



ORIGINAL ARTICLE

The Role of Ultrasonography in Evaluating Fetal Outcome in Cases of Threatened Miscarriage

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Submit Date 12-02-2023

Revise Date 03-04-2023

Accept Date 14-04-2023



ABSTRACT

Background: The aim of this study was to examine the usefulness of ultrasound examination for assessing fetal outcomes following threatened miscarriage .**Methods:** This prospective single-center study included 400 pregnant females. Patients were enrolled from the outpatient clinic of the Department of Obstetrics and Gynecology and followed up with regular ultrasound examination. The association of ultrasound parameters with fetal outcomes were analyzed. **Results:** Adverse fetal outcomes were more common in cases with abnormal findings especially increased nuchal translucency at 13 weeks gestation in about 13% of cases ($P \leq 0.001$). Fetal tricuspid valve flow at 13 weeks gestation in about 3.9% of cases ($P = 0.031$). Fetal ductus venosus flow at 13 weeks gestation (A-wave) in about 11% of cases ($P \leq 0.001$). Maternal artery Doppler (notch) at 22-24 weeks gestation in about 12% of cases ($P \leq 0.001$). Abnormal umbilical A Doppler at 26-28 weeks gestation in about 24.9% of cases ($P \leq 0.001$). There were no adverse fetal outcomes in cases with normal findings during follow-up by ultrasound and Doppler .**Conclusions:** Close follow-up of women presenting with first trimester vaginal bleeding might help identify cases likely to have adverse fetal outcomes.

Keywords:Threatened miscarriage, Ultrasound parameters,Fetal outcomes.

INTRODUCTION

Every day about 800 women die around the world from pregnancy and childbirth-related complications. Mortality is higher in developing countries, especially in rural areas and among poorer communities [1]. The most common cause of mortality is severe bleeding; other causes include infection, unsafe abortion, eclampsia, obstructed labor,

ectopic pregnancy and systemic illnesses such as anaemia, heart disease and malaria[2].Bleeding occurs in 15%-25% of all pregnancies [3,4], the common causes being ectopic pregnancy, molar pregnancy and miscarriage [5].

Threatened miscarriage is defined as bloody vaginal discharge or bleeding through a closed cervical os during the first half of pregnancy after confirmation of fetal cardiac

pulsation by Ultrasound [6,7]. In addition to bleeding, patients may complain of lower abdominal pain for hours to days, low backache, and suprapubic discomfort. In threatened miscarriage, the outcome pregnancy is difficult to predict [8,9].

Ultrasound examination can ascertain the viability of the fetus, the site of insertion of the placenta, and the presence of subchorionic hematoma (which is present in 14%-33% of cases) [10,11]. About 50% of cases of threatened miscarriage end in pregnancy loss, but the risk is substantially lower if Doppler ultrasound shows fetal cardiac activity [12,13]. Treatments used for threatened miscarriage include bed rest, restriction of sexual intercourse and drug therapy (progesterone and human chorionic gonadotropin); however, most obstetricians favor a "wait and see" approach [9,14]. Continued bleeding will result in poor maternal and fetal outcomes. This prospective study aimed to evaluate the usefulness of follow-up with routine ultrasound and Doppler study for assessing fetal outcomes in patients presenting with threatened miscarriages.

METHODS

This prospective observational study was conducted from June 2020 to December 2021. A total of 400 pregnant women were enrolled from the outpatient clinic of the Department of Obstetrics and Gynecology, Muhammad Saleh Basharahil Hospital, Holly Makkah Saudi Arabia. Patients were eligible for inclusion if they were in the age range of 20–40 years; they had pregnancy confirmed by positive pregnancy test, were attending outpatient clinic due to bleeding suggestive of threatened miscarriage and fetal cardiac pulsation was confirmed by Ultrasound. Patients were excluded as emergencies, multiple pregnancy, concurrent

chronic diseases such as hypertension, diabetes mellitus and cardiac disease. Detailed history was elicited for each patient and a thorough general and obstetric examination was performed. Maternal age, gravidity, parity, and gestational age at onset of bleeding were recorded. Ultrasound examination was performed at enrollment to assess fetal gestational age and confirm presence of fetal cardiac pulsation. Subsequently, follow-up Ultrasound and Doppler imaging were performed at the following time-points:

