Section: Miscellaneous

Original Research Article

UTERINE ARTERY DOPPLER VELOCIMETRY IN SUBJECTS WITH PREGNANCY INDUCED HYPERTENSION, A CROSS SECTIONAL STUDY

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Abstract

Background: Pregnancies are complicated by Hypertensive disorders of about 5- 10% and along with hemorrhage, sepsis and fetal growth restriction constitutes a triad contributing to maternal morbidity and mortality. Pregnancy induced hypertension (PIH) is a syndrome of hypertension with or without proteinuria and oedema, occurring when systolic blood pressure is greater than 140mmHg and diastolic blood pressure greater than 90mmHg. **Aims:** To determine the effect of pregnancy induced hypertension on the Doppler parameters of the uterine artery waveform and detect abnormal waveforms like unilateral or bilateral early diastolic notch in uterine artery in study subjects **Materials and Methods:** Hospital based cross-sectional Study was conducted from JANUARY 2023 to JUNE 2024, Department Of Radio-Diagnosis in Collaboration with department of Gynecology and Obstetrics, Burdwan Medical College and Hospital. **Result:** We examined that most of the patients had RT ED NOTCH [67 (67.0%)]. It was statistically significant. Majority of the patients had Bilateral [49 (49%)]. There were 8 individuals with bilateral Notch and 20 patients with unilateral Notch in the PIH group. In moderate preeclampsia, 29 patients exhibited bilateral notch , while 10 individuals exhibited unilateral notch. Out of the11patients diagnosed with severe preeclampsia, 10 had bilateral notch and 1 had unilateral notch. The mean SBP of patients was [150.0200 ± 10.5734], the mean DBP of patients was [95.1111 ±5.8080],the mean GA during Scan (Wk) of patients was [29.0200 ± 2.3005], the mean RT PI of patients was[1.8327 ±.3870],the mean LT PI of patients was[1.8585 ±.4017],the mean RT RI of patients was [.6964 ± .1021], the mean LT RI of patients was [.7009 ± .1120]. **Conclusion:** Uterine artery Doppler velocimetry is a valuable diagnostic tool in managing pregnancies complicated by pregnancy-induced hypertension (PIH). This non-invasive method enables early detection of abnormal blood flow patterns, which are indicative of increased resistance in the uterine arteries. Our study demonstrated a significant correlation between abnormal Doppler readings and adverse pregnancy outcomes, such as preeclampsia, intrauterine growth restriction (IUGR), and preterm delivery. Early identification of at-risk pregnancies allows for closer monitoring, timely interventions, and improved management strategies, potentially mitigating complications associated with PIH. Implementing routine uterine artery Doppler screening in prenatal care protocols for women with PIH can enhance maternal and fetal outcomes by enabling proactive healthcare measures. Continued research and larger studies are recommended to further validate the utility of Doppler velocimetry and refine its application in clinical practice.

INTRODUCTION

Pregnancies are complicated by Hypertensive disorders of about 5- 10% and along with hemorrhage, sepsis and fetal growth restriction constitutes a triad contributing to maternal morbidity and mortality.[1,2] Pregnancy induced hypertension (PIH) is a syndrome of hypertension with or without proteinuria and oedema, occurring when systolic blood pressure is greater than 140mmHg and diastolic blood pressuregreater than 90mmHg.

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Generalized Overview

Hypertension is the most common medical problem encountered during pregnancy, complicating up to 10% of pregnancies. According to NHEPEP and ACOG, hypertension in pregnancy is defined as systolic blood pressure.>140mm of Hg and diastolic blood pressure>90mm of Hg in a previously normotensive woman after 20 weeks of gestation on two occasions 4-6 hours apart. Diastolic blood pressure is the disappearance of sounds (Kortkoff Phase V). Blood pressure should be measured in sitting or inleft lateral position with the arm at the level of heart. An appropriately sized cuff (length 1.5 times the circumference of the arm) should be used. If BP is high in one arm, the arm with the higher value should be used for all BP measurements.

Classification Of Hypertensive Disorders Of Pregnancy: Based on International society for the study of Hypertension in Pregnancy (ISSHP), hypertensive disorders in pregnancy is classified into following types

- Gestational hypertension
- Pre-eclampsia(PE)
- Eclampsia syndrome
- Chronic hypertension–Essential/Secondary
- Preeclampsia Superimposed On chronic hypertension.

Diagnostic criteria of hypertensive disorders complicating Pregnancy

1. Gestationalhypertension

(a) BP>140/90 after 20weeks (b) Proteinuria-Absent

2. Preeclampsia

Hypertension with associated proteinuria > 0.3g/l in a 24 hour urine collection.

Definition: New onset hypertension with BP >/=140/90 mm of Hg with new onset proteinuria after 20weeks in a previously normotensive patient.Edema has beenremoved from the definition .

3. Eclampsia

Seizures that cannot be attributed to other causes in a woman with pre eclampsia.

4. Chronic Hypertension

- BP>/=140/90 before pregnancy.
- ACOG(2013)-released guidelines for diagnostic criteria for PE.
- Mild PE is defined as“PE without severe features”
- Severe PE is defined as “PE with severe features”
- Proteinuria (>5gm) has been eliminated from the list of features defining severe features,
- FGR is removed from the list of features defining severe disease.

Proteinuria

15- 25% of gestational hypertension progress to preeclampsia.

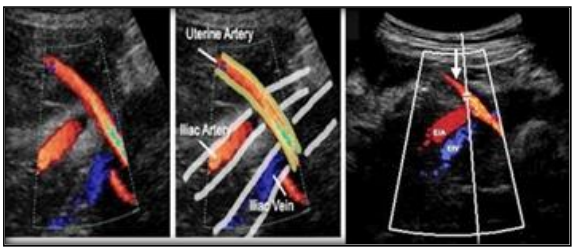
Gross Anatomy of the Uterineartery

Uterine artery originates from internal iliac artery and meets the uterus just above the cervix.

