A Study of Fundus Changes in Patients with Pregnancy Induced Hypertension Attending Tertiary Care Centre

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Abstract: Introduction: Retinal changes are a frequent observation in pregnancy-induced hypertension. Early detection and monitoring of these changes can help to determine the further course of pregnancy. The study is intended to determine the prevalence of retinal changes in pregnancy-induced hypertension (PIH) and the association of these changes with the blood pressure, proteinuria, and disease severity. Methods: All patients admitted with the diagnosis of PIH were observed in this study. Age, gravida, gestational period, blood pressure, and proteinuria were noted. A proper history of any ophthalmological symptoms and Fundoscopic examination was done after dilation of the pupils with a direct ophthalmoscope in, the ward itself. All findings were noted and then analyzed. Results: A total of 75 patients of PIH were examined. The mean age of patients was 24.88 years (range 18-39 years). The gestation period ranged from 27 weeks to 42 weeks; 40 (53.33%) were primigravida. 35(46.66%) were multigravida. 44 (58.66%) patients had mild preeclampsia, 26 (34.66%) had severe preeclampsia and 5 (6.66%) had eclampsia. Retinal changes (hypertensive retinopathy) were noted in 25 (33.33%) patients --- grade I in 19 (25.33%) and grade II in 4 (5.33%). Haemorrhages or exudates were seen in 1 (1.33%) patient and retinal detachment was seen in 1(1.33%) patient. There was a statistically significant positive association between retinal changes and blood pressure ($p<0.0001$), proteinuria ($p=0.0000036$) and severity of the PIH ($p=0.0001$). Conclusion: Ophthalmic fundus examination is an important procedure to be performed in all pregnant hypertensive women. It helps to determine the further course of pregnancy. In our study, Retinal changes were seen with PIH and they were significantly associated with blood pressure, proteinuria, and severity of the disease. [D Patel, Natl J Integr Res Med, 2018; 9(1):7-11]

Key Words: Fundus changes, Pregnancy induced hypertension, Proteinuria

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Introduction: Pregnancy Induced Hypertension (PIH) is a hypertensive disorder of pregnancy that occurs after 20 weeks of pregnancy, in the absence of any other causes of raised blood pressure, the blood pressure is more than 140/90 mmHg pressure taken after rest on two separate occasions at a minimum interval of 6 hours, in combination with generalized edema and/or proteinuria. PIH includes pre-eclampsia and eclampsia which occurs in approximately 5% of pregnancies usually after the 20th week of pregnancy.[1] Pre-eclampsia is characterized by hypertension, proteinuria, and generalized edema.[2] Pregnancy changes the metabolism, blood circulation and the hormonal profile of the mother which in turn affects the ocular functions and has adverse effects on the health of the fetus. The incidence of PIH is 10% out of which 5% are affected by eclampsia leading to 17.2% of maternal mortality and 22% of fetal mortality. Early detection and treatment are therefore very important.[3]

The pathological changes of PIH, pre-eclampsia, and eclampsia are related to vascular endothelial dysfunction and the consequences that follow. These include generalized vasospasm and capillary leakage. The retinal vascular changes usually correlate with the severity of systemic hypertension. However, the vasospastic changes are reversible and the retinal vessels return to normal after delivery. This systemic disease can affect multiple organ systems of the body that include the cardiovascular changes, hematological abnormalities, neurological or cerebral manifestations, hepatic and renal involvement. It also has potentially devastating consequences for mother and baby.[4]

Ocular involvement in PIH occurs in 30-100% of the patients. However visual involvement only occurs in up to 25% patients.

Abnormalities of the conjunctiva like capillary tortuosity, conjunctival hemorrhage, intravascular thrombi, and localized ischemic necrosis of conjunctiva due to severe vasospasm have been observed along with the changes in the retina, retinal vasculature, choroid, optic nerve and visual cortex.[5]

The common symptoms are blurring of vision, photopsia, scotomas, and diplopia.These visual symptoms may be the precursor of seizures.

Various other changes are Angiospasm- Constriction of the arterioles of the retina which is initially focal[6,7,8], involving the nasal side and gradually progressing to generalized narrowing[6,9] which are usually reversible[6], Retinal edema- persistent decrease in perfusion causes retinal edema.[4,10], Sclerosis- sclerosis, arteriovenous crossing changes, hemorrhages, cotton wool spots., Serous detachment- It is exudative, usually bilateral, the exudation from choroid elevates the retina.[11], Spontaneous vitreous hemorrhage, retinal neovascularisation, Optic neuropathy- vascular changes in vessels of the optic nerve head can occur in PIH causing papilloedema, acute ischemic optic neuropathy, optic atrophy[10], Cortical blindness is rare. There are many cases of total visual recovery and this is simultaneous with the resolution of edema[12].

