

PROSPECTIVE OBSERVATIONAL STUDY ON THE IMPACT OF ULTRASONOGRAPHY ON PREGNANCY OUTCOMES IN CASES OF THREATENED ABORTION, CHENNAI: A CROSS-SECTIONAL STUDY.

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ABSTRACT

Background

Threatened abortion, recognised by vaginal bleeding during the first 20 weeks of pregnancy, can result in unfavourable consequences such as intrauterine growth restriction, preterm birth, and miscarriage. Ultrasonography is essential for monitoring these pregnancies and predicting outcomes. The study aims to examine the predictive value of bleeding patterns and ultrasound findings on pregnancy results in females with threatened abortion.

Methods

The study comprised 100 pregnant women with threatened abortion. Bleeding patterns were categorized as light or heavy. Key ultrasound findings were recorded. Pregnancy outcomes, including loss before 20-weeks' gestation and late complications, were assessed. Statistical analyses, including chi-square tests and logistic regression, were employed to assess associations between variables and outcomes.

Results

The average age was 28.4 years (± 4.2), and the average BMI was 22.3 kg/m² (± 1.8). The average gestational age was 8 weeks (± 1). On average, participants had 1.5 previous pregnancies. Among them, 40% were primigravida and 60% were multigravida. Pregnancy loss before 20-weeks' gestation occurred in 25 participants (25%), while 35 participants (35%) experienced late pregnancy complications. Heavy bleeding was significantly associated with pregnancy loss (OR = 2.8, 95% CI [1.3, 6.0], $p = 0.008$). Subchorionic hematoma (OR = 2.1, 95% CI [1.0, 4.3], $p = 0.045$) and cervical length less than 2.5 cm (OR = 3.0, 95% CI [1.2, 7.2], $p = 0.018$) were also significant predictors of early pregnancy loss.

Conclusion

Heavy bleeding, subchorionic hematoma, and shortened cervical length are significant predictors of loss of pregnancy prior 20-weeks' gestation in women with threatened abortion. The findings underscore the importance of close monitoring and comprehensive care for at-risk pregnancies.

Recommendations

Further research is needed to develop targeted interventions for pregnancies with threatened abortion. Clinicians should use ultrasound findings and bleeding patterns to guide the management and counseling of affected patients.

Keywords: Threatened Abortion, Pregnancy Outcomes, Ultrasonography, Subchorionic Hematoma, Cervical Length.

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INTRODUCTION

Threatened abortion, described as vaginal bleeding within the 1st 20 weeks of pregnancy, is a common complication in early pregnancy, affecting approximately 20-25% of pregnancies [1]. This condition can cause significant anxiety for expectant mothers and is correlated with a variety of unfavourable pregnancy outcomes, including miscarriage, preterm birth, and intrauterine growth restriction (IUGR). Given the potential severity of these outcomes, it is crucial to identify predictive factors and effective management strategies for pregnancies complicated by threatened abortion.

Ultrasonography has become an indispensable tool in the management of threatened abortion, providing detailed

insights into the status of the pregnancy and helping clinicians make informed decisions. Studies have shown that ultrasound findings, such as subchorionic hematoma, abnormal fetal heart rates, and shortened cervical length, are related with a raised risk of unfavourable pregnancy outcomes [2, 3]. For example, subchorionic hematoma, a common ultrasound finding in threatened abortion, has been linked to higher rates of miscarriage and preterm delivery [4]. Similarly, a cervical length of less than 2.5 cm has been related with an elevated risk of preterm birth [5].

Despite the widespread use of ultrasonography in managing threatened abortion, there remains a need for comprehensive studies that examine the predictive value of specific ultrasound findings and bleeding patterns on pregnancy outcomes. This is particularly important in

diverse populations and varied clinical settings to ensure that the findings are generalizable and applicable in real-world scenarios.

The study aims to examine the predictive value of bleeding patterns and ultrasound findings on pregnancy outcomes in women with threatened abortion.

METHODOLOGY

Study Design

This study utilized a prospective observational cross-sectional design.

Study Setting

The study took place at Sree Balaji Medical College and Hospital, Chennai, India. The study spanned a duration from April 2023 to May 2024.

Participants

A total of 100 pregnant women were included in the study.