Sonographic Anatomy of the Uterine Artery

The uterine artery is identifiable with colour Doppler ultrasonography and on pulsed wave Doppler mode.

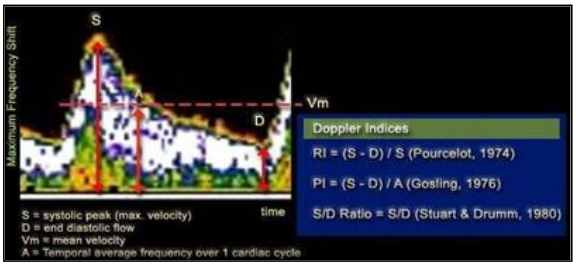
- On pulsed Doppler (PD), the uterine artery waveform is influenced by gestational age and placental location. The uterine artery waveform during the first half of pregnancy shows a physiologic notch in the early diastole signifying high vascular resistance.



Doppler Ultrasound: Doppler ultrasound provides a non-invasive method for the study of fetal hemodyanamics. Investigation of the uterine and umbilical arteries gives information on the perfusion of the uteroplacental and fetoplacental circulation, respectively, while Doppler studies of selected fetal organs are valuable in detecting the hemodyanamic rearrangements that occur in response to fetal hypoxemia.

Doppler velocimetry: Qualitative assessment: Achieved usually by analysing the waveforms or the colour distribution. Quantitative assessment: Allows assessment of velocity.

Semi-quantitative assessment: The relationship between systolic and diastolic components of waveforms is evaluated and angle dependence which is important in quantitative measurements becomes less important. Commonly used indices available on most commercial scanners are



1. Resistance index(RI)
2. Systolic/Diastolic ratio(S/D)
3. Pulsatility index (PI).

UAD In a Normal Pregnancy: The uterine artery blood flow begins to increase in the luteal phase and peaks in the window of implantation25.

In a normal pregnancy, there is no significant change in the uterine artery impedance from 24 weeks to the end of pregnancy.

“Notching” is a relatively common characteristic that appears during the early stages of 46– 64% of normal pregnancies. UtA-PI is preferred as an indicator of vascular impedance with its objective detection.

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Transabdominal or transvaginal ultrasound can detect UAD.

UAD In Recurrent Pregnancy Loss (RPL): RPL refers to two or more pregnancy losses before 20–24 weeks of pregnancy.

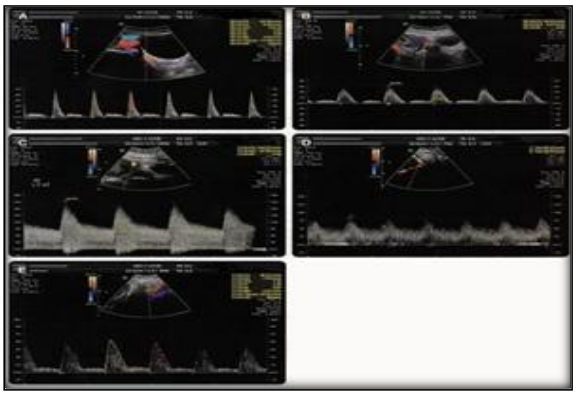
Patients with unexplained RPL (uRPL) had increased uterine artery resistance and decreased sub-endometrial blood flow. UAD and PE/FGR:

PE is a leading cause of maternal and perinatal death in both developed and under-developed countries.

Studies of UAD in the First Trimester: Recently, researchers have increasingly studied the application of UAD in the first trimester.A study considered uterine artery mean PI > 2.35 as the cut-off value for predicting PE or FGR among low-risk pregnant women at 11–14 weeks of gestation.

Studies of UAD in the Second Trimester: It could be beneficial to screen UAD in a high-risk population in the second trimester.

Studies of UAD in the Third Trimester: A comparative analysis of the pregnancy outcomes between normotensive patients with increased UtA-PI and pregnant women with normal uterine artery blood flow at 34 weeks of gestation revealed that pregnant women with increased UtA-PI delivered at earlier gestational weeks, having lower fetal weight, and a higher incidence of SGA infants (P< 0.05). pregna



A-Nonpregnant patient.
B-First trimester.
C-Second trimester,
D-Third trimester
E-Abnormal uterine artery Doppler wave formed demonstrating high resistance

Sequential UAD Screening: A study performed sequential detection of UAD in 870 pregnant women at 11–14 and 19– 22weeks respectively34.Basedon the outcomes, pregnant women with persistently elevated

UtA-PI faced the greatest risk for gestational hypertension and FGR 34.

UAD and Twin Pregnancy: In the first and second trimesters, the UtA-PI of twin pregnant women was significantly lower than that of a single pregnant female. Similarly, in the second trimester, the UtA-RI of twins was markedly lower than that of singletons.

Clinical Implications of Screening UAD: Predicting pregnancy complications in advance allows practitioners to prevent and carryout timely interventions to avoid or lessen the harm to mothers and neonates.

Aims and Objectives

Primary Objective: To determine the effect of pregnancy induced hypertension on the Doppler parameters of the uterine artery wave form.

Secondary Objectives:

1. To detect abnormal wave forms like unilateral or bilateral early diastolic notch in uterine artery in study subjects.
2. To evaluate Pulsatility Index (PI) and Resistance Index (RI)of these wave forms in study populations.

MATERIALS AND METHODS

Study Design: Hospital based cross-sectional Study

Period of Study: From JANUARY 2023to JUNE 2024

Study area: Department of radio-diagnosis in collaboration with department of obstetrics & gynecology, burdwan medical college and hospital

Sample size: Sample size calculated using the formula n=(Zα)2 P(1-P)/d2 Where n is the sample size,

Zα is the standard normal variate at α=0.05level is 1.96,

Pisthe proportion of probable prevalence and disthe absolute precision.

