Original Research Article

ROLE OF ULTRASOUND IN FIRST TRIMESTER VAGINAL BLEEDING

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A B S T R A C T

Background: Vaginal bleeding during the first trimester of pregnancy is a common occurrence, affecting 20-25% of pregnant women and potentially indicating serious complications such as abortion, ectopic pregnancy, and molar pregnancy. This study aimed to evaluate the role of transvaginal ultrasonography (TVS) in diagnosing the causes of vaginal bleeding in early pregnancy.

Material and Methods: A cross-sectional study was conducted at Index Medical College Hospital and Research Centre, Indore, involving 60 pregnant patients referred for TVS due to bleeding in the first trimester from September 2023 to February 2024. Inclusion criteria comprised patients presenting with vaginal bleeding during the first trimester who consented to participate. Clinical data were collected, followed by TVS using a 7-12 MHz transducer. Statistical analysis was performed using IBM SPSS version 22.0.

Results: Among 2307 obstetric admissions, 60 cases (2.6%) with first-trimester bleeding were analyzed. The majority of patients were aged 21-25 years (48.4%) and primarily multigravida (66.7%). The most frequent clinical diagnosis was threatened abortion (48.3%), followed by incomplete abortion (26.7%) and missed abortion (10%). Ultrasound findings indicated incomplete abortion in 30% of cases and a viable pregnancy in 13%. There was a significant disparity between clinical and ultrasound diagnoses, with ultrasound showing 100% sensitivity across all cases. Management included conservative treatment in 21.7% of patients, while 53.3% underwent manual vacuum aspiration.

Conclusions: TVS proved to be a reliable and non-invasive tool for diagnosing causes of first-trimester vaginal bleeding, with high sensitivity and accuracy. This study emphasizes the critical role of ultrasound in guiding management decisions and optimizing patient care in early pregnancy complications

Keywords: First trimester bleeding, Ultrasound, Abortions.

INTRODUCTION

Vaginal bleeding is one of the most frequent and potentially serious causes that necessitate emergency consultation during pregnancy. The first trimester is a dynamic period that encompasses ovulation, fertilization, implantation, and organogenesis. Nearly 20-25% of pregnant women experience some degree of bleeding during the early months of gestation.[1]

The major causes of bleeding during pregnancy in the first trimester include abortion, ectopic pregnancy, and molar pregnancy, as well as certain conditions unrelated to pregnancy such as cervical erosion, cervical polyp, and cervical carcinoma.[2]

By relying solely on history or clinical examination, a definitive diagnosis is often impossible; however, ultrasonography has introduced new possibilities in managing early pregnancy complications, enabling timely and specific treatment.[3]

Ultrasonography aids in the early diagnosis, appropriate management, and post-evacuation follow-up of molar pregnancies. Coupled with serum βHCG monitoring, this approach makes follow-up of such cases feasible. In life-threatening emergencies like ectopic pregnancies, ultrasound is instrumental in confirming the diagnosis and determining the best course of action. When possible, conservative management can help preserve fertility.[3]

Ultrasound (both abdominal and TVS) plays a crucial role in managing patients with bleeding in the first trimester by confirming the pregnancy and determining whether it is intrauterine or extrauterine. Real-time sonography is a non-invasive and readily accessible approach that is highly beneficial for a specific diagnosis to be achieved. It also helps assess gestational age and facilitates the early detection of anembryonic pregnancies, which are often associated with chromosomal anomalies. Furthermore, ultrasound can evaluate the type of abortion—whether threatened, incomplete, complete, or missed—and identify any associated pelvic abnormalities. Additionally, it is essential for assessing fetal viability and confirming or ruling out suspected hydatidiform mole.[3]

In conclusion, clinical examination and non-invasive modalities like ultrasonography are essential for correlating findings, arriving at a diagnosis, and providing optimal management for patients. In light of this, a prospective study involving 60 patients was conducted to evaluate the role of ultrasound in first trimester bleeding. The study aimed to identify the causes of vaginal bleeding during this period using transvaginal ultrasonography, while also assessing outcomes and establishing appropriate obstetric management. Ultimately, the purpose of this research is to emphasize the importance of ultrasound in diagnosing the causes of first trimester vaginal bleeding, evaluating prognosis, and facilitating effective obstetric care.

