

# Fundus Changes in Pregnancy Induced Hypertension in a University Hospital of South India

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## ABSTRACT

### BACKGROUND

Gestational hypertension is a disorder of blood pressure that arises because of presence of pregnancy and the visual system may be involved. We wanted to estimate the prevalence of retinopathy in Pregnancy Induced Hypertension, and find the correlation between the fundus changes with the level of hypertension.

### METHODS

This hospital based prospective study was conducted between January 2016 to August 2017 at the SRM MCH & RC, a suburban tertiary care hospital at SRM university campus. Pupils were dilated with 0.5% tropicamide eye drops and fundus examination done with direct ophthalmoscope. All available demographic data of fundus findings of pregnancy induced hypertension patients visiting the hospital during the study period were examined and recorded.

### RESULTS

Mean age of the population in our study was  $22.61 \pm 2.76$  years with a range of 21 – 25 years. 67 (67%) were primigravidae and 33 (33%) were multigravidae. Fundus findings were seen in 23 (23%) cases with Pregnancy Induced Hypertension. Grade I changes were seen in 13 cases (13%), Grade II changes were seen in 5 case (5%) and Grade III changes were seen in 3 cases (3%). Bilateral serous retinal detachment (grade-IV) was seen in 2 cases (2%).

### CONCLUSIONS

Ophthalmoscopy should be done routinely in all cases of PIH to interpret the vascular changes. Though the definitive management will depend on other factors, a suggestive diagnosis by fundoscopy will guide the obstetric management of the patient.

### KEYWORDS

Pregnancy Induced Hypertension, Preeclampsia, Eclampsia, Retinal Changes, Cortical Blindness

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**BACKGROUND**

The term 'Pregnancy Induced Hypertension' includes gestational hypertension, pre-eclampsia and eclampsia.<sup>1</sup> Gestational hypertension includes the development of a blood pressure of 140/90 mm of Hg or more after twenty weeks of gestation.<sup>2</sup> Pre-eclampsia is a disease characterised by an elevated blood pressure and proteinuria after 20 weeks of gestation and sometimes an associated coagulation abnormality or liver disease. If coma or convulsions occur in addition it is termed eclampsia. It is seen in 10% of pregnancies and is more common among primiparas.

The onset of PIH is after the twentieth week of gestation.<sup>2</sup> Hypertension is the most significant primary sign. Proteinuria is defined as 300 mg or more of urine in a 24-hour urine sample or 100 mg/dl or more in at least two or more random samples collected six or more hours apart. Eclampsia is life threatening. Single or multiple seizures each lasting approximately for a minute may be followed by a coma of varying duration. Multiple organs may be involved in PIH.<sup>4</sup> Hepatic dysfunction and platelet abnormalities may occur. Neurological involvement may vary from headache and drowsiness to seizures hemiplegia and coma.

The visual system may be involved in PIH. Rarely visual disturbances may be the presenting symptom. Other less common symptoms include amaurosis, photopsia, scotomata, diplopia, chromatopsia and hemianopia. The abnormalities of the retina and the retinal vasculature are most frequent though the conjunctiva, choroid, optic nerve and the visual cortex may be affected. Visual loss as a result of vascular involvement is unusual. Vision threatening conditions involve central retinal artery occlusion, secondary optic atrophy, macular tear, central serous retinopathy, retinal detachment, central retinal vein occlusion, choroidal

ischemia and haemorrhage. Spontaneous vitreous haemorrhage may occur in cases of HELLP syndrome.<sup>3</sup> Most of the changes in the retina are under diagnosed. progression of retinal changes correlates with the fetal mortality due to similar vascular ischemic changes in placenta. Pregnant hypertensive mothers having fundus changes should be followed up for their babies and these babies will be screened for Retinopathy of prematurity and early detection of toxæmic retinopathy in mother may help the obstetrician to manage mother and foetus both.<sup>4</sup>

We wanted to estimate the prevalence of retinopathy in Pregnancy Induced Hypertension and correlate between the fundus changes and the amount of hypertension and also between the fundus changes and the severity of the disease.

**METHODS**

This hospital based prospective study was conducted between January 2016 to August 2017 at the SRM MCH & RC, a suburban tertiary care hospital at SRM university campus. All available demographic data of fundus findings of pregnancy induced hypertension patients visiting the hospital during the study period were examined and recorded.

**Inclusion Criteria**

Patients with pregnancy induced hypertension with 36 weeks of Gestation and above.

**Exclusion Criteria**

Pre-existing hypertension, co-existing diabetes mellitus., co-existing renal disease, Coexisting ocular morbidity like glaucoma, cataract, corneal opacities, history of ocular trauma, surgery or previous laser treatment.

