

# Prevalence of Abruption Placentae and Potential Determinants of Maternal and Fetal Outcomes in Women with Abruption Placentae in a Tertiary Care Center in India: A Retrospective Study

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## ABSTRACT

**Background:** Abruption placentae is one of the obstetric emergencies for both mother and fetus. Obstetrical hemorrhage is one of the main causes of maternal and perinatal morbidity and mortality. Hence, this study was conducted to find out the prevalence of abruption placentae and potential determinants of maternal and fetal adverse outcomes at St John's Medical College and Hospital, Bengaluru, India.

**Methods:** This is a retrospective study of 5 years (2014–2019) at St John's Medical College and Hospital. Totally, 16,082 charts were reviewed to find 140 cases with abruption. Data were collected using a structured validated questionnaire which included four parts, namely, sociodemographic details, risk factors, maternal outcomes, and perinatal outcomes. Statistical analysis was performed using IBM SPSS statistics 23.0.

**Results:** A total of 16,082 deliveries occurred during study period, and 140 of them had abruption placentae with prevalence of 8.7 in 1,000 deliveries. Most of the women belonged to 20–35 years of age (91.4%) and 76 (54.3%) were between 28 and 34 weeks of gestation. One-hundred and thirty-seven (97.9%) had singleton pregnancy and 77 (80%) were multigravida. Seventy-nine (54.5%) had preeclampsia. Postpartum hemorrhage was most frequently observed in maternal complication (30%). Other complications were disseminated intravascular coagulation (5%), intensive care unit (ICU) admission of mother (1.5%), and acute renal failure (9.3%). Interval between diagnosis to delivery and mode of delivery and parity index were analyzed as predictors for maternal and perinatal course, but they were not significant statistically. Significance was found for multipara and ICU admission of mother ( $p = 0.023$ ).

**Conclusion:** There is high association between antenatal complications like preeclampsia and abruption placentae. Interval between diagnosis to delivery should not be prolonged (<24 hours). High parity index women need more attention during their antenatal period.

**Keywords:** Abruption, Acute renal failure, Disseminated intravascular coagulation, Fetal outcome, Maternal outcome, Obstetric complication.

**Key messages:** Newer approach of treatment with better pregnancy outcomes in mothers with abruption with risk determination in an Indian population.

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## INTRODUCTION

Abruption placentae is defined as premature separation of placenta from its implantation site after 20 weeks of gestation. Abruption placentae complicated approximately 1% of births.<sup>1</sup> This premature detachment commonly produces pain, vaginal bleeding, and other clinical features depending upon the severity of the abruption in mother. Fetal complications may vary from mild hypoxia to mortality.<sup>1</sup> Maternal complications associated with abruption include massive blood loss leading to disseminated intravascular coagulopathy (DIC), renal failure, postpartum hemorrhage (PPH) and less commonly maternal deaths.<sup>2–4</sup> Abruption is potentially dangerous to the fetus as well. It remains an important cause of perinatal morbidity and mortality, with perinatal mortality as high as 60%.<sup>1</sup> In spite of having so much of potentially disastrous outcome in mother as well as fetus, there is limited information about the condition and predicting factors for maternal and fetal outcome. If we can identify the potential determinants of maternal and fetal adverse outcomes related to abruption placentae, then we can bring down the morbidity and mortality associated with it. This study was therefore conducted to determine the prevalence and predict the potential determinants of maternal and fetal outcome in a case of abruption placentae at a tertiary care center in India.

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**Conflict of interest:** None

## MATERIALS AND METHODS

Study site: Department of Obstetrics and Gynecology, St John's Medical College and Hospital Research Centre, Bengaluru.

Study period: 5 years (2014–2019).

Study design: Retrospective, descriptive sampling technique—universal sampling.

Sample size: 140 pregnant women with abruption placentae.

Study subjects: All pregnant women with features of abruption placentae after 24 weeks of gestation were included in the study.

