Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 15s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Feto-Maternal Outcomes in Antenatal Women with First-Trimester Vaginal Bleeding: A Retrospective Observational Study

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Cite this paper as: Dr. Navya Manohar, Prof. Dr. Sai Latha Ramanujam, (2025) Feto-Maternal Outcomes in Antenatal Women with First-Trimester Vaginal Bleeding: A Retrospective Observational Study. *Journal of Neonatal Surgery*, 14 (15s), 1387-1393.

ABSTRACT

Background: First-trimester vaginal bleeding is a common obstetric concern associated with increased risks of adverse maternal and fetal outcomes. The aim of this study was to evaluate the impact of first-trimester bleeding on pregnancy outcomes and identify significant predictors of miscarriage.

Methods: This retrospective observational study included 100 pregnant women presenting with first-trimester vaginal bleeding. Data were collected on maternal characteristics, pregnancy-related factors, maternal outcomes, and fetal outcomes. Statistical analysis, including logistic regression, was performed to identify risk factors for miscarriage.

Results: The mean maternal age was 27.4 ± 4.2 years, with 45% of women being primigravida. The mean gestational age at the time of bleeding was 8.6 ± 2.1 weeks. Bleeding severity was classified as mild (55%), moderate (30%), or severe (15%). Associated abdominal pain was reported in 40% of cases, and 20% required hospital admission. Pregnancy continuation was observed in 70% of cases, while 25% resulted in miscarriage. Preterm labor occurred in 10% of cases, preeclampsia in 5%, and preterm rupture of membranes in 8%. Low birth weight (<2500g) was noted in 20% of neonates, while 10% required neonatal ICU admission. Logistic regression analysis identified severe bleeding (OR 6.5, $p<0.001$), associated pain (OR 4.2, $p<0.001$), early gestational age at bleeding (<8 weeks) (OR 3.1, $p=0.004$), maternal age >30 years (OR 2.2, $p=0.03$), and hospitalization (OR 3.8, $p=0.002$) as significant predictors of miscarriage.

Conclusion: First-trimester vaginal bleeding is associated with increased risks of miscarriage, preterm labor, and adverse fetal outcomes. Severe bleeding, associated pain, early gestational age at bleeding, and maternal age >30 years significantly increase miscarriage risk. Early evaluation, close monitoring, and appropriate management are essential to improve pregnancy outcomes. Future research should focus on developing standardized management protocols for first-trimester bleeding.

Keywords: *First-trimester bleeding, miscarriage, pregnancy outcomes, risk factors, maternal health*

1. INTRODUCTION

First-trimester vaginal bleeding is a common clinical presentation, affecting 15% to 25% of pregnancies [1]. It is associated with adverse outcomes such as spontaneous abortion, ectopic pregnancy, and gestational trophoblastic disease [2]. While nearly 50% of women presenting with first-trimester bleeding go on to have a normal pregnancy, the remaining half face complications such as miscarriage, preterm labor, or intrauterine growth restriction [3].

Bleeding in early pregnancy requires immediate evaluation to differentiate between normal and pathological causes, as it may indicate an underlying placental disorder leading to later complications, including preeclampsia, fetal growth restriction, and stillbirth [4]. The lack of standardized guidelines for assessing first-trimester bleeding complicates clinical decision-making, necessitating further research into its implications.

First-trimester vaginal bleeding occurs in approximately one-fourth of pregnancies [3]. Its causes vary and range from minor conditions like implantation bleeding to serious threats such as ectopic pregnancy or miscarriage [4]. Studies indicate that women with first-trimester bleeding have a higher risk of pregnancy loss than those without [1]. Threatened miscarriage, defined as vaginal bleeding without cervical dilation, affects 20% of pregnancies [2]. While many pregnancies continue normally, these women have a higher risk of miscarriage and preterm birth [4]. The underlying mechanism of bleeding varies by cause. In threatened abortion, bleeding results from decidual disruption without placental detachment. In contrast, ectopic pregnancies cause bleeding due to tissue invasion and rupture, and trophoblastic diseases lead to abnormal vascularization [3].