The incidence of pregnancy induced hypertension was found to be 7% from hospital records of previous two years which is I naccordance to various study findings showing an incidence varying from 5 to 15% in different settings [6,7]. Hence P is taken as 7% and d is taken as 5%.

Using the above formula sample size comes out to be approximately

Sampling Technique

Cases were selected by a simple random sampling meeting the inclusion & exclusion criteria.

Inclusion Criteria

Pregnant women with blood pressure of or greater than 140/90 mm Hg on two occasions (at least 4 hours apart) after 20th weeks of gestation in a previous normotensive patient.

Exclusion Criteria

Pregnant women with the following conditions are excluded from the study:

1. Diabetes mellitus.
2. Smokers.
3. Pre-existing Hypertension.
4. Cardiovascular disorders.
5. Multiple gestations.
6. Chronic renal disease.
7. Fetal congenital anomalies.

Study Tools and Imaging Protocols

1. Equipment:

Real time pulsed wave colour flow Doppler velocimetry of B/L Uterine artery was

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performedusing the LOGIQ P9 imaging system (GENERAL ELECTRICALS Healthcare) with suitable probe among.

2. Protocol of doppler measurement:

a. In supine position, the ultrasound transducer is placed in either the left or right iliac fossae of the abdomen, directed towards the lateral uterine walls and downwards into the pelvis, to obtain the sagittal section of the uterus and cervical canal.

b. This is followed by the introduction of the colour flow imaging to produce a colour map of flow over the region. The probe was tilted sideways but still maintaining its medial angulation (lower paracervical area), till the uterine artery was visualized as it crosses the external iliac artery, having originated from the internal iliac artery.

c. The sample volume is placed 1cm distal to the point of apparent cross over before any branching of the uterine arteries and the angle of insonation maintained below 60degree. Pulsed Doppler gate were placed at this location to obtain flow waveforms and when at least 3 consecutive consistent waveforms were produced, the image was frozen.The Doppler indices generated automatically from the machine, the Pulsatility Index (PI), Resistance Index (RI), presence or absence of diastolic notch are recorded and average is calculated.

RESULTS

Table 1: Distribution of Age in group

Age ingroup	Frequency	Percent
≤20	5	5.0%
21-30	84	84.0%
31-40	11	11.0%
Total	100	100.0%

In our study, 5 (5.0%) Patients were ≤20 years of age, 84 (84.0%) Patients were 21-30 years of age and 11 (11.0%) Patients were 31-40 years of age.

The value of zis 11.2405. Thevalue ofp is<.00001. The result is significant at p<.05.

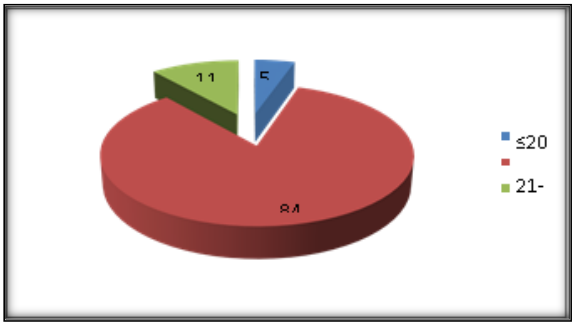

Table2: Distribution of Parity

Parity	Frequency	Percent
Multipara	29	29.0%
Primipara	71	71.0%
Total	100	100.0%

In our study, 29(29.0%) Patients had Multipara and 71(71.0%) Patients had Primipara

The value of z is 5.9397. The value of p is<.00001.The result is significantat p<.05.

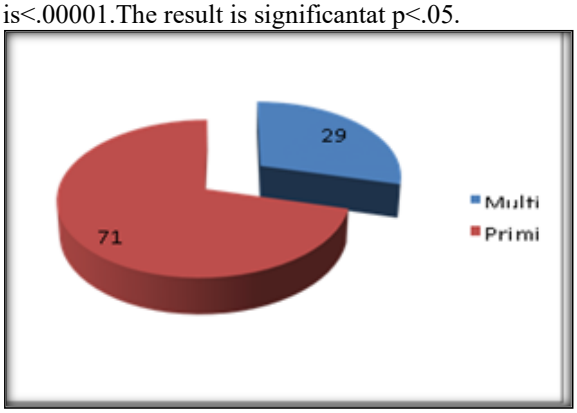

Table 3: Distribution of Urine protein

Urine protein	Frequency	Percent
Absent	48	48.0%
Present	52	52.0%
Total	100	100.0%

In our study, 52(52.0%) Patients had Urine protein Present.

The value of zis 0.5657. The value of pis. 56868. The result is not significant at p<.05.

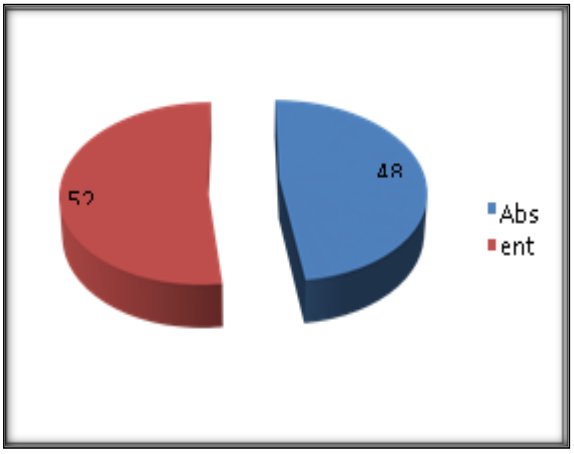

Table 4: Distribution of Previous obstetric H/O

Previous obstetric H/O	Frequency	Percent
GHTN	3	3.0%
LSCS and OTHERS	14	14%
NIL	83	83%
Total	100	100.0%

In our study,3 (3.0%) Patients had GHTN,14(14%) Patients had LSCS and OTHERS and 83 (83%) Patients had NIL

The value of z is11.4262. The value of p is <.00001.The result is significant at p<.05.

