

A STUDY ON FUNDUS CHANGES IN PREGNANCY-INDUCED HYPERTENSION: A FOUR-YEAR OBSERVATION

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Abstract

Introduction: Hypertensive disorders make difficulties in 5-10% of all pregnant women, forming the deadly triad of haemorrhage, heart disease, and maternal morbidity or mortality. The goal of this research is to identify retinal changes in pregnancy-induced hypertension and to identify the association between retinal changes and hypertension severity.

Methods: Data from 100 pregnant women admitted with pregnancy-induced hypertension (PIH) were collected retrospectively over the last four years. Vision, Anterior segment, and Fundus were evaluated.

Result: Fifty-four pregnant women suffered from mild preeclampsia, 40 pregnant with severe preeclampsia, and six pregnant with eclampsia with seizures. 24% of pregnant had hypertensive retinopathy. Grade 2, 3, and 4 retinopathy were observed in 22%, 6%, and 2% of pregnant women. Two percent of pregnant had macular edema grade 4 retinopathy (macular edema occurred simultaneously with hypertensive retinopathy), and 3% had central serous retinopathy were noticed. The fundus findings have a significant positive correlation with the severity of hypertension ($P < 0.001$). Arteriole narrowing was the most common fundus finding (45.7%).

Conclusion: Overall, 54% of pregnant were recorded with hypertensive retinopathy. A positive correlation was observed between fundus changes with the hypertension severity. This study emphasises the importance of routine fundus examination in hypertensive pregnant women. Retinal change during pregnancy is one of the indicator for deciding whether or not to terminate the pregnancy.

Keywords: pregnancy-induced hypertension, fundus examination, retinopathy.

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INTRODUCTION

Pregnancy hypertension is the one of the cause of maternal morbidity and mortality. Hypertension complicates 5-10% of pregnant to form a deadly triad, hemorrhage, or heart disease. According to WHO, hypertension disorders in pregnancy account for 14% of maternal deaths.¹ Pregnancy hypertensive disorders, such as chronic hypertension with/without superimposed pre-eclampsia/eclampsia, HELLP syndrome, gestational hypertension, preeclampsia with/without severe features, or eclampsia may pose risk to the mother and the foetus during pregnancy.^{2,3}

Pregnancy hypertension usually appears after the 20th week of pregnancy. Multiple organs may be involved in PIH, as well as hepatic dysfunction and platelet abnormalities.⁴ Headache, drowsiness, seizures, hemiplegia, and coma were all symptoms of neurological involvement. Visual disturbances are a rare presenting symptom.⁵ Pregnancy-induced hypertension results in vision-threatening illnesses like central retinal artery occlusion, central serous retinopathy, secondary optic atrophy, retinal detachment, macular tear, choroidal ischemia, central retinal vein occlusion, and haemorrhage.⁶ The most common retinal change observed was arteriole narrowing.

Several retrospective studies have been published,^{7,8} there were not mentioned fundus changes. There was a scarcity of data on the occurrence of fundus alterations in PIH in the literature. The current study was carried out to determine the prevalence of retinal changes in pregnancy-induced hypertension, as well as the association between the retinal changes and blood pressure and the severity of hypertension.

METHOD

This hospital-based retrospective observational study collected data from 01-01-2016 to 30-07-2020 for four years. Data were collected from medical records of 100 pregnant with pregnancy-induced hypertension, those who visit regularly for treatment to the district government hospital. The patients' ages, gravida, and para were recorded. Pregnant women who have recently developed hypertension in the 28th week of pregnancy with proteinuria visited at the department of obstetrics & gynecology were included for the complete ophthalmological evaluation at the Department of Ophthalmology.

All pregnant women had their blood pressure taken. All referred pregnant from the obstetrics & gynecology department underwent detailed ophthalmic examinations

such as visual acuity test, complete slit-lamp examination of the anterior and posterior segments, and fundus picture of all eyes. The patient's retina was examined by the senior general ophthalmologist, who also trained in vitreoretinal services. To rule out any additional co-morbidities, a systemic examination was performed.

