



## STUDY OF FUNDUS CHANGES BY USING OPTICAL COHERENCE TOMOGRAPHY IN HYPERTENSIVE DISORDERS OF PREGNANCY.

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**ABSTRACT** **BACKGROUND-** To determine fundus changes by using optical coherence tomography (OCT) in pregnancy induced hypertension patients. Fundoscopic findings in PIH include arteriovenous crossing changes, hemorrhages, exudates in retina, exudative retinal detachment, and choroidal infarcts. A very high systemic BP cause the development of hypertensive retinopathy with bleeding in the retina and retinal detachment which may progress to permanent visual impairment if untreated. Optical coherence tomography is noncontact, noninvasive imaging technique with high resolution which allows better understanding of fundus changes. So routine screening of PIH patients using optical coherence tomography might be helpful to diagnose early fundus changes and to prepare further guidelines for management of these patients. **METHODS-** This prospective observational study was carried out at Smt Kashibai Navale Medical College and General Hospital Narhe Pune in the OPD of Dept of Ophthalmology. 100 antenatal care female patients were included in this study. An informed consent was taken from each patient and participation was voluntary. **RESULTS-** Maximum number of PIH cases were found in the age group of 21 – 25 years. Maximum number of patients had either Normal fundus (47%) or grade 1 Hypertensive retinopathy (31%). 15% had grade 2, 3% had grade 3 and 2% of the cases had grade 4 Hypertensive retinopathy. Another 1 % had Exudative retinal detachment. 1% of the case studied showed Exudative retinal detachment with Macular Oedema. Fundus changes found in all the 100 cases was correlated with the severity of hypertension. **CONCLUSION-** There is significant correlation with the severity of disease and the levels of hypertension. Timely ophthalmoscopy should be called for in all cases of PIH as it would affect the decision of induction of delivery, thereby preventing other complications.

### KEYWORDS :

#### INTRODUCTION

Pregnancy, being a real challenge to the human body, is associated with a group of physiologic and pathologic changes. Toxaemia of pregnancy is a recognised entity for over 2000 years with its known complications and fatality<sup>1,2,3</sup>. Pregnancy induced hypertension (PIH) was classified as gestational hypertension, preeclampsia, severe preeclampsia and eclampsia.

Nowadays, a most accepted terminology for the following defined syndrome is “hypertensive disorders in pregnancy” given by American College of Obstetrics and Gynaecology<sup>2,3</sup>. It is an important cause of maternal and fetal morbidity and mortality<sup>4,5,6</sup>. The syndrome is a multi-system disorder that can include cardiovascular changes, haematologic abnormalities, hepatic and renal impairment, and neurologic or cerebral manifestations<sup>1,2</sup>.

Retinal vessels are the only body parts of which the vascular changes can be directly observed in vivo, and fundus examination<sup>7,8</sup> was the principal criterion to evaluate the development degree of PIHS in the early years.

Traditional methods used for assessing ocular findings in preeclampsia have, until recently, included indocyanine green angiography, ocular fluorophotometry and angiography, and Doppler ultrasonography<sup>9,10</sup>. Low image resolution, low validity ratio in measurements, and differences between observers are disadvantages of these methods.

For these reasons, objective, reliable, quantitative, and highly sensitive imaging methods are required for the diagnosis and follow-up of ophthalmic disease in pregnant women. Appropriate imaging technologies were recently developed, one of which is OCT with a high-resolution tomographic section of the optic nerve head, retinal nerve fiber layer, and retina by using 800-840 nm wavelength light in a non-contact, non-invasive manner.

#### AIMS AND OBJECTIVES

The objectives of this study are:-

1. The primary objective of the study is to identify fundus changes by

using optical coherence tomography in pregnancy induced hypertension patients during second and third trimester of pregnancy.

2. To compare fundus findings with OCT.

#### MATERIALS AND METHODOLOGY:

This prospective observational study was carried out at Smt Kashibai Navale Medical College and General Hospital Narhe Pune in the OPD of Dept of Ophthalmology after institutional ethical committee approval. 100 female patients were included in this study. An informed consent was taken from each patient and participation was voluntary.

1. Patients screening – Primigravida with PIH during second and third trimester of pregnancy.
2. Information sheet will be given and informed consent will be taken.
3. Detailed eye examination:

#### INCLUSION CRITERIA

1. Gestational Hypertension
2. Per-eclampsia i.e. BP > 140/90 mmHg with proteinuria  $\geq$  1+ and edema
3. Eclampsia i.e. pre-eclampsia superimposed with convulsions

#### EXCLUSION CRITERIA

1. Known cases of diabetes.
2. Known cases of systemic hypertension.
3. Patients having pre existing retinal diseases.

#### Results:

##### Age-wise incidence of PIH

Maximum number of PIH cases were found in the age group of 21 – 25 years.