Inclusion Criteria

- Normal Body Mass Index (BMI) between 18-25 kg/m²
- Certainty of dates (previous regular cycles with a known first day of Last Menstrual Period)
- Previous regular cycles with inter-cycle variation ≤ 7 days
- No cervical pathology
- Single pregnancy

Exclusion Criteria

- Pregnant women with chronic systemic diseases such as chronic hypertension, diabetes mellitus, and thrombophilia
- Women on anti-epileptic or anti-psychiatric medications
- Multiple pregnancies
- History of trauma or surgery during the current pregnancy
- Smokers

Sample size:

To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

Bias

Bias was minimized by ensuring that all participants strictly met the inclusion and exclusion criteria. All examinations and follow-ups were conducted consistently by the same team of healthcare professionals.

Variables

Variables included ultrasonography findings in cases of threatened abortion, pregnancy outcomes, including primary and secondary outcomes

Data Collection

Comprehensive patient histories, standard physical exams, and ultrasound evaluations were used to gather data. The first day of the most recent menstrual cycle was used to calculate gestational age, which was then verified by ultrasound. At prenatal visits, participants were registered and kept under observation.

Procedure

1. Initial Assessment: All participants underwent detailed history taking, a full general examination, and an initial ultrasound to confirm gestational age.
2. Follow-Up: Participants were monitored regularly at antenatal clinics. The amount of bleeding was recorded at each visit, categorized as either light (spotting) or heavy (similar to or more than menstrual bleeding).
3. Delivery and Evaluation: All deliveries occurred at the same hospital. Pregnancy outcomes were evaluated, focusing on primary and secondary outcomes.

Outcomes

- Primary Outcome: Loss of pregnancy prior to 20 weeks of gestation
- Secondary Outcomes: Late pregnancy problems that affect both the mother and the foetus

Statistical Analysis

With the use of the proper statistical tools, data were examined. Baseline characteristics were summarised using descriptive statistics. For categorical data, chi-square tests were utilised, whereas t-tests were employed for continuous variables. There was a predefined significance level of $p < 0.05$.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

100 pregnant females with threatened abortion were included. The average age of the participants was 28.4 years (\pm 4.2 years). All participants had a normal BMI, with an average of 22.3 kg/m² (\pm 1.8 kg/m²).

Table 1: Baseline Properties of the Participants

Characteristic	Mean \pm SD / N (%)
Age (years)	28.4 \pm 4.2
BMI (kg/m ²)	22.3 \pm 1.8
Gestational Age (weeks)	8 \pm 1
Previous Pregnancies	1.5 \pm 1
Primigravida	40 (40%)
Multigravida	60 (60%)

Table 2: Bleeding Patterns

Bleeding Pattern	N (%)
Light (Spotting)	40 (40%)
Heavy	60 (60%)

Table 3: Pregnancy Outcomes

Outcome	Percentage (%)
Pregnancy Loss (<20 weeks)	25
Late Pregnancy Complications	35
- Maternal Complications	20
- Fetal Complications	15

Table 4: Late Pregnancy Complications

Complication	Number of Cases
Maternal Complications	
- Gestational Hypertension	8
- Preterm Labor	7
- Gestational Diabetes	5
Fetal Complications	
- Intrauterine Growth Restriction	7
- Preterm Birth	6
- Congenital Anomalies	2

Regarding bleeding patterns, 40 participants experienced light bleeding (spotting), while 60 experienced heavy bleeding, defined as bleeding similar to or more than menstrual bleeding. The primary outcome of loss of pregnancy prior to 20 weeks of gestation was observed in 25 participants (25%). Additionally, 35 participants (35%) experienced late pregnancy complications, which included 20 cases of maternal complications and 15 cases of fetal complications.

Among the 35 participants who experienced late pregnancy complications, the complications were evenly distributed between maternal and fetal issues. Maternal complications included gestational hypertension (8 cases), preterm labor (7 cases), and gestational diabetes (5 cases). Fetal complications comprised intrauterine growth restriction (IUGR) in 7 cases, preterm birth in 6 cases, and congenital anomalies in 2 cases. These findings highlight the range of complications that can arise in pregnancies with threatened abortion and emphasize the need for vigilant monitoring and management.