Data Analysis: The statistical analysis was carried out with the help of a statistical package for social sciences software version 16.0.(SPSS Inc., Chicago, IL, USA). The chi-square test was used to analyse all categorical data. The fundus findings and parity were compared and investigated. Fisher's exact test to assess the association. A '*p*' value <0.01 was considered statistically significant.

RESULT

A total of 100 pregnant women were included, with 60 being between the ages of 21 and 26 years, 21 being between the ages of 26 and 30 years, 11 being between the ages of 20 and 30, and the rest being older than 30 years. The highest number of PIH cases (n=81) were recorded in 21-30 years age group, followed by 11% in 20 years age group, and 8% in >31 years age group.

60 percent of primigravida instances and 40 percent in multigravida cases were identified. There was no association seen between fundus findings and the parity.

During admission, 67% of PIH cases had more than 32 weeks gestational age. There were 23 PIH cases with 29-32 weeks gestational age, 7 with 25-28 weeks gestational age, and 3 cases with 25 weeks gestational age. Fifty-four patients have mild preeclampsia (DBP<110 mm Hg), 40 have severe preeclampsia (DBP≥110 mm Hg), and six have hypertension with seizures (Eclampsia).

41 cases had normal fundus, and 59 cases had abnormal fundus findings and the retinal changes in total 59% cases.

Of the 62 primigravidas, 23 (37.1%) had normal fundus, and 39 (62.9%) cases had abnormal fundus. 18 (47.3%) cases of the 38 multigravidas had normal fundus, and 20 (52.6%) cases had abnormal fundus. The majority of patients (41%) had normal fundus or grade-1 hypertensive retinopathy (24%). The majority of patients (41%) had normal fundus or grade 1 hypertensive retinopathy (24%). 22% cases had grade-2 hypertensive

retinopathy, 6% cases had grade-3, and 2% had grade-4 hypertensive retinopathy. Another 2% of the pregnant were affected with macular edema. Only 3% of the patients studied had central serous retina. Hypertensive retinopathy was found in 54% of the cases studied. As a result, hypertensive retinopathy is the most commonly observed symptom of PIH (Table 1).

Table 1. Grouping of fundus changes according to parity

Fundus finding	Gravida					
	Primigravida		Multi gravida		Total	
	N	%	N	%	N	%
Normal Fundus	23	37.1%	18	47.4%	41	41.0%
Grade-1 HTN Retinopathy	14	22.6%	10	26.3%	24	24.0%
Grade-2 HTN Retinopathy	16	25.8%	6	15.8%	22	22.0%
Grade-3 HTN Retinopathy	3	4.8%	3	7.9%	6	6.0%
Grade-4 HTN Retinopathy	2	3.2%	0	.0%	2	2.0%
Central serous retinopathy	3	4.8%	0	.0%	3	3.0%
Macular edema	1	1.6%	1	2.6%	2	2.0%
Total	62	100.0%	38	100.0%	100	100.0%

Fisher's exact test, p=0.565.

A total of 54 patients were diagnosed with hypertensive retinopathy, with 59 % having retinal changes. 44.4 % of PIH patients had grade 1 hypertensive retinopathy with retinal arteriole narrowing. Changes in grade 2 account for 40.7 %, 11.1 % in grade-3, and 3.7 % in grade-4. (Table 2).

Table 2. Complaint Status

Fundus finding	Complaint									
	Nil		Headache		Blurred Vision		Loss of Vision		Total	
	N	%	N	%	N	%	N	%	N	%
Normal finding	4	36.4%	22	36.7%	16	55.17%	0	0%	41	41.0%
Grade-1 HTN Retinopathy	4	36.4%	14	23.3%	6	20.68%	0	0%	24	24.0%
Grade-2 HTN Retinopathy	2	18.2%	15	25.0%	5	17.24%	0	0%	22	22.0%
Grade-3 HTN Retinopathy	0	.0%	4	6.7%	2	6.9%	0	0%	6	6.0%
Grade-4 HTN Retinopathy	0	0.0%	2	3.3%	0	0%	0	0%	2	2.0%
Central serous retinopathy	1	9.1%	2	3.3%	0	0%	0	0%	3	3.0%
Macular edema	0	.0%	1	1.7%	0	0%	0	0%	2	2.0%
Total	11	100.0	60	100.0	29	100.0	0	0%	100	100.0%