Inclusion criteria were subjects between 18 and 40 years of age who are more than 24 weeks of gestation. Clinical and sonological findings were utilized to diagnose, abruption placentae. Clinical diagnosis was reached in the presence of one or more of the following characteristics: history-wise onset of vaginal bleeding associated with sudden onset of continuous pain abdomen may be associated with other obstetric complications and loss of fetal movements. Clinical examination included hypertonus uterine contractions, uterine tenderness, vaginal bleeding, blood-stained liquor in case of ruptured membranes, non-reassuring fetal heart rate, fetal distress, and intrauterine fetal demise.

In general condition of mother—presence of pallor, tachycardia, tachypnea, other signs and symptoms of hypotension, and presence of retroplacental clot on ultrasound examination in a case of concealed abruption. The presence of retroplacental clots after delivery of placentae supported the final diagnosis.

Exclusion criteria were pregnant women with chronic kidney disease, coagulopathies, vascular disease, autoimmune diseases, and vaginal bleeding due to other causes like placental previa, cervical lesions, or vaginal diseases.

Charts of participants were analyzed once they met the study criteria. The information was extracted using a structured detail checklist from the charts about antenatal history, obstetric score including maternal age, associated obstetric complications like first-trimester bleed, preeclampsia, eclampsia, HELLP, premature rupture of membranes, gestational diabetes, and anemia. Examination findings included blood pressure, pallor, systemic examination, and obstetric examination along with per speculum and per vaginal examination. Details of development of complications like DIC, acute kidney injury (AKI), need for dialysis, and degree of anemia were collected. The investigations included hemoglobin, blood group and Rh typing, coagulation profile which included platelet count, prothrombin time international normalized ratio, activated partial thromboplastin time and peripheral smear, D-dimer, liver function tests, renal functions tests, LDH, and serum electrolytes. All the necessary investigations were repeated every 6th hour, and obstetric ultrasound findings were collected. Fetal well-being was assessed by cardiotocography.

Management details about transfusion of blood and blood products, including packed cells, fresh frozen plasma, platelet and cryoprecipitate, need for ICU admission, and dialysis were collected. All the above information was entered in a detailed master chart for analysis. Labor details like mode of delivery and interval between diagnosis to delivery in hours also were collected. After delivery of placentae, the size of retroplacental clot and development of postpartum hemorrhage (PPH) were documented.

Predictors for fetal outcome were gestational age, birth weight, APGAR score, and neonatal ICU admissions.

### Statistical Analysis

Standard descriptive statistics were used in the analysis. Categorical variables were described by frequency and percentage. Results were analyzed applying the Chi-square test and Fisher exact test to evaluate the significance of association of adverse maternal outcomes. Factors influencing maternal complications were analyzed using logistic regression. Results are presented as odds ratio (OR) supplemented by a 95% confidence interval. The Wald test

was used to test the statistical significance of OR. The results were considered statistically significant at the level of alpha <0.05 in all applied analyses. Analyses were performed using IBM SPSS statistics 23.0.

### Ethical Clearance

Ethical clearance was provided by the St John's Medical College ethical committee. Consent from the participants was waived off as this is a retrospective study done by analysis of charts.

### Objectives

Abruption placentae is a grave obstetrical emergency, and there is limited information about the condition and predictors of maternal and perinatal outcome. Hence, this study is being conducted to determine the prevalence of abruption placentae in our center and the potential determinants of adverse outcomes of abruption placentae.

### RESULTS

A total of 16,082 cases were admitted during the study period. Out of them, 140 patients had abruption placentae. The prevalence rate was 8.7 per 1,000 deliveries. Maximum frequency of abruption placentae was observed in the age-group of 20–35 years with frequency of 128 (91.4%). About 77 (80%) were multipara. Out of them, three (2%) were grand multipara. Gestational age was mainly between 28 and 34 weeks ( $n = 76, 54.3\%$ ), and 21 (15%) women were extreme preterm (gestational age less than 28 weeks). Forty-three (30.7%) women were more than 34 weeks. One hundred and thirty seven (97.9%) women had singleton pregnancy, and three (2.1%) women had multiple pregnancy. One hundred and thirty six (97.1%) women had regular antenatal checkup, and four (2.9%) women did not go for regular antenatal checkup (Table 1).