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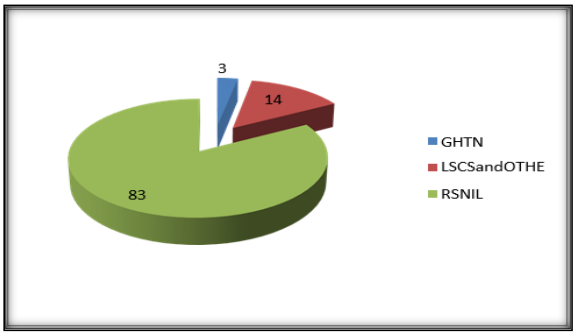

Table 5: Distribution of PIH among study population

Definition	Frequency	Percent
PIH	48	48.0%
Mild Preeclampsia	39	39.0%
Severe Preeclampsia	11	11.0%
Eclampsia	2	2.0%
Total	100	100.0%

In our study,48(48.0%) Patients hadPIH,39(39.0%) Patients had Mild Preeclampsia,11 (11.0%) Patients had Severe Preeclampsia and 2 (2.0%) Patients had Eclampsia
The value of zis 7.5118. The value of pis<.00001.The result is significant at p<.05.

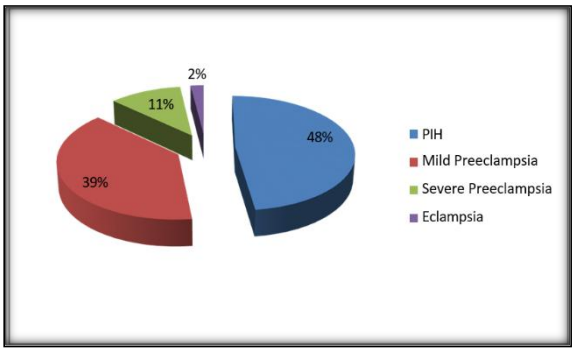

Table 6: Distribution of RTED Notch

RTED NOTCH	Frequency	Percent
Absent	33	33.0%
Present	67	67.0%
Total	100	100.0%

In our study,67 (67.0%) Patients had RTED NOTCH Present
The value of zis 4.8083. The value of pis<.00001.The result is significant at p<.05.

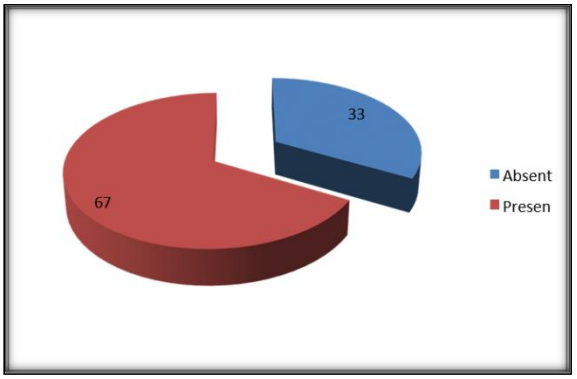

Table 7: Distribution of LTED Notch

LTEDNOTCH	Frequency	Percent
Absent	36	36.0%
Present	64	64.0%
Total	100	100.0%

In our study,64(64.0%) Patients had LTED NOTCH Present
The value of z is 3.9598. The value of p is.00008. The result is significant at p<.05.

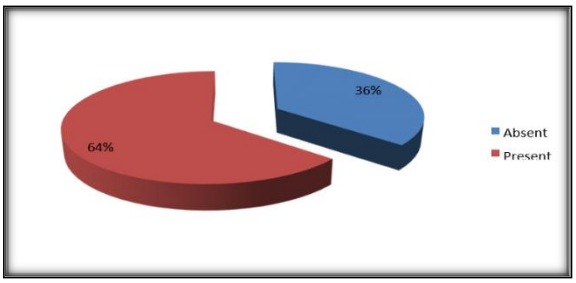

Table 8: Distribution of laterality of ED Notch

EDNOTCH	Frequency	Percent
Unilateral	31	31%
Bilateral	49	49%
Absent	20	20%
Total	100	100.0%

In our study,31 (31%) Patients had Unilateral and 49 (49%) Patients had Bilateral
The value of zis4.3137. The value of pis<.00001. The result is significant at p<.05.

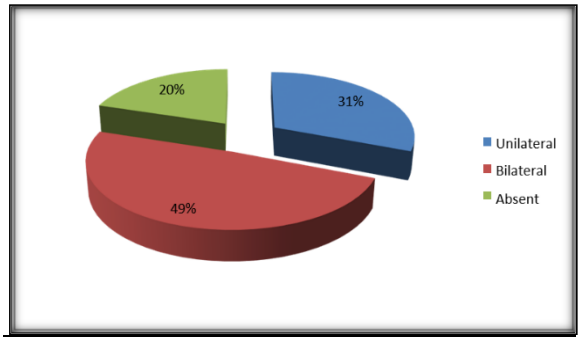

Table 9: Distribution of ED Notch among study population

Notch	PIH	Mild Preeclampsia	Severe Preeclampsia	Eclampsia
Bilateral	8	29	10	2
Unilateral	20	10	1	0
Total	28	39	11	2
Absent	20	0	0	0

Chi-square Value:20.764085 P value:0.0001
In PIH 8 patients had bilateral Notch with PIH and 20 patients had unilateral Notch with PIH.
In Mild Preeclampsia 29 patients had bilateral Notch with mild preeclampsia and 10 patients had unilateral Notch with mild preeclampsia.
In Severe Preeclampsia10patients had bilateral Notch with severe preeclampsia and1 patient had unilateral Notch with severe preeclampsia