Table 3: Organizing the fundus findings by age group

Fundus finding	Age group (years)											
	<= 20 yrs		21 - 25 yrs		26 - 30 yrs		31 - 35 yrs		>35 yrs		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Normal finding	4	36.4%	22	36.7%	13	61.9%	1	16.7%	1	50.0	41	41.0%
Grade-1 HTN Retinopathy	4	36.4%	14	23.3%	3	14.3%	3	50.0%	0	.0%	24	24.0%
Grade-2 HTN Retinopathy	2	18.2%	15	25.0%	3	14.3%	2	33.3%	0	.0%	22	22.0%
Grade-3 HTN Retinopathy	0	.0%	4	6.7%	2	9.5%	0	.0%	0	.0%	6	6.0%
Grade-4 HTN Retinopathy	0	.0%	2	3.3%	0	.0%	0	.0%	0	.0%	2	2.0%
Central serous retinopathy	1	9.1%	2	3.3%	0	.0%	0	.0%	0	.0%	3	3.0%
Macular edema	0	.0%	1	1.7%	0	.0%	0	.0%	1	50.0%	2	2.0%
Total	11	100.0%	60	100.0%	21	100.0	6	100.0%	2	100.0	100	100.0

Fisher's Exact Test; P=0.502

PIH was observed in primigravidas more frequently than in multigravidas. However, the fundus findings did not correlate with parity. There was no association between the Fundus findings and parity (Fisher's exact test, P=0.565) (Table 3). There is no association between the patient's age and fundus findings (Fisher's exact test, p= 0.502) (Table 4).

Table 4: The relationship between fundus findings and the severity of hypertension

Fundus finding	type of PIH							
	Mild HTN (DBP <100)		Severe HTN (DBP >=100)		Eclampsia		Total	
	N	%	N	%	N	%	N	%
Normal	30	55.6%	11	27.5%	0	.0%	41	41.0%
Grade-1 HTN Retinopathy	15	27.8%	7	17.5%	2	33.3%	24	24.0%
Grade-2 HTN Retinopathy	9	16.7%	13	32.5%	0	.0%	22	22.0%
Grade-3 HTN Retinopathy	0	.0%	6	15.0%	0	.0%	6	6.0%
Grade-4 HTN Retinopathy	0	.0%	0	.0%	2	33.3%	2	2.0%
Central serous retinopathy	0	.0%	2	5.0%	1	16.7%	3	3.0%
Macular edema	0	.0%	1	2.5%	1	16.7%	2	2.0%
Total	54	100.0%	40	100.0%	6	100.0	100	100.0%

All 100 cases had fundus changes, which were correlated with hypertension severity, and two variables had a strong association (p= 0.001, Fisher's exact test). As the severity of hypertension increased, so did the likelihood of abnormal fundus findings. The fundus findings were found to have a positive correlation with the hypertension severity. (Table 5).

Table 5. Status of Visual Acuity (BE)

Fundus finding	type of PIH							
	6\6		6\12		CFCF		Total	
	N	%	N	%	N	%	N	%
Normal findings	41	52.56%	0	0%	0	.0%	41	41.0%
Grade-1 HTN Retinopathy	22	28.2	2	11.11%	0	0%	24	24.0%
Grade-2 HTN Retinopathy	15	19.23%	7	38.89%	0	.0%	22	22.0%
Grade-3 HTN Retinopathy	0	.0%	6	33.33%	0	.0%	6	6.0%
Grade-4 HTN Retinopathy	0	0%	0	0%	2	33.3%	2	2.0%
Central serous retinopathy	0	.0%	2	11.11%	1	16.7%	3	3.0%
Macular edema	0	0%	1	5.5%	1	16.7%	2	2.0%
Total	78	100.0%	18	100.0%	4	100.0	100	100.0%

