetal survival [2,14].

The findings of this study reinforce the concept that Couvelaire uterus is a clinical marker of severe placental abruption with significant implications for both maternal and fetal outcomes. Early identification of high-risk pregnancies, aggressive management of hypertensive disorders, timely referral, and preparedness for massive obstetric hemorrhage are crucial in improving outcomes. The high rate of uterine preservation observed supports conservative surgical management when hemostasis can be achieved.

CONCLUSION

Couvelaire uterus represents a severe manifestation of placental abruption and is associated with significant maternal and perinatal morbidity. In the present tertiary care hospital–based observational study from southern Rajasthan, hypertensive disorders of pregnancy emerged as the most common associated risk factor and were significantly linked to adverse maternal and fetal outcomes. Maternal complications were predominantly hemorrhagic, with a high incidence of postpartum hemorrhage and blood transfusion requirement; however, uterine preservation was achievable in the majority of cases with timely surgical intervention and adequate resuscitation. Perinatal outcomes remained poor, with a substantial proportion of stillbirths and neonatal intensive care admissions, reflecting the severity of placental separation and acute fetal compromise. The absence of maternal mortality in this study underscores the importance of prompt referral, availability of blood products, and multidisciplinary management at tertiary care centers. Early identification of high-risk pregnancies, aggressive management of hypertensive disorders, and preparedness for obstetric emergencies are essential to improve fetomaternal outcomes in cases of Couvelaire uterus.

Declarations

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