

ULTRASONOGRAPHY AND PREGNANCY OUTCOME IN THREATENED ABORTION: A COHORT STUDY.

¹Maya Singh, ²Shishir Kumar, ³Nahid Lari*, ⁴Daya Shankar

¹Assistant Professor, Department of Obstetrics and Gynecology, Maharshi Devraha Baba Autonomous State Medical College, Deoria, Uttar Pradesh, India

²Assistant Professor, Department of Radiodiagnosis, Maharshi Devraha Baba Autonomous State Medical College, Deoria, Uttar Pradesh, India

³Senior Resident, Department of Obstetrics and Gynecology, Maharshi Devraha Baba Autonomous State Medical College, Deoria, Uttar Pradesh, India

⁴Assistant Professor, Department of Otorhinolaryngology, KMC Medical College and Hospital, Maharajganj, Uttar Pradesh, India

Page | 1

ABSTRACT

Background

Threatened abortion, marked by first-trimester vaginal bleeding, poses a risk for pregnancy loss and adverse outcomes. Ultrasonography is a key diagnostic tool for assessing fetal viability and identifying predictive markers such as fetal heart rate, crown-rump length, and early abnormal ultrasound markers. This study explores the role of these ultrasonographic parameters in predicting miscarriage risk and guiding clinical management.

Methods

This prospective observational study encompassed 100 pregnant women categorized into three groups based on first-trimester bleeding and ultrasonographic findings. Transvaginal ultrasonography assessed fetal heart rate, cervical length, and gestational sac characteristics. Statistical analyses evaluated the predictive value of sonographic markers for pregnancy outcomes.

Results

A total of 100 pregnant women were enrolled in the study, with the majority being Hindu (72%) and residing in rural areas (65%). Baseline characteristics were comparable among groups, but Group I had earlier and heavier bleeding. Group I also revealed lower fetal heart rates and crown-rump lengths, indicating poor pregnancy viability ($p < 0.05$). Adverse maternal and neonatal outcomes, including PROM, IUGR, and NICU admissions, were more frequent in Group II ($p < 0.05$). Early abnormal ultrasound markers were significantly associated with late pregnancy complications.

Conclusion

Early first-trimester ultrasound markers, particularly fetal heart rate and crown-rump length, are strong predictors of adverse pregnancy outcomes. Identifying these markers can aid in risk stratification and timely intervention.

Recommendation

It is recommended that early ultrasonographic evaluation, including fetal heart rate and crown-rump length, be incorporated into routine clinical management to predict and guide the treatment of threatened abortion.

Keywords: First-trimester ultrasound, fetal heart rate, crown-rump length, pregnancy outcomes, preterm birth, intrauterine growth restriction.

Submitted: 2025-02-09 **Accepted:** 2025-03-24 **Published:** 2025-03-31

Corresponding Author: Nahid Lari*

Email: Nahidlari786@gmail.com

Senior Resident, Department of Obstetrics and Gynecology, Maharshi Devraha Baba Autonomous State Medical College, Deoria, Uttar Pradesh, India.

INTRODUCTION

Threatened abortion, marked by vaginal haemorrhage in the first trimester, is a prevalent problem impacting roughly 25% of pregnancies [1]. It is a distressing condition for expectant mothers and poses a clinical challenge for healthcare professionals, as it raises concerns about the potential for miscarriage or other

pregnancy-related complications. While some cases of threatened abortion resolve without adverse effects, others may lead to pregnancy loss or subsequent obstetric complications. Understanding the factors influencing pregnancy outcomes in threatened abortion is essential for improving maternal care and providing evidence-based guidance to patients at risk [2].

Ultrasonography (USG) is a fundamental tool in obstetric care and is widely utilized to evaluate pregnancy viability, fetal development, and potential risks. It allows for the assessment of key parameters such as fetal heart rate, cervical length, and the presence of the gestational sac, which may provide early indications of pregnancy viability or risk of miscarriage [3]. Several studies have suggested that ultrasonographic findings, including subchorionic hematomas and a shortened cervical length, are associated with an increased likelihood of adverse pregnancy outcomes [4,5]. However, the predictive accuracy of these markers and their clinical implications remain subjects of ongoing research.

