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A retrospective study of risk factors and feto-maternal outcomes in abruptio placentae: Insights from a tertiary care hospital

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Abstract
Background: Abruptio placenta is a major obstetric complication and has a substantial maternal and fetal morbidity and mortality. In this retrospective cohort study, the incidence, risk factors and feto-maternal outcome assessments were ascertained of abruptio placenta in a tertiary care hospital.
Methods: A retrospective cohort study was carried out between January 01, 2019 and December 31, 2024 in St. Stephen's hospital, Delhi. The sample comprised all pregnant females admitted with suspicion of placental abruption at 28 weeks gestation and above. Demographics, obstetric history, co-morbidities, clinical presentation, and pregnancy outcomes were examined.
Results: Incidence of abruptio placentae was 1.28% (70/5450). The risk factors of abruptio placentae were: preeclampsia / eclampsia [OR 5.26; 95% CI 3.08-8.98], diabetes [OR 2.95; 95% CI 1.53-5.70], previous caesarean section [OR 1.28; 95% CI 0.74-2.20], premature rupture of the membrane [OR 2.74; 95% CI 1.41-5.34], multigravida [OR 2.20; 95% CI 1.23-3.90], and multiparity [OR 3.25; 95% CI 1.80-5.85]. Maternal complications of abruptio placentae were antepartum haemorrhage [OR 8.66; 95% CI 4.49-16.7], postpartum haemorrhage [OR 7.62; 95% CI 3.68-15.8], Caesarean section [OR 2.76; 95% CI 1.60-4.76], need for blood transfusion [OR 13.7; 95% CI 8.3-22.7], disseminated intravascular coagulation [OR 8.5; 95% CI 6.3-15.2], longer hospital stay [OR 4.24; 95% CI 2.42-7.43]. The adverse fetal outcomes in cases of abruptio placenta were birth weight < 2.5 kg [OR 3.41; 95% CI 2.13-5.44], preterm birth [OR 2.87; 95% CI 1.71-4.82], need for NICU admission [OR 2.98; 95% CI 1.72-5.18], APGAR score at 5 minutes <7 [OR 2.04; 95% CI 1.08-3.85] and perinatal mortality [OR 2.41; 95% CI 1.08-5.36] all indicating statistical significance.
Conclusions: Abruptio placenta persists as an important contributor to maternal and perinatal morbidity and mortality. Herein, we highlight that early diagnosis and timely intervention play a crucial role in ensuring early interventions that save lives for pregnant women. If modifiable risk factors such as diabetes, hypertension and premature rupture of membranes can be treated or addressed, this may contribute to lowering the risk of abruptio placenta. Better prenatal care with improved healthcare facilities and health provider awareness is important to improve outcomes for mothers and babies affected by this condition.

Keywords: Antepartum hemorrhage, post-partum hemorrhage, perinatal death, pre-eclampsia, preterm labour, parity

Introduction
Abruptio placenta or placental abruption is an important obstetric emergency where a normally implanted placenta is separated from the uterine wall prematurely prior to the birth of a neonate. The Royal College of Obstetrics and Gynaecology describes antepartum haemorrhage (APH) as bleeding from or into the genital tract after 28 weeks until the baby is born [1]. It continues to be a top cause of maternal and perinatal morbidity and mortality worldwide, particularly in developing countries with a lack of access to timely obstetric care. It contributes to about 20-25% of all APH cases and the incidence of abruptio placenta is documented, depending on geographical region, to be between 0.5% and 1.5% of pregnancies [2], but the various adverse consequences may lead to disproportionately high adverse outcomes. The etiology is multi factorial and a number of maternal and environmental risk factors are associated with its incidence [3]. Hypertensive disease during pregnancy, trauma, advanced maternal age, grand multiparity, cigarette smoking, prior abruption and premature rupture of membranes have all been shown to be linked to an increased incidence of placental separation [4].

While prenatal care and monitoring have advanced, abruptio placenta remains a diagnostic and clinical challenge owing to its sudden onset and unpredictable course. The condition puts maternal health at risk due to hemorrhage, disseminated intravascular coagulation with a need for emergency surgical intervention, or the fetus at risk due to complications such as intrauterine hypoxia, prematurity, low birth weight, and stillbirth [5]. To address these deadly sequelae of abruptio placenta, a nuanced knowledge of its severity, risk, and adverse events is extremely important not only for making medical knowledge useful but also for designing prevention and treatment methods. This retrospective study seeks to assess feto-maternal outcomes in abruptio placenta individuals, potential risk factors and potential clinical management targets for optimal maternal and neonatal health.

Methodology

A retrospective analysis was conducted at St. Stephen's Hospital in Delhi from January 2019 to December 2024, aimed at evaluating the risk factors and outcomes for mothers and fetuses associated with abruptio placenta.