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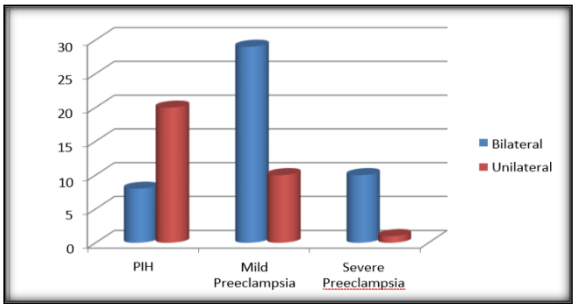
In Eclampsia 2 patients hadbilateral Notch with eclampsia



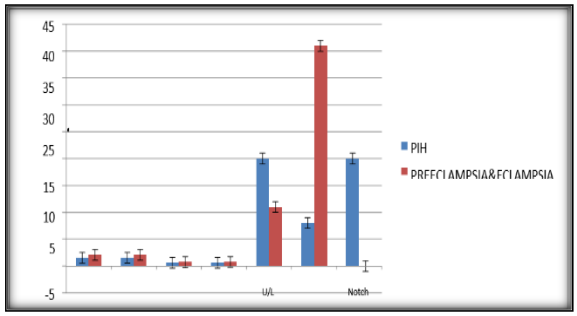


Table 10: Table: Distribution of mean Age.

	Number	Mean	SD	Minimum	Maximum	Median
Age	100	24.8900	3.8136	19.0000	35.0000	24.0000

Above table showed tha the mean Age (mean±s.d.) of patients was 24.8900 ±3.8136.

Table 11: Distribution of mean SBP

	Number	Mean	SD	Minimum	Maximum	Median
SBP	100	150.0200	10.5734	138.0000	180.0000	150.0000

Above table showed that the mean SBP (mean±s.d.) of patients was 150.0200±10.5734

Table 12: Distribution of mean DBP

	Number	Mean	SD	Minimum	Maximum	Median
DBP	99	95.1111	5.8080	88.0000	112.0000	94.0000

In above table showed that the mean DBP (mean±s.d.) of patients was 95.1111±5.8080

Table 13: Distribution of mean GA during Scan (Wk)

	Number	Mean	SD	Minimum	Maximum	Median
GA during Scan (Wk)	100	29.0200	2.3005	24.0000	34.0000	29.0000

In above table showed tha the mean GA during Scan (Wk) (mean±s.d.) of patients was 29.0200 ± 2.3005

Table 14: Distribution of mean GA during Scan (Wk)

	Number	Mean	SD	Minimum	Maximum	Median
GA during Scan (Wk)	100	29.0200	2.3005	24.0000	34.0000	29.0000

Table 15: Distribution of mean RTPI

	Number	Mean	SD	Minimum	Maximum	Median
RT PI	100	1.8327	.3870	1.1400	2.5900	1.8900

In above table showed that the mean RTPI(mean±s.d.) of patients was1.8327 ±.3870

Table 16: Distribution of mean LTPI

	Number	Mean	SD	Minimum	Maximum	Median
LTPI	100	1.8585	.4017	1.1100	3.0400	1.9100

Above table showed that the mean LTPI (mean±s.d.) of patients was1.8585 ±.4017

Table 17: Distribution of mean RTRI

	Number	Mean	SD	Minimum	Maximum	Median
RT RI	100	.6964	.1021	0.5400	0.9000	0.6900

Above table showed that the mean RTRI (mean±s.d.) of patients was.6964 ±.1021

Table 18: Distribution of mean LTRI

	Number	Mean	SD	Minimum	Maximum	Median
LTRI	100	.7009	.1120	0.4300	0.9400	0.6900

Above table showed that the mean LTRI(mean±s.d.) of patients was.7009 ±.1120

Table 19: Distribution of wave form in subjects with PIH and complicated PIH including Preeclampsia and eclamptic features

Subject	Number	Mean RtPI	Mean LtPI	Mean RtRI	Mean LtRI	ED notch U/L	ED notch B/L	Absent ED Notch
PIH	48	1.55	1.58	0.63	0.63	20	8	20
PREECLAMPSIA & ECLAMPSIA	52	2.10	2.11	0.75	0.76	11	41	0

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DISCUSSION

Hospital based cross-sectional Study from JANUARY 2023 to JUNE, 2024 of Department Of Radio-Diagnosis in collaboration with Department Of Obstetrics & Gynecology, Burdwan Medical College And Hospital. Total 100 patients were included in this study.

In our study, out of 100 patients most of the patients were 21-30 years old (84.0%). It was statistically significant (p< .00001), (z=11.2405) Similar study by Cho HY et al (2015) showed that the analysis included participant characteristics such as age, parity, abortion history, previous cesarean delivery, gestational age at delivery, neonatal sex, and birth weight. The mean uterine artery PI was significantly lower in the placenta accreta group compared to previa alone (0.51 versus 0.57; P = .002). Similar study by Ayyuba R et al (2015)found that A total of 264 pregnant women with in the age of 18–40 years with a mean± standard deviation of 31.33 ± 5.92 were studied. One hundred and twenty-four (29.90%) presented with pregnancy-induced hypertension (PIH), 72 (58.06%) had abnormal resistive indices (RIs) of at least 0.58 of which 4 had diastolic notches. Similar study by Figueira CO et al (2016)showed that Means (±SD) for intervals of gestational age and percentiles 5, 50, and 95 were calculated for each parameter. The Intraclass Correlation Coefficients (ICC) were also estimated for assessing intra- and inter-variability of measurements We examined that, majority of the patients had Primipara [71 (71.0%)]. It was statistically significant (p< .00001), (z=5.9397). We found that,significantly higher of patients had Urine protein [52 (52.0%)]

I twas Not statistically significant (p.56868),(z=0.5657).However it is possible for having significantly higher number of cases having urine for urine protein as we have all the cases having pregnancy induced hypertension and 52 cases are in preeclampsia and eclampsia group .We examined that, most of the patients had LSCS and OTHERS [14(14%)]. It was statistically significant (p< .00001), (z=11.4262). Similar study by Hemalatha S et al 56(2021) observed that Different variables of the study population like period of gestation [<20 weeks, =20 weeks], previous cesarean section if present, previous preterm delivery if present, hypertension in previous pregnancy, history of paternal hypertension, history of abortions if have been, history of any still births, family history of PIH have been noted.