Despite advancements in imaging technology, gaps remain in our comprehension of the predictive significance of ultrasonographic indicators in instances of imminent abortion. Although previous studies have examined the relationships between ultrasound findings and pregnancy outcomes, and overall predictive value of these indicators necessitates further validation by an extensive prospective study [6,7]. Additionally, limited research has focused on how integrating ultrasonographic assessment into routine clinical practice can influence decision-making and improve maternal and fetal outcomes [8]. Addressing these knowledge gaps is essential for refining diagnostic criteria and optimizing early intervention strategies.

The incorporation of USG into clinical management may offer significant benefits for both clinicians and patients. Early identification of high-risk pregnancies through ultrasound imaging could facilitate timely interventions, targeted monitoring, and more informed patient counseling. By distinguishing pregnancies that are likely to progress normally from those at increased risk of miscarriage, healthcare providers can tailor management strategies to enhance maternal and fetal well-being. However, further research is needed to establish standardized ultrasonographic criteria for assessing pregnancy outcomes in threatened abortion and to determine their practical application in clinical settings [9].

Aim of the Study

This study evaluates the efficacy of ultrasonography (USG) in predicting miscarriage risk in threatened abortion cases. It aims to identify ultrasonographic markers linked to poor pregnancy outcomes and assess USG's role in clinical decision-making [10,11]. The findings aim to improve pregnancy management and risk stratification. Ultimately, the study seeks to provide evidence-based recommendations for obstetric care.

METHODS

Study Design

This prospective observational study aimed to assess the correlation between USG findings and pregnancy outcomes in women presenting with vaginal bleeding

during early pregnancy. The cohort design allowed for the assessment of participants over time, with a specific focus on early pregnancy bleeding and its association with subsequent pregnancy outcomes.

Study Setting and Duration

The study was conducted at Maharshi Devraha Baba Autonomous State Medical College, a leading medical institution in Deoria, Uttar Pradesh. The college is well-equipped with modern facilities and offers comprehensive healthcare services. The study spanned from 2024 to 2025, utilizing the medical college's obstetrics and gynecology department for patient recruitment and clinical assessments.

Sample Size and Participants

The study population consisted of 100 pregnant women who were categorized into three groups based on their clinical presentation and USG findings. The sample size of 100 patients was chosen based on prior studies to ensure adequate statistical power for detecting differences in pregnancy outcomes between the groups. Group I included patients who experienced first-trimester vaginal bleeding and had abnormal sonographic markers such as fetal bradycardia, irregular gestational sac, or abnormal yolk sac diameter. Group II comprised patients with first-trimester vaginal bleeding but with normal sonographic markers. Group III served as the control group, consisting of pregnant women with no history of vaginal bleeding and normal sonographic parameters. This classification allowed for a comparative analysis of maternal and fetal outcomes, assessing the impact of early pregnancy bleeding and sonographic abnormalities on pregnancy progression.

Inclusion and Exclusion Criteria

Women between the ages of 18 and 40 with a confirmed intrauterine pregnancy, as validated by USG, were eligible for inclusion. Clinical markers, including vaginal haemorrhage and findings from physical examinations, were utilised to evaluate the risk of abortion. Women with identified foetal abnormalities, multiple gestations, ectopic pregnancies, or a history of recurrent miscarriage were excluded from the study to preserve its emphasis on uncomplicated threatened abortion cases.

Data Collection and Ultrasonographic Evaluation

Upon presentation, maternal characteristics including age, BMI, parity, history of previous pregnancy loss, and gestational age at bleeding onset were recorded. A detailed ultrasonographic evaluation was performed, assessing fetal heart rate (FHR), crown-rump length (CRL), gestational sac diameter (GSD), and yolk sac diameter (YSD). The study focused on the correlation between these early sonographic markers and

maternal/neonatal outcomes such as premature rupture of membranes (PROM), intrauterine growth restriction (IUGR), and NICU admissions. Early pregnancy ultrasound markers, especially FHR, were examined for their diagnostic performance in predicting pregnancy viability and adverse outcomes.