##### Grouping of patients according to severity of hypertension

| Severity of hypertension | Number of patients |
|--------------------------|--------------------|
| Gestational hypertension | 11                 |
| Mild pre-eclampsia       | 48                 |
| Severe pre-eclampsia     | 39                 |

|           |     |
|-----------|-----|
| Eclampsia | 2   |
| Total     | 100 |

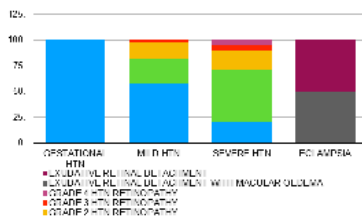
Maximum number of patients had either Normal fundus (47%) or grade 1 Hypertensive retinopathy (31%). 15% had grade 2, 3% had grade 3 and 2% of the cases had grade 4 Hypertensive retinopathy. Another 1 % had Exudative retinal detachment. 1% of the case studied showed Exudative retinal detachment with Macular Oedema. 51% of the cases studied had Hypertensive retinopathy. This makes Hypertensive retinopathy as the most frequently noted sign in PIH.

### Comparing the different grades of retinopathy

| Grades of retinopathy | Number of patients | Percentage |
|-----------------------|--------------------|------------|
| Grade 1               | 31                 | 60.78%     |
| Grade 2               | 15                 | 29.41%     |
| Grade 3               | 3                  | 5.88%      |
| Grade 4               | 2                  | 3.92%      |
| Total                 | 51                 | 100%       |

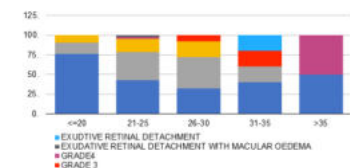
A total of 51 patients had hypertensive retinopathy. Of all the PIH patients with hypertensive retinopathy changes, 60.78% had grade 1 hypertensive retinopathy changes with narrowing of the retinal arterioles. 29.41% had grade 2 changes, 5.88% had grade 3 and the rest 3.92% had grade 4 changes. This study shows that maximum number of patients with hypertensive retinopathy had grade 1 and 2 changes.

### Correlating fundus findings with severity of hypertension



Fundus changes found in all the 100 cases was correlated with the severity of hypertension and Fisher's exact test was done on the same. P value for the test was found to be <0.001, showing that the two variables have a strong association. That means, as the severity of hypertension increases, there is more chance of the patient having abnormal fundus finding.

### Grouping the fundus findings according to age group



The different fundus findings were grouped based on their age and the data was studied and compared. Fisher's Exact test was done on the data and P value was 0.502, which is statistically insignificant. This suggests that there is no association between the age of the patient and their fundus findings.

### DISCUSSION:

Hypertension is the most common medical problem encountered in pregnancy and remains an important cause of maternal and foetal morbidity and mortality. It complicates almost 10% of all pregnancies. Preeclampsia is an obstetric disease that affects approximately 5% of pregnant women. Eclampsia is an acute and life-threatening complication of pregnancy characterised by the appearance of tonic-clonic seizures, usually in a patient who had developed preeclampsia.

The retinal vascular changes have been said to correlate with the severity of hypertension. These changes help as a guideline for termination of pregnancy as they may reflect similar ischemic vascular changes in the placenta.

Therefore, this study was undertaken to evaluate the fundus changes in 100 patients of Hypertensive disorders of pregnancy.

A total of 100 cases were included in this study, of which 47 were in the age group of 21-25 years, 25 in the age group of 26-30

years, 21 cases had age  $\leq 20$  years and the rest  $>30$  years. Mean age of the cases in our study was  $24.29 \pm 6.58$  years. Mean age-group of patients in the present study matches with the studies by Karki et al, and Shukla et al. In the study conducted by Karki et al, mean age group of patients with retinal changes was  $23.86 \pm 5.51$ .

Age in our study ( $P = 0.502$ ) was not associated with retinopathy changes ( $P > 0.05$ ) which is similar to the results quoted by Reddy et al<sup>1</sup>.

### Severity of hypertension

In the present study, 11% of the cases studied had gestational hypertension, 48% had mild hypertension with blood pressure  $< 110$  mm Hg. 39% had severe hypertension with blood pressure  $\geq 110$  mm Hg and the rest 2% had hypertension with seizures (eclampsia).

In the studies by Tadin et al., (1983) the percentage of occurrence of retinal vascular changes in mild pre-eclampsia was similar to that of our study.