**RESULTS**

Age Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 20 years	24	31.17	4	30.77	1	20.00	1	33.33	0	0.00
21-25 years	38	49.35	8	61.54	2	40.00	2	66.67	2	100.00
26-30 years	15	19.48	0	0.00	2	40.00	0	0.00	0	0.00
31-35 years	0	0.00	1	7.69	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.7791 Not Significant

*Table 1. Age Distributions (Groups)*

Complaints Status	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
Nil	56	72.73	9	69.23	3	60.00	1	33.33	0	0.00
Headache	18	23.38	3	23.08	2	40.00	0	0.00	0	0.00
Blurred Vision	3	3.90	1	7.69	0	0.00	2	66.67	0	0.00
Loss of Vision	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=<0.0001 Significant

*Table 2. Complaint Status*

Gravida Status	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
Primigravida	50	64.94	9	69.23	3	60.00	3	100.00	2	100.00
Multigravida	27	35.06	4	30.77	2	40.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.6001 Not Significant

*Table 3. Gravida Status*

Systolic Blood Pressure Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 150 mm Hg	62	80.52	8	61.54	1	20.00	1	33.33	0	0.00
> 150 mm Hg	15	19.48	5	38.46	4	80.00	2	66.67	2	100.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0126 Significant

*Table 4. Systolic Blood Pressure Distribution (Groups)*

Diastolic Blood Pressure Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 100 mm Hg	61	79.22	10	76.92	2	40.00	1	33.33	0	0.00
> 100 mm Hg	16	20.78	3	23.08	3	60.00	2	66.67	2	100.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P = 0.0231 Significant

*Table 5. Diastolic Blood Pressure*

Duration of BP Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 30 days	69	89.61	11	84.62	3	60.00	2	66.67	1	50.00
31-60 days	7	9.09	0	0.00	1	20.00	0	0.00	0	0.00
51-90 days	1	1.30	0	0.00	0	0.00	0	0.00	0	0.00
91-120 days	0	0.00	1	7.69	1	20.00	1	33.33	1	50.00
121-150 days	0	0.00	1	7.69	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0011 Significant

*Table 6. Duration of BP Distribution (Groups)*

Visual Acuity (BE) Status	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
6\6	77	100.00	13	100.00	4	80.00	1	33.33	0	0.00
6\12	0	0.00	0	0.00	1	20.00	2	66.67	0	0.00
CFCF	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=<0.0001 Significant

*Table 7. Visual Acuity (BE) Status*

Hemoglobin Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 9 mg/dl	14	18.18	3	23.08	1	20.00	1	33.33	0	0.00
9.1 - 11 mg/dl	58	75.32	9	69.23	2	40.00	2	66.67	0	0.00
11.1- 13 mg/dl	5	6.49	1	7.69	2	40.00	0	0.00	1	50.00
13.1 - 15 mg/dl	0	0.00	0	0.00	0	0.00	0	0.00	1	50.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0005 Significant

*Table 8. Haemoglobin Distribution (Groups)*

Proteinuria Status	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
Nil	18	23.38	1	7.69	0	0.00	0	0.00	0	0.00
1+	41	53.25	8	61.54	1	20.00	0	0.00	0	0.00
2+	10	12.99	2	15.38	2	40.00	1	33.33	0	0.00
3+	8	10.39	2	15.38	2	40.00	1	33.33	0	0.00
4+	0	100.00	0	100.00	0	100.00	1	66.67	2	0.00

P=0.0142 Significant

*Table 9. Proteinuria Status*

Blood Urea Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 20 mg/dl	22	28.57	3	23.08	0	0.00	0	0.00	0	0.00
21-30 mg/dl	51	66.23	8	61.54	4	80.00	1	33.33	0	0.00
31-40 mg/dl	2	2.60	2	15.38	1	20.00	2	66.67	2	100.00
> 40 mg/dl	2	2.60	0	0.00	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0798 Not Significant

*Table 10. Blood Urea Distribution (Groups)*

Serum Creatinine Distribution (Groups)	Normal	%	Gr 1 HTN Retinopathy	%	Gr 2 HTN Retinopathy	%	Gr 3 HTN Retinopathy	%	Gr 4 HTN Retinopathy	%
≤ 0.8 mg/dl	20	25.97	6	46.15	2	40.00	0	0.00	0	0.00
0.9-1.0 mg/dl	32	41.56	2	15.38	1	20.00	1	33.33	1	50.00
1.1-1.2 mg/dl	22	28.57	3	23.08	0	0.00	1	33.33	0	0.00
> 1.2 mg/dl	3	3.90	2	15.38	2	40.00	1	33.33	1	50.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.1416 Not Significant