We found that, a greater number of patients had PIH [48(48.0%)]. It was statistically significant (p< .00001), (z=7.5118) Similar study by Ain SN et al (2023) showed that pregnancy induced hypertension (PIH) is a significant cause of morbidity among pregnant females and also affects the fetal outcome. Numerous risk factors have been identified. This study was conducted to estimate the prevalence of PIH and the factors associated with PIH. Similar study by Peter BB et al 60 (2024) found that the significance level was 0.05. Over 50% of the women were knowledgeable about PIH and associated risk factors ((χ2=4.92; p = 0.04). The prevalence of PIH was 51.8%, and married women were more aware of the PIH risk factors (71.1%). Women with previous pregnancies were more likely to be aware of PIH (OR = 17.1, 95%; CI = 9.09 to 32.15) compared to first time mothers. Women in age group 36-45 were 2.5 times more likely to be aware of PIH (OR=2.5, 95% CI: 1.19–3.24) compared to women aged <35 years. Another study by Lakhkaret al, found out that the uterine artery had a better specificity (90-95%) as compared to the umbilical artery (85-90%) for predicting bad maternal and perinatal outcome in PIH and SGA babies.

There were 8 individuals with bilateral Notch and 20 patients with unilateral Notch in the PIH group. In the case of moderate preeclampsia, 29 patients exhibited bilateral notch symptoms, while 10 individuals exhibited unilateral notch symptoms. Out of the 11 patients diagnosed with severe preeclampsia, 10 had bilateral notch and 1 had unilateral notch. Two patients with eclampsia had bilateral notched bellies. We examined that, most of the patients had RT ED NOTCH [67 (67.0%)]. It was statistically significant (p< .00001), (z=4.8083) Similar study by Thaler et al, who also found that the presence of pre-diastolic notching was associated with a much higher RI value. They studied 140 womenwith hypertension inpregnancy generally. Twenty-five of the women had pre-diastolic notching in their uterine artery waveform, 14 had systolic notch and it was absent in 101 of the women.Those that had pre-diastolic notch had a mean RI value of 0.75±0.09 while those without a notch had a much lower RI value of 0.65 ± 0.10. They also noted that the rate of IUGR were significantly higher in women with notch than those without a notch. We found that a greater number of patients had LTEDNOTCH [64(64.0%)]. It was statistically significant (p=.00008), (z=3.9598) Study by Thaler et al, who also found that the presence of pre-diastolic notching was associated with a much higher RI value. They studied 140 women with hypertension in pregnancy generally. Twenty-five of the women had pre- diastolic notching in their uterine artery wave form, 14 had systolic notch and it was absent in 101 of the women. Those that had pre-diastolic notch had a mean RI value of 0.75 ± 0.09 while those without a notch had a much lower RI value of 0.65 ± 0.10. They also noted that the rate of IUGR were significantly higher in women with notch than those without a notch. We examined that, majority of the patients had Bilateral [49 (49%)]. It was statistically significant (p< .00001), (z=4.3137). Similar study by Myatt L et al (2012) showed that development of preeclampsia overall was associated with increased resistance index, pulsatility index, a pulsatility index or resistance index multiple of the

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medianator above the 75th percentile but not the presence of a notch or a bilateral notch before 21 weeks of gestation. The sensitivity was 43% (95% confidence interval [CI] 35–51) and specificity67% (95% CI 65–69) for prediction of preeclampsia overall. The presence of a notch or bilateral notch, resistance index, and pulsatility index multiple of the median was significantly associated with early onset (before 34 weeks of gestation) compared with late onset or no preeclampsia (oddsratio [OR] 6.9,95% CI2.3–20.9; sensitivity 78%, 95% CI52–94; specificity 66%, 95% CI64–68). There were 8 individuals with bilateral Notch and 20 patients with unilateral Notch in the PIH group. In the case of moderate preeclampsia, 29 patients exhibited bilateral notch symptoms, while 10 individuals exhibited unilateral notch symptoms. Out of the 11 patients diagnosed with severe preeclampsia, 10 had bilateral notch and 1 had unilateral notch. Two patients with eclampsia had bilateral notched bellies. It was statistically significant (P=0.0001) In our study, the mean Age of patients was [24.8900 ± 3.8136], the mean SBP of patients was [150.0200 ± 10.5734], the mean DBP of patients was [95.1111 ±5.8080], the mean GA during Scan (Wk)of patients was[29.0200 ±2.3005], the mean RTPI of patients was [1.8327 ± .3870], the mean LT PI of patients was [1.8585 ± .4017], the mean RT RI of patients was [.6964 ± .1021], the mean LT RI of patients was [.7009 ± .1120].

Summary

- Most of the patients were 21-30 years old (84%), which was statistically significant.
- The majority of the patients were Primipara (71%), which was statistically significant.
- A higher number of patients had urine protein (52%), but this was not statistically significant.
- Most of the patients had LSCS and other delivery methods (14%), which was statistically significant.
- A greater number of patients had PIH (48%), which was statistically significant.
- Most of the patients had RTED NOTCH (67%), which was statistically significant.
- A greater number of patients had LTED NOTCH (64%), which was statistically significant.
- The majority of the patients had Bilateral notch (49%), which was statistically significant.