Study Population

The research encompassed all pregnant women diagnosed with abruptio placenta through clinical assessment and/or ultrasound during the designated time frame. Abruptio placenta was characterized as either partial or complete premature separation of a normally situated placenta occurring after 28 weeks of gestation, which is recognized as the viability threshold for the fetus in this context. Diagnosis was made based on clinical evaluations (including symptoms, risk factors, and findings such as vaginal bleeding, abdominal pain, hypertonic uterus, and a tense-tender abdomen), ultrasound results indicative of abruptio placentae, and observations noted during cesarean deliveries (specifically regarding the presence of retroplacental clots alongside antepartum hemorrhage). Women with a gestational age under 28 weeks, those presenting with placenta previa, lower genital tract lesions, bleeding disorders, or incomplete medical records were excluded from participation.

Data Collection

Information was collected from hospital records including antenatal charts, delivery logs, and patient files. The data gathered encompassed maternal demographic details (such as age, gravidity, parity, socioeconomic status), obstetric and medical history (including hypertension, trauma incidents, prior cesarean sections, and past episodes of abruption), alongside clinical findings at initial presentation. Details regarding management strategies employed, mode of delivery, maternal complications encountered during labor and delivery process, fetal condition at birth, and neonatal outcomes were also documented. Participants presenting with placenta previa or other placental abnormalities as well as those involved in multiple pregnancies were not included in the study.

Outcome Measures

Maternal Outcomes: These comprised postpartum hemorrhage; need for blood transfusions; preterm premature rupture of membranes; requirement for cesarean delivery; disseminated intravascular coagulation; acute renal failure; necessity for intensive care unit admission; along with length of hospital stay.

Fetal Outcomes: These included low birth weight; preterm births; intrauterine growth restriction (IUGR); fetal distress; low APGAR scores; NICU admission needs; and rates of perinatal mortality.

Statistical Analysis

Data were entered into an MS Excel spreadsheet using the Statistical Package for the Social Sciences Version SPSS 28.0 (IBM Corp., Armonk NY USA) for analytical purposes. Descriptive statistics summarized baseline characteristics. The prevalence rate of abruptio placenta was calculated as a proportion of total deliveries. Potential correlations between risk factors and abruptio placenta were assessed using chi-square tests or Fisher's exact tests for categorical variables while independent t-tests were employed for continuous variables. Odds ratios (ORs) with 95% confidence intervals (CIs) related to risk factors associated with abruptio placentae as well as maternal-fetal outcomes were computed via multivariable logistic regression analysis. A P-value under 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee (SSHEC_R0374/2025), with informed consent being waived due to the retrospective nature of this research.

Results

A total of 5,450 deliveries were examined after excluding cases involving placenta previa and other bleeding causes. Among them, 70 instances of abruptio placentae were identified, resulting in an estimated incidence rate of 1.28% (70/5,450) throughout the study period. The demographic and obstetric details of the participants are presented in Table 1. Of the cases analyzed, 25 (36%) were classified as concealed abruption and 45 (64%) as revealed abruption. The most prevalent clinical manifestation was bleeding, observed in 25 (35.7%) patients, followed by a combination of pain and bleeding in 18 (25.7%), and pain alone in 15 (21.5%). There were also 12 cases of fetal distress diagnosed post-delivery through placental examination.

Demographic and Obstetric Characteristics of Study Participants

The average maternal age for those with abruptio placentae compared to those without showed no statistically significant difference [28.7 ± 4.8 years versus 27.51 ± 5.6 years (p=0.815)]. A greater proportion of women experiencing abruption were multigravida compared to those without abruption [mean 3.2 ± 1.6 versus 2.6 ± 1.4 (p=0.010)]. The majority of patients (77%) had received some form of antenatal care; however, 23% had not attended any prenatal appointments, with about 15.7% belonging to a lower socioeconomic class as outlined in Table 2 and illustrated in Figure 1.

Risk Factors for Abruptio Placentae

The results from a multivariate logistic model assessing risk factors linked to abruptio placentae within this population are summarized in table 3. Significant risk factors identified include preeclampsia/eclampsia [OR 5.26; 95% CI 3.08-8.98], diabetes [OR 2.95; 95% CI 1.53-5.70], premature rupture of membranes [OR 2.74; 95% CI 1.41-5.34], multigravida status [OR 2.20; 95% CI 1.23-3 .90], and multiparity [OR 3 .25; 95% CI 1 .80-5 .85]. Previous cesarean sections, chronic hypertension, and male infant sex did not show significant associations with abruptio placentae within our study group as depicted in Figure 2.

Maternal Outcomes Associated with Abruptio Placentae: Illustrated in Table 4 are the results from a logistic regression

model regarding maternal outcomes associated with abruptio placentae compared to non-abruptive cases: women with abruptio placentae faced higher risks for antepartum hemorrhage [OR 8 .66; 95% CI 4 .49-16 .7], postpartum hemorrhage [OR 7 .62; 95% CI 3 .68-15 .8], cesarean delivery [OR 2 76; 95% CI 1 60 -4 76], disseminated intravascular coagulation [OR 8 50; 95% CI (6 30 -15 20)], and blood transfusions need [OR 13 70; 95% CI 8 30 -22 70]. Furthermore, patients with abruptio placentae exhibited prolonged hospital stays compared to those without abruption [OR 4 24; 95% CI (2 42 -7 43). While there was an increased likelihood for induced labor and transfers to intensive care units among patients with abruptio placentae, these associations did not reach statistical significance as shown in Figure 3.

