

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20214345>

Original Research Article

A prospective observational study to analyse the relationship between fundus changes in pregnancy induced hypertension with visual impairment and its reversibility

Vinitha Dharmalingam^{1*}, R. Kala²

¹Department of Ophthalmology, ²Department of Obstetrics and Gynaecology, Government Head Quarters Hospital, Cuddalore, Tamil Nadu, India

Received: 09 September 2021

Revised: 05 October 2021

Accepted: 06 October 2021

***Correspondence:**

Dr. Vinitha Dharmalingam,

E-mail: vinithadharmalingam@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Irreversible visual impairment and morbidity are associated with pregnancy induced hypertension. It causes pathological changes in vascularity of placenta, kidney and brain along with two major pathological types of changes in fundus namely arteriolar vasospasm and permeability changes in vascular endothelium. The aim of our study was to analyse the relationship between fundus changes in pregnancy induced hypertension with visual impairment and its reversibility.

Methods: A prospective observational study done on pregnant women with any grade of pregnancy induced hypertension with recent visual impairment from 24 completed weeks of pregnancy.

Results: Out of 75 patients with PIH, all the patients had varying degree of fundus changes in one or both eyes. In 150 eyes of the 75 patients, 86 (57.30%) eyes had isolated arteriolar vasospasm, 14 (9.33%) had grade III hypertensive retinopathy, 4 (2.66%) had grade IV hypertensive retinopathy, 30 (20%) had macular oedema, 4 (2.66%) had central serous chorioretinopathy, 2 (1.33%) had vascular occlusion, 2 (2.66%) eyes had normal fundus with cortical blindness, 2 (2.66%) had exudative retinal detachment, 6 (4%) eyes had normal fundus with changes in the other eye.

Conclusions: Out of 75 patients, 7 (9.3%) patients had irreversible loss of vision, 3 (42.85%) due to arteriolar vasospasm, and 4 (57.15%) due to choroidal ischemia. Among the 4 patients with choroidal ischemia, 3 (75%) were in the group of eclampsia and 1 (25%) in gestational hypertension.

Keywords: Eclampsia, Pregnancy induced hypertension, Visual impairment

INTRODUCTION

The retinopathy of pregnancy was first discovered in 1855, four years after the discovery of ophthalmoscope. Earlier it was thought that retinopathy for pregnancy occurred once in 3000 pregnancies. It was also claimed that the toxemia of pregnancy is due to an unknown substance circulating in the blood that produces thrombosis is the reason to cause degenerative changes in the fundus, kidney and other organs. Hence, termination of pregnancy is considered even in the absence of albuminuria.

Later, it was thought that retinal changes were seen only in patients with nephritic toxemia and it was not only an indication for termination of pregnancy but also an indication for sterilisation to prevent further pregnancies. After several observations, the cause of toxemia of pregnancy is found to be due to angiospasm which can exist for several days without becoming fixed and sclerotic. The histology of the constricted arterioles is same as the vascular changes in kidney. Almost half of the patients with late toxemia complained of visual disturbances.¹

Ocular manifestations during pregnancy induced hypertension (PIH) being the interest of the study can be classified into physiological changes, pregnancy specific eye disease and modification of existing eye disease.²

The physiological changes of the pregnancy can also cause visual symptoms due to corneal and adnexal changes. The corneal changes include increase in both the corneal thickness and curvature, dry eye syndrome which usually resolves after delivery. Ptosis is also seen in few patients which can cause defective vision.

The fundus changes and visual abnormalities during pregnancy induced hypertension comes under pregnancy specific eye disease. The most common ocular finding in the eye due to pregnancy induced hypertension is vasospasm of the retinal arterioles. The decrease in artery to vein ratio correlates well with the severity of pregnancy induced hypertension. The other changes visualised during fundus examination are retinal haemorrhages in the nerve fibre layer (NFL), diffuse retinal oedema, hard exudates, cotton wool spots, exudative retinal detachment (ERD), vascular occlusion, ischemic optic neuropathies, etc. Rarely, patient may also present with severe macular oedema, optic neuritis, ischemic optic neuropathy etc.

Irreversible visual impairment and morbidity are associated with pregnancy induced hypertension. The toxemia of pregnancy causes pathological changes in vascularity of placenta, kidney and brain along with two major pathological types of fundus changes are arteriolar vasospasm and choroidal ischemia due to permeability changes in vascular endothelium.

If our visualisation of fundus could predict the type of grave morbid changes, it will definitely be useful in management of patients suffering from pregnancy induced hypertension more so in mothers with precious babies. I also would like to add that most of the changes seen in the fundus are reversible. Care should be taken not to decide on premature termination of pregnancy in the interest of saving the life of the mother and the baby, and also to avoid premature babies.