Preeclampsia was the most common antenatal complication observed in 79 women (56.4%), and out of them, 10 (7.1%) had eclampsia. Other associated antenatal complications were HELLP (2.9%), gestational diabetes mellitus (2.1%), and preterm premature rupture of membranes (3.6%). Four (2.9%) women had anemia. First trimester bleeding with subchorionic hematoma was noted in 13 (9.3%) (Table 2).

Once the diagnosis was confirmed, immediate delivery plan was made, and 48 (34.3%) women went into spontaneous labor and

**Table 1:** Demographic details

Variable	<i>n</i> = 140	Percentage (%)
Mother's age (years)		
<20	07	5%
20–35	128	91.4%
>35	05	3.6%
Gestational age (weeks)		
<28	21	15%
28–34	76	54.3%
>34	43	30.7%
Number of fetus		
Singleton pregnancy	137	97.9%
Multiple pregnancy	03	2.1%
Parity		
Primigravida	60	42.9%
Multigravida	77	80%
Grand multigravida	3	2.1%

**Table 2:** Antenatal complications

Complication	n = 140	Percentage (%)
Gestational hypertension	1	0.7%
Preeclampsia	79	56.4%
Eclampsia	10	7.1%
HELLP	4	2.9%
Anemia	4	2.9%
GDM	3	2.1%
PROM	3	2.1%
PPROM	5	3.6%
Fibroid	2	1.4%
Hypothyroidism	2	1.4%
Subchorionic hematoma	13	9.3%
Previous LSCS	4	2.9%

**Table 3:** Abruption implications on fetus and pregnancy

Variable	n = 140	Percentage (%)
FHR normal range	43 (out of 58 live fetus)	74%
Fetal distress	15 (out of 58 live fetus)	26%
Mode of delivery—spontaneous vaginal	48	34.3%
Induced vaginal	44	31.4%
LSCS	48	34.3%
Retroplacental clot in g		
Less than 100 g	43	30.7%
100–199 g	42	30.0%
200–299 g	15	10.7%
300–399 g	8	5.7%
400–499 g	14	10.0%
More than 500 g	18	12.9%

44 (31.4%) got induction of labor. Forty-eight (34.3%) underwent emergency lower segment cesarean section. During cesarean, 8.6% of women had Couvelaire uterus.

Approximately 30% of women had retroplacental clot weighing between 100 and 199 g. Moreover, 10.7% had between 200 and 299 g, 5.7% had between 300 and 399, and 12.9% had more than 500 g. Moreover, 30.7% had revealed abruption in whom retroperitoneal clot was measuring less than 100 g (Table 3).

Predictors that were associated with maternal outcome were presence of anemia on admission, which was corrected aggressively with packed red cell transfusion. Presence of DIC was confirmed by sending coagulation profile every 6 hours. Seven (5%) women had DIC.

Admission to ICU helped 21 (15%) women to recover. Thirteen (9.3%) women developed acute renal failure, and five (3.5%) women needed dialysis. Forty-two (30%) women developed atonic PPH which was managed medically. Nobody required hysterectomy for the same. Fifty-seven (40.7%) of women did not develop any of the complications (Table 4).

If the hemoglobin was less than 11 g%, immediate correction was carried out with blood transfusion. One hundred and eleven women had mild anemia at admission, and only 102 were anemic after 24 hours. Massive transfusion protocol was initiated if hemoglobin was found to be less than 7 g%. Blood products used

**Table 4:** Maternal complications

Variables	n = 140	Percentage (%)
PPH	42	30%
DIC	7	5%
ICU admission	21	15%
AKI	13	9.3%
Need for dialysis	5	3.5%

**Table 5:** Assessment of anemia

Hemoglobin (g%)	At admission	After 24 hours
9–10.9	111 (79.9%)	102 (72.8%)
7–8.9	15 (10.8%)	26 (18.7%)
4.1–6.9	9 (6.5%)	07 (5%)
<4	2 (1.4%)	00

**Table 6:** Details of transfusion of blood and blood products

Blood product	Frequency n = 140	Percentage (%)
No blood transfusion	100	71.4%
PRBC	24	17.1%
FFP	1	0.7%
Platelets	9	6.4%
Cryoprecipitate	1	0.7%

for transfusion were packed red blood cells (PRBC), fresh frozen plasma, platelet, and cryoprecipitate (Table 5).