In the present study significant correlation was observed between the severity of PIH and the development of retinopathy changes. Similar association between the severity of PIH and retinopathy changes were noted in other studies.

The prevalence rate of fundus changes found in our study is 53%. S.C. Reddy et al<sup>11</sup> studied 78 cases with PIH and found a prevalence rate of 59%.

Various authors have reported PIH changes in the visual system causing multitude of affections viz. focal or generalized narrowing of retinal arterioles, haemorrhages, exudates, peripapillary or focal retinal edema, serous retinal detachment, isolated cases of acute ischemic optic neuropathy, transient blindness, cortical blindness, bilateral retinal detachment, exudative retinal detachment in one eye and severe macular edema in the other eye, retinal pigment epithelial lesions, temporary decrease in vision secondary to severe retinal arteriolar spasm and retinal edema, permanent blindness secondary to central retinal artery occlusion and optic atrophy.

In our study hypertensive retinopathy was the most frequently noticed finding seen in 51% of the patients. 1 case of exudative retinal detachment with macular oedema and 1 case of exudative retinal detachment were also noticed. Both the above cases were from the eclampsia group, so could not come to ophthalmology OPD for examination. And both of them were examined after delivery once stable.

In a study done on 130 PIH patients by Ayush Singal, 57.69% patients were reported to have grade 1 changes, 3 patients each had grade 2 and 3 hypertensive retinopathy changes, 2 patients had grade 4 retinopathy changes. He reported 4 cases of exudative retinal detachment.

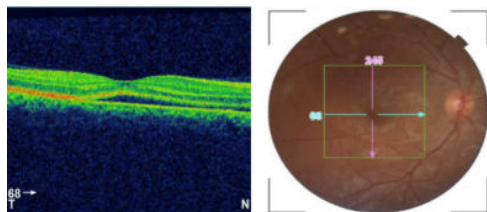
Rasdi et al<sup>21</sup> reported a case of serous retinal detachment from Malaysia.

Hutchings et al. suggested that retinal detachment is a consequence of choroidal vascular damage.

This is comparable to study done by Tadin et al from Croatia. He reported 45% of retinal changes in their study on 40 patients with PIH. In our study one case of a 28-year-old primipara woman presented to the emergency at 38 weeks of gestation with headache seizures and generalized edema and blurred vision in both eyes. General examination found high blood pressure at 220/130. Ophthalmologic examination was carried out once the patient was stable next day. The visual acuity (VA) was 6/9 in the right eye and 6/30 in the left one. Anterior segment was normal. Fundus examination revealed bullous serous retinal detachment in both eyes. Optical coherence tomography (OCT), confirmed retinal serous detachment with foveal uprisings in the both eyes. Two weeks later, her VA had improved to 6/6 in both eyes. Fundus examination and macular OCT showed complete resorption of the retinal serous detachment.

Fundoscopy may cause missed diagnosis of such severe retinopathy as retinal edema and shallow retinal detachment in some patients. Even ultrasound examination may fail to diagnose shallow retinal

detachment, and it is inappropriate to check fundus changes of pregnant women with fundus fluorescence angiography (FFA),<sup>12-13</sup> due to the use of contrast media<sup>11</sup>. However, the noninvasive and repeatable OCT test allows high-resolution cross-sectional microimaging of ocular structures, which can facilitate observations of the retina and other nearby tissues and thus provide objective and dependable basis for clinical diagnosis and treatment.



## CONCLUSION:

In conclusion, ophthalmoscopy is a simple tool that can help the obstetrician in assessing the severity of disease in cases of PIH. There is significant correlation with the severity of disease and the levels of hypertension. Most of the fundus changes in PIH are underdiagnosed. Timely ophthalmoscopy should be called for in all cases of PIH as it would affect the decision of induction of delivery, thereby preventing other complications. In spite of the increased awareness amongst patients regarding their health and the need for routine examinations and institutional deliveries in pregnancy and an improvement in the management of Pregnancy Induced Hypertension, complications like serous retinal detachment continue to occur, causing ocular morbidity in a physiological state as pregnancy. A change in the retinal vasculature could also reflect a similar disease in the placental microcirculation and predict fetal prognosis.

Thus, it is crucial to do regular OCT test simultaneously with prenatal examinations for pregnant women who have a pregnancy duration of more than 20 weeks and a medical history of hypertension or unstable blood pressure. This can contribute to earlier finding of fundus changes, and thus provide diagnostic basis for obstetricians to take medical measures in time. Further studies are needed to confirm the practical value of OCT in observing fundus changes of PIHS patients.

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