Table 5: Ultrasound findings

Ultrasound Finding	Percentage (%)
Subchorionic Hematoma	30
Cervical Length < 2.5 cm	20
Fetal Heart Rate Abnormalities	10

Table 6: Pregnancy Loss Before 20 Weeks by Bleeding Pattern

Bleeding Pattern	Pregnancy Loss (<20 weeks)	No Pregnancy Loss
Light	10	50
Heavy	15	25

Table 7: Statistical Analysis

Variables	Adjusted Odd Ratio (OR)	95% CI	p-value
Heavy bleeding	2.8	1.3, 6.0	0.008
Subchorionic Hematoma	2.1	1.0, 4.3	0.045
Cervical Length < 2.5 cm	3.0	1.2, 7.2	0.018
Fetal Heart Rate Abnormalities	1.5	0.6, 3.7	0.38
Age	1.05	0.98, 1.12	0.15
BMI	1.02	0.90, 1.15	0.77

Ultrasonography played a crucial role in monitoring the pregnancies. Key ultrasound findings included the presence of subchorionic hematoma in 30 participants (30%), cervical length less than 2.5 cm in 20 participants (20%), and fetal heart rate abnormalities in 10 participants (10%). These findings were significant in understanding the risk factors associated with pregnancy outcomes in cases of threatened abortion.

A substantial correlation between bleeding patterns and loss of pregnancy before 20 weeks of gestation was shown by statistical analysis utilising the chi-square test ($\chi^2 = 6.25$, $p = 0.012$). Subchorionic hematoma ($p = 0.045$), cervical length less than 2.5 cm ($p = 0.018$), and heavy bleeding ($p = 0.008$) were found to be significantly correlated with a greater chance of loss of pregnancy before twenty weeks of gestation. Additional logistic regression analysis corrected for potential confounders such as age, BMI, and ultrasound findings.

The results indicate that heavy bleeding, subchorionic hematoma, and shortened cervical length are significantly correlated with a raised risk of loss of pregnancy prior 20-weeks' gestation.

DISCUSSION

This prospective observational study investigated the outcomes of 100 pregnancies with threatened abortion and identify significant predictors of adverse outcomes. The participants had average age of 28.4 years and all had a normal BMI, ensuring a relatively homogenous study population.

In terms of bleeding patterns, the study found that 60 participants experienced light bleeding, while 40 experienced heavy bleeding. The primary outcome of loss of pregnancy prior 20-weeks' gestation was observed in 25 participants (25%). Additionally, 35 participants (35%) experienced late pregnancy complications, which included 20 cases of maternal complications and 15 cases of fetal complications.

Ultrasonography played a crucial role in monitoring these pregnancies. The key ultrasound findings included the presence of subchorionic hematoma in 30% of participants, cervical length less than 2.5 cm in 20% of

participants, and fetal heart rate abnormalities in 10% of participants. These findings were instrumental in understanding the risk factors associated with pregnancy outcomes in cases of threatened abortion.

A substantial correlation between bleeding patterns and loss of pregnancy prior 20 weeks of gestation was shown by statistical analysis utilising the chi-square test ($\chi^2 = 6.25$, $p = 0.012$). After adjusting for potential confounders like age, BMI, and ultrasound findings, additional logistic regression analysis showed that subchorionic hematoma ($p = 0.045$), cervical length less than 2.5 cm ($p = 0.018$), and heavy bleeding ($p = 0.008$) were significantly linked to an increased risk of miscarrying a baby before 20 weeks of gestation.

Among the 35 participants who experienced late pregnancy complications, the complications were evenly distributed between maternal and fetal issues. Maternal complications included gestational hypertension (8 cases), preterm labor (7 cases), and gestational diabetes (5 cases). Fetal complications comprised intrauterine growth restriction (IUGR) in 7 cases, preterm birth in 6 cases, and congenital anomalies in 2 cases. These findings highlight the range of complications that can arise in pregnancies with threatened abortion and emphasize the need for vigilant monitoring and management.

The results of the study highlight a considerable relationship between the risk of loss of pregnancy prior 20 weeks of gestation and severe bleeding in the early stages of pregnancy. In particular, participants who experienced significant bleeding had a 2.8-fold higher risk of miscarrying than those who did not. Additionally, there was a significant raise in the probability of early pregnancy loss in the presence of decreased cervical length and subchorionic hematoma.