One-hundred (71.4%) women did not get any blood products. Twenty-four (17.1%) women got transfused with PRBC. One (0.7%) woman received fresh frozen plasma, nine (6.4%) women received platelet transfusion, and one (0.7%) woman received cryoprecipitate (Table 6).

Interval between diagnosis to delivery, parity index, and mode of delivery were analyzed as potential determinants for developing maternal complications like PPH, ICU admission developing DIC, AKI, and number of dialysis required. PPH was observed in 22 (52.4%) women in whom interval between diagnosis to delivery was less than 12 hours, 63 (64.3%) did not have PPH. Twenty (47.6%) developed PPH who delivered after 12 hours. As per our institutional protocol, the interval between diagnosis of abruption to delivery is restricted to 24 hours. Due to the above protocol, most of the women did not develop PPH ( $p = 0.816$ ). Parity index ( $p = 0.136$ ) and mode of delivery ( $p = 0.264$ ) did not show any significance in developing PPH (Table 7).

Analysis of ICU admissions of women with abruption showed no significance for interval between diagnosis to delivery (less than 12 hours, more than 12 hours) ( $p = 0.716$ ) and mode of delivery—vaginal or cesarean ( $p = 0.633$ ). However, it was significant for parity index. Out of 21 women who got admitted to ICU, 17 (81.0%) were multigravida ( $p = 0.023$ ) (Table 8).

When these determinants, that is, interval between diagnosis to delivery, parity index, and mode of delivery, were analyzed for developing DIC and AKI, they did not show any significance. Maybe the immediate corrective measures taken at the earliest when DIC was observed and not allowing the labor duration to exceed more than 24 hour, analysis of creatinine at regular intervals and instituting the treatment for acute renal failure at the

Prevalence of Abruption Placentae

**Table 7:** PPH

	PPH—absent	PPH—present	OR	95% of CI (LCI, UCI)	p value
Interval between diagnosis to delivery					
Less than 12 hours	63 (64.3%)	22 (52.4%)	0.61	0.294, 1.272	0.186
More than 12 hours	35 (35.7%)	20 (47.6%)			
Parity index					
Primigravida	46 (46.9%)	14 (33.3%)	0.57	0.266, 1.202	0.136
Multigravida	52 (53.1%)	28 (66.7%)			
Mode of delivery					
Vaginal delivery	59 (60.2%)	21 (50.0%)	0.66	0.319, 1.368	0.264
Cesarean delivery	39 (39.8%)	21 (50.0%)			

p value using logistic regression; OR, odds ratio; LCI, lower confidence interval; UCI, upper confidence interval

**Table 8:** ICU admission (n = 21)

	ICU admission—absent	ICU admission—present	OR	95% of CI (LCI, UCI)	p value
Interval between diagnosis to delivery					
Less than 12 hours	73 (61.3%)	12 (57.1%)	0.84	0.328, 2.150	0.716
More than 12 hours	46 (38.7%)	9 (42.9%)			
Parity index					
Primigravida	56 (47.1%)	4 (19.0%)	0.27	0.084, 0.834	0.023*
Multigravida	63 (52.9%)	17 (81.0%)			
Mode of delivery					
Vaginal delivery	67 (56.3%)	13 (61.9%)	0.79	0.306, 2.055	0.633
Cesarean delivery	52 (43.7%)	8 (38.1%)			

p value using logistic regression; \*p value <0.05 is statistically significant; OR, odds ratio; LCI, lower confidence interval; UCI, upper confidence interval

