Original Research Article

Role of ultrasound in the first trimester bleeding

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Abstract

Aim: The study aims to evaluate the role of Ultrasound in assessing patients with the first trimester bleeding and prognosticate and predict the status of abnormal pregnancies. **Methods**: Fifty cases of first-trimester Vaginal bleeding were evaluated by Ultrasonography. Clinical diagnosis and ultrasound diagnosis were correlated. **Results**: Among these 50 cases, 26 cases were diagnosed as threatened Abortion clinically, out of which Ultrasonography confirmed only 12 cases. Ultrasound examination confirmed 12 cases of clinically suspected threatened abortions and aids in correctly diagnosing 8 cases that were missed on clinical examination. 12 cases out of 18 threatened abortions continue to term gestation with a successful outcome of 66%. All cases of threatened abortion (n=18), incomplete abortion (n=10), missed abortion (n=4), ectopic (n=4), inevitable abortion (n=4), blighted ovum (n=2), and HM (n=2), were correctly diagnosed on USG. Forty-eight out of 50 cases were correctly diagnosed on Ultrasound compared to 18 out of 50 cases based on clinical diagnosis with a disparity of 64%. Four out of five proved ectopic pregnancies were correctly diagnosed both on Ultrasound and clinical examination. **Conclusion**: Ultrasound examination is a non-invasive tool in the differentiation of causes of first trimester vaginal bleeding; it helps correct diagnosis of clinically misdiagnosed cases apart from confirming the diagnosis in others. When Ultrasonography reveals the nature of the pregnancy (viable/nonviable), unnecessary complications and misdiagnosis at first trimester bleeding can be avoided. Unnecessary hormonal treatment and prolonged hospitalization can be avoided.

Keywords: The first trimester bleeding, Ultrasound examination, clinical examination, accuracy.

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Introduction

Vaginal bleeding during the first trimester of pregnancy is common and causes anxiety both to the patient and obstetrician. The incidence of first trimester bleeding per vaginum is estimated to be 7% to 24% in early pregnancies[1]. 50% of the first trimester bleeding leads to miscarriage; these are spontaneous abortions, ectopic pregnancies, and gestational trophoblastic diseases[2].

By simple clinical definitive diagnosis is usually impossible. Pelvic examination and Clinical history are often inadequate in assessing the cause and the prognosis of bleeding. The causes of bleeding are a spectrum of conditions ranging from viable pregnancy to nonviable pregnancy. Ultrasound (both trans-abdominal and transvaginal sonography) plays an important role in identifying the risk factors of the first trimester bleeding and predicting the status of abnormal pregnancy. Real-time sonography is a non-invasive modality that is extremely useful to arrive at an accurate diagnosis. Sonography has been used to diagnose various anomalies in the first trimester, including skeletal dysplasia, holoprosencephaly, sacrococcygeal teratoma, and conjoined twins. Abnormalities in amniotic fluid volume can be calculated, especially for pregnancies at increased risk of loss[3-7].

By endovaginal Ultrasonography, it is possible to detect the intrauterine gestational sac at five weeks.

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Diagnosis of a normal intrauterine pregnancy helps the physician manage and gives psychological relief to the patient.

But unavailability of modern ultrasound devices and trained practitioners may limit the use of this test. Hence, the current study was undertaken to assess the cause of bleeding in the first trimester of pregnancy at our tertiary care center to identify the leading causes whose knowledge can improve their management even in the absence of Ultrasound.

In the present study of 50 patients, we have evaluated the role of Ultrasound in the accurate diagnosis of causes of bleeding in the first trimester and the role of Ultrasound in the management of first trimester bleeding.

Materials and methods

Ethical approval for this protocol was obtained from the ethical Committee of MNR Medical College & Hospital, Sangareddy, Telangana State. One hundred patients were admitted to our hospital with a history of bleeding in the first trimester of pregnancy in whom an ultrasound scan was done studied in November 2012 and July 2014.

Inclusion criteria

Patients with clinically suspected first trimester bleeding (< 12 completed weeks).

Exclusion criteria

All non-obstetrical causes of vaginal bleeding and patients with more than 12 completed weeks of gestation.

All patients were evaluated using transabdominal sonography, and transvaginal Ultrasound was preferred whenever transabdominal study was inconclusive or equivocal.

