Updated Role of Ultrasound for Predicting Pregnancy Outcome in First-Trimester Vaginal Bleeding

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ABSTRACT

Backgrounds: Vaginal bleeding during the first trimester is a common obstetric condition. Approximately 20-25% women in their first trimester complain of vaginal bleeding   The vast variety of reasons of early pregnancy bleeding, the risk of miscarriage, and the worry of having any life threatening etiology puts pregnant women with first trimester hemorrhage in a state of uncertainty, leading to anxiety .

Aim: To predict pregnancy outcome through sonographic findings of subchorionic hematoma, slow fetal heart rate and high resistance to subtrophoblastic circulation in women presenting with vaginal bleeding in first trimester

Patients &Methods: A prospective study was conducted during twenty-month   period from September 2021 to April 2023 on 60 pregnant patients during 6-13+6dweeks of gestation with positive pregnancy test ,complaining of vaginal bleeding. The study group was subdivided into group of non-viable pregnancy (16 cases) and threatened abortion group(44 cases). The   group of threatened abortion was subdivided into group of patients who ended in second trimester miscarriage (6 patients) and termination of pregnancy (2 patients) and a group who continued pregnancy (36 patients). Pregnancies were followed up until the final outcome was known . Confirmation of completed pregnancy loss was done with examination of the abortus products that passed spontaneously or after uterine aspiration for non viable group .Antenatal and neonatal outcomes were obtained from hospital records for cases of threatened abortion continued pregnancy to labor   . The relation between slow embryonic (fetal) heart rate , subchorionic hematoma and high resistance to subtrophoblastic circulation   and fetal demise was recorded and statistically analyzed.

Results: Spotting was most common nature of bleeding per vagina 63.3% (38/60). .Among 60 subjects who were included in the study, 44 patients (73.3%) were diagnosed by US as viable pregnancy and 16 patients (26.7%) were non-viable pregnancy . Among 44 cases of viable pregnancy in the first trimester, 6 (10.0%) ended in second trimester miscarriage , 2(3.3%) were subjected to pregnancy termination (aneuploidy) and 36 (60%) completed their pregnancies of which the live birth rate   was 81.8% of which 28 patients had no perinatal complications, and others (22.2%) had problems of PROM, and preterm labor . The prevalence of subchorionic hematoma in threatened abortion group was 22.7% (n = 10)

and there was   association between the size of the   subchorionic hematoma and first trimester miscarriage. There was a statistically significant differences in pregnancy outcomes between those with and without subchorionic hematoma .There is highly significant relation between incidence of abortion and the slowing FHR and high resistance to subtrophoblastic circulation where p-value <0.001 and   respectively

Conclusions:
 First trimester bleeding could be a predicting factor for perinatal complications .Slow embryonic (or fetal) heart rate as well as increased resistance to subtrophoblastic circulation could be the earliest predictors for subsequent possible miscarriage.Large subchorionic hematoma may increase the risk of miscarriage in patients with vaginal bleeding and so early follow up by ultra sound is recommended a and this help the clinician to make the diagnosis of fetal demise quickly.

Introduction:

The first trimester, mostly defined as the first 100 days of pregnancy, is characterized by many important landmarks heralding the ultimate outcome of pregnancy. The primary causes of first trimester bleeding are spontaneous abortion, ectopic pregnancy, and gestational trophoblastic disease in addition to some cases of chromosomal fetal abnormalities; however, the most common cause of bleeding is spotting caused by implantation of the conceptus into the endometrium(**Datta and Raut ;2017**).   The amazing improvement of technical equipment and deepened knowledge of embryonic and early fetal development have brought sonomorphologic exploration of pregnancy forward into 1st trimester to enable timely decisions about management(**Detti et al ;2020).**

Previous studies on the fetal heart rate (FHR) normally measured about 100-120 beat per minute (b/pm) when it is first visible on sonography at approximately 5 weeks gestation. the rate increases progressively over the subsequent 2-3 weeks (**Doubilet et al.,2014).**   Pregnancies with early (embryonic) fetal heart   < 90 at 6-8 weeks of GA has been associated with poor outcome   .Abnormal EHR may indicate poor prognosis and higher risk of spontaneous miscarriage, routine assessment of EHR may be used as a prognostic tool for miscarriage .Fetal demise often occurs within 1 week after the slow FHR and almost always occurs by the end of the first trimester (**Nasr .,2019).**

