

# To Compare Frequency of Pre-Eclampsia in Pregnant Women with or Without Persistent Early Diastolic Notch on Uterine Artery Doppler at 24 Weeks of Gestation

Shumaila Kiran, Zoya Khan, Muzimma Zulfqar Bhatti and Saima Ashraf

## ABSTRACT

**Objective:** To compare frequency of pre-eclampsia in pregnant women with or without persistent early diastolic notch on uterine artery Doppler at 24 weeks of gestation.

**Study Design:** Comparative study.

**Place and Duration of Study:** This study was conducted at the Outpatient Department of Obstetrics & Gynecology Nishtar Hospital Multan from May 2015 to May 2016.

**Materials and Methods:** A total of 148 pregnant women fulfilling inclusion and exclusion criteria were enrolled for the study. Informed consent was obtained from all the patients by explaining the procedure and its outcome and ensured of their confidentiality. Study was conducted after approval from ethical committee of the institution. A detailed history including demography of the patients like name, age and address was recorded. In all women, Doppler flow rate wave forms at the portion of the uterine artery on the side of uterus were recorded. Resistance index and pulsatility index values of right and left uterine arteries were evaluated separately. After having wave form obtained at 24 weeks gestation, according to presence of EDN, cases were divided into two groups. Group A consisted of 74 women without early diastolic notch (unexposed group) and Group B of 74 women with early diastolic notch (exposed group). Then these pregnancies were followed until birth.

**Results:** In our study, out of 148 cases (74 in each group) 58.11% (n=43) in Group-A and 63.51% (n=47) in Group-B were between 21-30 years while 41.89% (n=31) in Group-A and 36.49% (n=27) in Group-B were between 31-35 years of age, mean±sd was calculated as 28.22±4.91 and 27.69±4.83 respectively. Comparison of pre-eclampsia in both groups was done which shows that 4.05% (n=3) in Group-A and 18.92% (n=14) in Group-B had pre-eclampsia while remaining 95.95% (n=71) in Group-A and 81.08% (n=60) in Group-B had no findings of the morbidity, p value was calculated as 0.004 which shows a significant difference between the two group, Relative Risk= 0.2143.

**Conclusion:** We concluded that the frequency of pre-eclampsia in pregnant women is significantly higher in patients with persistent early diastolic notch on uterine artery Doppler at 24 weeks of gestation as compare to those having no diastolic notch.

**Key Words:** Persistent early diastolic notch, diagnosis, pre-eclampsia.

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## INTRODUCTION

Pre-eclampsia as well as intrauterine growth restriction (IUGR) are one of the major causes of maternal morbidity which can lead to increased perinatal morbidity and mortality rates<sup>1-2</sup>. Coagulopathy, renal failure and liver failure are one of the major maternal complications of pre-eclampsia.

Department of Obstetrics & Gynecology Nishtar Hospital Multan.

Correspondence: Dr. Zoya Khan, Department of Obstetrics & Gynecology Nishtar Hospital Multan.

Contact No: 0332-6171987

Email: zoya6171987@gmail.com

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Furthermore it is also associated with significant proportion of stroke in these patients.<sup>3</sup>

Abnormal placental formation is often characterized with pre-eclampsia and IUGR that leads to inadequate blood flow across uteroplacenta. Due to this phenomenon, usage of color Doppler ultrasonography has gained much attention for the assessment of the velocity of uterine artery blood flow in patients in routine practice of ultrasonographic screening these days.

Low end-diastolic velocities as well as early diastolic notch (EDN) may specifically characterize uterine artery blood flow waveforms among ladies which are not expecting or who are being screened in their first trimester of pregnancy. Assessment of a diastolic notch over 26 weeks of gestation and abnormal uterine artery blood flow velocity ratio may be related with inadequate trophoblast invasion.<sup>3</sup>

Precise assessment of pre-eclampsia and intrauterine growth restriction (IUGR) plays a key role in allowing accurate disbursement of resources for the purpose of monitoring and preventive options for the improvement of perinatal and maternal outcomes.<sup>4</sup> Furthermore, various studies evaluating the diagnostic accuracy of uterine artery colour Doppler indices demonstrated that artery Doppler ultrasonography could be employed as a predictive test.<sup>5</sup>

In one study,<sup>6</sup> perinatal outcomes were evaluated with and without early diastolic notch, pre-eclampsia was found in 2.8% without early diastolic notch and 16.3% among pregnant ladies having early diastolic notch.