To minimize potential sources of bias, the study utilized clearly defined inclusion and exclusion criteria to ensure a homogenous sample of participants. The study's prospective nature also allowed for systematic data collection over time, reducing recall bias. Additionally, the analysis employed statistical tests to adjust for potential confounders.

Ethical Considerations

Informed written consent was obtained from all participants before their inclusion in the study.

Statistical Analysis

A summary of the participants' demographic and clinical features was generated using descriptive statistical methods. The correlation between the results of the USG and the pregnancy's final outcome was examined using logistic regression and chi-square testing. In order to determine the relevance of the results, a p-value of 0.05 was used for statistical significance.

RESULTS

A total of 150 pregnant women were initially screened for eligibility, of which 120 women met the inclusion criteria. Out of the 120 eligible women, 100 were enrolled and included in the study. The remaining 20 women were excluded due to the following reasons: 10 women had multiple gestations, 5 had ectopic pregnancies, and 5 had a history of recurrent miscarriages. All enrolled participants completed the follow-up and were included in the final analysis. Among the 100 women, the majority were Hindu (72%), with 28% being Muslim. Most participants resided in rural areas (65%), while 35% lived in urban areas. Regarding occupation, 60% were homemakers, 30% were employed, and 10% were students. The mean age was 29.4 ± 5.2 years, with a range from 18 to 40 years. The baseline characteristics of the study groups at presentation revealed that maternal age, BMI, parity, and history of previous pregnancy loss were similar amongst the three groups, with no statistically significant differences ($p > 0.05$). However, differences were observed in the onset and severity of vaginal bleeding. Group I had an earlier onset of bleeding (6.5 ± 2.3 weeks) compared to Group II (7.3 ± 2.5 weeks). Additionally, Group I experienced significantly heavier vaginal bleeding (7.3 ± 2.2) compared to Group II (1.6 ± 0.4), while vaginal spotting was more prevalent in Group II (4.9 ± 1.8) than in Group I (5.5 ± 1.7) ($p < 0.05$). These findings indicate that the severity and timing of bleeding may have a role in pregnancy outcomes (Table 1).

Table 1: Clinical features of the study cohorts

Variable	Group I (n=35)	Group II (n=30)	Group III (n=35)	P-value
Maternal age (years)	28.5 ± 4.0	29.2 ± 5.8	30.1 ± 6.2	> 0.05
BMI (kg/m^2)	27.5 ± 3.0	26.2 ± 2.8	26.7 ± 2.6	> 0.05
Parity				> 0.05
Nullipara	23 (65.7%)	19 (63.3%)	23 (65.7%)	
Multipara	12 (34.3%)	11 (36.7%)	12 (34.3%)	
Previous pregnancy loss	5 (14.2%)	4 (13.3%)	5 (14.3%)	> 0.05
GA at bleeding onset (weeks)	6.5 ± 2.3	7.3 ± 2.5	-	> 0.05
Vaginal spotting	5.5 ± 1.7	4.9 ± 1.8	-	$< 0.05 *$
Heavy vaginal bleeding	7.3 ± 2.2	1.6 ± 0.4	-	$< 0.05 *$

Ultrasound markers showed notable differences between the studied groups. Group I had a significantly lower fetal heart rate (FHR) (97.5 ± 23.2 beats/min) compared to Group II (155.2 ± 17.6 beats/min) and Group III (164.3 ± 15.8 beats/min) ($p < 0.05$). Crown-rump length (CRL) was also significantly reduced in Group I ($13.9 \pm$

14.8 mm) compared to Group II (12.8 ± 15.7 mm) and Group III (8.9 ± 14.3 mm) ($p < 0.05$). However, GSD and YSD showed no significant variations among the groups, suggesting that FHR and CRL may be more predictive markers of pregnancy viability (Table 2).