Fetal Outcomes Associated with Abruptio Placentae: Table 5 provides a summary of fetal outcomes related to abruptio placentae after adjusting for confounding variables: infants born to mothers experiencing this condition faced heightened risks for low birth weight (correlation heatmap displayed in Figure '5' indicated that conditions such as preeclampsia, gestational diabetes mellitus, and anemia were positively correlated with preterm births, low birth weights, and NICU admissions, suggesting clustering patterns among metabolic disorders leading to adverse perinatal outcomes. Maternal complications like postpartum hemorrhage, strongly correlated with low Apgar scores along with NICU stays. A multivariable logistic regression analysis was conducted aiming to identify independent factors associated with low birth weight (<2.5 kg) among women experiencing abruption. The predictors included pre-eclampsia, preterm delivery, intrauterine growth restriction, unbooked status, anemia, mode of delivery, gravida status, and parity. After standardization, it was noted that significant positive coefficients emerged concerning preterm births, IUGR, and preeclampsia indicating an elevated risk for low birth weight as demonstrated in Figure '6'.

Summary of Key Findings: In the cohort experiencing abruption, occurrences of low birth weight (45 .7%) and preterm births (31.4%) were identified as prominent adverse outcomes highlighting significant fetal risks tied to abruptio placenta. The logistic regression analysis established that preeclampsia, intrauterine growth restriction(IUGR), and premature labor served as independent predictors for low birth weight while demonstrating strong discriminative ability(AUC=0.81).The correlation matrix further illustrated close clustering between hypertensive disorders especially preeclampsia gestational diabetes, maternal anemia and both maternal hemorrhagic complications alongside neonatal challenges, supporting the notion that these conditions share common pathophysiological mechanisms. Additionally, maternal morbidities including postpartum hemorrhage, blood transfusion requirements, and intensive care unit admissions exhibited direct correlations reflecting severity concerning fetal morbidity and mortality underscoring their interconnectedness within cases involving abruptio placenta.

Table 1: Demographic and obstetric profile of the abruptio placenta cohort.

Variable	Mean ± SD / n (%)
Maternal age (years)	28.74 ± 4.8
Gravida	3.2 ± 1.6
Parity	2.4 ± 1.2
Unbooked status	16 (23%)
Lower socio-economic class	11 (15.7%)

Table 2: Demographic and obstetric characteristics of the study participants

Maternal characteristic	Placental abruption (n = 70)	No abruption (n = 5380)	Chi-square	P value
Maternal age (mean ± SD)	28.74 ± 4.8	27.51 ± 5.6		
Age range (years): <20	7 (10.0)	442 (8.1)	0.41	0.815
20-34	55 (78.6)	4310 (79.0)		
≥35	8 (11.4)	698 (12.4)		
Antenatal care: Booked	54 (77.0)	4480 (82.2)	0.89	0.347
Unbooked	16 (23.0)	970 (17.8)		
Gravida: 1	16 (22.8)	1650 (30.3)	9.17	0.010*
2-4	42 (60.0)	3380 (62.0)		
≥5	12 (17.2)	420 (7.7)		
Parity: 0	17 (24.3)	1450 (26.6)	5.92	0.052
1-4	47 (67.1)	3820 (70.1)		
≥5	6 (8.6)	180 (3.3)		
Socio-economic class: Lower	11 (15.7)	695 (12.8)	0.65	0.721
Middle	51 (72.9)	4035 (74.1)		
Upper	8 (11.4)	720 (13.2)		

Mean and standard deviation
P value calculated from chi square

Table 2: Risk factors for abruptio placenta and their odd ratio with CI

Risk factor	Placental abruption (n = 70)	No abruption (n = 5380)	Adjusted OR (95% CI)	P value
Pre-eclampsia / Eclampsia	22 (31.4)	436 (8.1)	5.26 (3.08-8.98)	<0.001*
Diabetes / GDM	12 (17.1)	350 (6.5)	2.95 (1.53-5.70)	0.001*
Chronic hypertension	7 (10.0)	295 (5.5)	1.91 (0.87-4.20)	0.104
Previous Caesarean	18 (25.7)	1150 (21.3)	1.28 (0.74-2.20)	0.376
PPROM	11 (15.7)	345 (6.4)	2.74 (1.41-5.34)	0.003*
Multigravida	54 (77.1)	3250 (60.4)	2.20 (1.23-3.90)	0.007*
Parity ≥ 2	42 (70.0)	2250 (41.8)	3.25 (1.80-5.85)	<0.001*
Male fetus	41 (58.6)	2750 (51.1)	1.33 (0.83-2.13)	0.228

Table 3: Maternal outcome in women with abruption and their odd when compared to those without abruption