Uterine artery Doppler ultra-sonographic assessment in 2<sup>nd</sup> trimester is very useful screening modality for accurate characterization of high risk pregnancies which may be kept under sophisticated surveillance to improve maternal and neonatal outcomes<sup>7-10</sup> in these patients. Uterine artery Doppler can also identify poor trophoblastic invasions of spiral arteries which may severely hinder trophoplacental blood flow and lead to the early onset of this disease<sup>11-13</sup>.

The results of this study may help to guide us to pick/predict abnormal testing in all those women who could potentially lead to increase surveillance (fetal and maternal) and intervention that can improve clinical outcome. Also this study results will be helpful to find out frequency of women who do develop preeclampsia with normal second trimester uterine artery Doppler study.

## MATERIALS AND METHODS

A total of 148 pregnant women fulfilling inclusion and exclusion criteria coming to Outpatient Department of Obstetrics & Gynecology Nishtar Hospital Multan were enrolled for the study. Following inclusion criteria was adopted; Age between 21–35 years; Singleton pregnancy (assessed on USG); Women with diastolic notch (exposed) and without diastolic notch (non exposed) [confirmed on Doppler ultrasonography]; Pregnant women visiting Outpatient Department of Gynecology between 20–24 weeks of gestation determined on dating scan. Patients with previous history of; Preeclampsia; preterm delivery; intrauterine death; chronic hypertension; diabetes mellitus; connective tissue disorder; previous family history of hypertensive disorders and those having BMI  $\geq 35$  kg/m<sup>2</sup> were excluded from our study. Informed consent was obtained from all the patients by explaining the procedure and its outcome and ensured of their confidentiality. Study was conducted after approval from ethical committee of the institution. A detailed history including demography of the patients like name, age and address was recorded. In all women, Doppler flow rate wave forms at the portion of the uterine artery on the side of uterus were recorded. Resistance index and pulsatility index values of right and left uterine

arteries were evaluated separately. After having wave form obtained at 24 weeks gestation, according to presence of EDN, cases were divided into two groups.

Group A consisted of 74 women without early diastolic notch (unexposed group) and Group B of 74 women with early diastolic notch (exposed group). Then these pregnancies were followed until birth. And pre-eclampsia was defined as All those cases, who were having systolic pressure above 140 mmHg and/or diastolic pressure  $>90$ mmHg measured at least two times with 6 hours interval and proteinuria  $\geq 300$ mg/day with and without persistent early diastolic notch, was accepted as preeclampsia, after 20 weeks of gestation till delivery. Data was entered and analyzed by using computer software SPSS 10. Descriptive statistics were used to analyze the data. Mean  $\pm$ SD was calculated for age and gestational age of women. Frequencies and percentages were calculated for parity and preeclampsia (Yes, No). Chi-square test was applied for comparison of preeclampsia in two groups with and without early diastolic notch.

## RESULTS

A total of 148 cases fulfilling the inclusion/exclusion criteria were enrolled to compare frequency of pre-eclampsia in pregnant women with or without persistent early diastolic notch on uterine artery Doppler at 24 weeks of gestation. Mean age of our patients was 27.84  $\pm$  4.53 years while mean age of patients in group A was 28.22 $\pm$ 4.91 and in group B was 27.69 $\pm$ 4.83 respectively (ranging from 21 to 35 years). Mean gestational age was 21.73  $\pm$  1.41 weeks with mean age was 21.64 $\pm$ 1.39 weeks in Group-A and 21.85 $\pm$ 1.51 weeks in Group-B while 68.92%(n=51) patients in Group-A and 59.46% (n=44) belonging to Group-B were between 20-22 weeks of gestation while 31.08%(n=23) in Group-A and 40.54%(n=30) in Group-B were between 23-24 weeks of gestation. Parity distribution of the patients shows 71.62%(n=53) in Group-A and 77.03%(n=57) in Group-B were between 1-3 paras while 28.38%(n=21) in Group-A and 22.97%(n=17) in Group-B had  $>3$  paras. Comparison of pre-eclampsia in both groups was done which shows that 4.05%(n=3) in Group-A and 18.92%(n=14) in Group-B had pre-eclampsia while remaining 95.95%(n=71) in Group-A and 81.08%(n=60) in Group-B had no findings of the morbidity, p value was calculated as 0.004 which shows a significant difference between the two group, Relative Risk= 0.2143.

Stratification for pre-eclampsia with regards to age shows that out of 3 cases in Group-A 2 were between 21-30 years and 1 was between 31-35 years while out of 14 cases in Group-B 8 were between 21-30 years and 6 were between 31-35 years, p value was 0.000. Stratification for pre-eclampsia with regards to gestational age shows that out of 3 cases in Group-A 3 were between 20-22 weeks and no case between 23-24

weeks while out of 14 cases in Group-B 10 were between 20-22 weeks and 4 were between 23-24 weeks, p value was 0.000.