With the use of 7.5 MHz trans-vaginal probes, more detailed structures of the fetal heart could be identified. The atrial and ventricular walls were visualized at the end of week 10, and the atrioventricular valves at the end of week 11 (**DeVilbiss et al.,2020).)**

Extravillous trophoblast should invade the myometrium, maternal decidua, and blood vessels for healthy placentation . With the use of Doppler sonography, the effect of abnormal placentation on early and late complications of pregnancy has been investigated.   Abnormal velocity waveforms in early pregnancy are related to pregnancy complications, including preeclampsia and intrauterine growth retardation(**Cooley et al.,2011**).

Previous studies have examined the role of Doppler US   in the first trimester in predicting further pregnancy complications but, There are conflicting results regarding changes in the uterine and the spiral arteries   in normal early pregnancy and cases of threatened abortion (**Khong et al.,2015**)

Salim et al(2020) ,reported that the abnormal resistance of uterine artery may be useful to predict recurrent fetal loss. However, **Okçu and Gürbüz (2021)** did not find differences in Doppler velocimetry of the uterine and spiral arteries in women with normal and pathological pregnancy in first trimester. There remains controversy as to whether Doppler ultra-sound assessment is useful in predicting outcomes of women with threatened abortion

Intrauterine hematoma (IUH) is a term used for a sonographic diagnosis of a crescent-shaped hyperechoic or hypoechoic area between the chorionic membrane and the myometrium **(Yan et al.,2023).**The role of IUH in miscarriage and pregnancy outcome remains controversial. **Sukur et al (2014)** demonstrated that ultrasonographically detected subchorionic hematoma increases the risk of miscarriage in patients with vaginal bleeding and threatened abortion during the first 20 weeks of gestation. However, it does not affect the pregnancy outcome measures of ongoing pregnancy. **Naert et al(2019)** demonstrated that there was no association between the presence of IUH in the first trimester and first-trimester miscarriage. However, an association with preterm birth independently of the presence of vaginal bleeding, was evident.

The aim of this study was to predict pregnancy outcome through sonographic findings: subchorionic hematoma,embryonal (fetal) heart rate and intervillious circulation (sub trophoblastic arteries) in women presenting with first trimester vaginal bleeding correlating the findings with actual pregnancy outcome of these patients.

Materials&Methods: This was a prospective study which was conducted in   between first of September,   2021 to the April, 2023. The studied cases were examined in the Radiodiagnosis Department of Ain Shams University (45 patient) and one private center(15 cases) . Informed consent was obtained from all the patients and the study was approved by the local ethics committee.

Inclusion criteria included singleton pregnancies in patients with age ranging from 19 to 42 years ,complicated with vaginal bleeding at less than 14 weeks' gestation.

Exclusion criteria included multiple pregnancies, patient who had gynecological pathologies such as polyps, cervicitis or cervical myomas and patients of reproductive age with a missed period and negative urine pregnancy test .

Demographic characteristics, including age, gravidity and parity were recorded, in addition to   gestational age as estimated from LMP. Details of the present pregnancy such as period of amenorrhea at the time of first episode of bleeding, amount and duration of bleeding, associated abdominal pain and history of expulsion of fleshy mass/clots were recorded.

Relevant clinical history, physical examination including pelvic examination was obtained in all patients and a provisional clinical diagnosis was made. In all cases routine investigations like hemoglobin level, blood grouping and Rh-typing, urine pregnancy test   were recorded . Then the patients were subjected to ultrasound examination.

Ultrasound examinations were performed by using a GE Loqic 7 Ultrasound equipped with a 3.5–7-MHz curvilinear transducer and 4.2-6.5-MHz endovaginal probe. All patients were subjected to transabdominal ultrasonography .Transvaginal US was performed when the gestational age was 7 weeks or less and whenever transabdominal sonography was inconclusive or equivocal.

Nature of vaginal bleeding experienced in study period was recorded as 'spotting', 'more than spotting' and 'clot'. A spotting episode was noticed only while wiping, an episode having flow equivalent to usual menstrual period but lighter than heaviest day of flow of menstrual period was defined as more than spotting while an episode as heavy or heavier than usual

menstrual period with passage of clots has been categorised under clots .

