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**Research Article**

# Study of Color Doppler of Uterine Artery, Umbilical Artery, Middle Cerebral Artery in PIH Patients on Antihypertensive Therapy

Authors
**Dr Yashodhara Gaur[1], Dr Rashmi Jacob Kujur[2], Dr Hemlata Parashar[3]**
[1]Professor - Dept of Obstetrics and Gynaecology G.R. Medical College, Gwalior
[2]Post Graduate - Dept of Obstetrics and Gynaecology G.R. Medical College, Gwalior
[3]Assistant Professor - Dept of Obstetrics and Gynaecology Peoples Medical College, Bhopal

**Abstract**
**Background:** *Hypertensive disorders remain one of the leading causes of both maternal and perinatal mortality.*
**Aims and Objective:** *To study the effect of antihypertensive drugs on hemodynamics of mother and fetus, uterine artery, umbilical artery, middle cerebral artery via flow velocity time wave and to compare Doppler study with control group.*
**Materials and Methods:** *A randomized prospective comparative study on 35 PIH patients was done in the Obstetrics and Gynecology Department, Kamla Raja Hospital Gwalior attending OPD. Two groups were formed as study (n=18, on antihypertensive drugs) and control (n=17, not on antihypertensive drugs). A detailed history along with laboratory investigations along with Color Doppler for both the groups was performed.*
**Results:** *Most of the patients belong to <25 years age group, were direct cases and belonged to urban area in both the Control and Study groups (58.82% vs. 61.11%, 76.47%vs. 88.88%, 94.11% vs. 88.88% respectively). Unbooked (88.23%) patients were more among control whereas booked (61.11%) patients were more among study group. Most of the patients were primigravida in both the groups. Maximum patients among Control (94.11%) and Study groups (83.33%) were of 32-37 weeks of gestation. Significant difference was recorded among Study group before (161.11/103.88 mmHg) and after (147.22/97.77 mmHg) antihypertensive treatment (P<0.001)for systolic and diastolic blood pressure respectively. Colour Doppler revealed that umbilical artery (1.13 vs. 1.23), middle cerebral artery (1.35 vs. 1.41) pulsatility index (PI) as insignificantly increased after treatment whereas PI of right uterine artery (0.91 vs. 0.89) and left uterine artery (0.84 vs. 0.82) insignificantly decreased before and after treatment respectively.*
**Conclusion:** *Antihypertensive drugs affect maternal hemodynamic and to certain extent fetal hemodynamic as evident by middle cerebral artery colour doppler indices but it was not significant.*
**Keywords:** *Antihypertensive, colour Doppler, middle cerebral artery, hemodynamic.*

## Introduction

Pregnancy induced hypertension (PIH) comprises of group of hypertensive disorders which develops because of gravid state mainly after 20 weeks of pregnancy (blood pressure ≥140/90 mm of Hg) without proteinuria.[1,2] Gestational hypertension

with proteinuria is defined as pre-eclampsia with convulsions.[3]

Incidence of PIH in Indian population is 15.2%, and it is 4 times higher in primipara women than in multipara.[2,4] Pre-eclampsia decreases the placental perfusion by increasing the vascular spasm and causes defects in fetal hemodynamics. These defects in fetal perfusion can be easily analyzed by colour Doppler.[5]

Antihypertensive therapy to pregnant women will result in exposure of the fetus to these drugs, hence the potential short term maternal benefits have to be balanced against possible short and long term benefits and risk to fetus and infants. Fetus stands to gain indirectly by treating maternal hypertension as it may reduce the likelihood of developing severe hypertension or progression to pre-eclampsia.[6]

The present study was performed to evaluate the effect of antihypertensive on the fetal and maternal blood flow indices through colour Doppler.

## Materials and Methods

A randomized prospective comparative study was carried out in the Obstetrics and Gynecology Department, Kamla Raja Hospital Gwalior in 35 PIH patients attending OPD between October 2008 to October 2009.

Institutional Ethics Committee approval and written informed consent was obtained before starting study.

Patients were divided in to Study group (n=18, on antihypertensive drugs) and Control group (n=17, not on antihypertensive drugs).

Antenatal cases of PIH/pre-eclampsia with 20-40 weeks of gestation were included in the present study. Patients with IUGR and oligoamnios, twin pregnancy, congenital malformation of fetus, chronic hypertension, placenta previa, diabetes, severe anemia and cardiac and renal diseases were excluded from the study.

Study group: Patients with blood pressure (BP) ≥150/100 mmHg and proteinuria >0.3 gm/L in 24 hours urine collection were considered as study group. A detailed history along with laboratory investigations results including hemogram, blood sugar, urine protein, liver function test, renal function test, ophthalmological examination, platelet count ultrasound and colour Doppler were recorded. Colour Doppler indices including pulsatility index (PI), resistance index in uterine artery, fetal middle cerebral artery and umbilical artery was also recorded. Patients received labetalol or alphamethydopa as antihypertensive medication for 1 week. Colour Doppler was repeated after 1 week of treatment and indices were recorded.

Control group: Patients with BP ≥ 140/90 mmHg and proteinuria >0.3 gm/L in 24 hour urine collection were taken as control group. All other investigations similar to Study group were done but were not given antihypertensive medication; Doppler parameters were measured and repeated after 1 week.

All the analysis was done with IMB SPSS ver. 20 software. Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on mean ± standard deviation (SD). Unpaired t test and analysis of variance (ANOVA) with post-hoc. Pearson correlation test was used to find correlation between study parameters. Significance is assessed at 5 % level.

