

## **DOPPLER STUDY IN 1ST AND 2ND TRIMESTER ON UTERINE AND UMBILICAL ARTERIES TO PREDICT HYPERTENSIVE DISORDERS OF PREGNANCY AND IUGR.**

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### **Abstract:**

#### **Background and objectives:**

Complications during pregnancy are frequently associated with adverse outcomes for the mother and foetus. These complications may result from preexisting maternal conditions and prior obstetric complications. A higher risk of developing intrauterine growth restriction, Hypertensive disorder is associated with impaired trophoblastic invasion of the maternal spiral arteries. The objective of study is the to predict this complication of hypertensive disorder and IGUR in 1<sup>st</sup> and 2<sup>nd</sup> trimester pregnancy by using Doppler study on uterine and umbilical arteries.

#### **Method:**

This study on Uterine and umbilical arteries Doppler Ultrasound assessment among pregnant women in 1<sup>st</sup> and 2<sup>nd</sup> trimester to predict hypertensive and IUGR disorder, There were a total of 200 women enrolled in the study, same 1<sup>st</sup> trimester pregnant women continuation with 2<sup>nd</sup> trimester for Doppler study. Data were obtained from 200 registered patients attending prenatal OPD in hospitals between 1<sup>st</sup> and 2<sup>nd</sup> trimester.

#### **Results:**

In the present study we found that **Uterine artery Doppler RI: 12%, PI: 10 %, S/D: 12 % in first trimester, and Uterine artery Doppler RI: 38%, PI: 34 %, S/D: 38 %, ED Notch: 18 % in 2<sup>nd</sup> trimester and 15 %** of women had raised SBP and DBP Of the total 200 pregnant women.

#### **Conclusion:**

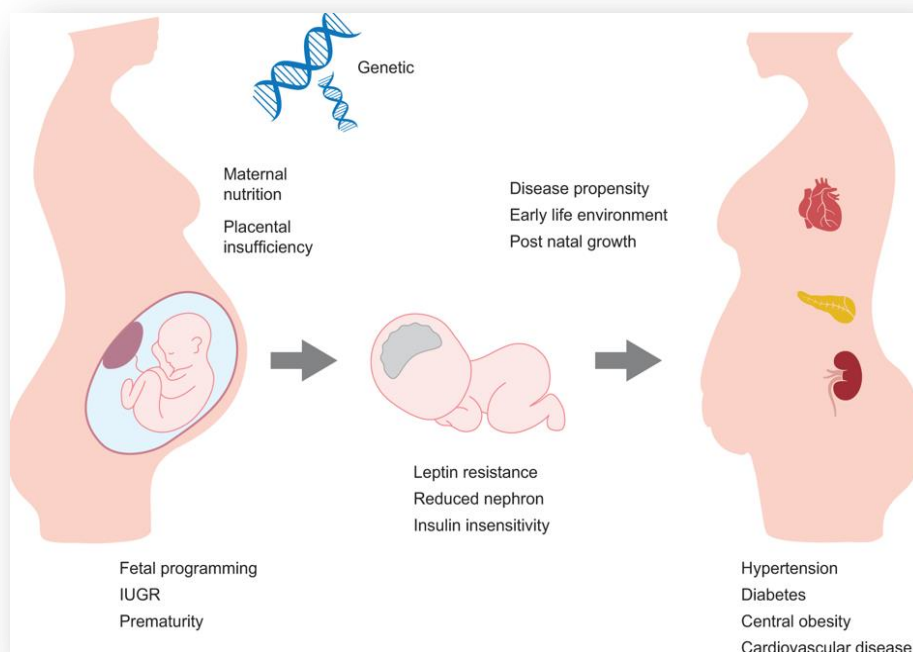
Uterine and umbilical artery Doppler has potential. Clinicians would have the chance to stop the condition before it shows clinical symptoms by implementing an ultrasound screening programme in high-risk pregnant mothers.