MATERIALS AND METHODS

After approval from institutional ethical committee, this cross-sectional study was conducted in the Department of Radiodiagnosis at Index Medical College Hospital and Research Centre, Indore and included 60 pregnant patients referred from Department of Obstetrics and Gynecology with history of bleeding per vagina in first trimester of pregnancy during the 6 months period of study duration (1st September 2023-28th February 2024) for transvaginal ultrasound. Patients satisfying the inclusion criteria were enrolled after taking a written informed consent.

Inclusion Criteria
- All patients who present with bleeding per vagina and admitted for the same in first trimester of pregnancy
- Patients consenting to participate in the study.

Exclusion Criteria
- Non-consenting patients

Methodology
Clinical details such as age, parity, obstetric history, personal history, medical history, past history, menstrual history, and specifics of the current pregnancy were recorded. This involved noting the period of amenorrhea at the time of the initial bleeding episode, along with the amount (light or heavy) and duration of the bleeding. Additionally, it was important to determine whether the bleeding was accompanied by abdominal pain or was painless, whether it occurred intermittently or continuously, and any history of expulsion of tissue or clots. A general physical examination and pelvic examination were conducted to establish a provisional clinical diagnosis.

- Per speculum examination: The status of the cervical os was assessed, determining if it was open or closed.
- Per vaginal examination: The size and position of the uterus were evaluated.

Laboratory tests, including beta human chorionic gonadotropin (β-hCG) testing, along with imaging techniques such as transvaginal ultrasonography, were employed to confirm the diagnosis. Data were gathered using a preformatted proforma, and clinical findings were correlated with ultrasound results. Transvaginal sonography was conducted using a 7-12 MHz transducer, and analyses were carried out using suitable statistical methods.

Statistical Analysis
The raw data was recorded on a Microsoft Excel spreadsheet and analyzed using IBM Statistical Package for Social Sciences (SPSS), version 22.0. The mean and standard deviation were used to compare continuous parametric data while meaning and interquartile range was used for continuous non-parametric data and percentages for categorical data. The comparison of categorical data was conducted using Chi-square test, while that of continuous data was done using an independent t-test. This goodness-of-fit test compares the observed and expected frequencies in each category to test either that all categories contain the same proportion of values or that each category contains a user-specified proportion of values. A 'p' <0.05 was considered statistically significant.

RESULTS

During the study period, a total of 2307 obstetric admissions were recorded. Among these, 60 cases (2.6%) presented with bleeding per vagina during the first trimester.

Majority of the patients were in age group of 21-25 years constitutes 29 (48.4%). 18 cases (30%) in 18-20 years, 8 (13.3%) in 26-30 years, 5 (8.3%) in >30 years. The mean age was 23.5 + 3.74 years. In this study of 60 patients, 33.3% (20 patients) were primigravida, while 66.7% (40 patients) were

multigravida. Majority of patients i.e., 25 (41.6%) had gestational age between 6.1 to 8 weeks, followed by 8.1 to 10 weeks and 10.1 to 12 weeks with 22(36.4%) and 13 (22%) patients respectively. The cervical os was closed in 41 (68.3%) and open in 19 (31.7%). Regarding the fornices, 54 (90%) patients were free, while 6 (10%) showed tenderness.
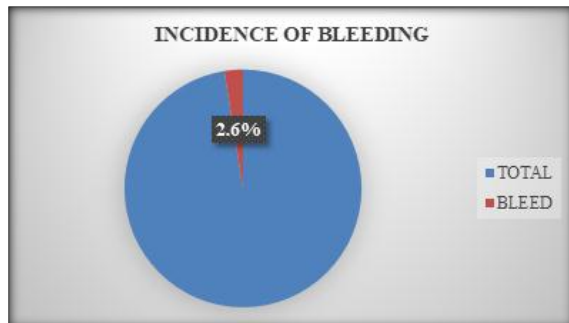
Graph 1: Incidence of bleeding