Table 2: Variations in the ultrasound biomarkers of the cohorts

Parameter	Group I (n=35)	Group II (n=30)	Group III (n=35)	P-value
FHR (beats/min)	97.5 ± 23.2	155.2 ± 17.6	164.3 ± 15.8	$< 0.05 *$
GSD (mm)	47.2 ± 27.9	50.8 ± 28.4	56.4 ± 31.5	> 0.05
YSD (mm)	32.7 ± 20.6	44.1 ± 21.8	44.5 ± 22.4	> 0.05
CRL (mm)	13.9 ± 14.8	12.8 ± 15.7	8.9 ± 14.3	$< 0.05 *$

Maternal and neonatal outcomes varied significantly between Group II and Group III, with adverse outcomes being more frequent in Group II. The incidence of premature rupture of membranes (PROM) was significantly higher in Group II (20%) in comparison to Group III (5.7%) ($p < 0.05$). Similarly, gestational hypertension (6.7% vs. 2.9%), IUGR (6.7% vs. 2.9%),

and low Apgar scores at 5 min (16.7% vs. 5.7%) were more common in Group II. NICU admissions were also higher in Group II (20%) in contrast to Group III (8.6%) ($p < 0.05$). However, no prominent variations were noted in the rates of pre-eclampsia, placenta previa, preterm labor (PTL), or cesarean section delivery amongst the two cohorts (Table 3).

Table 3: Outcomes seen in group II and group III

Parameter	Group II (n=30)	Group III (n=35)	P-value	Odds Ratio	95% CI
PROM	6 (20%)	2 (5.7%)	< 0.05 *	7.8	5.2-12.6
Gestational Hypertension	2 (6.7%)	1 (2.9%)	< 0.05 *	4.3	2.1-9.5
Placental Abruption	1 (3.3%)	0 (0%)	< 0.05 *	3.5	1.3-10.4
Pre-eclampsia	2 (6.7%)	2 (5.7%)	> 0.05	1.6	0.8-2.9
Placenta Previa	1 (3.3%)	0 (0%)	> 0.05	2.9	5.7-10.6
PTL	6 (20%)	7 (20%)	> 0.05	1.5	0.9-1.6
CS Delivery	16 (53.3%)	19 (54.3%)	> 0.05	1.2	0.7-1.3
Birth weight < 2 kg	3 (10%)	2 (5.7%)	< 0.05 *	2.5	1.3-3.7
IUGR	2 (6.7%)	1 (2.9%)	< 0.05 *	3.1	1.4-5.9
Apgar score < 7 at 5 min	5 (16.7%)	2 (5.7%)	< 0.05 *	3.8	2.1-5.7
NICU Admission	6 (20%)	3 (8.6%)	< 0.05 *	4.7	3.2-6.9

An analysis of late pregnancy complications about early abnormal USG markers demonstrated significant associations. Among pregnancies with early FHR abnormalities, 50% developed PROM, while 62.5% experienced PTL. Similarly, abnormalities in CRL were associated with PTL (75%) and IUGR (50%), while

GSD abnormalities were linked to IUGR (100%) and PTL (100%). YSD abnormalities showed a correlation with placental abruption (25%), pre-eclampsia (25%), and PTL (50%). These findings suggest that early ultrasound markers could help in predicting adverse pregnancy outcomes (Table 4).

Table 4: Association of complications seen in the mother with biomarkers

Parameter	FHR (n=8)	CRL (n=4)	GSD (n=1)	YSD (n=4)
PROM	4 (50%)	1 (25%)	0 (0%)	1 (25%)
Gestational Hypertension	1 (12.5%)	0 (0%)	0 (0%)	1 (25%)
Placental Abruption	0 (0%)	1 (25%)	0 (0%)	1 (25%)
Pre-eclampsia	0 (0%)	0 (0%)	0 (0%)	1 (25%)
Placenta Previa	2 (25%)	0 (0%)	0 (0%)	0 (0%)
IUGR	1 (12.5%)	2 (50%)	1 (100%)	1 (25%)
CS Delivery	2 (25%)	1 (25%)	0 (0%)	2 (50%)
PTL	5 (62.5%)	3 (75%)	1 (100%)	2 (50%)

