

# Fundus changes in pregnancy induced hypertension

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## Abstract

• **AIM:** To determine the prevalence of retinal changes in pregnancy induced hypertension (PIH) and any association between the retinal changes and blood pressure, proteinuria, and severity of the disease.

• **METHODS:** All the patients admitted with diagnosis of PIH were included in this study. Age, race, gravida, gestation period, blood pressure, and proteinuria were noted from the case records. After taking history for any eye symptoms, fundus examination was done after dilating the pupils with direct ophthalmoscope in the ward itself. All the findings were noted on a data sheet, and were analyzed using SPSS programme.

• **RESULTS:** A total of 78 patients of PIH were examined. Majority (75.6%) were Malays. The mean age of patients was 30.2 years (range 21-45 years). The gestation period ranged from 25 weeks to 41 weeks; 34 (43.5%) were primi gravida. Thirty (38.4%) patients had mild preeclampsia, 46 (59%) had severe preeclampsia and 2 (2.5%) had eclampsia. Retinal changes (hypertensive retinopathy) were noted in 46 (59%) patients --- grade I in 41 (52.6%) and grade II in 5 (6.4%). Haemorrhages or exudates or retinal detachment were not seen in any patient. There was statistically significant positive association of retinal changes and blood pressure ( $P=0.001$ ), proteinuria ( $P=0.018$ ) and severity of the PIH ( $P=0.024$ ).

• **CONCLUSION:** Retinal changes (grade I and II hypertensive retinopathy) were seen in 59% of patients with PIH and they were significantly associated with blood pressure, proteinuria

and severity of the disease. Fundus examination helps in assessing the severity of PIH.

• **KEYWORDS:** pregnancy induced hypertension; retinal changes; preeclampsia; eclampsia; cortical blindness

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## INTRODUCTION

Pregnancy induced hypertension (PIH) is a hypertensive disorder in pregnancy that occurs in the absence of other causes of elevated blood pressure (140/90mmHg, or a rise of 30mmHg of systolic pressure, or a rise of 15mmHg of diastolic pressure), taken on two occasions after rest, in combination with generalized edema and/or proteinuria. When there is significant proteinuria it is termed as preeclampsia; seizures or coma as a consequence of PIH is termed as eclampsia<sup>[1]</sup>. The pathological changes of this disease appear to be related to vascular endothelial dysfunction and its consequences (generalized vasospasm and capillary leak). The retinal vascular changes generally, but not always, correlate with the severity of systemic hypertension. Vasospastic manifestations are reversible and the retinal vessels rapidly return to normal after delivery<sup>[1]</sup>.

Even though two retrospective studies on eclampsia have been published from Malaysia<sup>[2,3]</sup>, there is no mention of retinal changes in these studies. There is paucity of data available in the published literature on the prevalence of retinal changes in PIH from Malaysia<sup>[4-6]</sup>. Therefore, this study was undertaken to determine the prevalence of retinal changes in PIH and association between the retinal changes and blood pressure, proteinuria, and severity of the disease.

## SUBJECTS AND METHODS

This cross sectional, observational study was conducted over a period of eighteen months (January 2007-June 2008). All the patients who fulfilled the diagnostic criteria of PIH (>24 weeks of pregnancy, high arterial blood pressure and proteinuria) admitted in Obstetric ward, Hospital Tuanku Jaafar, Seremban were included in this study. Patients who had preexisting diabetes or hypertension or renal disease or hazy media which did not permit fundus visualization were excluded from the study. After taking history for any eye

**Table 1 Retinal changes (hypertensive retinopathy) in pregnancy induced hypertension (n=78)**

Grades of retinopathy	Number of patients with changes	Percentage
No changes	32	41.0%
Grade I	41	52.6%
Grade II	5	6.4%
Grade III	0	0%
Grade IV	0	0%

**Table 2 showing the association of retinopathy with different variables in patients with pregnancy induced hypertension (n=78)**

Parameter	Retinal changes			Total	P
	Nil n=32	Gr I n= 41	Gr II n= 5		
Blood pressure					
<150mmHg systolic					
<100mmHg diastolic	28	21	0	49	0.001
>150mmHg systolic					
>100mmHg diastolic	4	20	5	29	
Proteinuria					
+	22	17	1	40	0.018
++	7	5	2	14	
+++	0	10	2	12	
Severity of disease					
Mild preeclampsia	17	12	1	30	0.024
Severe preeclampsia	15	28	3	46	
Eclampsia	0	1	1	2	
Age					
21-30 years	17	26	0	43	0.41
31-40 years	12	14	4	30	
41-45 years	3	1	1	5	
Race					
Malay	25	30	4	59	0.93
Chinese	2	4	0	6	
Indian	5	7	1	13	
Gravida					
Primi	13	19	2	34	0.34
Multi	12	15	0	27	
Grand multi	7	7	3	17	

symptoms, anterior segment was examined with torch light on the bed itself. Both pupils were dilated with 1% tropicamide eye drops and fundus examination was done by ophthalmologist with direct ophthalmoscope in a semi dark room in the ward. Hypertensive retinopathy changes seen in right or left or both eyes, was taken as positive findings in that patient. Age, race, para, gravida, blood pressure, proteinuria were noted from the case records. The PIH was graded as preeclampsia (mild and severe) and eclampsia. All the findings were noted on a data sheet.