Additional observations in specific groups:

- 8 individuals had bilateral notch and 20 had unilateral notch in the PIH group.
- In moderate preeclampsia, 29 patients had bilateral notch and10 had unilateral notch.
- Among those with severe preeclampsia,10 had bilateral notch and1had unilateral notch.
- Two patients with eclampsia had bilateral notched bellies, which was statistically significant

Overall patient characteristics:

- The mean age of patients was approximately 25 years.
- The mean SBP and DBP of patients indicated elevated blood pressure levels.
- The mean GA during scan was around 29weeks.
- The mean RT and LT PI, as well as RT and LT RI, showed specific Doppler indices measurements.

CONCLUSION

Prevention is better than cure; though preeclampsia is not a preventable disease; early prediction helps in increased Fetal surveillance and timely interventions. From the study it is concluded that in case of bilateral notches there is increased risk of preeclampsia and eclampsia compared to cases with unilateral notches and absent notches. those cases with bilateral notch require more Fetal surveillance and timely intervention compared to unilateral and absent notch. Cases with absent notches require only routine checkup and not frequent checkup.

The reference values for Doppler indices of the uterine artery were established in normotensive pregnant women and significantly higher values were seen in PIH patients. The presence of high RI and PI of the uterine artery or the appearance of diastolic notch is associated with an increased risk of development of PIH.

Combination of parameters is superior to the use of a single parameter since it was found that abnormal RI, PI and early diastolic notch was found to be higher in patients with PIH than the normotensives. If single parameter is considered, presence of unilateral or bilateral diastolic notch is superior than others. The results of this study are consistent with previous studies done by various authors in different parts of the world.

Doppler indices of the uterine artery can act as antenatal surveillance tool for the prediction of PIH. It is recommended that UADV in pregnancy induced hypertensive patients improve perinatal outcome. Since UADV is noninvasive, it should be employed into routine antenatal care in the second trimester for pregnancy induced hypertensive patients or those at risk for PIH for example, the primigravida.

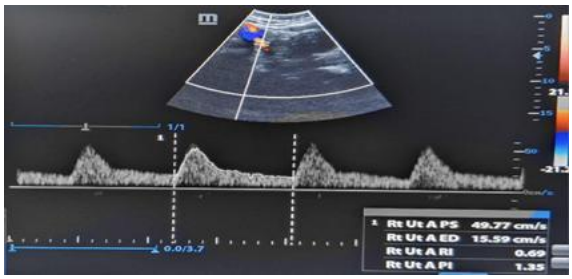

Image 1: Right Uterine Artery With Increased Ri And Pi

Limitations of the Study

In spite of every sincere effort my study has lacunae. The notable short comings of this study are:

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1. The sample size was small.Only100 cases are not sufficient for this kind of study.
2. The study has been done in a single centre.
3. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out.
4. The presence of early diastolic notching on the right and left uterine artery was not correlated with the location of lateral placentas viz-a-viz right lateral and left lateral placental respectively. As it is documented that early diastolic notching is important on the side the placenta is located in cases of lateral placenta.

