ORIGINAL RESEARCH PAPER

Radio-Diagnosis

ASSOCIATION OF MID-TRIMESTER UTERINE ARTERY DOPPLER WITH ADVERSE PERINATAL OUTCOMES

KEY WORDS: Uterine artery Doppler, Perinatal outcome, IUGR, Preterm delivery

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ABSTRACT

Background: Abnormal placentation leads to increased uteroplacental vascular resistance, which can be assessed non-invasively using uterine artery Doppler. While uterine artery Doppler has been widely studied for prediction of pre-eclampsia, its role in predicting adverse perinatal outcomes remains clinically relevant. **Aim:** To evaluate the association between mid-trimester uterine artery Doppler findings and adverse perinatal outcomes. **Materials And Methods:** This prospective observational study included 155 pregnant women between 13 and 24 weeks of gestation. Bilateral uterine artery Doppler was performed, assessing pulsatility index (PI), resistance index (RI), and presence of early diastolic notch. Patients were followed until delivery. Adverse perinatal outcomes assessed included intrauterine growth restriction (IUGR), preterm delivery, low birth weight, and NICU admission. Statistical analysis was performed using Chi-square test, with $p < 0.05$ considered significant. **Results:** Out of 155 cases, 46 (29.7%) showed abnormal uterine artery Doppler findings. Adverse perinatal outcomes were significantly more common in pregnancies with abnormal Doppler. IUGR was seen in 18 (39.1%) cases with abnormal Doppler compared to 11 (10.1%) cases with normal Doppler ($p < 0.001$). Preterm delivery and low birth weight were also significantly associated with abnormal uterine artery Doppler. **Conclusion:** Mid-trimester uterine artery Doppler is a useful screening tool for identifying pregnancies at risk for adverse perinatal outcomes and can help in risk stratification and closer antenatal surveillance.

INTRODUCTION

Adverse perinatal outcomes such as intrauterine growth restriction, preterm birth, and low birth weight remain major contributors to neonatal morbidity and mortality worldwide [4]. A significant proportion of these complications are related to placental insufficiency resulting from abnormal trophoblastic invasion of the maternal spiral arteries [5].

Uterine artery Doppler performed during the mid-trimester provides an indirect assessment of uteroplacental circulation. Increased resistance indices and the presence of early diastolic notch reflect impaired placentation and reduced uterine blood flow [6]. Although uterine artery Doppler has been extensively studied for prediction of pre-eclampsia, several studies have also demonstrated its association with adverse perinatal outcomes such as fetal growth restriction and preterm birth [7,8].

Early identification of pregnancies at risk allows timely referral, closer antenatal monitoring, and appropriate intervention, thereby potentially improving perinatal outcomes, especially in low-resource settings [9]. The present study was undertaken to assess the relationship between mid-trimester uterine artery Doppler findings and adverse perinatal outcomes.

MATERIALS AND METHODS

Study Design And Setting

Prospective observational study conducted at a tertiary care teaching hospital.

Study Period

This prospective observational study was conducted between November 2024 and January 2026 at a tertiary care teaching hospital.

Study Population

A total of **155 pregnant women** between **13 and 24 weeks of gestation** were included.

Inclusion Criteria

- Singleton pregnancy
- Gestational age 13–24 weeks
- Informed consent obtained

Exclusion Criteria

- Multiple gestation
- Known chronic hypertension
- Diabetes mellitus
- Renal or autoimmune disorders

Doppler Technique

Uterine artery Doppler was performed using transabdominal ultrasound. The uterine artery was identified at its crossover with the external iliac artery. Doppler parameters assessed included:

- Pulsatility Index (PI)
- Resistance Index (RI)
- Presence of early diastolic notch

Mean values of bilateral uterine arteries were considered. Doppler findings were considered abnormal if PI or RI was above the 95th percentile for gestational age and/or if early diastolic notch was present [6,7].

Follow-up And Outcome Measures

All patients were followed until delivery. The following adverse perinatal outcomes were recorded:

- Intrauterine growth restriction (IUGR)
- Preterm delivery (<37 weeks)
- Low birth weight (<2.5 kg)
- NICU admission

Statistical Analysis

Categorical variables were analyzed using Chi-square test. A p-value <0.05 was considered statistically significant.

Ethical Clearance

Approval was obtained from the Institutional Ethics Committee.