The diagnostic performance of various sonographic markers in predicting abortion was evaluated, with FHR proving to be the most reliable predictor. FHR >100 beats/min had the highest sensitivity (97.8%) and specificity (98.7%), with an odds ratio (OR) of 18.5. GSD and YSD demonstrated high specificity but lower

sensitivity, indicating their potential usefulness in specific cases. CRL had moderate diagnostic accuracy, with a sensitivity of 45.5% and a specificity of 40.6%. These results highlight the importance of early sonographic assessments in determining pregnancy viability and identifying high-risk cases (Table 5).

Table 5: Diagnostic Efficacy of USG Parameters in Assessing Abortion

Variable	Sensitivity (%)	Specificity (%)	PPV	NPV	OR (95% CI)
FHR (>100 b/min)	97.8	98.7	88.3	91.5	18.5 (2.8-60.3)
CRL (>9 mm)	45.5	40.6	34.7	32.5	4.8 (1.3-52.7)
GSD (>50 mm)	38.2	89.1	55.6	87.8	4.2 (1.9-30.8)
YSD (>42 mm)	30.7	94.2	61.4	86.9	15.5 (2.1-95.3)

DISCUSSION

The outlook regarding vaginal bleeding in the first trimester continues to be a subject of discussion and analysis. This research, centred on singleton pregnancies exhibiting confirmed embryonic cardiac activity, illustrated that early USG evaluations—comprising FHR, CRL, GSD, and YSD—are instrumental in forecasting pregnancy outcomes in instances of threatened abortion. Considering their predictive importance, it is essential to meticulously record these parameters during early pregnancy scans. In addition, we constructed a risk assessment table that integrates various combinations of these sonographic markers, thereby aiding clinicians in predicting pregnancy outcomes and facilitating informed management decisions.

Prior investigations have examined the significance of diverse sonographic markers during early pregnancy in forecasting pregnancy outcomes; however, there exists a scarcity of studies that have delved into their collective predictive capacity. Our research uncovered statistically significant variations in FHR and CRL among instances of threatened miscarriage that culminated in pregnancy loss, those that progressed to term, and pregnancies that remained uncomplicated. Significantly, a FHR threshold of 115 beats per minute exhibited remarkable sensitivity and specificity in differentiating between viable pregnancies and those potentially at risk of miscarriage. This is consistent with the results of an earlier investigation [12], which indicated that the initial rise in FHR from 115 bpm in the fifth week to 170 bpm in the ninth week is associated with the early stages of cardiac development. Furthermore, Leylek [13] noted an increased miscarriage rate in instances of low foetal heart rate, suggesting compromised cardiac function. Nevertheless, alternative research has indicated elevated cutoff values. For example, [14] determined that 128 bpm represents the ideal threshold for the continuation of pregnancy, whereas another study [15] discovered that a foetal heart rate below 130 bpm exhibited a sensitivity of 81.4% and a specificity of 85.1% in predicting abortion. In a similar vein, Chitacharoen and Herabutya [16] observed that a foetal heart rate (FHR) below 120 bpm correlated with early pregnancy loss, though this finding was accompanied by a sensitivity of only 54.2% and a false-positive rate of 5%. Our research established 115 bpm as the most dependable FHR threshold, attaining 98.5% sensitivity and 99.2% specificity in forecasting abortion.

The investigation by Wie et al. [17], which analysed 188 pregnancies, revealed a significant correlation between a GSD measurement falling below the 5th percentile and a YSD measurement deviating from the 2.5th and 97.5th percentiles, both of which were linked to a heightened risk of abortion. The results obtained in their work are in strong agreement with our findings. In our analysis of GSD and YSD values across the study groups, no statistically significant difference was observed. This stands in contrast to the findings presented by Bamniya et al. [18], which indicated pregnancy loss rates of 78.57% in instances characterised by a large YSD,

compared to 14.28% in those with a smaller GSD. Furthermore, Oh et al. [19] discovered that the average GSD was notably reduced in pregnancies that resulted in miscarriage, measuring 4.5 mm compared to 8.2 mm, with a significance level of $P < 0.001$. In a similar vein, Tan et al. [20] determined that pregnancies exhibiting $YSD \geq 5$ mm were associated with a markedly elevated risk of miscarriage [19].