Fundoscopic examination in PIH detects a reduced arteriole to vein ratio, Arterio-Venous crossing changes, hemorrhages, exudates in the retina, exudative retinal detachments, choroidal ischemia, and infarcts.

The most common abnormality is spasm and narrowing of retinal vessels. It takes few days to develop and persists for months. They may persist even after termination of pregnancy. By detecting the retinal arteriolar spasm the ophthalmologist might determine when immediate delivery of the baby is required to reverse the pre-eclamptic state and prevent an adverse medical outcome.[4] thus the fundoscopic findings have become the primary investigative procedure in an assessment of ophthalmic changes in patients with PIH.

Methods: This was an observational study with a serial sample collection of a sample size of 75 cases completed over a period of twenty-four months. Approval from the ethical committee of Institute taken before starting the study.

Inclusion criteria consisted of all citizens of age ≥18 year, age range 18 to 39 years, attending the antenatal clinic.

Exclusion criteria consisted of Patients with preexisting systemic conditions like diabetes, hypertension, renal disease and Patients with hazy media restricting fundus visualization.

Assessment of patient: A detailed ocular and medical history followed by complete eye examination has been done in 75 patients who fulfilled the diagnostic criteria of PIH (>20 weeks of pregnancy, high arterial blood pressure generalized edema and/or proteinuria) admitted in our Obstetric ward, intending to eventually deliver in the labour room of Dhiraj hospital, piparia (Vadodara). Patient's consent was taken for involving his/her data in the study. Various visual parameters in accordance with the Study Performa had been recorded. These include uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA) done using Snellen's Chart.

The blood pressure was measured in upper arm using the Mercury Sphygmomanometer (ELKO B.P APPARATUS) after 10 minutes of rest, according to standard protocols. Fundus examination was done, on admission after dilating the pupils with 1% Tropicamide drops (one drop in each eye at 15 minutes interval for 3 times)with Direct Ophthalmoscopy and this examination was repeated weekly until the end of pregnancy and in cases showing abnormal fundal changes, fundus examination was continued until 10 days after delivery in the post-partum period.

The retinal changes (hypertensive retinopathy) were graded according to Keith-Wagener-Barker classification as follows:
Grade 1: mild generalized arteriolar narrowing or sclerosis.
Grade 2: Definite focal narrowing and arteriovenous crossings. Moderate to marked sclerosis of the retinal arterioles. Exaggerated arteriolar light reflex.
Grade 3: Retinal hemorrhages, exudates, and cotton wool spots. Sclerotic and spastic lesions of retinal arterioles.
Grade 4: Grade 3+ papilloedema. Elschning's spots may be present.Retinal Detachment."

Observation and Results: A total of 75 patients with pre-eclampsia and eclampsia were included in the study. Of these, there were 26 (34.66%) patients with no previous history of an antenatal check-up. The average age of the patients was 24.88 years. The minimum age being 18 years to the maximum age of 39 years. The average gestation period was 36.62

weeks. The range is from 27 weeks to 42 weeks. There are 40 patients with primigravida and 35 were multigravida. There were 44 (58.66%) patients with mild pre-eclampsia, 26 (34.66%) patients with severe pre-eclampsia and 5 (6.66%) patients with eclampsia. There were 50 (66.66%) patients with no changes of hypertensive retinopathy, 19 (25.33%) patients showing Bilateral Grade 1 hypertensive retinopathy, 4 (5.33%) patients with Bilateral grade 2 hypertensive retinopathy, 1 (1.33%) patient with grade 3 hypertensive retinopathy and 1 (1.33%)patient with Bilateral exudative retinal detachment.

There were a total of 70 patients with pre-eclampsia. Of these, there were 44 (62.85%) patients with mild pre-eclampsia and 26 (37.14%) patients with severe pre-eclampsia.The retinal changes in patients with pre-eclampsia are as follows (table 1)

Table 1: Classification based on disease severity and retinopathy

Retinal changes	Mild pre-eclampsia (n=44)	Severe pre-eclampsia (n=26)
No hypertensive changes	35	15
Bilateral Grade 1 hypertensive retinopathy	9	9
Bilateral Grade 2 hypertensive retinopathy	Nil	1
Bilateral Grade 3 hypertensive retinopathy	Nil	1
Bilateral Grade 4 hypertensive retinopathy/ Retinal detachment	Nil	Nil