At 13 weeks gestation for assessment of nuchal translucency and maternal uterine artery

flow, fetal ductus venosus flow, blood flow through the fetal tricuspid valve. At 22-24 weeks gestation for assessment of maternal uterine artery flow. At 26-28 weeks gestation for assessment of umbilical artery flow.

During follow-up maternal complications (preeclampsia, antepartum hemorrhage, premature rupture of membrane, preterm labor) and fetal complications (IUGR, IUD, admission to NICU, perinatal mortality) were recorded. Gestational age at birth and the method of birth were also noted.

This study was approved by scientific and the Ethics Committee of Muhammad Saleh Basharahil Hospital. Written informed consent obtained from all patients at enrollment.

Statistical analysis

Data were analyzed using the Statistical Package of Social Science (SPSS) program for Windows (Standard version 21). The normality of data was first tested with one-sample Kolmogorov-Smirnov test. Qualitative data were described using number and percent. Association between categorical

variables was tested using Chi-square test and Fischer exact test were used when expected cell count less than 5 while paired groups were compared by Mc nemar test. Continuous variables were presented as mean \pm SD (standard deviation). Significant variables on univariate analysis entered into Logistic regression model using enter statistical technique to predict the most significant determinants and to control for possible interactions and confounding effects. Level of significance: For all above mentioned statistical tests done, the threshold of significance fixed at 5% level ($p > 0.05$) and significant when the probability of error is less than 5% ($p \leq 0.05$). (The smaller the p-value obtained, the more significant are the results).

RESULTS

In the study cohort of 400 patients presenting with threatened miscarriage.

Table 1: show characteristics of the included patients, pregnancy loss occurred in 29.75% of cases, complete pregnancy occurred in 70.25%, complicated pregnancy 97.86% , maternal age was not significantly associated with risk of maternal complications. The proportions of patients having vaginal delivery and cesarean section were not significantly different.

Table 2: show fetal outcome .Fetal outcomes in this study 60% of cases where pregnancy continued to full-term .Preterm delivery was the most frequent fetal complication (39.8%), followed by IUGR (13.9%) and IUFD (3.2%)

,NICU admission occurred in about 1.06% of cases, perinatal death were 1.06%

Table 3: show follow-up ultrasound and pulsed Doppler findings .Normally, EDN in maternal uterine artery doppler study persists till 18-22 weeks gestation. EDN was present in all cases at 13 weeks gestation and in 12% of cases at 22-24 weeks gestation, most of whom developed IUGR and preeclampsia. Fetal nuchal translucency measured at 13 weeks gestation revealed normal thickness (2.5-3 mm) in 50.5% of cases. Thickness was increased in 13.1% of cases. Fetal ductus venosus flow at 13 weeks gestation revealed normal wave form in 90% of cases and abnormal wave form in about 11% of cases. Abnormal fetal tricuspid valve flow at 13 weeks gestation was detected on doppler ultrasound in about 3.9% of cases .Abnormal umbilical artery flow at 26-28 weeks gestation was detected in about 24.9% of cases

Table 4: show the relationship between ultrasound /Doppler findings and adverse fetal outcome .The factors significantly associated with adverse fetal outcomes included abnormal nuchal translucency at 13 weeks gestation ($P < 0.001$), fetal ductus venosus flow at 13 weeks gestation ($P < 0.001$), maternal uterine artery Doppler at 22-24 weeks gestation ($P < 0.001$), umbilical artery flow at 26-28 weeks gestation ($P < 0.001$) and fetal tricuspid valve flow at 13 weeks gestation ($P = 0.031$), maternal uterine artery flow at 13 weeks gestation was not associated with fetal outcome .