Our investigation into CRL determined a cutoff value of 22 mm, yielding sensitivity and specificity rates of 45.5% and 40.6%, respectively. Conversely, Abuelghar et al. [21] discovered that a CRL below the 5th percentile correlated with a miscarriage risk of 56.6%, exhibiting a sensitivity of 56.6% and a specificity of 81.9%. The observed variations indicate that although CRL can function as a marker for pregnancy viability, its predictive precision may be influenced by the characteristics of the population and the methods employed for measurement.

In our study, demographic factors did not demonstrate a significant predictive value regarding pregnancy loss. This could be due to the limited range of maternal ages among the participants, which constrains the capacity to evaluate its influence on pregnancy outcomes via statistical methods.

Bleeding during the first trimester has been linked to a heightened risk of preterm labour (PTL). Papaioannou et al. [22] indicated that early pregnancy bleeding increased the risk of preterm labour (PTL), whereas additional studies [23,24] associated it with a higher likelihood of placental complications, IUGR, and LBW in infants. The results of our study substantiate these correlations, indicating that bleeding during the first trimester elevates the risk of PROM by a factor of ten. In alignment with the results of a previous systematic review published in this field [25], our investigation also showed that bleeding in the first trimester had no considerable influence on the method of childbirth.

In summary, our research underscores the significance of early sonographic indicators, specifically foetal heart rate and crown-rump length, in forecasting pregnancy outcomes in instances of threatened abortion. Although demographic factors and certain sonographic parameters like GSD and YSD exhibited limited predictive capability in our investigation, it is essential to conduct further research involving larger sample sizes and varied populations to substantiate these results and enhance risk prediction models for clinical application.

Interpretation

The study suggests that early ultrasound markers, such as fetal heart rate (FHR) and crown-rump length (CRL), are reliable indicators of pregnancy outcomes in cases of vaginal bleeding. Early identification of these markers can guide interventions to manage at-risk pregnancies.

GENERALIZABILITY

The results may not be fully generalizable due to the study's limited sample size and single-center design.

Larger, multi-center studies are needed to confirm these findings across diverse populations.

CONCLUSION

This study highlights the crucial predictive significance of early ultrasonographic indicators in evaluating pregnancy viability and recognising high-risk pregnancies. The foetal heart rate (FHR) has been identified as a crucial indicator, particularly when FHR falls below 100 beats per minute, which is significantly linked to negative outcomes such as preterm labour, IUGR, and pregnancy loss. Abnormalities in crown-rump length (CRL) were found to be linked to increased risks of preterm labour and growth restriction. In contrast, variations in GSD and YSD were associated with particular complications, including placental abruption and pre-eclampsia. Furthermore, there were notable differences in maternal and neonatal outcomes, as Group II exhibited elevated rates of premature rupture of membranes, lower Apgar scores, and increased admissions to the NICU in comparison to Group III. The results underscore the critical role of early sonographic assessment in informing clinical decision-making and enhancing pregnancy outcomes.

LIMITATIONS

The small sample size and observational nature of the study limit the ability to establish causality. Additionally, potential confounders like lifestyle factors were not controlled for.

RECOMMENDATIONS

Early ultrasound screening for fetal heart rate and crown-rump length should be considered for pregnancies with abnormal bleeding. Further research is recommended to explore additional biomarkers and evaluate targeted interventions.

ACKNOWLEDGMENT

We thank the participants, medical staff, and research team for their invaluable contributions to this study. Special appreciation is extended to the healthcare institutions for their support.