At admission, a detailed obstetric history and clinical examination were done to arrive at a provisional diagnosis. Transabdominal Ultrasonography was done in all cases with linear/sector 3.5 MHZ frequency transducer and transvaginal sonography using 5 MHZ probes (ESOATE BIOMEDICA EU5 API, GE LOGIQ α-200, ALOKA SSD-4 FLEXUS)was done in cases. Images were recorded

using DICOM software (ESOATE) and Digital Camera. Transvaginal sonography was also done in early gestation and in all cases suspected of having an ectopic pregnancy. Follow-up scans were done in cases of threatened Abortion till delivery and maternal/fetal outcome were evaluated. All threatened cases were followed up till full-term and delivery.

Statistical analysis

Variables studied were age, profession, gravidity, parity, heaviness of bleeding, ultrasound results, and concordance rate between clinical diagnosis and ultrasound diagnosis. The descriptive statistical test was applied for mean, standard deviation, frequency, and percentage. Chi-square analysis compares the observed frequencies for each category. Cross tabulations are used to explore the relationship between variables. Statistical analyses were performed by SPSS software version 22.0 (IBM, Armonk, NY, USA).

Results

Demographics

The current study group age ranged from 18 to 35 years. A majority of patients were from the age group of 21-26 years, totaling 21(42%), followed by 14 patients (28%) were between 26-30 years, 13 patients(26%) were < 20 years, and the least common age group was between 31-35years constituting only 4%. 70% of the patients were multipara compared to 30% of primipara. The majority of cases were of non-consanguineous marriage (80%). Consanguineous marriage constituted only 20% of cases. Our study consisted of patients presenting with amenorrhea in the range of 6 weeks to 12 completed weeks of pregnancy. The majority of patients presented between 8-10 weeks of pregnancy, constituting 52%, and the least common presentation was less than eight weeks.

Duration of bleeding and pain abdomen

The duration of bleeding ranges from 1 day to 8 days, with the majority presenting with 3 to 4 days (32%) of bleeding. The least common was between 7 to 8 days, constituting 4 %. Fourteen patients (28%) presented with 1-2 days of bleeding, 8 (16%) patients presented with 5-6 days of bleeding. Twenty patients (40%) were presented with pain abdomen before, during, or after bleeding. Out of 5 ectopic pregnancies, all were associated with pain abdomen. Out of 4 cases of inevitable pregnancies, 3 cases (75%) were associated with pain abdomen. Out of 10 cases of incomplete Abortion, 4(40%) patients were presented with pain abdomen. Only 4(22%) of 18 cases of threatened Abortion were presented with pain abdomen. Only one case (25%) of 4 missed Abortions presented with pain abdomen. Two cases were complete Abortions noted. One case of blighted anembryonic gestation was presented with pain abdomen.

Findings of ultrasound examination

On ultrasound examination, 28 cases (56%) out of 50 showed Gestational sac out of which 18 cases were of threatened Abortion. Out of 21 cases in which the Fetal node was visualized, 18 cases showed fetal cardiac activity. 2 cases with absent fetal cardiac activity were diagnosed as inevitable Abortion and one case as missed Abortion. Of the 3 cases which demonstrated less liquor, 2 cases were inevitable Abortion, and one case was threatened Abortion. The yolk sac was detected in 12 cases. All were diagnosed as threatened by Abortion. The placenta was visualized in 6 cases, and all were of more than 11 weeks gestation.