Women with heavy bleeding and associated pain have a higher risk of early pregnancy loss [1]. Bed rest does not improve outcomes, and there is insufficient evidence supporting progestin use in these cases [4].

Although first-trimester bleeding is widely studied, there is limited understanding of the underlying mechanisms influencing its outcomes. Further research is required to Differentiate between harmless and high-risk bleeding. Assess the role of bleeding volume and timing in pregnancy outcomes. Develop standardized clinical guidelines [4]. Additionally, the psychological effects of early pregnancy bleeding remain underexplored despite evidence linking it to anxiety and pregnancy-related stress [4]. First-trimester vaginal bleeding is a common yet clinically significant symptom requiring careful assessment. While many pregnancies progress typically, a subset of women experiences complications that impact maternal and neonatal health. Addressing the existing knowledge gaps through further research and standardized clinical protocols is necessary to improve pregnancy outcomes.

Study Objective:

- To measure the prevalence of patients with first-trimester vaginal bleeding, to evaluate factors associated with it
- To assess feto-maternal outcomes in those pregnant women

Methods

Study Design: This study is a retrospective observational study conducted at Chettinad Hospital and Research Institute (CHRI), Chennai, India. The study aims to evaluate feto-maternal outcomes in pregnant women presenting with first-trimester vaginal bleeding over a one-year period (January 2023 – January 2024).

Setting and Population: The study was conducted in the Department of Obstetrics and Gynecology at CHRI, a tertiary care teaching hospital. The population included pregnant women in their first trimester who presented with vaginal bleeding at either the Outpatient Department (OPD) or Emergency Unit during the study period.

Inclusion Criteria:

- Pregnant women aged 18-40 years with confirmed intrauterine pregnancy.
- Women experiencing vaginal bleeding during the first trimester (≤12 weeks of gestation).
- Patients with complete medical records available for retrospective analysis.

Exclusion Criteria:

- Women with multiple gestations (twins, triplets, etc.).
- Patients with pre-existing maternal conditions such as chronic hypertension, diabetes, or thyroid disorders, which could influence pregnancy outcomes.
- Cases of recurrent pregnancy loss (≥2 consecutive miscarriages).
- Women diagnosed with ectopic pregnancy or gestational trophoblastic disease.
- Patients with incomplete medical records or lost to follow-up.

Data Collection

Data were extracted from **hospital records and electronic medical records (EMR)** using a **standardized data collection form**. The following variables were assessed:

1. **Maternal Characteristics:**
    - Age
    - Gravidity and parity
    - History of previous miscarriages or pregnancy complications
2. **Pregnancy-Related Data:**
    - **Gestational age** at the time of bleeding
    - **Severity of bleeding** (mild, moderate, or severe)
    - Presence of **associated symptoms** (e.g., abdominal pain, cramping)
3. **Maternal Outcomes:**
    - Pregnancy progression (continuation vs. miscarriage)
    - Need for medical or surgical intervention (e.g., progesterone therapy, dilation & curettage)

- Development of maternal complications (**preeclampsia, preterm labor, premature rupture of membranes**)

4. **Fetal Outcomes:**
    - **Gestational age at delivery**
    - **Birth weight**
    - Presence of **intrauterine growth restriction (IUGR)**
    - **Apgar scores at 1 and 5 minutes**

The **severity of bleeding** was classified based on clinical presentation:

- **Mild**: Spotting or minimal bleeding
- **Moderate**: Heavier than spotting but no hemodynamic instability
- **Severe**: Requires hospitalization or transfusion

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 and R software (version 4.2.0). Descriptive statistics were presented as mean ± standard deviation (SD) for continuous variables and percentages for categorical variables. Chi-square test (χ^2) for comparing categorical variables (e.g., presence vs. absence of complications). Student's t-test for comparing continuous variables (e.g., birth weight in affected vs. unaffected pregnancies). Logistic regression analysis to assess risk factors for miscarriage and adverse perinatal outcomes. A p-value of <0.05 was considered statistically significant. To adjust for potential confounders (e.g., maternal age, gravidity), multivariate logistic regression was performed. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported for significant findings.