Maternal outcome	Placental abruption (n = 70)	No abruption (n = 5380)	Adjusted OR (95% CI)	P value
Antepartum haemorrhage	11 (15.7)	113 (2.1)	8.66 (4.49-16.7)	<0.001*
Post-partum haemorrhage	9 (12.9)	104 (1.9)	7.62 (3.68-15.8)	<0.001*
Caesarean delivery	54 (77.1)	2950 (54.8)	2.76 (1.60-4.76)	<0.001*
Need for blood transfusion	33 (47.1)	345 (6.4)	13.7 (8.3-22.7)	<0.001*
Disseminated intravascular coagulation [DIC]	11 (15.7)	256 (4.8)	8.5 (6.3-15.2)	<0.001
Acute renal failure	3 (4.3)	125 (2.3)	1.92 (0.60-6.15)	0.261
ICU admission	5 (7.1)	210 (3.9)	1.87 (0.75-4.65)	0.176
Hospital stay > 4 days	18 (25.7)	412 (7.6)	4.24 (2.42-7.43)	<0.001*

Table 4: Foetal outcome in women with abruption and their odd when compared to those without abruption

Fetal outcome	Placental abruption (n = 70)	No abruption (n = 5380)	Adjusted OR (95% CI)	P value
Birth weight < 2.5 kg	32 (45.7)	1055 (19.6)	3.41 (2.13-5.44)	<0.001*
Preterm birth	22 (31.4)	732 (13.6)	2.87 (1.71-4.82)	<0.001*
Fetal distress	20 (28.6)	785 (14.6)	2.31 (1.34-3.97)	0.002*
NICU admission	18 (25.7)	558 (10.4)	2.98 (1.72-5.18)	<0.001*
Apgar <7 at 5 min	14 (20.0)	591 (10.9)	2.04 (1.08-3.85)	0.026*
Intra-uterine death (IUD)	10 (14.3)	353 (6.6)	2.35 (1.17-4.73)	0.016*
Perinatal death	7 (10.0)	236 (4.4)	2.41 (1.08-5.36)	0.031*

Table 5: Predictors of low birth weight among a bruptio placenta

Predictor	Standardised β	Interpretation
Preterm birth	+1.18	Strongest positive predictor
IUGR	+0.93	Independent contributor
Preeclampsia	+0.61	Moderate effect
Unbooked status	+0.27	Weak effect
Anemia	+0.25	Weak effect
LSCS mode	-0.14	Protective trend
Gravida	-0.09	Non-significant
Parity	-0.05	Non-significant

The model achieved an Area under the ROC Curve (AUC) = 0.81, demonstrating good discriminative performance.