The patients were then distributed according to the age group < 20 years of age, n=10(13.33%), 21- 30 years of age, n=52(69.33%) And > 30 years of age, n=13(17.33%)

Table 2: Classification based on retinal changes and patients gravida

	Primigravida	Multigravida
No hypertensive retinopathy	24	26
Grade 1 hypertensive retinopathy	12	7
Grade 2 hypertensive retinopathy	3	1
Grade 3 hypertensive retinopathy	Nil	1
Grade 4 hypertensive retinopathy/Retinal detachment	1	Nil
Total patients showing changes for hypertensive retinopathy	16	9

The (p=0.39) showing no positive correlation between retinal changes and primigravida women.

The most common complaint about patients was a headache with 32 patients, 2 patients complained of blurring of vision with a headache while 1 patient complained of sudden loss of vision. Most of the patients did not complain of any symptoms.

Classification based on the systolic and diastolic blood pressure levels. Hypertensive retinopathy in PIH and mean BP Unpaired t-test, t =30.50, p<0.0001.9=this shows an extremely significant correlation between retinopathy and blood pressure levels (table 3)

Table 3: Distribution of hypertensive retinopathy in PIH and Mean BP

Grading of retinopathy	No. of patients with changes	Percentage	Mean systolic BP (in mmHg)	Mean diastolic BP (in mmHg)
Grade 1	19	25.33	165.78	100.10
Grade 2	4	5.33	177.5	115
Grade 3	1	1.33	186	120
Grade 4/Retinal detachment	1	1.33	198	126

The association of proteinuria with retinopathy is also depicted. Proteinuria has been graded as follows (table 4) = up to 0.3gm/L , ++ = Up to1gm/L and ++ + = more than 3gm/L

Table 4: Distribution of retinopathy and protienuria

	No. of patients	Percentage	Retinopathy(n)	% with retinopathy
+	23	30.66%	5	21.7%
++	30	40%	15	50%
+++	22	29.33%	22	100%

Discussion: In the present study, fundus changes of hypertensive retinopathy (grade1, 2, 3 and retinal detachment) were seen in 25 (33%) of patients with pregnancy-induced hypertension. Focal arteriolar narrowing was found in (5/25) patients, Bilateral hemorrhages and exudates were found in (1/25) patient while a bilateral exudative retinal detachment was seen in one patient in our study.

In Malaysia, a group of patients with hypertensive disorders of pregnancy was studied by Rasdi[13].This group included patients with gestational hypertension, chronic hypertension, preeclampsia/eclampsia and chronic hypertension with superadded preeclampsia / eclampsia. Retinal changes were detected in 21.5% patients (5/28) of preeclampsia/eclampsia. The findings included arteriolar narrowing in (5/28) patients, cotton wool spots in (1/28), hemorrhages in (1/28) and serous retinal detachment in (1/28).

A study in Croatia by Tadin [14] involving 40 patients with PIH reported 45% of retinal changes. A statistical correlation was observed between hypertensive retinopathy, proteinuria, and blood pressure. The severity of preeclampsia was directly proportional to the degree of retinopathy which is similar to our observation.

The prevalence of hypertensive retinopathy changes (33%) seen in our study is similar to 21.5% (15), 45% [14], but less than 59% [16] reported in the literature.

In conclusion, patients suffering from PIH have few visual symptoms. A headache of sudden onset, that is resistant to routine therapy in such patients, might be a warning symptom prior to the onset of the first convulsion. The observation of multiple hard exudates in the retina may be suggestive of albuminuric retinopathy, damage to the kidneys may also be possible. The presence of raised intracranial tension may lead to the development of papilloedema and these patients may also develop convulsions. In cases with toxemia of pregnancy, the fundal changes usually regress with a decrease in blood pressure and may also disappear completely after delivery due to lack of placental toxins.

Thus, repeated fundus examinations at regular intervals can assess the severity of the disease and the response to the treatment being instituted.

Conclusion: Fundus examination helps in assessing the severity of PIH and helps in determining the course of management.

Progressively deteriorating fundus changes in preeclampsia indicate worsening of the pathophysiological status and help in determining the course of management. Visual disturbances are highly prevalent amongst pregnant women with preeclampsia/Eclampsia. A thorough evaluation is required and immediate intervention may help in preserving the mother's vision and may be life-saving for both the mother and the baby.

Thus we conclude that early ophthalmoscopy should be conducted in all cases of PIH since it affects the decision on induction of delivery, and thereby prevents complications.

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