2. RESULTS

A total of 100 pregnant women with first-trimester vaginal bleeding were included in this retrospective observational study. The results are categorized into maternal characteristics, pregnancy-related factors, maternal outcomes, and fetal outcomes.

Table 1: Maternal Characteristics

Variable	Mean ± SD / Frequency (%)
Age (years)	27.4 ± 4.2
Gravida (G1)	45 (45%)
Gravida (≥G2)	55 (55%)
Previous miscarriage	20 (20%)
History of preterm labor	10 (10%)

The mean maternal age was 27.4 ± 4.2 years. 45% were primigravida, while 55% had previous pregnancies. 20% had a history of previous miscarriage, and 10% had a history of preterm labor.

Table 2: Pregnancy-Related Factors

Variable	Mean ± SD / Frequency (%)
Gestational age at bleeding (weeks)	8.6 ± 2.1
Severity of bleeding:	
Mild	55 (55%)
Moderate	30 (30%)
Severe	15 (15%)
Associated pain	40 (40%)
Hospital admission required	20 (20%)

The mean gestational age at the time of bleeding was 8.6 ± 2.1 weeks. 55% had mild bleeding, 30% had moderate bleeding, and 15% had severe bleeding. 40% of women had associated abdominal pain, and 20% required hospital admission.

Figure 1: Severity of Bleeding

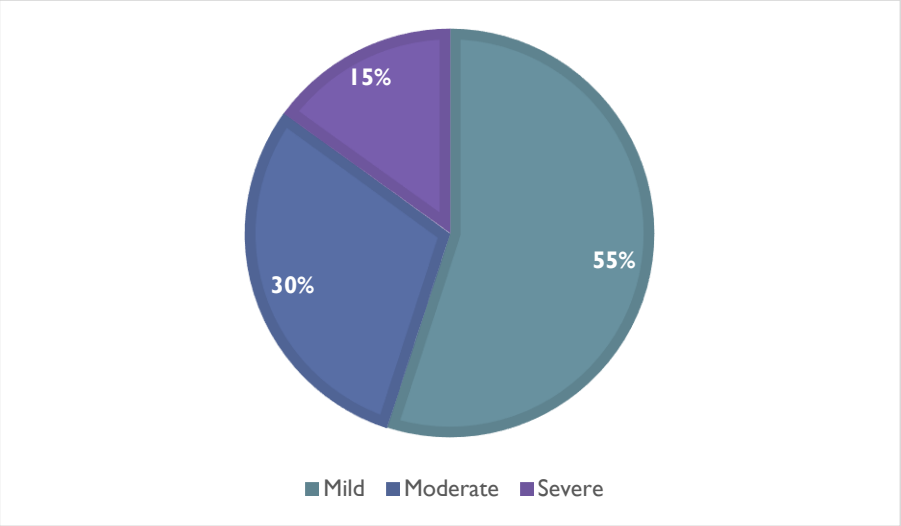

Table 3: Maternal Outcomes

Outcome	Frequency (%)
Pregnancy continuation	70 (70%)
Miscarriage (Spontaneous abortion)	25 (25%)
Preterm labor (<37 weeks)	10 (10%)
Preeclampsia	5 (5%)
Preterm rupture of membranes (PROM)	8 (8%)
Need for medical/surgical intervention	18 (18%)

70% of pregnancies continued, while 25% resulted in miscarriage. 10% of cases resulted in preterm labor, and 8% had preterm rupture of membranes (PROM). 5% of women developed preeclampsia. 18% required medical or surgical intervention (e.g., progesterone therapy, dilation & curettage).