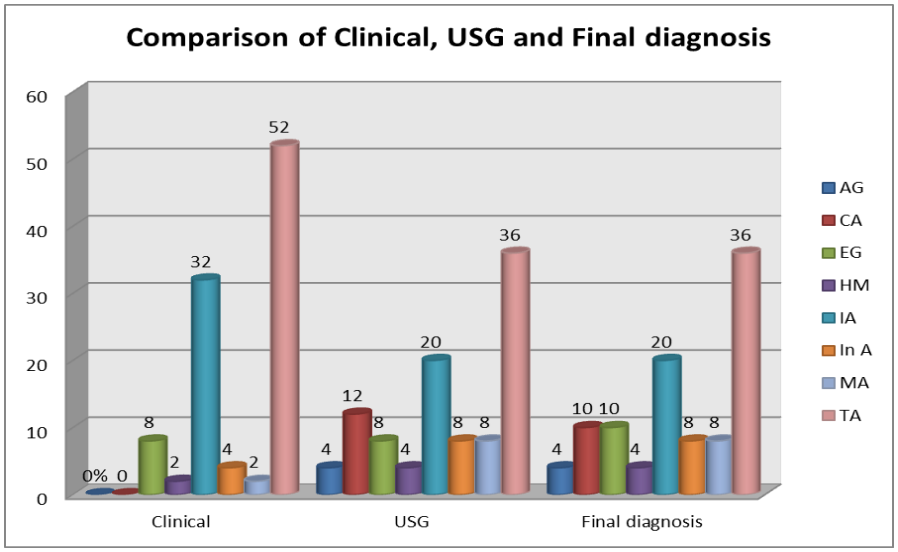

Fig 1:Bar graph showing a comparison of Clinical, USG, and Final diagnosis.

There is a significant disparity between the clinical diagnosis and final diagnosis, whereas ultrasound diagnosis has more excellent reliability. There is 100% sensitivity of ultrasound diagnosis in all cases except ectopic gestation, in which it has 80% sensitivity.

Table 1. Follow up of cases diagnosed clinically

Cases	No. of cases clinically diagnosed	Follow up and results
Threatened Abortion	26	Out of 26 cases
		12 cases- normal pregnancy 5 cases-IA 4 cases-CA 2 cases-in A 1 case- MA 1 case-HM 1 case-AG
Ectopic Gestation	4	Out of 4 cases, all 4 cases were correctly diagnosed
Incomplete	16	Out of 16 cases

Abortion		5 cases –IA 3cases – TA 3cases-CA 2cases-MA 1case-In A 1case- EG 1 case- AG
Inevitable Abortion	2	1case- In A 1 case- IA
Missed Abortion	1	1case-MA
Hydatidiform mole	1	1 case-HM

Clinically diagnosed cases showed out of 26 cases of suspected, threatened Abortion, only 18 cases were confirmed on sonography, out of which 12 cases continued to term gestation. Five cases of incomplete Abortion were misdiagnosed as threatened Abortion. 4 cases of clinically diagnosed threatened Abortion turned out to be complete Abortion. 2 cases of inevitable Abortion, and one case each of missed Abortion, HM, and anembryonic gestation were misdiagnosed as threatened Abortion. Out of 16 cases of incomplete Abortion which were diagnosed clinically, only five were confirmed. Three cases of missed Abortion and threatened Abortion were misdiagnosed as incomplete Abortion. 2 cases of missed Abortion and 1 case each of inevitable Abortion, ectopic, and anembryonic gestation were misdiagnosed as incomplete Abortion clinically. In one case, each of the inevitable Abortion missed Abortion and the Hydatidiform mole was correctly diagnosed clinically. Of the 4 clinically suspected ectopic pregnancies, were confirmed on Ultrasound.

Follow up of cases diagnosed on USG

On follow-up of sonologically diagnosed cases, out of 18 cases of threatened abortion 12 cases continued to normal term gestation while 6 cases present with miscarriage. On repeat ultrasound, out of these 6 cases, two were missed Abortion, two incomplete Abortion, and 2 cases with complete spontaneous Abortion. All 4 cases of ectopic gestation were correctly diagnosed on Ultrasound. Of the 6 cases of sonologically diagnosed complete Abortion, only 5 were correctly diagnosed, whereas one case of ectopic gestation was misdiagnosed as complete Abortion. Ten cases of incomplete Abortion, 4 cases of inevitable Abortion, 4 cases of missed Abortion, 2 cases of HM, and 2 cases of anembryonic gestation were all correctly diagnosed on Ultrasound. We have divided our study group into 3 main categories for statistical correlation.

The 3 groups are:

1. Viable intrauterine pregnancies
2. Nonviable intrauterine pregnancy
3. Ectopic pregnancy/gestation

All cases of viable intrauterine pregnancies were to be followed up without intervention, while other cases were managed as appropriate based on the ultrasound findings.