Table 1: Characteristics of the patients (n=400)

Parameters		(%)
Age, years	29.92 ± 6.04	
Primigravida	183	45.75%
Multipara	217	54.25%
Gestational age (weeks) at miscarriage onset	17.68 ± 1.45	
Complete miscarriage	119.01 ± 1.05	29.75%
Complete pregnancy	281.68 ± 1.75	70.25%
Complicated pregnancy	275.02 ± 1.03	97.86%
Non-complicated pregnancy	8	2.14%
Gestational age at delivery, weeks	37.58 ± 0.78	
Mode of delivery		
-Vaginal delivery	168	59.8%
- Cesarean section	113	40.2%

Table 2: Fetal outcome

Fetal outcome	n	%
Full-term	169	60.1%
Preterm	112	39.8%
IUGR	39	13.9%
IUFD	9	3.2%
NICU admission	3	1.06 %
Perinatal death	3	1.06%
Shoulder dystocia	0	0%

Table 3: Follow-up ultrasound and pulsed Doppler finding

Abnormal finding	n	%
Nuchal translucency at 13 weeks	37	13.1
Fetal tricuspid valve flow at 13 weeks (TR)	11	3.9
Fetal ductus venosus flow at 13 weeks (A-wave)	31	11
Maternal uterine artery Doppler (EDN) at 22-24 weeks	34	12
Umbilical artery Doppler at 26-28 weeks	70	24.9

Table 4: Relationship between ultrasound /Doppler findings and adverse fetal outcome

Findings	Yes	No	X ²	P
Nuchal translucency at 13 weeks	37	244	118.7	<0.001*
Fetal tricuspid valve flow at 13 weeks(TR)	11	270		0.031*
Fetal ductus venosus flow at 13 weeks(A-wave) ^a	31	239	23.51	<0.001*
Maternal uterine artery Doppler (EDN)at 13 weeks	0	281	-	-
Maternal uterine artery Doppler (EDN) at 22-24 weeks ^a	34	236	27.71	<0.001*
Umbilical artery Doppler at 26-28weeks	70	211	53.34	<0.001*

DISCUSION

Threatened miscarriage has multiple effects on the mother and fetus. Poor maternal outcomes

Include preterm labor, preeclampsia, preterm premature rupture of membranes (PPROM), placenta previa and placental abruption, while poor fetal outcomes include intrauterine growth restriction (IUGR), low birth weight baby, NICU admission and fetal or neonatal death [15,16].This study was performed to evaluate the usefulness of regular ultrasound and Doppler examination for identifying cases likely to have adverse outcome.

In this cohort study of 400 patients presenting with threatened miscarriage, pregnancy loss occurred in 29.75% of cases; this is consistent with the study of Patel et al [13],in which miscarriage occurred in 34% of patients. In the study by Barik et al [16],threatened preterm labor occurred in 53% of patients and 39.8% of patients actually progressed to preterm labor.

In previous studies, PROM/PPROM occurred in 23.1%–36.0% of patients[3,12,13,15,16]. In our cohort, placental abruption occurred in 12.1% of patients; this figure is close to that reported by Amirkhani et al [5] but only about half of that reported by Rai et al [3]and Patel

et al [13]. Preeclampsia and placenta previa occurred in about 5.7% and 3.9% of patients, respectively in our study. These figures are close to those reported by Patel et al [13] but lower than those reported by Rai et al.³ and Rao et al [15]. In the present study, maternal age was not significantly associated with risk of maternal complications. The proportions of patients having vaginal delivery and cesarean section were not significantly different.

Fetal outcomes in this study were similar to those in the studies done by Rai et al [3], Barik et al [16] and Patel et al [13]. In the 60% of cases where pregnancy continued to full-term, no fetal complications occurred; this is consistent with the study by Rai et al.³ but higher than studies by Lewis et al.¹⁷ and Patel et al [13]. Preterm delivery was the most frequent fetal complication (39.8%), followed by IUGR and IUFD as in the studies done by Lewis et al [17] and Rai et al [3]. The proportion of preterm deliveries was higher in the study by Rao et al [16]. NICU admission occurred in about 1.06% of cases; this rate was higher than in the studies by Lewis et al [17], Rai et al and Patel et al [13].