The retinal changes (hypertensive retinopathy) were graded according to Keith Wagener classification into: Grade I- mild generalized arterial attenuation, particularly of small branches; Grade II-more severe grade I+focal arteriolar attenuation; Grade III-grade II+haemorrhages,hard exudates, cotton wool spots; Grade IV-grade III=optic disc swelling (papilloedema)<sup>[7]</sup>.

The severity of PIH was classified into preeclampsia (mild and severe) and eclampsia, based on the following findings: Mild preeclampsia --- BP >140/90mmHg, proteinuria+, and/or mild edema of legs; Severe preeclampsia --- BP > 160/110mmHg, proteinuria ++ or +++, headache, cerebral or visual disturbances, epigastric pain, impaired liver function tests, and increased serum creatinine; Eclampsia --- severe preeclampsia + convulsions. Proteinuria was tested using dipstix method and was graded as + = 0.3gm/L, ++ =

1gm/L, and +++ = 3gm/L<sup>[8]</sup>.

The results were analyzed using SPSS program. Chi-square test was used to determine the association between the retinal changes and blood pressure, proteinuria, and severity of PIH. A P value <0.05 was taken as significant. This research project was approved by Ethics Committee of International Medical University.

## RESULTS

A total of 78 patients were examined; 59 (75.6%) were Malays, 13(16.7%) were Indians and 6(7.7%) were Chinese. The mean age of patients was 30.2±6.2 years (range 21-45 years). The gestation period ranged between 25 and 41 weeks. Thirty four (43.6%) were primi gravida (first time pregnant), 27 (34.6%) were multi gravida (2-4 pregnancies) and 17 (21.8%) were grand multis (5 or more pregnancies). Thirty (38.5%) had mild preeclampsia, 46 (59%) had severe preeclampsia and 2 (2.5%) had eclampsia.

Blurring of vision was present in two patients of severe preeclampsia visual acuity was 6/9 in both eyes in both patients) and in one patient of eclampsia (visual acuity was 6/12 in both eyes). The visual acuity was normal (6/6 in both eyes) in 75 patients. Retinal changes (hypertensive retinopathy) were noted in 46 (59%) patients (Table 1).

The association between retinal changes and different parameters is shown in Table 2. There was statistically

significant positive association between the presence of retinal changes and blood pressure ( $P=0.001$ ), proteinuria ( $P=0.018$ ) and severity of PIH ( $P=0.024$ ). However, age ( $P=0.41$ ), race ( $P=0.93$ ) and gravida ( $P=0.340$ ) were not associated with occurrence of retinopathy in our study.

### DISCUSSION

In the present study, hypertensive retinopathy changes (grade I and II) were seen in 59% of patients with pregnancy induced hypertension. Haemorrhages, exudates and retinal detachment were not seen in any of the patients in this study. Since the antenatal check up of pregnant ladies has improved very much in Malaysia, hypertension was detected early during the antenatal visits and treatment was started immediately. This could be the probable reason for the presence of only grade I and grade II hypertensive retinopathy changes in our study.

Pregnancy induced hypertension is responsible for maternal deaths, especially in the developing countries. During the period 1997-2000, eclampsia was the cause of death in 7.8% and preeclampsia in 4.1% cases in Malaysia<sup>[9]</sup>. Rasdi *et al*<sup>[6]</sup> from Malaysia studied a group of patients with hypertensive disorders of pregnancy (gestational hypertension, chronic hypertension, preeclampsia/eclampsia, chronic hypertension with superadded preeclampsia/eclampsia). The retinal changes were seen in 21.5% (5 out of 28 patients) of preeclampsia/eclampsia. They found generalized arteriolar narrowing (5/28), cotton wool spot (1/28), haemorrhage (1/28) and serous retinal detachment (1/28). They noted the resolution of all the above retinal changes except narrowing of arteries during the puerperium period.

The visual system may be affected in 30% to 100% of patients with PIH; the most common abnormality seen in the fundus is narrowing of retinal arterioles<sup>[1]</sup>. Various changes in the fundus and visual problems reported in patients of preeclampsia and eclampsia from different countries include spasm and focal/generalized narrowing of retinal arterioles, haemorrhages, exudates, peripapillary or focal retinal edema, serous retinal detachment<sup>[10]</sup>, isolated cases of acute ischemic optic neuropathy<sup>[11]</sup>, transient blindness<sup>[45]</sup>, cortical blindness<sup>[12-14]</sup>, bilateral retinal detachment<sup>[15]</sup>, exudative retinal detachment in one eye and severe macular edema in the other eye<sup>[16]</sup>, retinal pigment epithelial lesions<sup>[17]</sup>, temporary decrease in vision secondary to severe retinal arteriolar spasm and retinal edema<sup>[18]</sup>, permanent blindness secondary to central retinal artery occlusion and optic atrophy<sup>[19]</sup>. Although transient blindness has been reported in 1% to 3% of patients with eclampsia<sup>[20]</sup>, with current methods of treatment the present incidence is probably much lower. Optic atrophy secondary to retinal vascular involvement is unusual but may cause visual impairment<sup>[18,21]</sup>.