DISCUSSION

The retina is a unique location where the vasculature of the human body can be seen directly with an ophthalmoscope. Hence, a change in retinal arterioles indicates the similar state of placenta, provides the reasonable idea for placental circulation and fetus health. If PIH is detected early, maternal and fetal complications can be avoided.^{9,10} The pathological changes are related to vascular endothelial dysfunction and its consequences (generalized vasospasm and capillary leak). Vasospastic manifestations are reversible, and the retinal vessels return to normal soon after birth.^{4,11}

The pregnant's mean age was 25.2 ± 5.89 years in the present study. In a study by Jaeffe and Schatz, it was 28 years.⁴ In the present study, age was does not shown association with retinal changes ($P > 0.05$). This was consistent with study by Reddy et al.¹¹ In the present study, 62% (62) were primigravidae and 38% (38) were multigravidae. In an Indian study, K Nandha et al. discovered that 67 percent of PIH cases were primigravidas.¹² In our study, gravida was not associated with retinopathy changes, which is consistent with the findings of Reddy et al.

In the present study, 54% of cases had mild

hypertension < 110 mm Hg. 40% of patients had severe hypertension ≥ 110 mm Hg, and 6% had hypertension with seizures (eclampsia). In a study of 300 cases of PIH, Bakhda RN et al. reported 182 cases had mild preeclampsia, 76 cases had severe preeclampsia, and 42 cases had eclampsia.⁷ Bhandari et al. reported 32% of patients had mild pre-eclampsia, 50% had severe pre-eclampsia, and 18% cases had eclampsia.

In the current study, 59% cases had retinal changes. Tadin et al. reported 45% of retinal changes.¹³

In the current study, hypertensive retinopathy was the most common finding in 54% of patients [24% grade 1, 22% of grade 2 hypertensive retinopathy], there were three cases had central serous retinopathy and two cases had macular edema grade-4 retinopathy (macular edema occurred concurrently with hypertensive retinopathy). Both the cases with grade 4 retinopathy had blood pressure 160/110mm Hg and the fundus showed no disc edema. The most common fundus finding was arteriole narrowing (45.7%). Topical anti-inflammatory medication was given to patients with macular edoema and central serous retinopathy. Bhandari AJ et al., study reported exudative retinal detachment occurs in 7% of

PIH cases and 12% cases had macular edema.⁸

Reddy et al., recorded retinal changes in 53.4% of preeclampsia, and 71.2% of eclampsia. Jaffe and Schatz, as well as Reddy et al., have both confirmed the absence of hemorrhages and exudates. This is due to proper antenatal care and early detection of PIH cases, which prevents them from progressing to Grade 3 hypertensive retinopathy.

The current study found a positive correlation between the fundus findings and hypertension severity. Similar to previous studies, the severity of PIH was significantly ($P = 0.004$) associated with retinopathy.¹⁴⁻¹⁸ Similarly, Tadin et al., study identified that the degree of retinopathy was proportional to preeclampsia severity. According to them, the presence of hypertensive retinopathy is one of the prognostic factor for the severity of preeclampsia.

CONCLUSION

Retinal changes are the indicator of hypertension severity. In PIH patients, grade-1 and grade-2 hypertensive retinopathy is the common. The presence of disc edema, macular edema, or retinal detachment was an indication that the procedure should be terminated. The retinal changes resolve shortly after the pregnancy is terminated. If the retinal changes persist, a history of chronic hypertension must be ruled out. Pregnant hypertensive mothers should be followed up on for their babies, who will be screened for Retinopathy of Prematurity, and early detection of toxæmic retinopathy may help obstetricians to manage the mother and fetus. Patients must be followed up even after the pregnancy is terminated until the retinal changes resolve.

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