*Table 11. Serum Creatinine Distribution (Groups)*

Serum Uric Acid Distribution (Groups)	Normal		Gr 1 HTN Retinopathy		Gr 2 HTN Retinopathy		Gr 3 HTN Retinopathy		Gr 4 HTN Retinopathy	
	Normal	%		%		%		%		%
≤ 3.5 mg/dl	6	7.79	0	0.00	0	0.00	0	0.00	1	50.00
3.6-5.5 mg/dl	48	62.34	8	61.54	3	60.00	2	66.67	1	50.00
5.6-7.5 mg/dl	17	22.08	5	38.46	2	40.00	1	33.33	0	0.00
> 7.5 mg/dl	6	7.79	0	0.00	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.8849 Not Significant

**Table 12. Serum Uric Acid Distribution (Groups)**

Severity of PIH Status	Normal		Gr 1 HTN Retinopathy		Gr 2 HTN Retinopathy		Gr 3 HTN Retinopathy		Gr 4 HTN Retinopathy	
	Normal	%		%		%		%		%
Gestational Hypertension	15	19.48	1	7.69	0	0.00	0	0.00	0	0.00
Mild Preeclampsia	41	53.25	7	53.85	0	0.00	0	0.00	0	0.00
Severe Preeclampsia	16	20.78	4	30.77	4	80.00	2	66.67	1	50.00
Eclampsia	5	6.49	1	7.69	1	20.00	1	33.33	1	50.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0239 Significant

**Table 13. Severity of PIH Status**

Correlation with Blood Pressure Status	Normal		Gr 1 HTN Retinopathy		Gr 2 HTN Retinopathy		Gr 3 HTN Retinopathy		Gr 4 HTN Retinopathy	
	Normal	%		%		%		%		%
Yes	56	72.73	11	84.62	5	100.00	3	100.00	2	100.00
No	21	27.27	2	15.38	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0279 Significant

**Table 14. Correlation with Blood Pressure Status**

Correlation with Severity of PIH Status	Normal		Gr 1 HTN Retinopathy		Gr 2 HTN Retinopathy		Gr 3 HTN Retinopathy		Gr 4 HTN Retinopathy	
	Normal	%		%		%		%		%
Yes	54	70.13	10	76.92	5	100.00	3	100.00	2	100.00
No	23	29.87	3	23.08	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>77</b>	<b>100.00</b>	<b>13</b>	<b>100.00</b>	<b>5</b>	<b>100.00</b>	<b>3</b>	<b>100.00</b>	<b>2</b>	<b>100.00</b>

P=0.0383 Significant

**Table 15. Correlation with Severity of PIH Status**

**DISCUSSION**

In the present study the mean age of the population was 22.6±2.76 years. In Z. Kurdoglu et al study<sup>5</sup> the mean age was 30 years. In S. C. Reddy et al study;<sup>6</sup> the mean age was 30.62 ± 6.2 years. In Tadin I et al study,<sup>7</sup> the mean age was 29.1 ± 4 years. There was no significant effect of extremes of age on degree of changes. This observation was similar to that of S.C Reddy et al study and against AR. Rasdi et al study.<sup>8</sup> In our study 67% (67) were primigravidae and 33% (33) were multigravidae. In S.C. Reddy et al (4) study, 43.6% (34) were primigravidae, 34.6% (27) were multigravidae and 21.8% (17) were grandmultis. There was no significant association of changes was found in association with gravida. This observation was similar to that of S.C Reddy et al study. In N. Ramabharathi et al study there was significant association with primigravida which was against our observation.

In our study 16% (16) had gestational hypertension, 48% (48) had mild preeclampsia, 27% (27) had severe preeclampsia and 9% (9) had eclampsia. In S. C. Reddy et al study, 38.5% (30) had mild preeclampsia, 59% (46) had severe preeclampsia and 2.5% (2) had eclampsia. In Tadin. I. et al study, all cases 100% (40) had severe preeclampsia. In Z. Kurdoglu et al study all cases 100% (148) were preeclamptic. In Jaffe and Schatz study. 17 cases had mild preeclampsia and 14 cases had severe preeclampsia. Eclampsia is life threatening. Headache was the most common symptom seen in our patients 23% (23) whereas headache, floating specks or blurred vision was most

common in Z. Kurdoglu et al study<sup>5</sup> while blurring of vision was seen in three cases in S.C. Reddy et al study.