RESULTS

Out of 155 pregnancies studied, **46 (29.7%)** showed abnormal

uterine artery Doppler findings, while **109 (70.3%)** had normal Doppler.

Table 1: Distribution Of Uterine Artery Doppler Findings

Doppler finding	Number	Percentage
Normal	109	70.3%
Abnormal	46	29.7%

Interpretation:
Table 1 shows that out of 155 pregnancies evaluated during the mid-trimester, 46 cases (29.7%) demonstrated abnormal uterine artery Doppler findings, while the majority, 109 cases (70.3%), had normal Doppler parameters. This indicates that nearly one-third of the study population exhibited evidence of increased uteroplacental vascular resistance, highlighting a substantial proportion of pregnancies potentially at risk for placental insufficiency.

Table 2: Association Of Uterine Artery DopplerWith IUGR

Doppler	IUGR present	IUGR absent	Total
Normal	11	98	109
Abnormal	18	28	46
p-value			<0.001

Interpretation:
Table 2 demonstrates a strong association between abnormal uterine artery Doppler findings and the occurrence of intrauterine growth restriction. IUGR was observed in 18 out of 46 cases (39.1%) with abnormal Doppler, compared to only 11 out of 109 cases (10.1%) with normal Doppler findings. This difference was statistically significant ($p < 0.001$), suggesting that abnormal uterine artery Doppler during the mid-trimester is a significant predictor of fetal growth restriction.

Table 3: Association Of Uterine Artery DopplerWith Other Perinatal Outcomes

Outcome	Normal Doppler (n=109)	Abnormal Doppler (n=46)	p-value
Preterm delivery	14 (12.8%)	16 (34.8%)	<0.01
Low birth weight	21 (19.3%)	18 (39.1%)	<0.01
NICU admission	12 (11.0%)	15 (32.6%)	<0.01

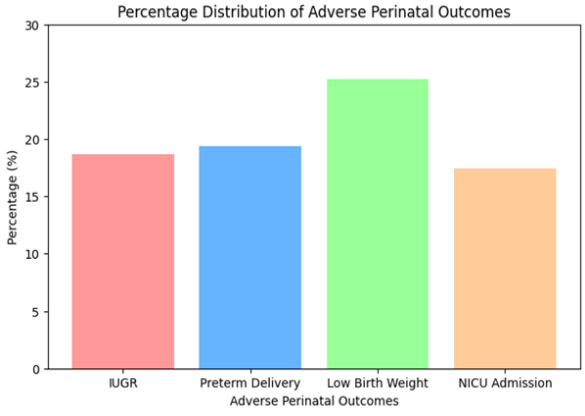

Figure 3. Percentage Distribution Of Adverse Perinatal Outcomes In The Study Population.

The bar chart illustrates the proportion of intrauterine growth restriction, preterm delivery, low birth weight, and NICU admission observed in the study cohort.

Overall Interpretation:
Pregnancies with abnormal uterine artery Doppler findings showed a significantly higher incidence of adverse perinatal outcomes compared to those with normal Doppler. The increased rates of IUGR, preterm delivery, low birth weight, and NICU admission indicate that abnormal mid-trimester uterine artery Doppler reflects underlying placental insufficiency and is associated with compromised perinatal outcomes.

DISCUSSION

The present study demonstrates a significant association between abnormal mid-trimester uterine artery Doppler findings and adverse perinatal outcomes. Nearly one-third of the study population showed abnormal Doppler parameters, and these pregnancies had a higher incidence of IUGR, preterm delivery, and low birth weight.

Abnormal uterine artery Doppler reflects increased uteroplacental vascular resistance due to defective trophoblastic invasion, leading to placental insufficiency and compromised fetal growth [5,6]. Similar findings have been reported in previous studies, which showed that elevated uterine artery PI and presence of diastolic notch are associated with increased risk of fetal growth restriction and preterm birth [7,8,11].

The findings of the present study highlight the clinical utility of uterine artery Doppler as a simple, non-invasive screening tool for early identification of high-risk pregnancies. Incorporation of uterine artery Doppler into routine mid-trimester ultrasound evaluation may help in improved risk stratification and targeted antenatal care [9,12].

CONCLUSION

Mid-trimester uterine artery Doppler shows a significant association with adverse perinatal outcomes such as IUGR, preterm delivery, and low birth weight. Its use as a screening tool can aid in early identification of high-risk pregnancies and facilitate closer antenatal surveillance.

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Conflict of Interest: The authors declare no conflict of interest.

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