Laboratory investigations and ultrasound was collected and noted carefully. . Patients contact numbers were recorded for future correspondence

Ultrasonographic assessment of the uterine size, presence of gestational sac, size and margin of gestational sac, presence of fetal pole, crown rump length (CRL) with calculation of embryonic or fetal age. Cardiac activity and   fetal movements   were assessed . A failed intrauterine pregnancy was only diagnosed if cardiac activity was absent in an embryo ≥7mm.

In cases of empty uterus , the endometrial thickness was measured and examination of the uterine cavity for any intrauterine fluid (pseudogestational sac) was performed noting the shifting of the fluid as the exam progresses (unlike the fixed position of a true intrauterine gestational sac).

Both adnexa were examined for any adnexal masses or gestational sac with or without yolk sac and with or without cardiac activity with searching for any free fluid in pelvic cavity. Duplex Doppler US was performed demonstrating vascularity in or around the mass with searching for randomly dispersed blood vessels surrounding   the adnexal mass noting their velocity with measurement of RI .

Uterine spiral arteries were assessed by color Doppler and a flow spectrum on the spectral wave US in mid first trimester (6–10 weeks) patients, with threatened miscarriage (vaginal bleeding/ spotting with or without abdominal pain)   . Spiral arteries just beneath the chorion frondosum were assessed by power Doppler imaging . Flow velocity waveforms were obtained by placing the Doppler gate over the colored areas and activating the pulsed-wave Doppler function. The pulsed Doppler sample volume was set at a width of 2 mm. The high-pass filter was set at 50 Hz. Mechanical index (MI) was 0.82 and thermal index for soft tissues (TIs) was 0.7.Resistance (RI) and pulsatility indices (PI) were measured. The average of the respective values from two consecutive flow velocity waveforms obtained from the spiral arteries was calculated. All sonographic procedures were performed by the same investigator to avoid inter-observer variations.

In cases of GTD, demonstration of any vascularity among the vesicles or at the adjacent myometrium was assessed to differentiate between avascular and vascular forms of GTD   .

In cases of vaginal bleeding   between 11 to 13+6 weeks' gestation (or when the CRL is between 45 and 84 mm), ultrasound screening was performed with assessment of

Fetal viability was documented by fetal movements and fetal heart rate .

Fetal measurements were assessed by measuring crown-rump length (CRL), biparietal diameter (BPD), and femur length (FL).

Evaluation of fetal anatomy   included the following:

Skull and brain (skull shape and cranial ossification, lateral ventricles, choroid plexus, cerebellum); Face (visualization of orbit and viewing fetal profile, looking for nasal bone); neck (nuchal translucency [NT] measurement, searching for the presence of cystic hygroma); spine ,heart ; stomach (existence in left upper abdomen) and abdominal wall .

For measuring transcranial translucency, NT and nasal bone , magnification of the image was performed such that the fetal head and thorax occupy the whole screen obtaining mid-sagittal view of the face defined by the presence of the echogenic tip of the nose and rectangular shape of the palate anteriorly, with the fetus in neutral position (with the head in line with the spine) identifying the translucent diencephalon in the center of the posterior fossa and the nuchal membrane posteriorly. Measurements of the NT were taken in the widest part of translucency

with the inner border of the horizontal line of the calipers placed on the line that defines the nuchal translucency thickness .

For measuring NT, one caliper should be placed on the outer edge of the skin, and the other against the outer edge of the occipital bone with the angle of insonation is approximately 30º to the horizontal.

For examining nasal bone, echogenity was assessed (normally more than the overlying skin) .For measuring NB ,the ultrasound transducer was held parallel to the direction of the nose.

For assessment DV , color Doppler US was used to localize the site of aliasing between the left portal vein and the inferior vena cava in a sagittal plane using a small (0.5–1 mm) sample volume. Observation of the waveform, and identification of its three components (the S wave, the D wave, and the A wave) were performed with demonstration of the direction of the A wave. whether antegrade or retrograde . The S wave reflects ventricular systole, the D wave reflects ventricular diastole, and the A wave reflects atrial contraction.