Jaffe and Schatz<sup>[22]</sup> from USA have reported significant correlation between the reduction in arteriole to vein ratio, number of focal arteriolar constrictions and severity of

preeclampsia. They did not find any haemorrhages, exudates, cotton wool spots, or retinal detachment in their study of 17 mild preeclamptic and 14 severe preeclamptic patients.

In a study of 275 cases of preeclampsia and 125 cases of eclampsia, Reddy<sup>[23]</sup> from India has reported retinal changes in 53.4% preeclampsia and in 71.2% in eclampsia patients (over all 59%, 236 out of 400). The most common retinal change noted was narrowing of arterioles (45.7%, 183 out of 400 cases). He found that retinal changes were significantly more in patients with severe hypertension.

Tadin *et al*<sup>[24]</sup> from Croatia have reported 45% of retinal changes in their study of 40 patients with PIH. They found a statistical correlation between proteinuria, blood pressure and hypertensive retinopathy. The degree of retinopathy was directly proportional to severity of preeclampsia. They stated that hypertensive retinopathy is a valid and reliable prognostic factor in determining the severity of preeclampsia; examination of fundus is a valuable and necessary diagnostic procedure in pregnant women with preeclampsia.

Karki *et al*<sup>[25]</sup> from Nepal have reported 13.7% of fundus changes in their study of 153 subjects with PIH. They 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; and fundus evaluation in patients with PIH is an important procedure to predict adverse foetal outcomes.

The prevalence of hypertensive retinopathy changes (59%) seen in our study is higher than 13.7%<sup>[25]</sup>, 21.5%<sup>[6]</sup>, 45%<sup>[24]</sup>, but similar to 59%<sup>[23]</sup> reported in the literature. The absence of haemorrhages and exudates observed in present study has been supported by Jaffe and Schatz<sup>[22]</sup>.

Exudative retinal detachment is seen rarely in PIH patients. It is thought to be caused by choroidal ischemia<sup>[26]</sup>. Retinal pigment epithelial lesions, called Elschnig spots, may also be found in preeclamptic patient with choroidal infarcts. The prognosis in these cases is good, with visual symptoms and retinal pigment epithelial changes resolve spontaneously within weeks of delivery<sup>[17]</sup>. Presence of macular edema or papilloedema or retinal detachment are the warning signs for termination of pregnancy to save the vision of the mother<sup>[16]</sup>. The management of retinal detachment is not surgery, but termination of pregnancy after controlling blood pressure so that vision can be saved in the affected eye.

Cortical blindness refers to reduced vision from bilateral damage to any portion of the visual pathways posterior to the lateral geniculate nucleus. Eye examination is typically normal, including a normal pupillary light reflex. It can occur in ante partum and postpartum period, lasting for several hours to several days in preeclampsia and eclampsia patients<sup>[27]</sup>. Other presenting symptoms include headache,

seizures and loss of consciousness. MRI shows hypertense signals on T2-weighted images and hypotense signals on T1-weighted images in occipital cortex. These findings are consistent with transient ischemic events as a result of cerebral edema<sup>[14,27]</sup>. Management includes magnesium sulphate for seizure prophylaxis, anti-hypertensives for severe hypertension, fluid restriction to avoid worsening of cerebral edema, ophthalmologic and neurologic consultation as well as neuroimaging. Prompt delivery is curative, with resolution of neuroimaging findings<sup>[14]</sup>.

The retinal changes were more often seen in patients with severe hypertension, severe proteinuria and severity of the disease in present study; they were significantly associated with these factors (Table 1). A similar association between hypertensive retinopathy and the above three parameters was reported in earlier studies<sup>[23-25]</sup>. We did not find any case of serous retinal detachment in present study which is similar to the previously reported studies<sup>[23-25]</sup>. However, Rasdi *et al*<sup>[6]</sup> reported a case of serous retinal detachment from Malaysia.

In general, it is believed that the presence of changes in the retinal arterioles and retinal haemorrhages may indicate similar changes in the placenta. Since the well being of the foetus depends on the placental circulation, ophthalmoscopic examination of mother's fundus may give a clue to similar micro-circulation changes in the placenta and indirectly to the foetal wellbeing. Fundus examination in patients with PIH is an important clinical evaluation to predict adverse foetal outcomes<sup>[25]</sup>.

In conclusion, visual symptoms are few in patients with PIH and often absent unless the macula is involved. Sudden onset of headache, which is resistant to routine therapy in these patients, may be the warning symptom before the onset of first convulsion. The presence of multiple hard exudates in retina may indicate albuminuric retinopathy and the possibility of damage to the kidneys. The presence of papilloedema in the eyes may indicate raised intracranial tension and such patients may develop convulsions. In cases of toxemia of pregnancy, the retinal changes usually regress with decrease in blood pressure and may disappear completely after delivery due to lack of placental toxins. Therefore, by repeated fundus examinations at regular intervals one can assess the severity of the disease and also response to treatment instituted.

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