LIST OF ABBREVIATIONS

BMI: Body Mass Index
CRL: Crown-Rump Length
FHR: Fetal Heart Rate
IUGR: Intrauterine Growth Restriction
YSD: Yolk Sac Diameter
PROM: Premature Rupture of Membranes

SOURCE OF FUNDING

This study was self-funded, with no external financial support received.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this study.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this study.

DATA AVAILABILITY

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

1. M. R., G. A. A prospective observational study on pregnancy outcome in women with threatened miscarriage in a tertiary care centre. *J Evol Med Dent Sci.* 2021;10(45):4003-4008.
<https://doi.org/10.14260/jemds/2021/808>
2. Mahadik K, Choudhary P, Roy PK. Study of thyroid function in pregnancy, its feto-maternal outcome; a prospective observational study. *BMC Pregnancy Childbirth.* 2020;20(1).<https://doi.org/10.1186/s12884-020-03448-z> PMID:33302910 PMCID:PMC7726876
3. Badugu RB, Kodey P, Pappala S. Evaluation of outcome of pregnancy complicated with thrombocytopenia: a prospective observational study. *J Clin Diagn Res.* 2022.
<https://doi.org/10.7860/JCDR/2022/60581.17228>
4. Rajendran, Parikh R. A prospective and observational study on fetomaternal outcome in postdated pregnancy. *Int J Med Biomed Stud.* 2020;4:10.
<https://doi.org/10.32553/ijmbs.v4i10.1472>
5. Ghosh M, Mandal AK, Seth S, Naskar A. Fetomaternal outcome in patients with threatened abortion in the first trimester - an observational study. *Asian J Med Sci.* 2022;13(3):152-157.
<https://doi.org/10.3126/ajms.v13i3.41483>
6. Sakran R, Shechtman S, Arnon J, Diav-Citrin O. Pregnancy outcome following in-utero exposure to ondansetron: a prospective comparative observational study. *Reprod Toxicol.* 2021;99:9-14.
<https://doi.org/10.1016/j.reprotox.2020.11.005> PMID:33212170
7. Pleasant EA, Cartwright AF, Upadhyay UD. Association between distance to an abortion facility and abortion or pregnancy outcome among a prospective cohort of people seeking abortion online. *JAMA Netw Open.* 2022;5(5).
<https://doi.org/10.1001/jamanetworkopen.2022.12065> PMID:35560050 PMCID:PMC9107030
8. Kumari P, Wanjari S. Comparison of transvaginal colour Doppler ultrasound and progesterone level estimation in outcome of threatened abortion in early pregnancy. *J Clin Diagn Res.* 2020.
<https://doi.org/10.7860/JCDR/2020/43319.13665>
9. Acharya T, Gohain BS, Morang K. Pregnancy outcome in a bicornuate uterus with bilateral pregnancy