Combined first trimester screening (FTS) between 11+0 and 13+6 weeks' gestation was used as standard and most effective method of screening. The inclusion of maternal serum biochemical markers (PAPP-A) Pregnancy-associated plasma protein-A (PAPP-A)   likely provides added benefit. If fetal structural defects are detected or if the NT thickness is increased, the patients were referred for amniocentesis   .

Pregnancies were followed up until the final outcome was known

Confirmation of completed pregnancy loss was done with examination of   the abortus products that passed spontaneously or after uterine aspiration

Antenatal and neonatal outcomes were obtained from hospital records for cases of threatened abortion continued to labour.

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). The quantitative data were presented as mean± standard deviation and ranges. Also qualitative variables were presented as number and percentages. Independent-samples t-test of significance was used when comparing between two means. The Comparison between groups with qualitative data was done by using Fisher's exact test . *P value* <0.05 was considered as significant value.

Results

Sixty women aged between 19 and 43 years old with an average of 30 years were enrolled in this study. The modal age group was 29 to 32 years old representing 41.7% **(Table 1).** Twenty-four patients (40%) were pregnant for the first time and 10 (16.66%) were primiparous. Mean gestational age was 9 weeks with the extremes of 6 and 12 weeks^{+6d}, the 6 to 10 weeks period were predominant (**Table 2**). In 50 patients (83.3%) the bleeding was spontaneous while in 10 (16.7%) bleeding was caused by sexual intercourses (8 patients) and road accidents in 2 patients. (**Table 3**).

18 cases (30.0%) had uterine size <10 weeks and 20 (33.3%) had uterine size between 10 and 12 weeks. Cervical os was open in 4 (6.7%) and closed in 56 (93.3%) patients. Fornices were free in 54 patients (90.0%) while forniceal tenderness was present in 6 cases (10.0%).

Table 1: Distribution of cases according to age group.

Age (years)	Patient's No.	Percentage (%)

19-23	11	18.3
24-28	13	21.7
29-32	25	41.7
33-38	6	10
38-43	5	8.3

Table 2. Distribution of patient by gravidity parity and gestational age

	No.	%
Gravidity		
Primigravida	24	40
Multigravida	36	60
Parity		
Primipara	10	16.7
Multipara	26	43.3
Gestational age		
6-8weeks	13	21.7
8-10weeks	32	53.3
>10 weeks to 13weeks^{+6days}	15	25.0

Table 3: Distribution of patients by nature and cause of vaginal bleeding.

Nature of bleeding	Frequency	Percentage (%)
Heaviness		
-Spotting	**36**	**60.0**
-Light	**15**	**25.0**
-Heavy	**9**	**15.0**
Etiology		
- Spontaneous	**50**	**83.3**
-Caused	**10**	**16.7**
Sexual intercourse	**8**	**80.0**
Road accidents	**2**	**20.0**

Among our 60 patients, , threatened abortion was the commonest cause of vaginal bleeding ,where 44 (73.3%) were diagnosed by US as threatened abortion, 4 (6.7%) each as incomplete abortion and as missed abortion, 3(5.0%) as ectopic pregnancy and 2(3.3%) each as complete abortion and as anembryonic pregnancy (**Table 4**) .One case (1.7%)of hydatidiform mole   was also demonstrated .

Table 4: US diagnosis of 60 cases.

	No. of patients	Percentage
Threatened abortion	44	73.3
Incomplete abortion	4	6.7
Missed abortion	4	6.7
Ectopic pregnancy	3	5.0