**Table 9:** DIC complications

	DIC—absent	DIC—present	OR	95% of CI (LCI, UCI)	p value
Interval between diagnosis to delivery					
Less than 12 hours	10 (83.3%)	75 (58.6%)	0.28	0.060, 1.345	0.112
More than 12 hours	2 (16.7%)	53 (41.4%)			
Parity index					
Primigravida	2 (16.7%)	58 (45.3%)	4.14	0.873, 19.667	0.074
Multigravida	10 (83.3%)	70 (54.7%)			
Mode of delivery					
Vaginal delivery	8 (66.7%)	72 (56.3%)	0.64	0.184, 2.244	0.488
Cesarean delivery	4 (33.3%)	56 (43.8%)			

p value using logistic regression; OR, odds ratio; LCI, lower confidence interval; UCI, upper confidence interval

earliest had given the early recovery and better maternal outcome (Tables 9 and 10).

**Perinatal Outcomes**

On admission, 82 (58.6%) women were diagnosed with intrauterine fetal demise. In the group of women with live fetus (n = 58, 41.4%), 19.3% had fetal distress.

Seventy-six (54%) of newborns weighed between 1 and 2 kg. Twenty-three (16.4%) babies had APGAR score less than 6 at 1 minute of life. Only five (3.6%) babies remained to have APGAR less than 6 even at 5 minutes of life. That shows immediate resuscitation of the newborn helped to improve the outcome (Table 11).

**DISCUSSION**

Abruption placentae is one of the major causes to develop hemorrhagic shock and its consequences like developing DIC, AKI, requiring dialysis, and maternal ICU admission, finally leading to maternal death.<sup>1,3,5</sup> Because of worsening maternal condition, need for preterm delivery is increased, and because of prematurity and birth asphyxia, perinatal morbidity and mortality are also increased.<sup>1</sup> In developed countries of the world, lower prevalence of abruption placentae and few adverse maternal and perinatal outcomes are seen when compared to developing countries. Study done by Ananth et al.<sup>6</sup> showed the overall prevalence rate of abruption was 9.6 per 100. In our study, the prevalence was found to be 8.7 per 1,000.



**Table 10: Renal failure**

	<i>Renal failure—absent</i>	<i>Renal failure—present</i>	<i>OR</i>	<i>95% of CI (LCI, UCI)</i>	<i>p value</i>
Interval between diagnosis to delivery					
Less than 12 hours	78 (61.4%)	7 (53.8%)	0.73	0.233, 2.309	0.596
More than 12 hours	49 (38.6%)	6 (46.2%)			
Parity index					
Primigravida	56 (44.1%)	4 (30.8%)	0.56	0.165, 1.925	0.360
Multigravida	71 (55.9%)	9 (69.2%)			
Mode of delivery					
Vaginal delivery	70 (55.1%)	10 (76.9%)	0.27	0.713, 1.322	0.143
Cesarean delivery	57 (44.9%)	3 (23.1%)			

*p* value using logistic regression; OR, odds ratio; LCI, lower confidence interval; UCI, upper confidence interval

**Table 11: Perinatal outcome**

<i>Variable</i>	<i>n = 140</i>	<i>Percentage (%)</i>
Fetal outcome		
Live birth	58	41.4%
Intrauterine demise	82	58.6%
Birth weight		
<1 kg	27	19.2%
1–2 kg	76	54.0%
>2 kg	37	26.4%
NICU admission		
Required	50	35.7%
Not required	21	13.6%
APGAR (at 1 minute of life)		
≥6	48	34.3%
<6	23	16.4%
APGAR (at 5 minutes of life)		
≥6	66	47.5%
<6	5	3.6%

The maternal age in our study was mainly between 20 and 35 years accounting for 91.4% of cases. This is similar to other study done by Sengodan et al.<sup>4</sup> at other center in India. Similar study by Nandonde et al.<sup>5</sup> in a center at Tanzania also was comparable.