Figure 2: Miscarriage

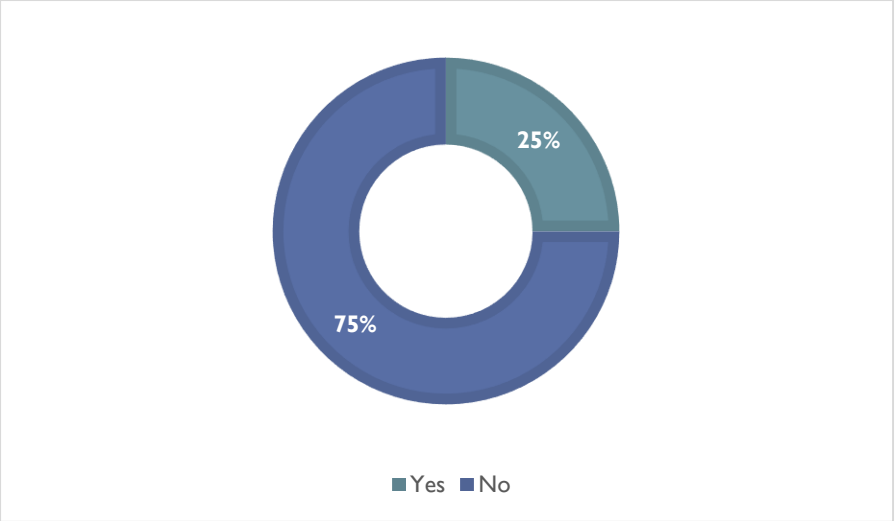

Table 4: Fetal Outcomes

Outcome	Mean ± SD / Frequency (%)
Gestational age at delivery (weeks)	37.6 ± 2.4
Birth weight (grams)	2,800 ± 450
Low birth weight (<2500g)	20 (20%)
Apgar score (1 min)	7.6 ± 1.2
Apgar score (5 min)	8.9 ± 0.8
Neonatal ICU admission	10 (10%)
Intrauterine growth restriction (IUGR)	12 (12%)

The mean gestational age at delivery was 37.6 ± 2.4 weeks. 20% of neonates had low birth weight (<2500g). Neonatal ICU admission was required for 10% of cases, primarily due to prematurity. 12% of cases showed intrauterine growth restriction (IUGR).

Table 5: Comparison Between Women with and without Miscarriage

Variable	Miscarriage (n=25)	No Miscarriage (n=75)	p-value
Mean maternal age (years)	29.1 ± 3.9	26.8 ± 4.3	**0.03***
Gestational age at bleeding (weeks)	7.5 ± 1.8	9.0 ± 2.1	**0.01***
Severe bleeding (%)	12 (48%)	3 (4%)	**<0.001***
Associated pain (%)	18 (72%)	22 (29.3%)	**<0.001***
Need for hospitalization (%)	10 (40%)	10 (13.3%)	**0.002***

Maternal age was significantly higher in women who had a miscarriage ($p = 0.03$). Earlier gestational age at bleeding was associated with an increased risk of miscarriage ($p = 0.01$). Severe bleeding and associated pain were strongly correlated with pregnancy loss ($p < 0.001$). Women requiring hospitalization had a higher likelihood of miscarriage ($p = 0.002$).

Table 6: Logistic Regression Analysis for Predictors of Miscarriage

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Severe bleeding	6.5	2.3 – 18.4	**<0.001***
Associated pain	4.2	1.8 – 9.5	**<0.001***
Gestational age at bleeding (<8 weeks)	3.1	1.4 – 6.8	**0.004***
Maternal age (>30 years)	2.2	1.1 – 5.1	**0.03***
Need for hospitalization	3.8	1.5 – 8.6	**0.002***

Severe bleeding was the strongest predictor of miscarriage, with an OR of 6.5. Associated pain (OR: 4.2) and gestational age at bleeding <8 weeks (OR: 3.1) significantly increased miscarriage risk. Maternal age >30 years (OR: 2.2, p=0.03) was a weaker but significant risk factor.

3. DISCUSSION

The findings from this retrospective observational study provide valuable insights into the maternal and fetal outcomes associated with first-trimester vaginal bleeding. A total of 100 pregnant women were analyzed, with results categorized into maternal characteristics, pregnancy-related factors, maternal outcomes, and fetal outcomes.

The mean maternal age was 27.4 ± 4.2 years, with 45% being primigravida and 55% multigravida. A history of previous miscarriage was noted in 20% of participants, while 10% had a history of preterm labor. These findings align with existing literature, which identifies advanced maternal age and prior obstetric history as potential risk factors for adverse pregnancy outcomes (5,6). The mean gestational age at the time of bleeding was 8.6 ± 2.1 weeks. Bleeding severity varied, with 55%

experiencing mild bleeding, 30% moderate, and 15% severe. Associated abdominal pain was reported by 40% of women, and 20% required hospital admission. The association between bleeding severity and adverse outcomes has been documented, suggesting that heavier bleeding may correlate with increased risks (7,8).