Complete abortion	2	3.3	
Anembryonic preganancy	2	3.3	
Hydatidiform mole	1	1.7	

Table 5 showing US findings of 16 cases of abnormal first trimester pregnancy

Clinical &US criteria	Threatened 44	Incom. abortion 4	Missed abortion 4	Ectopic preg. 3	Compl abortion 2	Anemb. Preg. 2	Complete mole 1
Bleeding							
Spotting	32	-		-	2	2	-
Light	7	2	3	2	-	-	1
Heavy	5	2	1	1	-	-	-
			-				
Assoc. Symptoms	Pelvic pain 39 Cramps 5	Cramps 4	Pelvic pain 2	Pelvic pain 2 Cramps 1	Mild pelvic pain 2	Mild pelvic pain 1	Hyperemesis 1
Uterine content							
GS	Regular	Deformed	Irregular smaller than age	Empty 2	Empty	present	No
YS	Less than 6mm	Not seen	Large >6mm	Pseduo sac 2		Absent	No
CRL	Normal with age	Not seen	Smaller that age	- -		Absent	No
FH	Normal 34 Bradycardia 4	Absent	Ascent			Absent	No Multiple cystic spaces
Decidual reaction	Thick echogenic		Irreg.	-		Thin	Absent
Subtrophoblastic vascularity	Normal with RI>0.55	Irregular Increased resist >0.55	Increased resist. >0.55	-		Not seen	Not seen

Int.os	closed				closed	closed	closed
Adnexal masses	Luteal Cyst (7cases)	Opened	Closed	Closed Extraovar. 3 with YS sac in 2 F.pole in 1 No cardiac activity			

Thirteen cases of threatened abortion with a gestational age >10 weeks up to 13weeks+6d were subjected to US screening, where, 2 cases were diagnosed by US as aneuploidy (Table 7), proved by amniocentesis as trisomy 21, followed by termination of pregnancy. First trimester US screening after 10 weeks ′gestation may be a beneficial approach for detection of fetal anomalies.

Table 6 Major fetal anomalies from screening of 15 cases more than 10 weeks' gestation

Maternal age (years)	Nasal bone	NT	Cystic hygroma	TCT	DV	Biochem tests
>35 No.3	Absent 2 small 1	Thickened2 Normal 1	Present 1 Abcent2	Thin 1 Normal 2	Reflux 2 Normal 1	Abnormal 2
<35No.10	Small 1 Normal 9	Normal 10	Abcent10	Normal 10	Normal 10	Not done

Table 7 Correlation of maternal age with nuchal translucency Nasal bone thickness in fetuses>12week'sgestationncy

Maternal age (years)	Nasal bone	NT	Cystic hygroma	TCT	DV	Biochem tests
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<35No.10	Small 1 Normal 9	Normal 10	Abcent10	Normal 10	Normal 10	Not done

In six patients who ended in   miscarriage in the second trimester :4 cases   had bradycardia (table 8)in the first trimester (<100bpm) while in 5 patients   increased   RI and PI of the the subtrophoblastic circulation was detected by Doppler US(table 9).

Table 8: FHR and Doppler US of subtrophoblastic circulation between continued group and aborted group.

Parameter	Continued No. %		Miscarriage No. %		*P-value*
FHR **Normal (>100bpm)** **Bradycardia(<100bpm)**	34 2	94.4 5.60	2 4	33.2 66.7	<0.001*
Doppler US of subtrophobstic circulation **Normal (RI : ≤0.55)** **High resistance (High RI >0.55)**	31 5	86.1 13.9	1 5	16.7 83.3	<0.001*

Table 9 Correlation of Doppler US of spiral arteries RI&PI in continued group and miscarriage group of threatened abortion .

Spiral arteries	Continued (N=36)	Miscarriage (N=6)	p-value
RI (Mean ± SD)	**0.45±0.08**	**0.58±0.08**	**0.005***
PI (Mean ±SD)	**0.85±.18**	**1.10±.19**	**0.003***

*p-value <0.05 Significant

In the present study, there was a statistically significant difference between the aborted group and continued group regarding the occurrence of fetal bradycardia and resistance to blood flow in the   subtrophoblastic circulation

From our 44 patients with threatened abortion, 10 cases had SCH, of them 5 had large SCH (>half of chorionic circumference), followed by second trimester miscarriage in 4 of them (table 10). There was association between the presence of SCH and subsequent miscarriage. In the presence of SCH, its size added a risk on miscarriage.