Table 2: Correlation of Clinical diagnosis with Final diagnosis and Correlation of Clinical diagnosis with Final diagnosis

Parameters	True positive	False Positive	False - negative	True negative	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy	P-value
Viable intrauterine pregnancy	15	11	3	21	83.33	65.65	57.69	87.50	72.00	<0.001**
Ectopic Pregnancy	4	0	1	45	80.00	100.00	100.0	97.83	98.00	<0.001**
Nonviable intrauterine pregnancy	16	4	11	19	59.28	82.61	80.00	63.33	70.00	0.003**

Based on clinical examination, 15 out of 50 suspected viable intrauterine gestation cases were confirmed as high false-positive cases (n=11). This shows a sensitivity of 83.33%, specificity of 65.65%, PPV of 57.69%, and accuracy of 72.0% with a significant p-value (<0.001). Of the four ectopic pregnancies diagnosed clinically, all were confirmed with the specificity of 100% and PPV of 100%. One case of ectopic pregnancy not diagnosed clinically turned out to be ectopic with the sensitivity of 80%, NPV of 97.83%, and accuracy of 98% with a significant p-value (<0.001). Clinical diagnosis to diagnose the nonviable pregnancies has got very poor statistical correlation with a sensitivity of 59.28%, specificity of 82.61%, NPV 63.33%, and accuracy of 70%.(p-value of 0.003).

Table 3: Correlation of USG diagnosis with Final diagnosis- an observation and Correlation of USG diagnosis with Final diagnosis- an evaluation

Parameters	True positive	False Positive	False-negative	True negative	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy	P-value
Viable intrauterine pregnancy	18	0	0	32	100.00	100.00	100.00	100.00	100.00	<0.001**
Ectopic Pregnancy	4	0	1	45	80.00	100.00	1000.00	97.83	98	<0.001**
Nonviable intrauterine pregnancy	27	1	0	22	100	95.65	96.43	100	98	<0.001**

In the present study, 18 cases of viable intrauterine pregnancies were correctly diagnosed on Ultrasound with zero false positives and zero false negativity with sensitivity, specificity, PPV, NPV, and accuracy of 100% each.

80% of ectopic pregnancies were correctly diagnosed with specificity and PPV of 100 % whereas 1 case was missed on sonography with a sensitivity of 80% and NPV of 97.83% with an accuracy of 98%. The nonviable pregnancies diagnosed on Ultrasound were confirmed with sensitivity and NPV of 100%, whereas 1 case of false-positive complete Abortion was made on Ultrasound with a specificity of 95.65%, PPV of 96.43%, and accuracy of 98%. Ultrasound diagnosis proved to be very accurate on statistical evaluation with a very significant p-value of <0.001.

Table 4: Correlation of Clinical diagnosis with USG diagnosis- an observation and correlation of Clinical diagnosis with USG diagnosis- an evaluation

Parameters	True positive	False Positive	False-negative	True negative	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy	P-value
Viable intrauterine pregnancy	15	11	3	21	83.33	65.63	57.69	87.5	72.00	<0.001**
Ectopic Pregnancy	3	1	1	45	75.00	97.93	75.00	97.83	96.00	<0.001**
Nonviable intrauterine pregnancy	16	4	12	18	57.14	81.82	80.00	60	68.0	0.052+

Predictive value and Accuracy

In the present study, compared to the ultrasound diagnosis, clinical diagnosis has a true positive of 15, false-positive of 11, and true negative of 21 in diagnosing viable pregnancies that constitute threatened Abortion. Clinical diagnosis has high false negative and true negative in diagnosing nonviable intrauterine pregnancies. Our study has a sensitivity of 83.3, PPV of 57.7, and accuracy of 72% in diagnosing viable pregnancies with a very significant p-value (< 0.001).

Clinical diagnosis of ectopic pregnancy has good specificity (97.93%), NPV (97.83%) and accuracy (96%) with p value < 0.001 which is very significant.

Clinical diagnosis has got very poor statistical correlation when compared to ultrasound diagnosis in evaluating nonviable intrauterine pregnancies with a sensitivity of 57.14 %, NPV of 60%, and accuracy of 68.0 % which shows a p-value of 0.052. This data shows that ultrasound diagnosis is considerably more accurate than clinical diagnosis.