**Keywords:** Doppler, uterine artery, umbilical artery, pregnancy

### **Introduction:**

Pregnancy complications are frequently associated with a negative outcome for the mother and foetus. Such complications may be the result of preexisting maternal conditions and previous obstetric complications [1-2]. Other factors include maternal social and

anthropometric characteristics as well as health issues (pregnancy-induced hypertension, preeclampsia, and gestational diabetes) diagnosed during pregnancy, labour, and delivery [3-4]. Other problems that can happen when the placenta doesn't work right are preeclampsia, placental abruption, intrauterine growth restriction, and oligohydramnios [5]. These problems can lead to the death of both the mother and the baby. According to some studies, certain complications that occur later in pregnancy have their roots in the earlier stages of gestation. These complications include abnormal blood flow in the uterine arteries during the first trimester of pregnancy, as well as the occurrence of hypertensive disorders and low birth weight (LBW) [6-7]. Impaired trophoblastic invasion of the maternal spiral arteries is linked to an increased risk of developing intrauterine growth restriction, preeclampsia, and placental abruption [8]. Recent studies have suggested that it may be more beneficial to identify an abnormal Doppler waveform during the first trimester and then treat the condition with a low dose of aspirin rather than wait until the second trimester to evaluate these vessels[9-13]. The main problem with abnormal blood flow in the uterus is that it increases the risk of preeclampsia in the last stages of the second and third trimesters of pregnancy. This problem lasts for the whole pregnancy. Since Fitzgerald and Drumm's initial report of signals from the umbilical artery, Doppler techniques have been the centre of interest and research in obstetrics [14-16]. It has been assumed for a very long time that insufficient uterine, placental, and foetal circulation result in negative pregnancy outcomes and that these abnormalities can be identified by Doppler ultrasonography. Pregnancies complicated by hypertension and intrauterine development constraints result in a decrease in uteroplacental blood flow (IUGRs). This decrease is associated with a pathologic condition of spiral arteries, which is believed to arise during placentation in the first trimester of pregnancy. Therefore, it may be possible to predict the development of these circumstances by assessing uteroplacental blood flow early during pregnancy using colour Doppler. Doppler ultrasonography examination of the fetoplacental and uteroplacental circulations seems promising for the management of difficult pregnancies. Doppler examination of the uteroplacental circulation revealed a decrease in peripheral resistance throughout early pregnancy,



**Figure 1: complication during pregnancy**

#### Materials and Methods:

This study on Uterine and umbilical arteries Doppler Ultrasound assessment among pregnant women in 1<sup>st</sup> and 2<sup>nd</sup> trimester to predict hypertensive and IUGR disorder, There were a total of 200 women enrolled in the study, same 1<sup>st</sup> trimester pregnant women continuation with 2<sup>nd</sup> trimester for Doppler study. Data were obtained from 200 registered patients attending prenatal OPD in hospitals between 1<sup>st</sup> and 2<sup>nd</sup> trimester.

#### Inclusion criteria:

1. Pregnancy with a single baby
2. 1<sup>st</sup> and 2<sup>nd</sup> trimester pregnancy
3. Pregnant ladies who gave valid consent were included

#### Exclusion criteria:

1. 3<sup>rd</sup> trimester pregnancy
2. Pregnant ladies who didn't give valid consent were excluded.

#### Method:

An ultrasonographic examination was carried out with a GENERAL ELECTRIC LOGIQ P5 ultrasound scanner, which was equipped with a curved array transabdominal transducer operating at 3.5–5.0 MHz [17-18]. All individuals underwent a baseline obstetric scan to exclude foetal abnormalities and multiple pregnancies at recruitment. In addition, a Doppler ultrasonography examination of the uterine and umbilical arteries was carried out during the first and second trimesters of pregnancy. This examination was carried out in a semirecumbent position with a slight lateral tilt to prevent the gravid uterus from compressing the inferior vena cava. Following the method described by Bramham et al., the colour Doppler mode was utilised in order to locate the uterine artery at the point where it crosses the external iliac artery. Pulsed wave Doppler was then employed after the Doppler

scanning parameters were determined to be as follows: wall filter of 50–60 Hz, angle of insonation below 20, and a gate size of 2 mm over the uterine artery at approximately 1 cm below the crossover point to form the spectral wave pattern.

A free loop of the umbilical cord was found during the Doppler examination of the umbilical artery, which was performed when there was neither foetal movement nor uterine contraction. Doppler interrogation of the umbilical artery using the colour and pulsed wave generated the spectrum waveform in accordance with the method of Bramham et al. and the International Society of Ultrasound in Obstetrics and Gynecology. Automatic tracing was applied to trace the generated uterine and umbilical artery spectral waveform; however, human tracing was also utilised in appropriate instances.