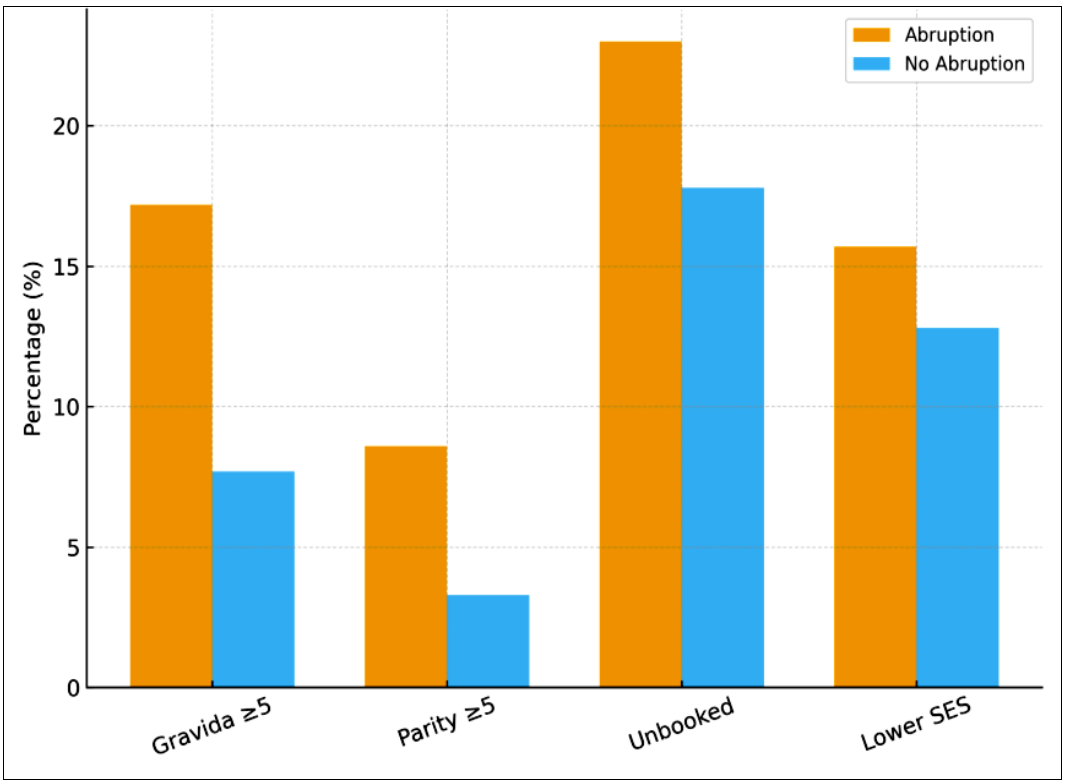

Fig 1: Comparison between demographic and obstetric profile

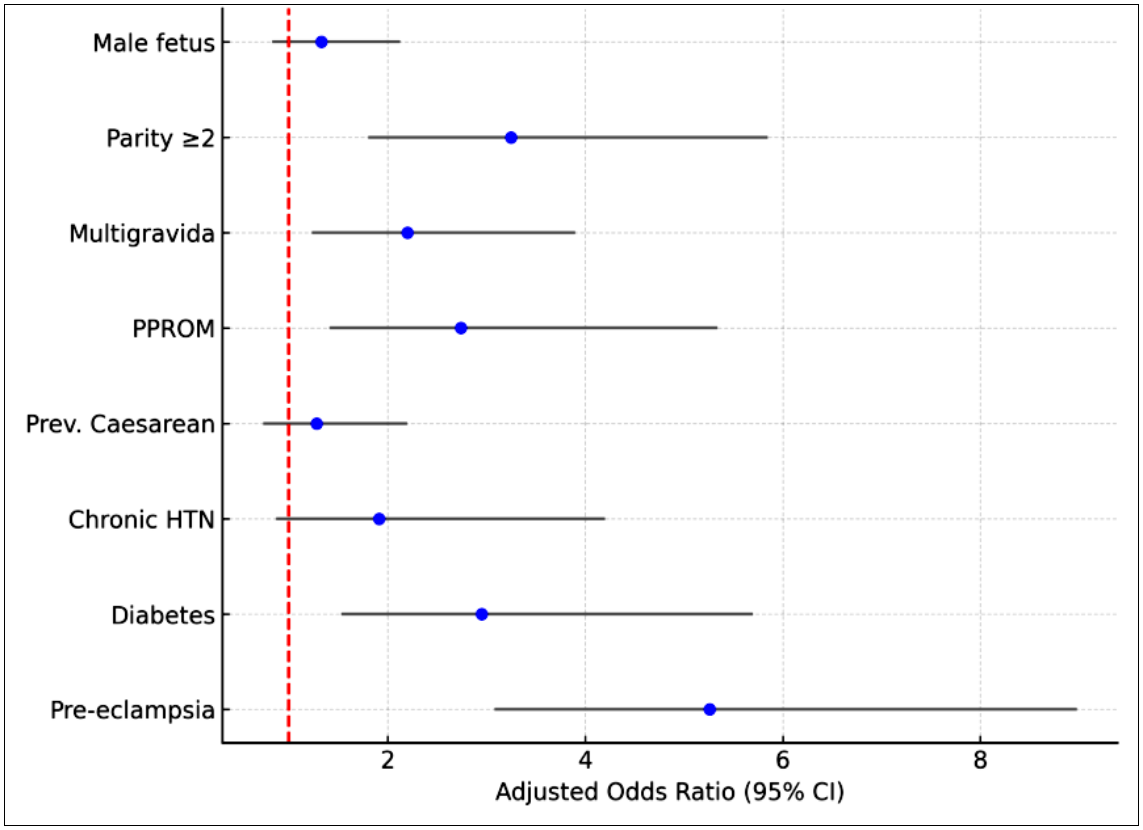

Fig 2: Risk factors associated with abruptio placenta

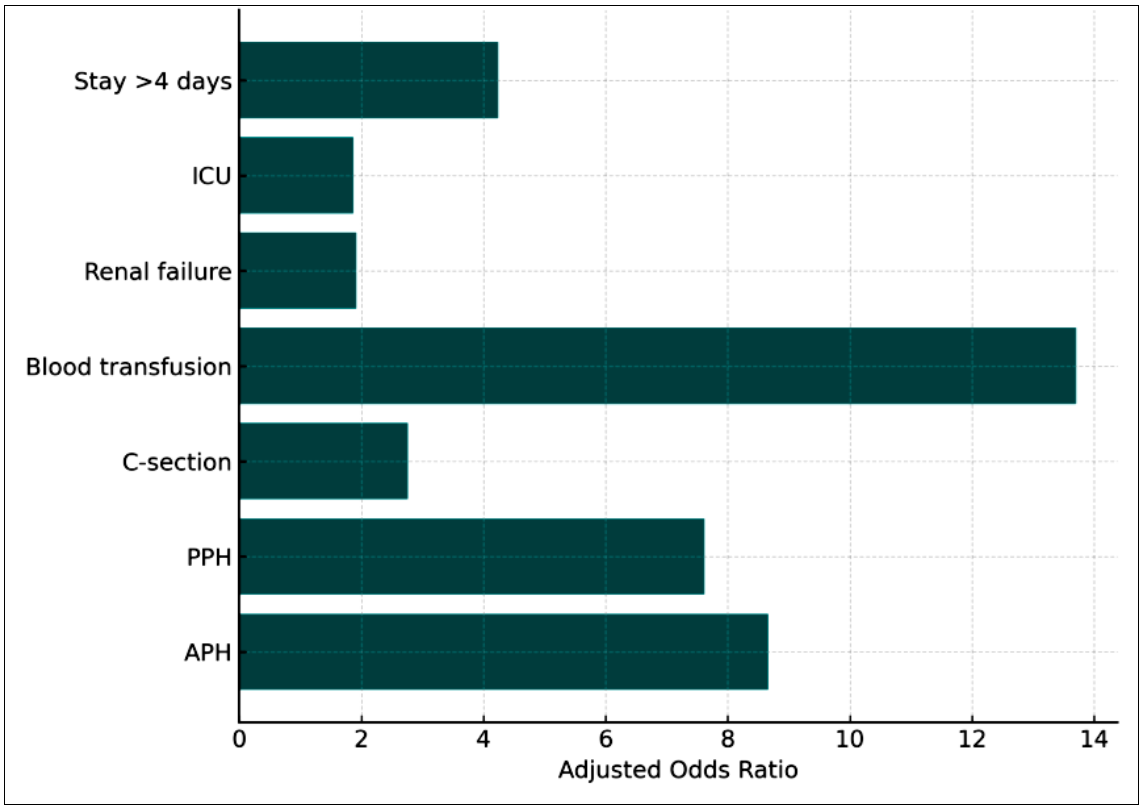

Fig 3: Maternal outcomes associated with abruptio placenta

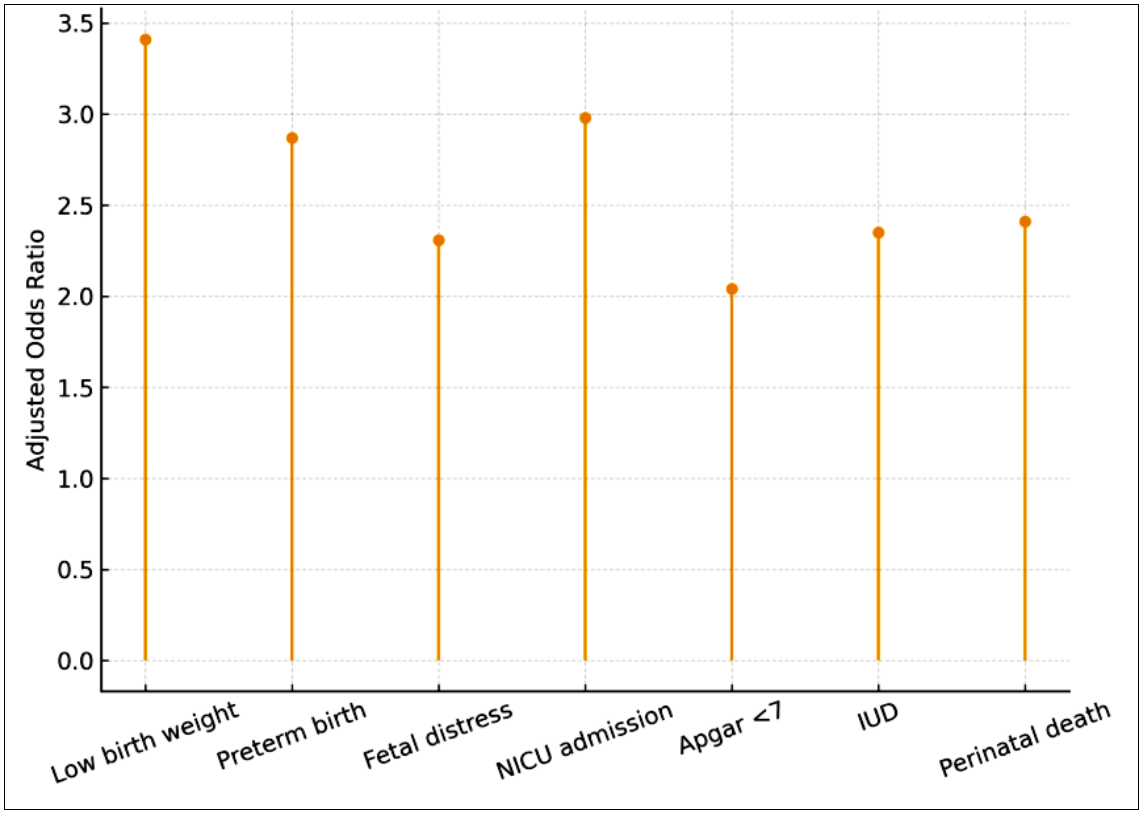

Fig 4: Fetal outcomes associated with abruptio placenta

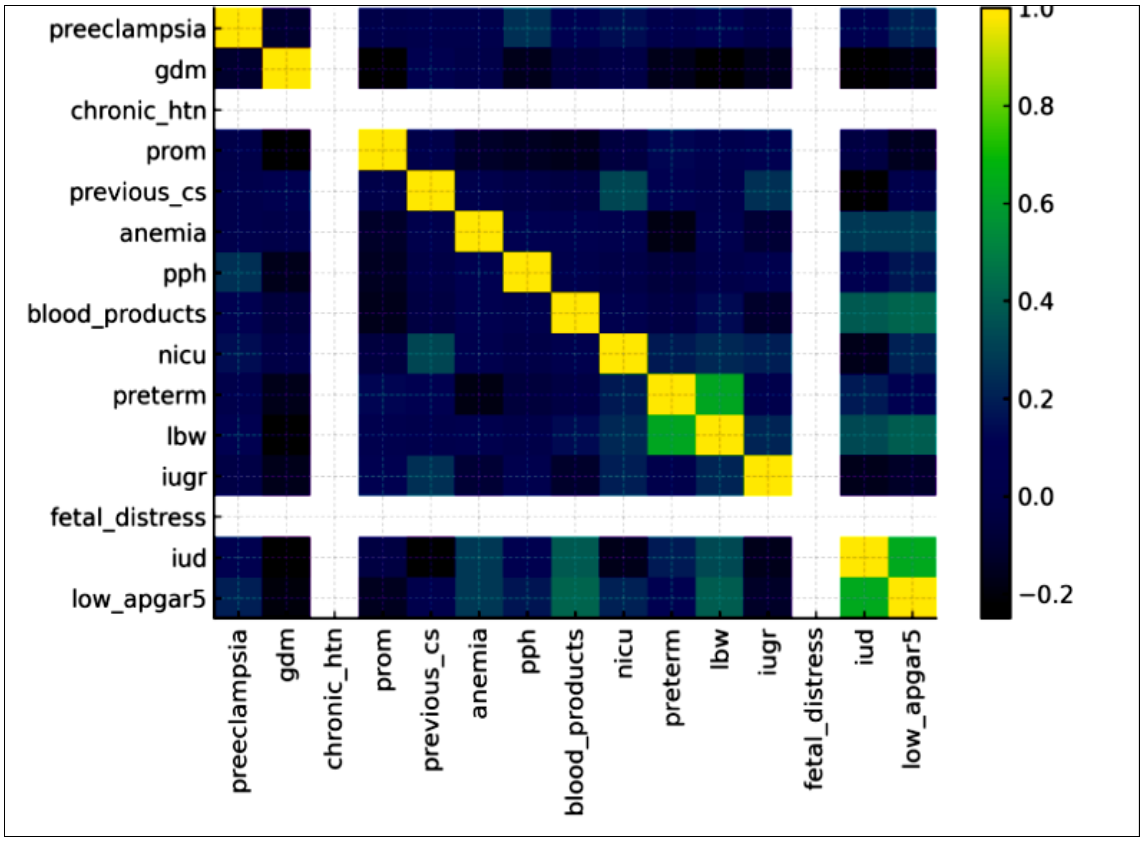

Fig 5: Correlation heatmap of binary maternal and fetal variables

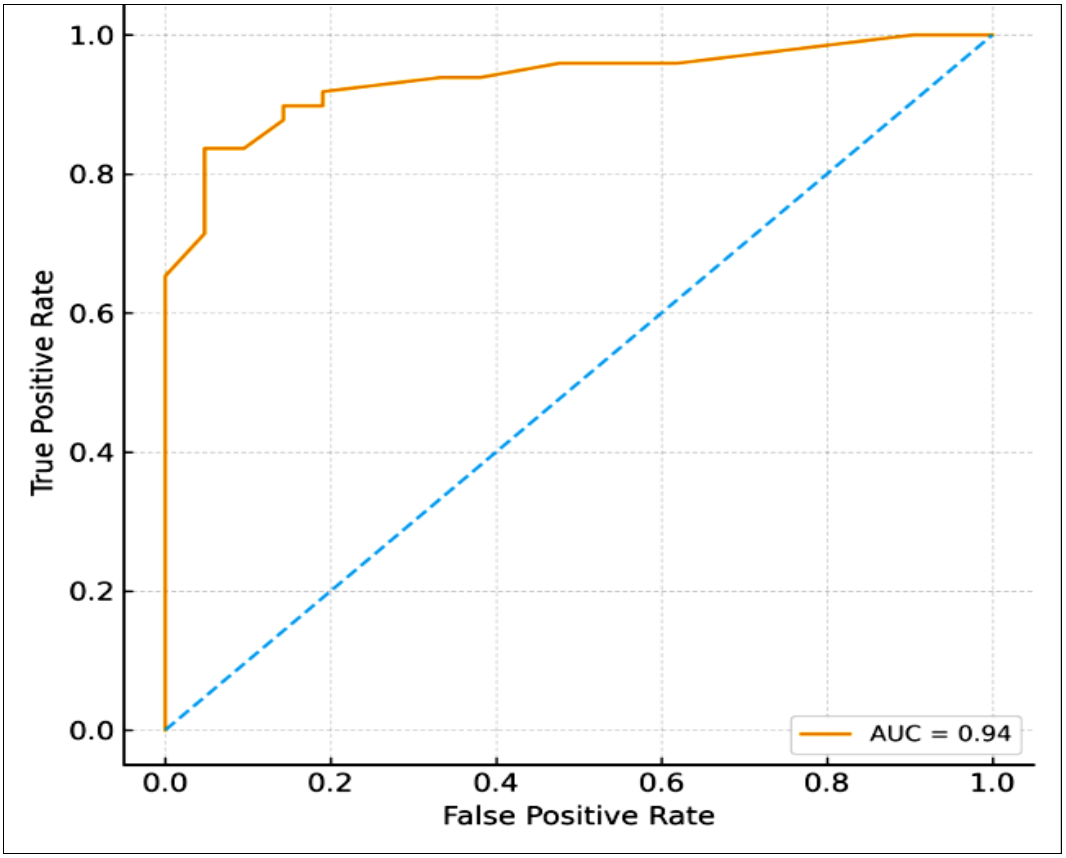

Fig 6: ROC curve for predicting low birth weight among abruption cases

Discussions

In this research, we observed that the incidence of abruptio placentae was 1.28%, which aligns with the previously reported range of 0.5-1.5% among American, European, and East Asian populations [6]. The predominant symptom presented was bleeding, occurring in 37 (38%) women, compared to the 25% noted by Tikkanen [15]. Severe pre-eclampsia/eclampsia emerged as the most prevalent antenatal risk factor in our study, affecting 31% of cases, followed by diabetes at 17% and chronic hypertension at 10%. These findings are consistent with earlier studies that identified severe pre-eclampsia as a significant risk factor for abruption; however, other research has suggested that transient hypertension and mild pre-eclampsia may also be associated with this condition [7, 8]. Previous literature has established links between chronic hypertension and preeclampsia/eclampsia with an elevated risk of abruptio placentae, which is supported by our results [9, 10].