Treatment and outcome

Out of 50 cases in our study, 30 patients were managed conservatively. Four cases of inevitable Abortion were spontaneously aborted on expectant management. 1 out of the four missed abortions and 2 out of the five ectopic pregnancies were managed conservatively. All cases of complete Abortion were treated with bed rest. 3 cases out of 5 of ectopic pregnancy were treated by laparotomy. All incomplete abortions and anembryonic gestation were surgically evacuated. Two cases of hydatidiform mole were treated by dilation and curettage. Twelve out of 18 sonologically confirmed cases of threatened Abortion were followed up to term gestation with a successful outcome. Six cases of threatened Abortion were terminated on follow-up with 2 cases as complete Abortion, two cases as missed Abortion, and 2 cases with repeat bleeding showing incomplete Abortion.

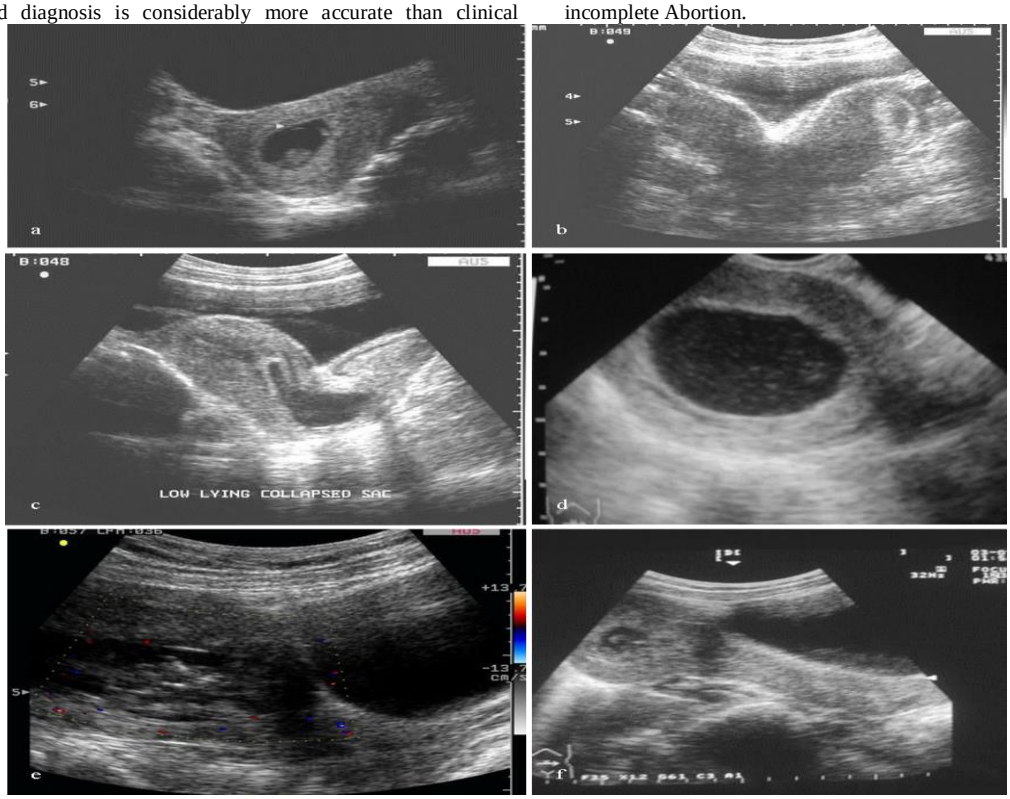

Fig 2. a. Normal, b. Bicornuate Uterus with Pregnancy In One Horn, c. Inevitable Abortion, d. Blighted Ovum, e. Missed Abortion, f. Incomplete Abortion.