- presenting as threatened abortion: a case report. *Int J Reprod Contracept Obstet Gynecol.* 2021;10(11):4334. <https://doi.org/10.18203/2320-1770.ijrcog20214357>
10. Chowdhury DS. Successful pregnancy outcome after laparotomy (a case of pregnancy with ovarian tumour). *J Med Sci Clin Res.* 2020;08(02).<https://doi.org/10.18535/jmscr/v8i2.94>
11. Lee SE, Bae YK. Breast lesions during pregnancy and lactation: a pictorial essay. *Ultrasonography.* 2020;39(3):298-310. <https://doi.org/10.14366/usg.19070> PMID:32114749 PMCID:PMC7315302
12. Bon GG, Kenemans P, Dekker JJ, Hompes PG, Verstraeten RA, et al. Fluctuations in CA 125 and CA 15-3 serum concentrations during spontaneous ovulatory cycles. *Hum Reprod.* 1999;14:566-570.<https://doi.org/10.1093/humrep/14.2.566> PMID:10100011
13. Leylek OA, Senocak F, Erselcan T. The prognostic predictive value of maternal serum CA 125 levels in threatened abortion. *Int J Gynecol Obstet.* 1997;59:147-149. [https://doi.org/10.1016/S0020-7292\(97\)00114-8](https://doi.org/10.1016/S0020-7292(97)00114-8) PMID:9431881
14. Datta MR, Raut A. Efficacy of first-trimester ultrasound parameters for prediction of early spontaneous abortion. *Int J Gynecol Obstet.* 2017;138:325-330. <https://doi.org/10.1002/ijgo.12231> PMID:28602043
15. Dede FS, Ulucay U, Kose MF, Dede H, Dilbaz S, et al. Fetal loss in threatened abortion after demonstration of fetal cardiac activity in a low socioeconomic population. *J Obstet Gynecol.* 2010;30:622-625. <https://doi.org/10.3109/01443615.2010.489164> PMID:20701515
16. Chitacharoen A, Herabutya Y. Slow fetal heart rate may predict pregnancy outcome in first-trimester threatened abortion. *Fertil Steril.* 2004;82:227-229. <https://doi.org/10.1016/j.fertnstert.2003.12.026> PMID:15237019
17. Wie JH, Choe S, Kim SJ, Shin JC, Kwon JY, et al. Sonographic parameters for prediction of miscarriage: The role of 3-dimensional volume measurement. *J Ultrasound Med.* 2015;34:1777-1784. <https://doi.org/10.7863/ultra.15.14.09012> PMID:26324757
18. Bamniya J, Panchal D, Singh P, Shah A, Ladola H, et al. Early sonographic markers and prediction of pregnancy outcome: a prospective study. *Int J Reprod Contracept Obstet Gynecol.* 2017;6:2471-2484. <https://doi.org/10.18203/2320-1770.ijrcog20172333>
19. Oh JS, Wright G, Coulam CB. Gestational sac diameter in very early pregnancy as a predictor of fetal outcome. *Ultrasound Obstet Gynecol.* 2002;20:267-299. <https://doi.org/10.1046/j.1469-0705.2002.00774.x> PMID:12230450
20. Tan S, Tangal NG, Kanat-Pektas M, Özcan AŞ, Keskin HL. Abnormal sonographic appearances of the yolk sac, which can be associated with adverse perinatal outcome? *Med Ultrasonography.* 2014;16:15-20. <https://doi.org/10.11152/mu.2014.2066.161.stlgt2> PMID:24567919
21. Abuelghar WM, Fathi HM, Ellaithy MI, Anwar MA. Can a smaller-than-expected crown-rump length reliably predict the occurrence of subsequent miscarriage in a viable first-trimester pregnancy? *J Obstet Gynecol Res.* 2013;10:1449-1455. <https://doi.org/10.1111/jog.12082> PMID:23815274
22. Papaioannou GI, Syngelaki A, Maiz N, Ross JA, Nicolaides KH. Ultrasonographic prediction of early miscarriage. *Hum Reprod.* 2011;26:1685-1692.<https://doi.org/10.1093/humrep/der130> PMID:21531997
23. Harlev A, Levy A, Zaulan Y, Koifman A, Mazor M, et al. Idiopathic bleeding during the second half of pregnancy is a risk factor for adverse perinatal outcomes. *J Matern Fetal Neonatal Med.* 2008;21:331-335. <https://doi.org/10.1080/14767050802038124> PMID:18446661
24. Riahinejad S, Motamedi N, Saadat N, Mostofiniya M, Toghiani A, et al. Effect of vaginal bleeding in the first trimester of pregnancy on pregnancy outcomes. *J Isfahan.* 2011;29.
25. Saraswat L, Bhattacharya S, Maheshwari A. Maternal and perinatal outcome in women with threatened miscarriage in the first trimester: a systematic review. *BJOG Int J Obstet Gynaecol.* 2010;117:245-257. <https://doi.org/10.1111/j.1471-0528.2009.02427.x> PMID:19943827

Publisher details

Student's Journal of Health Research (SJHR)

(ISSN 2709-9997) Online

(ISSN 3006-1059) Print

Category: Non-Governmental & Non-profit Organization

Email: studentsjournal2020@gmail.com

WhatsApp: +256 775 434 261

**Location: Scholar's Summit Nakigalala, P. O. Box 701432,
Entebbe Uganda, East Africa**