Table 10: Shows the incidence of individual adverse pregnancy outcomes in the patients with viable pregnancy (with vaginal bleeding)with and those without IUH.

outcome	Viable pregnancy	Subch.H	No subch.H	x^2	p-value[FE]

| Miscarriage | 6/44(13.6%) | 5/10(50%) | 1/34(2.9%) | 14.573 | <0.001** |
| PTB | 5/36(13.9%) | 4/10(40%) | 1/26(0.11%) | 7.893 | 0.019* |

*Using: Fisher's exact test; p-value >0.05 is insignificant; *p-value <0.05 is significant*

Out of the 44 cases of threatened abortion ,36 continued their pregnancies with a pregnancy continuation rate of 81.8 %. Out of 36 patients who completed pregnancy, 28 (77.7 %) had good antenatal and neonatal outcome with no complications. On the other hand, 6 cases (16.7 %) were associated with antenatal and neonatal complications: premature rupture of membranes in 4 cases, PTB in 5 patients of them 1 were subjected to neonatal resuscitation and 1 needed neonatal intensive care unit admission (**Table 11**).

Table.11: Incidence of antenatal and neonatal complications in 34 cases of completed pregnancy:

Complications	No. (6)	Percentage (%)
No-complications	*28*	*82.4%*
Yes-complications	*6*	*17.6%*
Preterm rupture of membranes	*4/6*	*66.7%*
PTB	*5/6*	*83.3%*
Admission to neonatal unit resuscitation	*1/6*	*16.7%*
Neonatal intensive care unit	*1/6*	*16.7%*

The final diagnosis was made by examination of the abortus products that passed spontaneously or after uterine aspiration or laparoscopic intervention) (for 24 cases of completed pregnancy loss or termination) and by medical records for 36 cases of threatened abortion continued to labor. The confrontation between the ultrasound diagnosis and the final diagnosis showed a concordance rate of 100% .

Discussion:

Approximately one-fourth of pregnant women will experience vaginal bleeding in the first trimester. The diagnostic possibilities for pregnant patients presenting bleeding in the first trimester are broad. The differential diagnosis includes threatened abortion, early pregnancy loss, and ectopic pregnancy. Clinical history and pelvic examination are inadequate in assessing the cause of bleeding and the prognosis (**Hendricks et al., 2019**).

In patients with first trimester vaginal bleeding , ultrasound is the modality of choice for establishing the presence of an intrauterine pregnancy; evaluating pregnancy viability, determining gestational age, and multiplicity; detecting pregnancy-related complications; and diagnosing ectopic pregnancy .Thus ultrasound (both TAS and TVS) plays an important role in the evaluation of the causes of the first trimester bleeding, their prognosis and predict the status of abnormal pregnancy to arrive at an accurate diagnosis and management of cases appropriately (**Murugan et al., 2020**).

We proposed this study to precisely identifying the causes of vaginal bleeding occurring in first trimester by ultrasonography , to predict pregnancy outcome through sonographic findings of subchorionic hematoma, slow fetal heart rate and high resistance to subtrophoblastic circulation in women presenting with vaginal bleeding in first trimester aiding to address the

appropriate   management and to assess the outcome of   cases of first trimester vaginal bleeding .

During this study, threatened abortion   was the commonest cause of first trimester vaginal bleeding (73.3 %) in our cases . This similar trend was observed in a study by **Guena et al.,(2019)** ,who demonstrated that   threatened abortion is the result of marginal abruption with separation of the chorion from the endometrial lining and subchorionic hemorrhage coming from the closed cervix which can lead to an abortion . The latter was seen in 6 of our cases.

Subchorionic hematoma (SCH) is a relatively common finding in the first trimester and has been reported to occur in 18%-22% of IUPs in patients presenting with vaginal bleeding   On TVUS, SCH appears as a crescent-shaped, heterogeneous avascular collection between the gestational sac and decidua basalis **(Zhou et al.,2017)** . During our study , from the 44 patients diagnosed as threatened abortion, 10 cases had associated   subchorionic hematomas of which 5 cases with large subchorionic hematomas (occupying more than the half of the whole chorionic surface) ended in miscarriage in the second trimester .This is in accordance with **Murugan et al.,2020**   who demonstrated that large subchorionic hematomas are associated with an increased risk of pregnancy loss, especially if the hematoma is greater than two thirds of the chorionic circumference .

During our study , 5 cases had preterm birth (PTB) ,of them 4 patients had large first trimester SCH This is in accordance with **Palatnik   et al.,**(2015) who demonstrated that the presence of IUH was associated with the incidence of preterm birth   but no other individual or overall antenatal, delivery or neonatal complications. So, patients with a large SCH in the first trimester may be at increased risk of PTB.