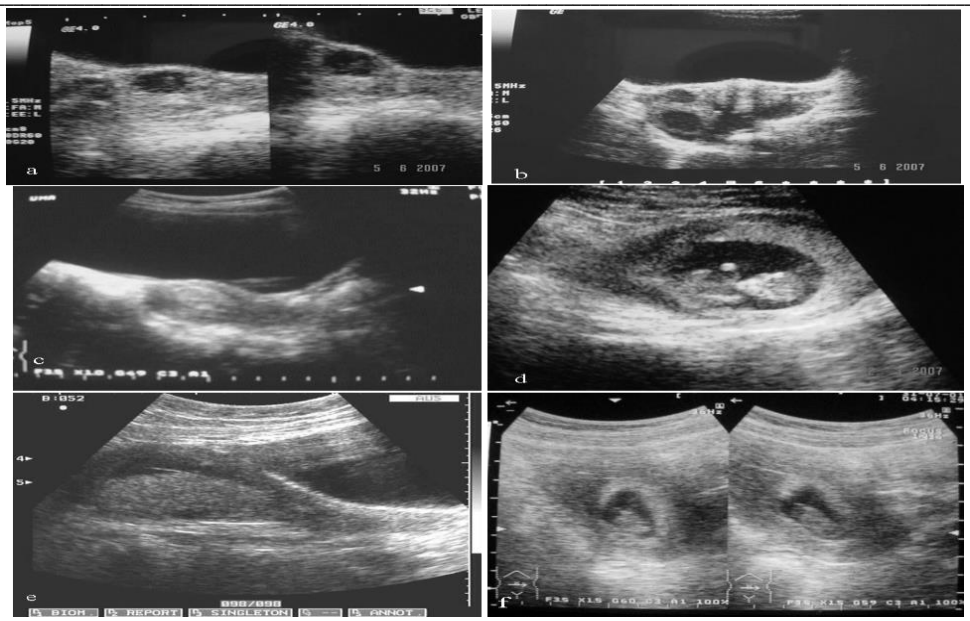

Fig 3. a. Ectopic Pregnancy, b. Ruptured Ectopic, c. Hydatidiform Mole, d. Subchorionic Bleed (Large).e. Retroplacental Bleed, f. Oligohydramnios.

Discussion

Vaginal bleeding during the early part of pregnancy often implies the presence of an underlying abnormality that cannot be diagnosed conclusively by clinical examination. Ultrasonography (USG) is helpful in all such cases. Accurate diagnosis of pregnancy status (viable or nonviable) can avoid unnecessary hormonal treatment and prolonged hospitalization. The ultrasonographic examination provides a good index for evacuation in cases of Abortion. Curettage is necessary if residual contents are seen but not when the uterus though bulky, appears empty.A total of 50 pregnant women with vaginal bleeding during the first trimester referred to our center for ultrasonography examination were included in this study.

The 50 women in this study ranged in age from 18 to 35 years with an average of 30 years. Patients aged between 21 and 26 years (42%) were more represented. Most of them were multigravidas (70%) and primipara (30%). This incidence rate is by findings reported in similar studies[2,8].In the present study, various abortions contributed to a major chunk of First trimester bleeding, constituting 86% with ectopic pregnancy and H Mole making up the rest of the cases with frequencies of 10% and 4%, respectively, when compared with Reddirani P et al. and Sofat R. et al[9,10].Transvaginal sonography (TVS) was more sensitive to visualize fetal pole, yolk sac, and cardiac activity compared to transabdominal sonography (TAS). In our study, the Yolk sac was visualized in 12 cases by s by TVS. Out of 21 cases in which fetal node was visualized, 18 cases showed fetal cardiac activity by TAS. 2 cases with absent fetal cardiac activity were diagnosed as inevitable Abortion and one case as missed Abortion. Transvaginal sonography demonstrated intrauterine embryo, heart motion, and yolk sac more clearly and more often when these structures were not apparent in TAS.In our study, out of 12 cases of sonologically diagnosed threatened Abortion; one out of which spontaneously aborted. The Remaining continued to term gestation. By comparing with the study by Steven R. et al.[11] and Jan Fog Pedersen et al.[12], our study has got slightly more incidence of subchorionic bleeds.In our study, only 18 clinically diagnosed cases were confirmed on Ultrasound with a disparity of 64%. The present study, when compared to Jaideep Malhotra et al.[13] and P Reddi Rani et al.[9] has got more disparity between clinical and Ultrasound diagnosis.In our study, 18 cases of threatened Abortion were diagnosed on Ultrasound based on the viability of the fetus corresponding to 36% of cases of First trimester bleeding. Our study is comparable to Nyberg et al.[14] and Charles W Schauberger et al.[15].In the present study, all cases of threatened Abortion missed Abortion, incomplete Abortion, blighted ovum, H Mole, and inevitable Abortion were diagnosed correctly by Ultrasound with an accuracy of 100%. One out of five cases of ectopic pregnancy and 1 out of 6 complete abortions were misdiagnosed with 80 and 83% accuracy, respectively. The results of our study are comparable with Rama Sofat[10] and Neelam SB[16].