In this study of 60 patients, the most common clinical diagnosis was threatened abortion, which accounted for 29 cases (48.3%). This was followed by incomplete abortion in 16 patients (26.7%), missed abortion in 6 patients (10%), and complete abortion in 4 patients (6.7%). Additionally, 2 patients (3.3%) each were diagnosed with ectopic pregnancy and inevitable abortion, and lastly 1 patient (1.7%) with molar pregnancy.
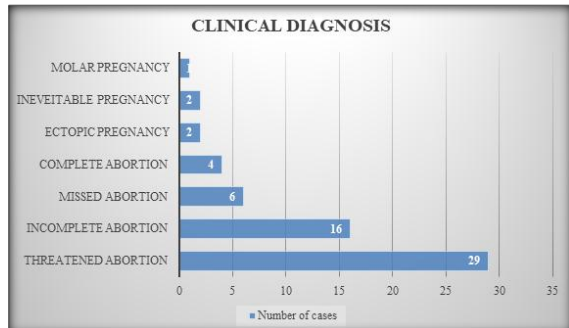
Graph 2: Distribution of patients as per clinical diagnosis

Ultrasonographic evaluations revealed that 8 (13%) patients showed signs of a viable pregnancy. Disorganized gestational sacs or echogenic debris, indicating incomplete abortion, were found in 30% (18 patients). Fetal echoes without cardiac activity, suggesting missed abortion, were seen in 21.7% (13 patients). Sonographic findings showed an empty gestational sac with no fetal pole in 4 (6.7%) indicating anembryonic gestation which is totally a sonographic diagnosis. Additionally, 5 (8.3%) patients displayed an adnexal mass, suggestive of ectopic pregnancy, and another 6 (10%) patients had an empty uterus, consistent with complete abortion. Molar pregnancy, characterized by vesicles in the uterine cavity, was diagnosed in 10% (6 patients).

Based on ultrasound diagnosis, majority patients were diagnosed with incomplete abortion i.e., 17 (28.3%) patients, followed by 14 (23.3%) patients with missed abortion, 9 (15%) patients) with threatened abortion, 6 (10%) patients with molar pregnancy, 5 (8.3%) patients each with complete abortion and ectopic pregnancy and 4 (6.7%) patients with anembryonic gestation.

The above table shows that major cause for bleeding per vagina in first trimester is abortion. In the present study, 81.7% had abortion as the major cause. The second cause is molar pregnancy constituting 10% followed by ectopic pregnancy which constitutes 8.3%.

Out of 29 cases which were clinically diagnosed as threatened abortion only 9 cases were sonographically confirmed as threatened abortion. There was disparity in 20 cases of threatened abortion which without the aid of ultrasonography, would not have received appropriate treatment. The disparity in case of incomplete abortion was 1 and in missed abortion was 8. 4 patients with anembryonic gestation were solely diagnosed by ultrasonography. The disparity in cases of ectopic was 3, in cases of complete abortion it was 1 and in case of molar pregnancy disparity was 5. The total disparity between clinical diagnoses and ultrasound diagnosis was 42 cases which accounts for 70%.

In present study, there is significant disparity between clinical diagnosis, ultrasound diagnosis and final diagnosis. Ultrasound diagnosis has got greater reliability. There is 100% sensitivity of ultrasound diagnosis in all cases.

Out of 60 cases, 13 patients (21.7%) were managed conservatively, while 32 patients (53.3%) underwent manual vacuum aspiration. Additionally, 6 patients (10%) required suction and evacuation, 6 patients (10%) with ectopic pregnancy underwent laparotomy, and 3 patients (5%) underwent instrumental evacuation.

We divided our study group into three main categories for statistical correlation: viable intrauterine pregnancies, nonviable intrauterine pregnancies, and ectopic pregnancies/gestations. These groups were formed based on the subsequent line of management for each case. All cases of viable intrauterine pregnancies were followed up without intervention, while other cases were managed appropriately according to the ultrasound findings.

A total 8 out of 29 cases of suspected viable intrauterine gestation on clinical examination were confirmed whereas it has got high false positive cases (n=21). This shows a sensitivity of 75.42%, specificity 62.56%, PPV of 22.19%, and accuracy of 65% with p value of 0.011. Of the 2 ectopic pregnancies diagnosed clinically, all were confirmed with specificity of 100% and PPV of 100% and accuracy of 92% with a p value 0.009. In diagnosing non-viable pregnancies, clinical diagnosis has got very poor statistical correlation with sensitivity of

76.48%, specificity of 81.33%, NPV of 85.63% and accuracy of 81% with p value of 0.010.