Maternal complications (threatened preterm labor, PROM, PET, and heavy bleeding) were significantly more common in cases with adverse fetal outcomes than in cases without adverse fetal outcomes. However, maternal age, parity, previous history of miscarriage, and previous history of first-trimester vaginal bleeding were not significantly different between the two groups.

Normally, EDN in maternal uterine artery Doppler study persists till 18-22 weeks gestation. Persistence beyond this is considered a risk factor for some pathological conditions, especially preeclampsia and IUGR [18]. In the present study, EDN was present in

all cases at 13 weeks gestation and in 12% of cases at 22-24 weeks gestation, most of who developed IUGR and preeclampsia.

Fetal nuchal translucency measured at 13 weeks gestation revealed normal thickness (2.5-3 mm) in 50.5% of cases. Thickness was increased in 13.1% of cases. Increased nuchal thickness may be associated with older maternal age or positional or cardiac causes as reported by Sharifzadeh et al [19]. Increased nuchal thickness does not by itself indicate an abnormal fetus, but it is important supportive evidence, especially in association with other markers such as maternal serum B-HCG, alpha-fetoprotein, PAPP-A, Inhibin-A and estriol levels and karyotyping [19,20].

Fetal ductus venosus flow at 13 weeks gestation revealed normal wave form in 90% of cases

and abnormal wave form in about 11% of cases. Most of the latter cases developed IUGR later in Pregnancy [21] suggesting that ductus venosus flow could be used to predict IUGR in women with first trimester vaginal bleeding. Abnormal fetal tricuspid valve flow at 13 weeks gestation was detected on Doppler ultrasound in about 3.9% of cases. Abnormal flow could be due to various causes so it has no abnormal umbilical artery flow at 26-28 weeks gestation was detected in about 24.9% of cases, most of which later were complicated by IUGR and preterm labor [22]. Thus, the factors significantly associated with adverse fetal outcomes included abnormal nuchal translucency at 13 weeks gestation ($P < 0.001$), fetal ductus venosus flow at 13 weeks gestation ($P < 0.001$), maternal uterine artery Doppler at 22-24 weeks gestation ($P < 0.001$), umbilical artery flow at 26-28 weeks gestation ($P < 0.001$), and fetal tricuspid valve flow at 13 weeks gestation ($P = 0.031$), maternal uterine artery flow at 13 weeks

gestation was not associated with fetal outcome. In logistic regression analysis, the independent predictors of adverse fetal outcome were abnormal umbilical artery flow 26-28 weeks gestation, threatened preterm labor, poor nuchal translucency at 13 weeks gestation, and moderate to heavy bleeding during presentation.

CONCLUSIONS

Routine ultrasound and Doppler study can help predict adverse fetal outcome in women presenting with threatened miscarriage. Parameters with predictive value are maternal uterine artery blood flow at 13 weeks gestation and at 22-24 weeks gestation, fetal ductus venosus flow at 13 weeks gestation, nuchal translucency at 13 weeks gestation, and umbilical artery flow at 26-28 weeks gestation. Thus, women presenting with first trimester vaginal bleeding should be followed up carefully with regular ultrasound and Doppler examination, with special attention paid to the identified risk factors.

Conflict of interest

The author of this manuscript declare no relevant conflicts of interest and no relationships with any companies, whose products or services may be related to the subject matter of the article.

Financial disclosures: no financial support or interest in this manuscript.

Declaration of interest : The author declares that they have no known competing financial interest or personal relationships that could have appeared to influence the work reported in this work.

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Citation:

MOHAMED, E., Abdelfatah, H. : Ultrasound for evaluating fetal outcome after threatened Miscarriage. *Zagazig University Medical Journal*, 2024; (3000-3007): -. doi: 10.21608/zumj.2023.193369.2748