Causes of First Trimester bleeding

Threatened Abortion

As ultrasonography findings threatened abortion 12 (24%), the highest cause of first trimester vaginal bleeding. This similar trend was observed in other studies[2,3,8,17,18].

Threatened Abortion is vaginal bleeding before 20 weeks without cervical dilatation or effacement. Sonographic findings depend on the stage of gestation and may show an empty bulky uterus or intrauterine GS with or without an embryo. The findings at ultrasound examination in patients with threatened Abortion are often both crucial and pivotal because, in most cases, the sonographic findings not only can determine the precise diagnosis but can also be used to guide therapy.

Complete Abortion

Two (4%)cases were diagnosed as complete Abortion in our study. This rate was similar to Coulibaly et al. who found a rate of 9.1%[19]. Complete Abortion is vaginal bleeding with complete expulsion of all products of conception before 20 weeks. Sonography shows an empty uterus.

Incomplete Abortion

In our study, ten (20%) cases were diagnosed as incomplete abortions. This rate was comparable to Yang and al, which found a rate of 23.1%[20]. Incomplete Abortion is vaginal bleeding with partial expulsion of products of conception before 20 weeks of gestation. Sonographic findings are blood clots and residual trophoblastic tissue in the endometrial cavity. (Figure 2).

Missed Abortion

Missed Abortion is intrauterine embryonic demise before 20 weeks of gestation without expulsion of products of conception; may or may not present with vaginal bleeding. Sonographic findings are intrauterine embryos without cardiac activity. The embryo and GS may be small for the gestation age and are disproportionate.

Recurrent Abortion

Recurrent Abortion is three or more consecutive spontaneous abortions. Sonographic findings depend on the stage of gestation and

type of Abortion.

Septic abortion

Septic abortion is a uterine infection associated with any of the above-described abortionsSonographic findings are thick and irregular endometrial lining with fluid in the endometrial cavity.

Inevitable Abortion

Patients with an open cervical OS found on pelvic examination but without a history or evidence of the passage of tissue are diagnosed as having an inevitable miscarriage. An anechoic area is seen on ultrasound examination around the sac, where the sac has been dissected away from the uterine wall. The separated sac is seen lying low in the uterus. The dilated cervical canal confirms the diagnosis even though a heartbeat may still be detected. Sometimes the sac will be seen to move in position during the scan.

Ectopic pregnancy

The term ectopic gestation refers to a gestation where the fertilized ovum gets implanted in a sit other than an intrauterine cavity. Tubal pregnancy is the commonest site accounting for 95-97%. The ampullary region is the common site in tubal pregnancy. Less common sites include ovaries (0.5-1%), cervix (0.1%) and abdominal cavity.

Molar pregnancy

The trophoblastic elements of the developing blastocyst are thought to undergo proliferative changes initiated by the persistence of chorionic villi from a blighted ovum and continue to undergo hydrated swelling. It can be a complete mole or partial mole.In a complete molar pregnancy, trophoblastic hyperplasia occurs with the absence of an identifiable embryo and amniotic membrane. Approximately 90% of molar pregnancies are of this type.In partial form, the hydatidiform changes are focal and affect only a variable portion of the placenta. An abnormal placenta may co-exist.

In our study, heavy bleeding occurred in incomplete and complete abortions, while spotting and light bleeding occurred in threatened abortions. A statistically significant relation ($p = 0.001$) was observed between ultrasonography findings and the heaviness of bleeding. Statistically significant ($p=0.001$) relation between Ultrasonography results and presence of blood clots. Threatened abortions, incomplete Abortion, molar pregnancy, stopped pregnancy, and ectopic pregnancy was characterized by adnexal mass, metrorrhagia, correctly diagnosed only through Ultrasound, and ectopic pregnancy, anembryonic pregnancy, and molar pregnancy[21].

Conclusion

Pelvic examination and Clinical history are inadequate to assess the cause and the prognosis. 48 out of 50 cases in the present study were correctly diagnosed based on Ultrasound compared to 18 out of 50 cases on clinical diagnosis with a disparity of 64%. Ultrasound is a non-invasive and accessible method to examine the patients with the first trimester bleeding with high accuracy to identify the actual cause of bleeding and guides the clinician to choose the proper management.

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Authors' Contribution

The first author has given the idea of the topic, the data collection, statistical part, and written the article. The second, and third authors also wrote, reviewed, and edited the article.

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