The gestational age in our study group majority was between 28 and 34 weeks accounting for 54.3%. Extreme preterm, that is, gestational age less than 28 weeks was 21 (15%) and gestational age more than 34 weeks was 43 (30.7%), and that is again comparable with other studies mentioned above.<sup>4,5</sup> Similarly, parity index was also comparable. Abruption placentae was observed more in multigravida compared to primigravidae.<sup>5</sup>

Most common antenatal complication associated with abruption placentae was preeclampsia ( $n = 79\%$ ), and out of them, 10% mothers had antepartum eclampsia. Similar observations were made in study by Sengodan et al.<sup>4</sup>

This study has clearly demonstrated the increase in the maternal and neonatal morbidity and mortality. Even though we did not observe maternal mortality due to abruption placentae, definitely morbidity was increased. Similar observations were made in other studies done in different other centers.<sup>4,7</sup> Increased maternal morbidity such as atonic PPH, DIC, AKI, need for dialysis and ICU admissions, and blood and blood product transfusion reported in this study were observed in other studies done in both developing and developed countries.<sup>5,6</sup> Study by Ananth et al.

clearly demonstrated 2- to 7-fold higher rate ratio for maternal complications compared to women without abruption placentae.<sup>6</sup> In our study, 47 women (26.9%) developed PPH, which is similar to study by Nandonde et al.<sup>5</sup> But none required hysterectomy for the management of PPH. DIC was observed in seven women (1.6%) which was very low compared with other studies.<sup>5,8</sup> Incidence of AKI was 1.6%, and admission to ICU was also low in our study group compared to other studies.<sup>9</sup> Cesarean delivery rate was comparable with other study.<sup>5</sup> A few older retrospective cohort studies suggested that outcomes in cases of abruption where the fetuses were alive were superior when there was a cesarean delivery to when vaginal deliver occurred.<sup>9</sup>

Hence, to see the other factors like interval between diagnosis to delivery, parity index, and mode of delivery have any predictive value for the maternal and perinatal outcome, this study was conducted.

A study by Gabby-Benziv et al.<sup>10</sup> concluded that in cases of suspected placental abruption, fetal short-term morbidity is probably related to the indication for cesarean delivery and not only to diagnosis-to-delivery interval. But Nandonde et al.<sup>5</sup> said that cesarean section has shown to reduce perinatal death.

Arazi et al.<sup>3</sup> said that placental abruption is not a risk factor for long-term maternal renal complication but did not comment on short-term renal complications.

Our study showed significant association between parity index and ICU admission ( $p$  value = 0.021), and our center follows a strict protocol to restrict diagnosis to delivery interval to 24 hours. Maybe because of that statistical significance was not observed when compared with other parameters. Hence maybe restricting the delivery time, morbidity may be reduced.

Predictors for the fetal outcomes were dependent on gestational age and other antenatal complication. We observed 82 (58.6%) intrauterine demises similar to other study where they documented 60% of perinatal mortality.<sup>1</sup> Study by Sengodan et al.<sup>4</sup> observed 30.2% stillbirths. Study by Nandonde et al.<sup>5</sup> showed strong association between perinatal death and low birth weight, fetal heart rate on admission, mode of delivery, and sign of retroperitoneal clot. This study also had 34.7% stillbirths and 23.2% early neonatal deaths.

In our study, we did not observe maternal death.

## CONCLUSION

There is high association between antenatal complications like preeclampsia, eclampsia, gestational diabetes, and maternal

anemia and incidence of abruption. This study had prevalence of 8.7 per 1,000. Antenatal care to prevent and detect the antenatal complications at the earliest would help in reducing the incidence of abruption and its maternal and perinatal complications. Timely diagnosis and intervention will reduce the morbidity, and restricting interval between diagnosis to delivery would definitely bring down the maternal morbidity and mortality. Close monitoring of high parity index pregnancies also can improve the outcome.

### Limitation of the Study

A prospective cohort study would have yielded better results. Some asymptomatic or mild form of abruption may be underreported. Follow-up of the subjects who had AKI would have helped in better evaluation of their renal status.

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