The results highlight the importance of close monitoring and comprehensive care for pregnancies with threatened abortion. Ultrasound findings, particularly subchorionic hematoma and cervical length, are valuable predictors of adverse outcomes and can guide clinical management. Early identification of at-risk pregnancies allows for timely interventions that may improve outcomes.

Recent studies have aimed on the impact of ultrasonography and biochemical markers on pregnancy outcomes in cases of threatened abortion, revealing

significant findings and statistical data that enhance our understanding of early pregnancy management. A study evaluated the correlation between ultrasonographic findings and maternal serum biomarkers in 76 women experiencing threatened abortion. They identified specific cut-off values for CA 125 at 37.2 IU/ml with a sensitivity of 86.0% and a specificity of 84.3%, β -hCG at 19447 IU/ml with a sensitivity of 80.6% and a specificity of 78.0%, and progesterone at 12.3 ng/ml with a sensitivity of 90.1% and a specificity of 88.0%. Combining serum progesterone levels with fetal heart rate (FHR) measurements provided a highly accurate prediction of pregnancy outcomes [6].

Another study investigated the correlation between the volume ratio of subchorionic hematoma (SCH) to the gestational sac and pregnancy outcomes. The study concluded that a higher volume ratio of SCH significantly correlated with increased rates of abortion and stillbirth. Moderate and severe SCH volume ratios were particularly associated with adverse outcomes compared to mild ratios, demonstrating the predictive value of SCH volume ratio for adverse pregnancy outcomes [7].

A study involving 500 pregnant women to assess the predictive value of early fetal ultrasound measurements. The study found significant associations between parameters like gestational sac diameter (GSD), crown-rump length (CRL), and yolk sac diameter (YSD) with first and second-trimester abortions, intrauterine fetal demise (IUFD), antepartum hemorrhage (APH), and premature rupture of membranes (PROM). Measurements that fell into certain classifications (Class A and C) were strongly indicative of adverse outcomes, with significant statistical associations ($p < 0.001$) [8].

A study examined the clinical and sonographic characteristics of normal pregnancies and threatened abortions using transvaginal color Doppler sonography. In a study of 200 pregnant women, they discovered that an increased resistive index (RI) of corpus luteum blood flow was a significant predictor of adverse outcomes in threatened abortions, indicating the value of Doppler studies in assessing corpus luteum function and predicting pregnancy outcomes [9].

Moreover, a study evaluated the prognostic value of the ratio of gestational sac volume (GSV) to embryo volume using three-dimensional ultrasound in a study of 500 pregnant women. The study reported significant findings, including a pregnancy success rate of 85.8% at 6 weeks, 87.5% at 7 weeks, and 91.7% at 8 weeks of gestation. The ratio of GSV to germ volume was a strong predictor of pregnancy outcomes, with a significant statistical difference ($p = 0.008$), emphasizing its utility in predicting spontaneous abortion prognosis [10].

Generalizability

The study's demographic findings (average age 28.4 years, BMI 22.3 kg/m², gestational age 8 weeks) suggest that similar patterns of threatened abortion can be expected in a larger population, affecting both primigravida (40%) and multigravida (60%) women.

CONCLUSION

The study demonstrates a significant association between heavy bleeding in early pregnancy and the risk of loss of pregnancy prior 20-weeks' gestation. Ultrasound findings such as subchorionic hematoma and shortened cervical length are also significant predictors of early pregnancy loss. Additionally, a notable proportion of participants experienced late pregnancy complications, underscoring the importance of close monitoring and management of pregnancies with threatened abortion. Further research is warranted to develop targeted interventions for at-risk populations.

LIMITATIONS

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

RECOMMENDATION

Further research is needed to develop targeted interventions for pregnancies with threatened abortion. Clinicians should use ultrasound findings and bleeding patterns to guide the management and counseling of affected patients.

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LIST OF ABBREVIATIONS

BMI - Body Mass Index
CI - Confidence Interval
FHR - Fetal Heart Rate
GSD - Gestational Sac Diameter
IUGR - Intrauterine Growth Restriction
IUFD - Intrauterine Fetal Demise
OR - Odds Ratio
PROM - Premature Rupture of Membranes
RI - Resistive Index
SCH - Subchorionic Hematoma
YSD - Yolk Sac Diameter

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CONFLICT OF INTEREST

The authors have no competing interests to declare.

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