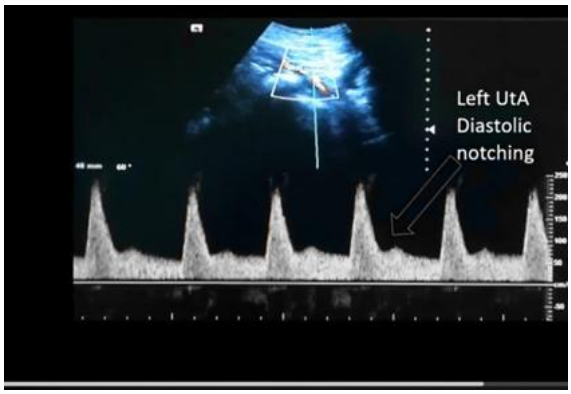

Image 2: Left Uterine Artery Early Diastolic Notch

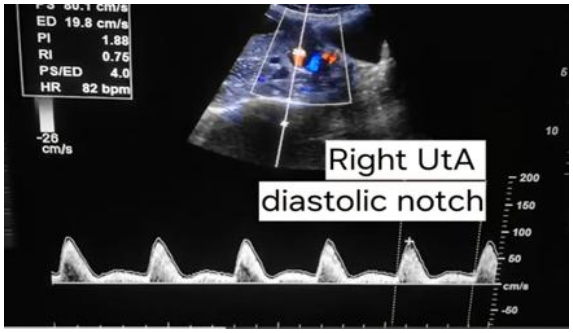

Image 3: Right Uterine Artery Early Diastolic Notch

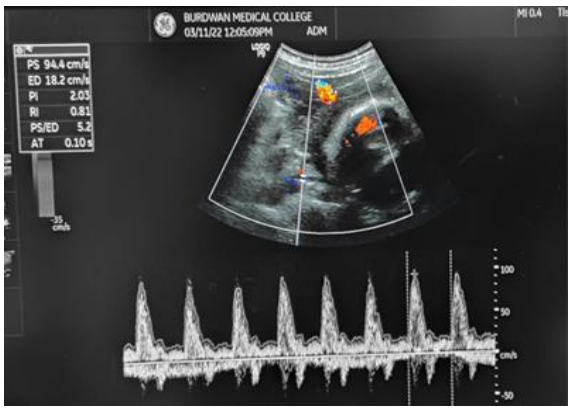

Image 4: Left Uterine Terywithincreasedpi, and Early Diastolic Notch

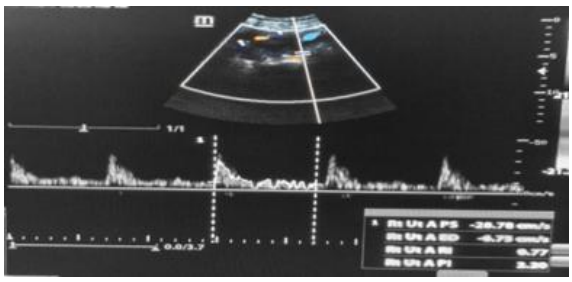

Image 5: Rt Uterine Artery Early Diastolic Notch At 2nd Trimester

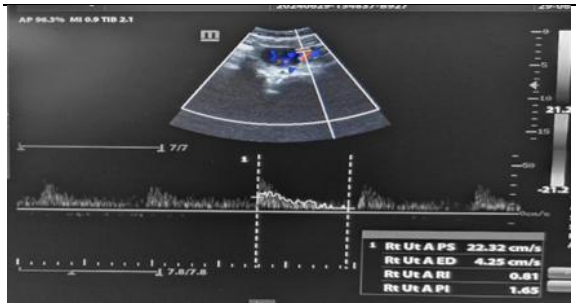

Image 6: Rtuterineartery within creasedpi, With Early Diastolic Notch

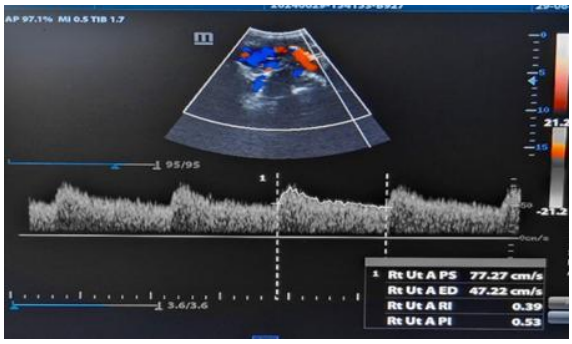

Image 7: Normal Uterine Artery Doppler In 3rd Trimester

REFERENCES

1. Hutcheon JA, Lisonkova S and Joseph KS. Epidemiology of pre-eclampsia and the otherhypertensive disorders of pregnancy. Best Pract Res ClinObstet Gynecol. 2011;25(4):391-403
2. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006;367:1066-1074
3. Zhang J, Zeisler J, Hatch MC, Berkowitz G. Epidemiology of pregnancy- induced Hypertension.Epidemiol Rev 1997; 19: 218-32
4. Steegers EA, von Dadelszen P, Duvekot JJ, Pijnenborg R. Pre-eclampsia. Lancet. 2010;376:631-644.
5. KassebaumNJ,Bertozzi-Villa A,CoggeshallMS,ShackelfordKA,SteinerC,Heuton KR et al.Global and regional and national levels and causes of maternal mortality during 1990-2013: asystemic analysis for the global burden of disease study 2013. Lancet. 2014:384:980-1004
6. Nobis PN, Hajong A. Eclampsia in India through the decades J ObstetGynaecolIndia.2016;66:172–6.
7. Brown MA, Lindheimer MD, de Swiet M, Van Assche A, Moutquin JM. The classification anddiagnosis of the hypertensive disorders of pregnancy: Statementfrom the International Society for the Study of Hypertension in Pregnancy (ISSHP) Hypertens Pregnancy. 2001;20:IX–XIV
8. Berg CJ, Harper MA, Atkinson SM, Bell EA, Brown HL, Hage ML, et al. Preventability of pregnancy-related deaths:

ISSN (O): 2687-5365; ISSN (P): 2753-6556

results of a state-wide review. Obstet Gynecol. 2005;106:1228-123
9. Schwarze A, Nelles I, Krapp M, Friedrich M, Schmidt W, Diedrich K, et al. Doppler ultrasoundof the uterine artery in the prediction of severe complications during low- risk pregnancies. Arch Gynecol Obstet. 2005 Jan;271(1):46–52
10. ChanFY, PunTC, LamC, Khoo J, Lee CP, LamYH. Pregnancyscreeningbyuterine arteryDopplervelocimetry—whichcriterionperformsbest?Obstetrics&Gynecology. 2009;85(4):596-602.
11. Adekanmi AJ, Roberts A, Adeyinka AO, Umeh EO, Anor F, Odo JC, et al. Normal second andthird trimester uterine and umbilical Doppler indices among healthy singleton gestation Nigerian women. West Afr J Radiol. 2017;24:1-7.
12. Ebeigbe P, Aziken M. Early onset pregnancy-induced hypertension/eclampsia in Benin City, Nigeria. Niger J ClinPract. 2010;13:388–393.
13. Singh S, Ahmed EB, Egondu SC, Ikechukwu NE. Hypertensive disorders in pregnancyamongpregnantwomeninaNigerianTeachingHospital. NigerMed
14. Li N, Ghosh G, Gudmundsson S. Uterine artery Doppler in high-risk pregnancies at23–24 gestational weeks is of value in predicting adverse outcome of pregnancy andselecting cases for more intense surveillance. ActaObstetGynecol Scand.(2014)93:1276–81. doi: 10.1111/aogs.12488
15. Gudnasson HM, Dubiel M, Gudmundsson S. Preeclampsia–abnormal uterine arteryDoppler is related to recurrence of symptoms during the next pregnancy. J PerinatMed. (2004) 32:400–3. doi: 10.1515/jpm.2004.135
16. Hemalatha S, Shaheedha SM, Borra R. Assessment of Prevalence of Hypertension in pregnant women with its Complications: A Cross Sectional Study. Research Journalof Pharmacy and Technology. 2021;14(7):3805-8.
17. Belayhun Y, Kassa Y, Mekonnen N, Binu W, Tenga M, Duko B. Determinants of pregnancy-inducedhypertensionamongmothersattendingpublichospitalsinWolaita Zone, South Ethiopia: findings from unmatched case-control study. international Journal of Hypertension. 2021 Oct 28;2021.

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