**Table No. 1: Comparison of Pre-Eclampsia (n=148)**

Pre-eclampsia	Group-A (n=74)		Group-B (n=74)	
	Frequency	%	Frequency	%
Yes	3	4.05	14	18.92
No	71	95.95	60	81.08
Total	74	100	74	100

P value= 0.004

Relative Risk= 0.2143

**Table No. 2: Stratification for Pre-Eclampsia with regards to age (n=17)**

Age(in years)	Pre-eclampsia		P value
	Group-A (n=3)	Group-B (n=14)	
21-30	2	8	0.000
31-35	1	6	

**Table No. 3: Stratification for pre-eclampsia with regards to gestational age (n=17)**

Gestational Age (in weeks)	Pre-eclampsia		P value
	Group-A (n=3)	Group-B (n=14)	
20-22	3	10	0.000
23-24	0	4	

## DISCUSSION

Uterine artery Doppler ultra-sonographic assessment in 2<sup>nd</sup> trimester is very useful screening modality for accurate characterization of high risk pregnancies which may be kept under sophisticated surveillance to improve maternal and neonatal outcomes in these patients. Uterine artery Doppler can also identify poor trophoblastic invasions of spiral arteries which may severely hinder trophoplacental blood flow and lead to the early onset of this disease<sup>13</sup>. We planned this study to pick/predict abnormal testing in all those women who could potentially lead to increase surveillance (fetal and maternal) and intervention that can improve clinical outcome. Also this study is helpful to find out frequency of women who do develop preeclampsia with normal second trimester uterine artery Doppler study. Mean age of our patients was  $27.84 \pm 4.53$  years while mean age of patients in group A was  $28.22 \pm 4.91$  and in group B was  $27.69 \pm 4.83$  respectively (ranging from 21 to 35 years). Comparison of pre-eclampsia in both groups was done which shows that 4.05%(n=3) in Group-A and 18.92%(n=14) in Group-B had pre-eclampsia while remaining 95.95%(n=71) in Group-A and 81.08%(n=60) in Group-B had no findings of the morbidity, p value was calculated as 0.004 which shows a significant difference between the two group, Relative Risk= 0.2143. The findings of our study are in-line with

a study by Espinoza J and others,<sup>6</sup> where perinatal outcomes were evaluated with and without early diastolic notch, pre-eclampsia was found in 2.8% without early diastolic notch and 16.3% in patients having early diastolic notch. Our results are conformed by Faik Gürkan Yaz<sup>14</sup> and colleagues who also found that patients with EDN are greater risk of preeclampsia. Jeltsje S, Rachel K, Joris AM, Aeilko H<sup>15</sup> also reported that abnormal uterine artery waveforms to be good predictor for early assessment of pre-eclampsia. A pulsatility index may be employed as the major predictive Doppler Index as single or in combination with notching and such indices must be employed in routine clinical practice.

While including the persistence of an early diastolic notch in the defining the abnormal uterine artery flow velocity waveforms for example high RI, may lead to early prediction of pre-eclampsia in such cases<sup>16-20</sup>. A study conducted by Bower et al<sup>21</sup> has documented the persistence of such kind of notch, characterized as isolated finding, to be a good early predictor in cases of pregnancy induced hypertension such as proteinuric, than that of cutoff values of the 95<sup>th</sup> centile of RI. Hence, persistence of such a notch in mid-gestation stages manifests the risks of later maternal complications involving such as pre-eclampsia. Although the A/c ratios may reflect the positive or negative notch, neither the RI nor the A/C ratio may indicate that if the notch was either present. The NDI represents the depth of the notch; thus it may be a better predictor than either the RI or the A/C ratio. However, the hypothesis of the study that "Pregnancy with early diastolic notch is associated with higher risk of pre-eclampsia" is justified. In summary, the results of the current and international studies mentioned above, relationship of early diastolic notch on uterine artery Doppler measurements with perinatal outcome is confirmed and further it may consider as a good predictor of pre-eclampsia. Uterine Doppler Measurements especially in Pakistan may be very useful because this test is cost effective and affordable and having good predictive results as well.

## CONCLUSION

We concluded that the frequency of pre-eclampsia in pregnant women is significantly higher in patients with persistent early diastolic notch on uterine artery Doppler at 24 weeks of gestation as compare to those having no diastolic notch.

### Author's Contribution:

Concept & Design of Study:	Shumaila Kiran
Drafting:	Zoya Khan & Muzimmal Zulfquar Bhatti
Data Analysis:	Saima Ashraf
Revisiting Critically:	Muzimmal Zulfquar Bhatti
Final Approval of version:	Shumaila Kiran

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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