### Results:

Doppler scans were performed second and third-trimester pregnancies, respectively

**Table 1: Uterine Artery Doppler – First-Trimester**

Doppler findings		Frequency	Percentage
Uterine artery RI	Normal	188	188
	Abnormal	12	12
	Total	200	200
Uterine artery PI	Normal	190	190
	Abnormal	10	10
	Total	200	200
Uterine artery S/D	Normal	188	188
	Abnormal	12	12
	Total	200	200

**Uterine artery RI: 12% abnormal**

**Uterine artery PI: 10 % abnormal**

**Uterine artery S/D: 12 % abnormal**

**Table 2: Uterine Artery Doppler – Second Trimester**

Doppler findings		Frequency	Percentage
Uterine artery RI	Normal	162	162
	Abnormal	38	38
	Total	200	200
Uterine artery PI	Normal	166	166
	Abnormal	34	34
	Total	200	200
Uterine Artery ED Notch	NO	182	182
	YES	18	18
	Total	200	200
Uterine artery S/D	Normal	162	162
	Abnormal	38	38
	Total	200	200

**Uterine artery RI: 38% abnormal**

**Uterine artery PI: 34 % abnormal**

**Uterine artery S/D: 38 % abnormal**

**Uterine Artery ED Notch: 18 % abnormal**

**Table 3: Blood pressure frequency in study**

Blood pressure		Frequency	Percentage
SBP	<140	175	85
	>140	25	15
DBP	<90	175	85
	>90	25	15

**Table 4: Umbilical Artery SD Ratio**

Umbilical Artery RI	No of cases	Percentage
<0.70	151	36.77
>0.70	49	172.33
Total	200	200

**Table 5: Umbilical Artery Resistance Index**

Sensitivity	No of cases	Percentage
No. of cases with positive umbilical artery Doppler	168	168
No. of cases with negative umbilical artery Doppler	32	32
Total	200	200

**Table 6: Uterine artery Doppler in predicting IGUR**

S r n o	INDICE S	TRU E (+) VE	FALS E (-) VE	FALS E (+) VE	TRU E (-) VE	SENSITIVI TY	SPECIFICIT Y	POSITIVE PREDICTI VE VALUE	NEGATIVE PREDICTI VE VALUE
1	S/D ratio	10	30	30	435	25%	94%	28 %	93 %
2	RI	15	25	25	430	37%	93%	33 %	94 %
3	Notch	25	15	45	440	62%	95%	35 %	96 %
4	Combine d	20	20	20	425	50%	90%	50 %	95 %

**Table 7: Uterine artery Doppler in predicting IGUR**

S r n o	INDICE S	TRU E (+) VE	FALS E (-) VE	FALS E (+) VE	TRU E (-) VE	SENSITIVI TY	SPECIFICIT Y	POSITIVE PREDICTI VE VALUE	NEGATIVE PREDICTI VE VALUE
1	S/D ratio	15	20	15	425	25%	94%	40 %	93 %
2	RI	10	30	15	430	42 %	93%	33 %	94 %

4	Combine d	20	25	20	425	50%	90%	50 %	95 %
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**Discussion:**

Maintaining healthy utero-placental circulation is essential for a proper pregnancy since pregnancy is connected with a number of vascular changes in the mother, placenta, and growing baby[19-20]. Negative pregnancy outcomes include IUGR, LBW, and stillbirths are caused by abnormal vascular resistance patterns [21]. By serially assessing the fetoplacental blood flow, umbilical artery Doppler has been used in obstetric care to evaluate pregnancies at risk of poor perinatal outcomes. However, little study has been done on the use of umbilical artery Doppler indices as a screening tool for the prediction of later development of unfavourable pregnancy outcomes in low-risk populations.

Among the 200 pregnant women under study, only 12 pregnant women showed abnormal doppler in First-trimester when 95th percentile is taken as cut off. Among them 12 had abnormal RI, 10 had an abnormal PI, and 12 had an abnormal S/D ratio. All of the Doppler measures used in the study's first trimester have the same sensitivity, and the parameter with the highest specificity and positive predictive value is PI.

When the 95th percentile is used as the cutoff, only 38 of the 200 pregnant women in the study displayed abnormal doppler in the second trimester. Among them, 18 displayed an early diastolic notch, and 38 had abnormal RI, 34 abnormal PI, 38 abnormal S/D ratio.

In Blood pressure frequency in study out of 200 ,15 % womens showed increase SBP and DBP.

Umbilical artery SD ratio was >20 in 200 cases, Umbilical artery RI was >0.70 in 172% of cases. 65% of cases showed changes in umbilical artery Doppler study whereas rest [35%] had no change.

**Conclusion:**

Doppler ultrasound testing has grown to be an effective way to gauge uteroplacental circulation in the early stages of pregnancy and has been proposed as a potential screening tool for the emergence of hypertension, foetal growth restriction (FGR), and IGUR. In order to facilitate future early preventative and treatment actions to promote maternal and newborn health, this study evaluated the prediction of hypertension and IGUR in the first and second trimesters of pregnancy.

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