The visual acuity was abnormal in 5% (5) of the cases in our study whereas the visual acuity was abnormal in 3.84%. (3) cases in S.C. Reddy et al study. In A. R, Rasdi et al study visual acuity was abnormal in 3.8% (6) cases. Visual symptoms may be involved in PIH. In the present study fundus findings were seen in 23% (23) cases with Pregnancy Induced Hypertension. Tadin I. et al from Croatia had reported 45% of retinal changes in their study of 40 patients with PIH. Reddy et al<sup>9</sup> in a study of 275 cases of preeclampsia and 125 cases of eclampsia found an incidence of 53.4% in preeclampsia and 71.6% in eclampsia of hypertensive retinopathy. S.C. Reddy et al studied 78 cases with PIH and found a prevalence rate of 59% .The prevalence rate of fundus changes found in our study, 23.33%, was lesser than that found in Tadin I et al study (45%); and S. C. Reddy et al.<sup>6</sup> Zehra Kurdoglu et al studied 148 cases of PIH retrospectively in Turkey. The prevalence rate of hypertensive retinopathy in their study was 48%. Karki et al<sup>10</sup> from Nepal have reported 13.7% of fundus changes in their study of 153 subjects with PIH. Our prevalence rate was higher.

In our study, grade I changes were seen in 13% cases (13), Grade II changes were seen in 3.70% (5) and Grade III changes were seen in 3% cases (3). Bilateral serous retinal detachment (grade-IV) was seen in 2% cases (2). S. C. Reddy et al did not find any case of haemorrhages, or cotton wool spots or retinal detachments probably reflecting the effective control of hypertension of patients. Also, their sample size was smaller. Tadin Let al had 25% (6 cases) with

grade -I changes; 15% (6) of grade-II changes and 5% (2) with Grade-III changes out of forty cases. Jaffe G. and Schatz H<sup>1</sup> did not find any haemorrhages, cotton wool spots or retinal detachments in their study as well. Z. Kurdoglu et al observed serous retinal detachment in 16% of the cases, as compared to our rate of prevalence of 1.3%.

In our study there was a statistically significant correlation between the retinopathy changes and the degree of blood pressure and the severity of the disease. S.C. Reddy et al, found a statistical correlation between proteinuria, blood pressure and hypertensive retinopathy. The degree of retinopathy was directly proportional to severity of preeclampsia with which our study was in accordance. Tadin I. et al found that the degree of retinopathy was directly related to the blood pressure and to the severity of disease. They stated that hypertensive retinopathy is a valid and reliable prognostic factor in determining the severity of preeclampsia. Z. Kurdoglu et al; found no significant correlation with severity of disease which was against our observation. Karki et al assessed the foetal outcome in these patients and concluded that retinal and optic nerve head changes were associated with low birth weight; choroidal and optic nerve head changes were associated with low Apgar score; fundus evaluation in patients with PIH is an important procedure to predict adverse foetal outcomes

The prevalence rate found in our study was lower than that found in. This could be due to the fact that the pregnant women in and around Kattankulathur, being admitted into SRM Medical College Hospital and Research Center, are undergoing routine prior antenatal check-ups and treatment for hypertension if any is being instituted. Racial factors could be playing a part. The incidence of severe changes exudative retinal detachment was more in our study than that in other studies due to the reason that few cases from remote areas are turning up at term gestation to SRM Medical College Hospital and Research Center with severe preeclampsia and eclampsia without prior antenatal check-ups. Incidentally, both cases of our study who had serous retinal detachment hailed from tribal areas and did not have any antenatal care. Exudative RD is sight threatening.

There is a significant positive correlation with the levels of hypertension and with the severity of the disease. This observation was similar to that of Tadin et al study, S.C. Reddy et al study, Ramabharathi et al study and Smita Dileep Javedkar et al study. Exudative retinal detachment is rare in PIH patients. In our study there were 2% cases (2) 11% (1) cases of eclampsia and 1.3% (1) of preeclampsia (1.3%).

#### Limitations

There was no blinding and the findings observed could be subject to observer bias. As the study included only those at 36 weeks period of gestation and above, those presenting earlier with a more severe form of the disease with possible fundus changes and whose pregnancy would be terminated

might have been missed. Most of the fundus changes in PIH are under diagnosed.

### CONCLUSIONS

Timely ophthalmoscopic examination should be called for in all cases of PIH as it would affect the decision of induction of delivery, thereby preventing other complications. A change in the retinal vasculature could also reflect a similar disease in the placental microcirculation and predict foetal prognosis. Ophthalmoscopy is a simple tool that can help the obstetrician in assessing severity of the disease in cases of PIH. There is significant correlation between severity of fundus changes and the levels of hypertension in our study.

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