A number of mechanisms have been proposed to explain how IUH may cause PTB, such as the hypothesis that IUH may hamper implantation and development of the placenta. A retrospective cohort study evaluating the relationship between IUH, sonographic cervical length and PTB, found an association between PTB and IUH even when adjusting for cervical length, the presence of vaginal bleeding and use of progesteronex.This suggests that another mechanism for PTB, other than cervical shortening, exists in women with an IUH. A candidate mechanism is subclinical infection where it was found that chorioamnionitis was more common in women with a persistent IUH **(Al-Memar et al 2020**) .

Normal implantation is very important to achieve a normal pregnancy outcome through the trophoblastic invasion into the myometrium and migration through the entire length of maternal spiral arteries. resulting in low resistance and high flow state in the intervillous space and an increase in uterine blood flow that regulates uterine receptivity and is important for normal placentation. These changes lead to a progressive reduction in the uterine arterial blood flow resistance **(Aseel .,2020).**

In a few studies evaluating the small vessels of the vascular uterine bed, including the spiral artery and subchorionic vessels, a significant association was reported between abnormal Doppler findings and pregnancy results, while no significant association was found in the other studies **(Schiffer et al.,2020   & Okçu and Gürbüz .,2021)**

In the present study, there was a statistically significant difference between the aborted group and continued group regarding the presence of increased resistance (mean values of RI)of the   sub trophoblastic circulation to blood flow in   the   subtrophoblastic circulation and it could be a predictor for threatened miscarriage outcome. Researches by **Bhoil et al (2019)** demonstrated that the most common complication of early pregnancy arise due to abnormalities

in early trophoblast invasion and persistently increased resistance of the spiral arteries. This is in agreement with **Al Halaby et al.,(2020)** who stated that the resistive index of trophoblastic flow was statistically significant as a consistent Doppler variable that might be a predictor of adverse pregnancy outcome at a cutoff point of <0.53.

Also **Salim et al.,(2020)** reported that both the pulsatility index (PI) as well as resistance index (RI) are significantly higher in patients presenting with features of threatened abortion that ended in miscarriage as compared to those with threatened abortion who continued their pregnancies. These results are in contrary to the findings reported by **Shehata   et al. (2018)** did not find differences in Doppler velocimetry of the uterine arteries in women with normal and pathological pregnancy.

During our study, from six patients who ended in   miscarriage in the second trimester :4 cases had   bradycardia in the first trimester . According to **Farag et al., (2018),**   an abnormally slow fetal heart rate during the first trimester of pregnancy has been linked to 83.3% miscarriage rate, a heart rate of less than 100 beats per minute is considered abnormal They also reported that first-trimester pregnancy outcomes were accurately predicted by EHR with a sensitivity of 97.5 %and a specificity of 100%

Four (6.7%) women were diagnosed during our study as incomplete abortions. This rate is less than that of **Pawde and colleges in 2016** , who found a rate of 23.1% of incomplete abortion in cases of first trimester bleeding . Persistent vaginal bleeding after an abortion may be due to retained trophoblastic tissue, but   these women may also present with symptoms of infection, including pain and fever . Findings on US are heterogeneous hypoechoic material in the endometrial cavity consistent of retained trophoblastic tissue and blood clots.

During our study another 4cases (6.7%) of missed abortion pregnancies were demonstrated. **Guena and colleagues**   found a higher rate of 18%. As US features, there was an ovular irregular gestational sac containing an embryo with no cardiac activity detected with abnormally large yolk sac . This may occur during the early stages of pregnancies usually under 10 weeks gestational age**(Abd Ellatif et al.,2018**).This was seen in 4 of our cases of less than 10weeks' gestation ..

Bleeding from an ectopic pregnancy is the most dangerous cause of first trimester bleeding. It concerned 5.0% of the cases in our study. **Rausch et al** found a rate of 5.2%. It occurs when the fertilized egg is implanted outside of the uterus, most often in the Fallopian tube. The ultrasonographic finding was the visualization of an annular adnexal mass containing a viable embryo or not   sometimes with a hemoperitoneum with an empty uterus   The incidence is higher in patients with a history of prior ectopic pregnancy, previous pelvic inflammatory disease, tubal disease, presence of an intrauterine device, and in those undergoing in vitro fertilization .