Additionally, a history of cesarean delivery increases the likelihood of experiencing abruption in subsequent pregnancies by 30-40% when compared to vaginal delivery outcomes [11]. This heightened risk could indicate a ruptured scar from previous cesarean procedures. Our findings indicated a higher incidence of abruptio placentae among women with high parity and multigravid status compared to nulliparous or primigravid individuals. These observations align with numerous prior studies but contrast with those conducted by Sanchez and colleagues, who found no association between these factors and abruptio placentae [12].

Preterm premature rupture of membranes prior to 37 weeks gestation accounts for approximately 4-12% of placental abruption cases [13]. our study showed a slightly elevated figure at 17%. Prior studies have linked the occurrence of abruptio placentae to increased maternal and fetal morbidity and mortality rates. Consistent with our findings, we found that women suffering from abruptio placentae faced a twelvefold increase in postpartum hemorrhage risk compared to those in the control group. Similarly, Sarwar *et al*. reported that 22.2% of patients experiencing abruptio placentae encountered severe postpartum hemorrhage due to uterine atony, coagulation issues, or puerperal sepsis [14].

More than half of the women within our study group affected by abruption required over one unit of blood transfusion; these results are comparable to those reported by Okolobiri *et al*. and Abasi *et al*. [16] Hemorrhage caused by abruption can result in hypovolemic shock and multi-organ failure. The likelihood of abruption is notably increased two- to threefold in twin pregnancies or higher-order multiples [17].