In the present study, 9 cases of viable intrauterine pregnancies were correctly diagnosed on ultrasound with zero false positive and zero false negativity with sensitivity, specificity, PPV, NPV and accuracy of 100% each. 98.9% of ectopic pregnancies were correctly diagnosed with a sensitivity and NPV of 100% whereas 1 case diagnosed as ruptured ectopic on sonography was unruptured with a specificity of 99.9% and PPV of 90% with an accuracy of 99%. Of the nonviable pregnancies diagnose on ultrasound all were confirmed with a sensitivity, NPV specificity, PPV and accuracy of 100%. Ultrasound diagnosis proved to be very accurate on statistical evaluation with a very significant p value of 0.000.
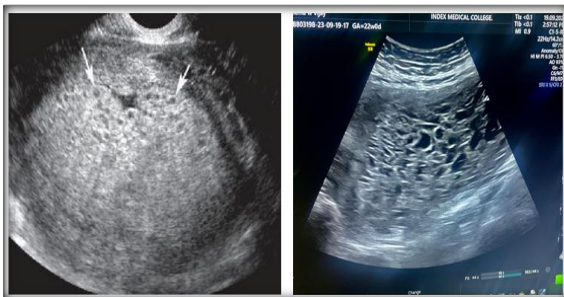

Figure 1: illustrates a case of a 25-year-old primigravida with 12 weeks of amenorrhea, presenting with light vaginal bleeding, white vesicle-like discharge, severe vomiting, a closed internal os on examination, an elevated beta-hCG level of 1,100,000 U/L, and transvaginal ultrasound findings of an enlarged uterus exhibiting a honeycombing appearance with multiple cystic lesions of mixed echogenicity, but no visible fetus suggestive of molar pregnancy (complete mole)
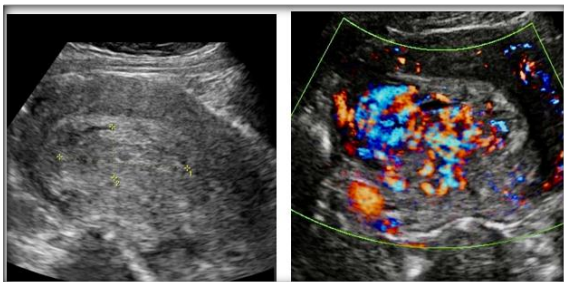

Figure 2: Depicts a case of a 25-year-old primigravida with 10 weeks of amenorrhea, presenting with a history of heavy vaginal bleeding; examination revealed an open internal os, a beta-hCG level of 33,415 U/L, and transvaginal ultrasound showing a heterogeneously hyperechoic lesion in the endometrial cavity with significant color flow on Doppler imaging, suggestive of retained products of conception
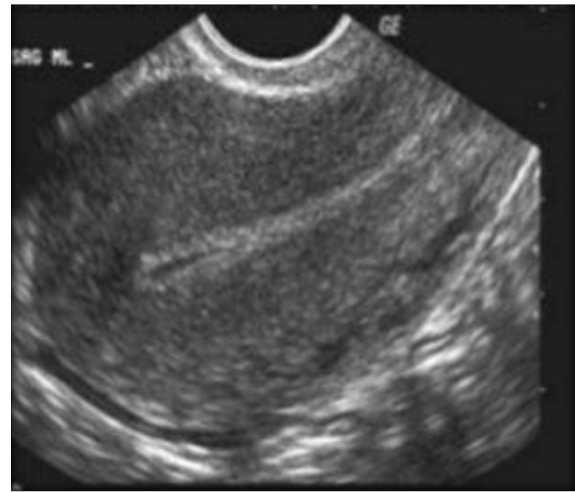