Two cases (3.3%) were diagnosed as complete abortion. This rate is different from   those of **Nandekar et al** who found a rate of 9.1%   . The causes of this are various, the presence of myomas, the genetic abnormalities, the infectious diseases such as malaria.The difference may be different inclusion and exclusion criteria during our study in which we exclude pregnant patients with non-obstetrical causes of vaginal bleeding as myomas.

An anembryonic pregnancy is an early failure of the embryo to develop within the GS as seen in our 2cases   (3.3%) patients. **Guena et al   in 2019** found a rate of 4.3% . The ultrasonographic finding was the visualization of a gestational sac within the uterus with an irregular contour without embryos which can contain a yolk sac .

Molar pregnancy is the most common gestational trophoblastic disease. It results from the fecundation of a single egg with no active nucleus, which means all the chromosomes present in the hydatidiform mole are paternal (**Ross et al.,2018**). Complete mole was diagnosed in 1 patient (1.7%) which is less than those found in similar studies .Ultrasound examination showed a heterogeneous echogenic endometrial mass with multiple variable-sized cysts (''Swiss cheese'' or ''snowstorm'' endometrium) and no visible embryo .

US performed at 11–14 weeks gestation, along with NT measurement and a detailed anatomic survey, can play an important role in early diagnosis of fetal chromosomal anomalies (**Yousef et al 2020**)

Kagan et al   have shown that a complete anatomic survey is possible in 95% of fetuses at 12–14 weeks' gestation, using transabdominal US in all cases and transvaginal US in 20% of cases. They also reported that If fetal structural defects are detected or if the NT thickness is increased, an amniocentesis should be offered

During our study, in 2 fetuses with GA of 12+6d and 13 weeks , NT was thickened where in the second case a cystic hygroma was also detected .Nasal bones was not seen   in one case and hypoplastic in the second case . Amniocentesis was performed and aneuploidy was confirmed.

Mirsafaie et al reported that ultrasound is a key component of aneuploidy screening. Nuchal translucency (NT) can be assessed in the first trimester. NT reflects the subcutaneous fluid-filled space between the back of the fetal neck and the overlying skin. There is an association between increased NT measurement and risk of aneuploidies, including Down Syndrome, with the detection rate for Down Syndrome being 64-70%. A nuchal cystic hygroma represents pathologic nuchal edema and is associated with aneuploidy, including Down Syndrome, in about 50% of cases.   A hypoplastic or absent nasal bone can be detected in the first trimester in 62-70% of fetuses with Down Syndrome, but is present in only 1% of normal fetuses.

Sonographers are responsible for safety of ultrasound and should be aware that intense ultrasound could damage embryonic tissue. Since the main biological effect of ultrasound absorption in tissue is an increase of temperature (thermal effect), users of diagnostic ultrasound should be familiar with the ultrasonic intensity of their machines and with methods to prevent possible thermal hazards to the embryo (**Kennedy and Woodward 2019).**

On the screen of all modern machines, the thermal index (TI) of any scanning activity is continuously displayed. TI 1 stands for 1°C temperature elevation above 37°C and, for example, TI 3 means a temperature rise of 3° from 37°C to 40°C in the tissue. The important item in diagnostic Doppler ultrasound is the duration of exposure.These values were taken into account when assessing first trimester pregnancies (**Antsaklis etal.,2019).** During our study, great care was taken in scanning febrile patients where the basic temperature is higher than 37°C, regarding exposure time.

During our study, when Doppler ultrasound was performed, the displayed thermal index (TI) was followed on the US screen to be ≤ 1.0 and exposure time was kept as short as possible (usually no longer than 5–10 min).According to **ISUOG (2021)** statement on the safe use of Doppler for fetal ultrasound examination in the first 13 + 6 weeks of pregnancy . If use of Doppler is clinically indicated, then the exposure time should be kept to a minimum.

Conclusion: Bleeding in the first trimester pregnancies is a very common obstetrical problem,. It is a source of anxiety both to the patients and the obstetrician. Absence of large

subchorionic hematoma (involving > 2/3 of the chorionic surface), normal FHR (>110b/m) and good subtrophoblastic circulation (RI<0.55) are good sonographic indicators for the prediction of outcome in women with threatened miscarriage.

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