Pregnancy continuation was observed in 70% of cases, while 25% resulted in miscarriage. Preterm labor occurred in 10% of cases, and 8% experienced preterm rupture of membranes (PROM). Preeclampsia developed in 5% of women, and 18% required medical or surgical interventions. These outcomes underscore the potential complications associated with first-trimester bleeding, emphasizing the need for vigilant monitoring (9,10).

The mean gestational age at delivery was 37.6 ± 2.4 weeks, with 20% of neonates classified as low birth weight (<2500g). Neonatal ICU admission was necessary for 10% of cases, primarily due to prematurity, and 12% exhibited intrauterine growth restriction (IUGR). These findings are consistent with studies indicating that first-trimester bleeding can be associated with adverse fetal outcomes, including preterm birth and low birth weight (11,12).

Significant differences were noted between women who experienced miscarriage and those who did not. Maternal age was higher in the miscarriage group (29.1 ± 3.9 vs. 26.8 ± 4.3 years, $p = 0.03$). Earlier gestational age at bleeding was associated with increased miscarriage risk (7.5 ± 1.8 vs. 9.0 ± 2.1 weeks, $p = 0.01$). Severe bleeding and associated pain were strongly correlated with pregnancy loss ($p < 0.001$), and hospitalization was more common among those who miscarried (40% vs. 13.3%, $p = 0.002$). These findings highlight the importance of early assessment and intervention in cases of first-trimester bleeding (13,14).

Logistic regression analysis identified several significant predictors of miscarriage: Severe bleeding: Odds Ratio (OR) 6.5; 95% Confidence Interval (CI) 2.3–18.4; $p < 0.001$. Associated pain: OR 4.2; 95% CI 1.8–9.5; $p < 0.001$. Gestational age at bleeding (<8 weeks): OR 3.1; 95% CI 1.4–6.8; $p = 0.004$. Maternal age (>30 years): OR 2.2; 95% CI 1.1–5.1; $p = 0.03$. Need for hospitalization: OR 3.8; 95% CI 1.5–8.6; $p = 0.002$. These results are in line with previous research identifying similar risk factors for miscarriage (15,16).

This study reinforces the association between first-trimester vaginal bleeding and increased risks of adverse maternal and fetal outcomes. Factors such as bleeding severity, associated pain, earlier gestational age at bleeding, and advanced maternal age are significant predictors of miscarriage. These findings underscore the importance of prompt evaluation and management of first-trimester bleeding to optimize pregnancy outcomes.

4. CONCLUSION

This study aimed to assess the maternal and fetal outcomes associated with first-trimester vaginal bleeding, identify predictors of miscarriage, and analyze risk factors contributing to adverse pregnancy outcomes. The findings highlight that vaginal bleeding in the first trimester is a significant clinical concern, with a notable proportion of cases leading to miscarriage (25%) and increased risks of preterm labor, preeclampsia, and preterm rupture of membranes. Key predictors of miscarriage identified in this study included severe bleeding, associated pain, early gestational age at bleeding (<8 weeks), advanced maternal age (>30 years), and the need for hospitalization. These findings emphasize the importance of early and thorough clinical evaluation of pregnant women presenting with vaginal bleeding, as well as close monitoring for potential complications. Fetal outcomes were also affected, with increased rates of low birth weight, neonatal ICU admissions, and intrauterine growth restriction among pregnancies complicated by first-trimester bleeding. Given these risks, appropriate interventions, such as maternal counseling, monitoring of fetal growth, and timely medical or surgical management when necessary, are crucial for optimizing pregnancy outcomes. In conclusion, this study reinforces the clinical significance of first-trimester vaginal bleeding as a predictor of pregnancy complications. The results underline the need for heightened awareness among healthcare providers to ensure early detection, risk stratification, and appropriate management strategies to improve maternal and fetal health outcomes. Future research should focus on developing standardized protocols for the management of first-trimester bleeding to reduce adverse outcomes.

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