Figure 3: Case 3: A 30-yr multigravida, 12 weeks of amenorrhea, h/o heavy vaginal bleeding since 2 days. Internal os closed, on per speculum examination. B-hcg 32879 U/L. TVS showed thin linear endometrium with minimal endometrial collection. No product of conception visualized
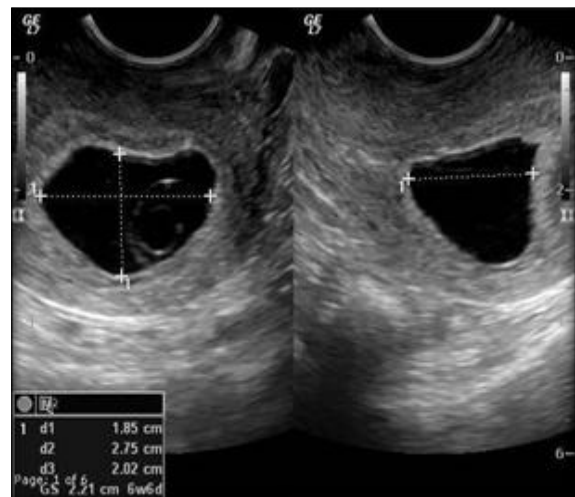
Figure 4: Case 4: A 30 yr primigravida, 7 weeks of amenorrhea, h/o light vaginal bleeding. Internal os closed, on per speculum examination. B-hcg 35978 U/L. TVS showed a G sac with yolk sac but no foetal pole. GSD measured approx 22mm correponding to 6w 6d

Table 1: Distribution of cases according to age

Age in years	Number	Percentage (%)	P value
18-20 years	18	30	
21-25	29	48.4	
26-30	8	13.3	p=0.001
>30 years	5	8.3	
Total	60	100	

Table 2: Distribution of cases according to parity

Parity distribution	Number	Percentage (%)	P value
Primigravida	20	33.3	p=0.001
Multigravida	40	66.7	
Total	60	100	

Table 3: Distribution of cases according to gestation in weeks

Period of gestation in weeks	Number	Percentage (%)
6.1-8	25	41.6
8.1-10	22	36.4
10.1-12	13	22
Total	60	100

Table 4: Distribution of cases according to Ultrasonographic features

Ultrasound features	Number of cases	Percentage %
Viable		
Embryonic heart activity	8	13.3
Non-viable		
Disorganized gestational sacs or echogenic debris	18	30
Fetal echoes without cardiac activity	13	21.7
Empty Uterus	6	10
Vesicles in the uterine cavity	6	10
Empty uterus with adnexal masses	5	8.3
Empty gestational sac with no fetal pole	4	6.7
Total	60	100

Table 5: The causes of bleeding per vagina in first trimester of pregnancy

Causes	Number of cases	Percentage %	P value
Abortion	49	81.7%	
Hydatiform mole	6	10%	0.001
Ectopic pregnancy	5	8.3%	
Total	60	100	

DISCUSSION

Bleeding per vaginum in the first trimester is a common emergency that necessitates an ultrasound examination. The causes of such bleeding vary widely, ranging from viable to non-viable pregnancies. Accurate diagnosis of pregnancy status—whether viable or non-viable—can inform the appropriate treatment. Key sonographic landmarks in the first trimester include the identification of the gestational sac, fetal pole, fetal cardiac activity, fetal movements, yolk sac, and amnion. These landmarks, particularly the gestational sac and fetal biometry, play a crucial role in diagnosing abnormalities and predicting pregnancy outcomes. Ultrasonography has significantly advanced the management of early pregnancy bleeding, enabling timely medical or surgical interventions as needed.[3]

Clinical history and pelvic examination alone are often insufficient for assessing the cause and prognosis of bleeding in early pregnancy. Therefore, ultrasound plays a crucial role in these cases, providing valuable insights that aid in appropriate management strategies emerging as an invaluable tool for obstetricians in establishing a definitive diagnosis, allowing for immediate implementation of appropriate medical or surgical care. This capability ensures timely intervention, which is crucial for improving maternal and fetal outcomes.

The prevalence of bleeding in the 1st trimester was reported as 2.6%. This was in concurrence with an Indian study done by Sandyashree PK et al. who also reported an incidence of 2.37%.[3] Similarly, Funderbert et al. also found a significantly lower percentage of 2%.[4] In contrast, Scott's study reported a higher range of 20-25%, indicating a relatively high prevalence.[5] Pandey et al. in their study showed a moderate prevalence of 15%.[6] Overall, the data highlights considerable variability in results across different studies, which may reflect changes over time, differences in populations, or methodological variations.