Maternal mortality associated with abruption has significantly declined from 8% in 1950 to below 1% in 2005; [18] importantly, we recorded no maternal fatalities due to abruption during our study period. Women whose pregnancies were complicated by abruptio placentae exhibited a threefold increased risk of delivering infants with low birth weight when contrasted with those in the control group [19]. According to Ananth *et al*., approximately 40-60% of infants affected are born prematurely due to abruption, while about 14% occur before reaching 32 weeks gestation [20].

The heightened likelihood of low birth weight deliveries among women experiencing abruptio placentae may stem from either premature termination initiated by clinicians due to severe conditions or intrauterine fetal growth restriction effects. Additionally, risks for stillbirths, intrauterine deaths, and perinatal mortality were elevated among women dealing with abruptio placentae relative to their counterparts without this complication; these outcomes are consistent with existing research indicating that stillbirth rates correlate closely with placental separation severity exceeding 50% [21].

Furthermore, patients diagnosed with abruptio placentae were

more prone to deliver infants exhibiting low Apgar scores at both one and five minutes post-delivery findings paralleled in research conducted by Saeed & Rana *et al*. [18] The elevated incidence of low Apgar scores may be attributed primarily to prematurity; however, within resource-limited settings, this could also reflect deficiencies in necessary equipment/supplies along with critical care expertise.

Limitations: Selection bias, since this was a hospital-based study, women with complicated pregnancies are more likely to be referred for delivery in the study setting. This may lead to overestimation of the reported risk and maternal fetal outcomes.
Secondly, diagnosis of abruptio placentae was based on an assessment made by the attending obstetrician. This subjective assessment may have resulted in some misclassification; especially for the severe and milder forms of abruptio placentae

Conclusions
Our research has established that factors such as preeclampsia/eclampsia, a history of cesarean delivery, chronic hypertension, and high parity are significant independent risk factors for abruptio placentae. This condition is linked to negative outcomes for both mothers and fetuses.
To mitigate the risk of abruptio placentae and its related adverse feto-maternal outcomes, it is crucial to provide effective counseling during antenatal appointments regarding these risk factors. Additionally, early identification of women at risk should be prioritized, along with the creation of personalized follow-up plans that include specific interventions and timely management strategies.
Moreover, enhancing the capabilities of obstetric and neonatal units is essential to improve maternal and perinatal outcomes in this context.

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Author Contributions
B.A: Conceptualization, Manuscript writing, communicating with statistician and data compilation
T.D: Data collection or management
N.C: Supervision- Project oversight and leadership
SS: Study design, methodology and creating tables.
RK: Data collection

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