## Results

Majority of the patients in Control [10 (58.82%)] and Study groups [11 (61.11%)] were having age <25 years. Most of the patients were direct cases in both the groups [13 (76.47%) in Control and 16 (88.88%) in Study). There was urban predominance in both Control [16 (94.11%)] and Study groups [16 (88.88%)]. Most of the patients in Control group were unbooked [15 (88.23%)] whereas in Study group majority were booked [11 (61.11%)]. Both the groups had majority of the primigravidae patients; [10 (58.82%) in Control and 11 (61.11%) in Study group). The gestation period in Control [16 (94.11%)] and Study groups [15 (83.33%)] were of 32-37 weeks of gestation.

**Table 1:** Comparison between both the groups before and after treatment

| Parameter | | Control | | P | Study | | P |
|---|---|---|---|---|---|---|---|
| | | Before | After | | Before | After | |
| Blood pressure[#] | Systolic | 143.52 | 140 | NS | 161.11 | 147.22 | <0.001 |
| | Diastolic | 90.58 | 88.23 | NS | 103.88 | 97.77 | <0.001 |
| Urine albumin* | Traces | 10 | 10 | NS | 4 | 4 | NS |
| | + | 7 | 7 | NS | 8 | 13 | <0.05 |
| | ++ | 0 | 0 | NS | 6 | 1 | <0.05 |
| | +++ | 0 | 0 | NS | 0 | 0 | NS |
| PI[#] | Right uterine artery | 0.65 | 0.65 | NS | 0.91 | 0.89 | NS |
| | Left uterine artery | 0.65 | 0.65 | NS | 0.84 | 0.82 | NS |
| | Umbilical artery | 1.03 | 1.03 | NS | 1.13 | 1.23 | NS |
| | Middle cerebral artery | 1.41 | 1.41 | NS | 1.35 | 1.41 | NS |
| RI[#] | Right uterine artery | 0.43 | 0.43 | NS | 0.55 | 0.54 | NS |
| | Left uterine artery | 0.43 | 0.43 | NS | 0.65 | 0.52 | NS |
| | Umbilical artery | 0.60 | 0.60 | NS | 0.68 | 0.69 | NS |
| | Middle cerebral artery | 0.74 | 0.75 | NS | 0.73 | 0.74 | NS |

[#]Data is expressed as mean, *Data is expressed as number, NS; not significant, P value < 0.05 is considered as significant, PI; pulsatility index, RI; resistance index

**Discussion**

Colour Doppler could be the right tool in forewarning the obstetrician about the approach-hing problem which may become tragedy if not intervene properly. [7]

Lunell et al studied the effect of labetalolon uteroplacental flow in 8 patients of PIH. Labetalol was administered via IV route after 30 minutes, a second uteroplacental blood flow index was calculated which showed no change.[8] Similar to Lunell et al, no significant changes in the indices were recordedin present study after antihypertensive treatment, but PI and RI of uterine artery were decreased insignificantly. Also PI and RI of umbilical artery and middle cerebral artery were insignificantly increased.

Pirhonen et al studied single dose of labetalol (0.8 mg/kg) in PIH on maternal hemodynamics and uterine and fetal blood flow velocity waveforms in 10 women of PIH. Intravenous labetalol was given and maximum effect occurred within 35 minutes after labetalol administration and no significant change was observed in colour Doppler indices which are in accordance to present study in which only 2 patients on labetalol therapy showed decrease in PI and RI of uterine artery and rest of the 7 patients did not show any significant changes.[9]

Mahmoud et al studied effects of oral labetalol therapy in 41 patients with moderate to severe PIH. The mean systolic BP and diastolic BP on entry were 154±7 mmHg and 105±5 mmHg and all had significant proteinuria. After one week on labetalol therapy, 85% of patients had their BP controlled but there were no significant changes in colour Doppler indices in umbilical artery.[10] In present study also, mean systolic BP before and after treatment was decreased significantly from 161.11 mmHg to 147.22 mmHg and mean diastolic BP decreased from 103.88 mmHg to 99.77 mmHg and colour Doppler indices does not show any significant changes after treatment, only 2 patients on labetalol therapy showed decreased in PI and RI of uterine artery out of 9 patients.

Montan et al studied 20 PIH patients of gestational age 35 weeks to record the effect of methyldopa onuteroplacental and fetal homodynamic. Doppler ultrasonography blood flow data before and after one week of methyl-dopa treatment showed no change in uterine artery indices, umbilical artery indices and middle cerebral artery indices.[11]Adiga et al has also reported similar findings. [12]

Penttijoupplia et al studied effect of labetalol 1mg/kg on placental and fetal blood flow in 13 PIH patients and found that although the maternal BP decreased but no changes occurred in the intervillous space, umbilical vein or fetal descending aorta and no change in peripheral

vascular resistance in the fetal aortawhich is in accordance with present study data.[13]

Study done by Gunen et al showed no significant difference in PI and RI of umbilical and middle cerebral artery between 25 to 36 weeks of gestation in PIH patients but indices of uterine artery were significantly lower after methyldopa treatment, whereas present study showed no such difference.[14] This may be due to small sample size of present study.

Study done by Montan et al showed that after atenolol treatment, the PI of umbilical artery was increases which is similar to the present study.[15]

Small sample size was the main limitation of present study; a large clinical trial is needed to confirm the present study findings.

**Conclusion**

Antihypertensive drugs affect maternal hemodynamic and to certain extent fetal hemodynamics as evident by middle cerebral artery colour Doppler indices but it was not significant. Antihypertensive may help to rectify maternal hemodynamics thereby may reduce maternal morbidity.

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