In the present study, various types of abortions were identified as a significant contributor to first trimester bleeding, accounting for 81.7% of cases. This finding aligns with previous studies by: Sandyashree PK et al,[3] Jagadeswari et al,[7] Reddirani P et al,[8] Bhargava et al,[9] and Mamatha S et al,[10] which also reported abortion as the leading cause of early pregnancy bleeding, with incidences of 81%, 82% 61%, 81.6%, and 83%, respectively. These results underscore the prevalence of abortion in cases of first trimester bleeding across multiple studies.

In the present study, the incidence of ectopic pregnancy was found to be 8.3%, while molar pregnancy accounted for 10%. This aligns with findings from previous studies: Sandyashree PK et al,[3] reported incidences of 9% for ectopic pregnancy and 10% for molar pregnancy, Reddirani P et al,[8] found 21% and 18%, Bhargava et al,[9] reported 13% and 4.35%, and Mamatha S et al,[10] noted 13% and 4% for ectopic and molar

pregnancies, respectively. These results illustrate the variability in the incidence of these conditions across different studies.

In our study the incidence of viable pregnancies on ultrasound is 13.3% and 78.4% of nonviable pregnancies. In similar studies done by Sandyashree PK et al,[3] Hertz et al,[11] Nyberg et al,[12] and Stabile et al,[13] the reported incidence was 13%, 58%, 44% and 64% of viable pregnancies and 78%, 42%, 52% and 36% of non-viable pregnancies respectively.

In our study, 60 clinically diagnosed cases were confirmed on ultrasound with disparity of 70%. This was comparable with studies done by Sandyashree PK et al,[3] and Gorade et al,[14] with 72% and 68% disparity. Khanna et al,[15] and Reddirani P et al,[8] reported disparity of 50% and 42% between clinical and ultrasound diagnosis respectively.

In our study all cases of threatened abortion, missed abortion, incomplete abortion, complete abortion, anembryonic gestation and molar pregnancy were diagnosed accurately on ultrasound with accuracy of 100%. The results of present study are comparable with anecdotal studies done by Sandyashree PK et al,[3] Sofat et al,[16] and Bharadwaj et al,[17] in diagnosing missed abortion, incomplete abortion, anembryonic gestation and Hydatiform mole with 100% accuracy.

In the first trimester, ultrasound has proven to be an extremely effective method for diagnosing the exact cause of vaginal bleeding, achieving 100% specificity in identifying threatened abortion, incomplete abortion, missed abortion, hydatidiform mole, anembryonic conception, and inevitable abortion. The accuracy of ultrasound for diagnosing complete abortion and ectopic pregnancy was found to be 99%. This research highlights the effectiveness of ultrasound in diagnosing first trimester bleeding, which allows for informed planning of management strategies.

However, this study has several limitations. First, the sample size may be relatively small, which could impact the generalizability of the findings. Second, as an observational study, it may introduce bias in data collection and interpretation. Additionally, reliance on ultrasound and clinical history for diagnosis may result in misclassification of some cases. Lastly, variations in regional healthcare practices and access to medical facilities could affect the reported incidence rates, limiting the applicability of the results to wider populations.

CONCLUSION

In conclusion, ultrasonography (USG) is an invaluable diagnostic tool for evaluating first-trimester bleeding in pregnant patients. This study highlights its critical role in accurately diagnosing various causes of vaginal bleeding, including threatened abortion, missed abortion, anembryonic gestation, incomplete abortion, ectopic pregnancy, and molar pregnancy. The reliability of ultrasound in identifying complete abortions has significant clinical implications, as it helps prevent unnecessary surgical interventions, thereby reducing patient morbidity.

The findings of this study emphasize that ultrasound provides superior diagnostic accuracy compared to clinical evaluation alone, enhancing the management and care of patients experiencing early pregnancy complications. By confirming and clarifying clinical diagnoses, USG facilitates timely and appropriate obstetric care, ultimately improving patient outcomes. Therefore, incorporating ultrasound into routine assessment practices for first-trimester bleeding is essential for optimizing the management of early pregnancy complications and ensuring the best possible care for patients.

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