Modification of existing eye disease are retinal effects on pre-existing hypertension and diabetes mellitus. Ocular complication of systemic disease in pregnancy like Grave's disease, idiopathic intracranial hypertension (IIH), Multiple Sclerosis (MS), etc.³

METHODS

It was an observational study conducted at Government Head Quarters Hospital, Cuddalore, Tamil Nadu from January 2019 to December 2019.

Aim of the study was to analyse the relationship between fundus changes in pregnancy induced hypertension with visual impairment and its reversibility.

Objectives were, to estimate the prevalence of irreversible visual impairment among the patients with PIH and to determine the association between type of fundus changes seen in PIH with recovery of visual impairment.

Inclusion criteria

All pregnant women with any grade of pregnancy induced hypertension with recent visual impairment from 24 completed weeks of pregnancy.

Exclusion criteria

Pregnant women with pre-existing hypertension and diabetes mellitus, pregnant women with pre-existing epilepsy, anaemia complicating pregnancy (haemoglobin <7 gm%), blood dyscrasias, patients with extremes of refractive error, previous history of acute or chronic renal failure, lens changes hindering fundus observation, patients who have not consented, patients who cannot cooperate for fields and fundus examination malingering, postpartum psychosis and low IQ mothers who cannot cooperate for fundus examination.

Sample size

The sample size was determined using the following formula; to have 95% confidence level and clinically expected deviation of 10%,

$$\text{Formula: } N = (Z/d)^2 \times P \times Q$$

$$N = 64$$

Where, 'N' is desired sample size; 'Z' is standard normal deviate, usually set at 1.96, which correspond to 95% confidence level; 'd' is the clinically expected deviation set at 10% 'P' is proportion in the target population estimated to have visual disturbance taken as 21%; 'Q' is proportion in the target population not having the particular characteristics. Considering 10% loss to follow up for my study, the required sample size would be 75 in total.

We prospectively carried out an observational study among the patients with pregnancy induced hypertension between 24 weeks of gestation and 6 weeks after delivery in Government Head Quarters Hospital Cuddalore, Tamil Nadu. From January 2019 to December 2019; for 12 months.

The study was approved by the institute ethical and scientific committee. The patients with pregnancy induced hypertension with visual impairment, at Government Head Quarters Hospital, Cuddalore, who satisfy the inclusion-exclusion criteria and after understanding the procedures and protocols, also after obtaining an informed consent were included in this study. Elaborate history and the details like demographic profile, height, weight, obstetric score, history of previous pregnancy and drug history were

recorded. Relevant ocular history was elicited, visual acuity with pinhole was checked in log MAR chart. Patient was also subjected to record intra ocular pressure, fields and colour vision with Ishihara chart.

Detailed anterior segment examination was done with torch, loop and slit lamp examination in patients who can be shifted to ophthalmology department. Both eyes dilated with 0.5% tropicamide drops and fundus examination done with indirect ophthalmoscopy in semi dark room to look for hypertensive retinopathic changes.

The retinal changes were noted on the data sheet graded according to Keith Wegener classification into, grade I- mild generalised arteriolar 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.

Other retinal changes were also recorded using fundus diagram. Fundus photograph and visual field assessment was done in all patients. Amsler grid chart was given to all patients for self-assessment of visual impairment.

Investigations like complete blood count, blood urea, serum creatinine, peripheral blood smear, urine for proteins and sugar, random blood sugar and serum uric acid were done.

Patients were subjected to all these examinations between 24 completed weeks of gestation and delivery (a minimum of one examination and 6 weeks after delivery (a minimum of one examination). A minimum of two examinations (one before and one after delivery) were done in every patient during the entire course of study.

The parameters of all 75 patients were recorded in the master chart and analysed to determine the outcome of the study. Data entered in MS Excel and analysis done using SPSS version 20. Shapiro Wilk test was used to assess the normality of the data. Frequency and percentage was used to represent the qualitative data. Mean and standard deviation was used to represent the quantitative data if it followed normal distribution. Median and inter-quartile range was used to represent the quantitative data if it followed normal distribution. Chi-square test /Fisher exact test was used to find the association between the quantitative data, if the data followed normality. Student's 't' test/ ANOVA was used to find the association between the quantitative data, if data followed non normal distribution. Appropriate graphs like bar chart, pie chart and box plots were used to represent the data. P value <0.05 was considered as statistically significant.

RESULTS

During the study period, all 75 patients in this study fall under the age group between 18 and 38 (Figure 4). About 45.3% of the patient's age is between 23 and 26. And most

of the patients were diagnosed to have fundus changes between 34 and 37 weeks of pregnancy (Figure 5). There was no statistical significance between fundus changes and height, weight, blood pressure and pulse. Out of 150 eyes, 79.33% had vision between 6/6 and 6/12. 14.66% had vision between 6/18 and 6/60 and 6% had vision less than 6/60. Out of 150 eyes, 86 (57.33%) had isolated arteriolar vasospasm, 14 (9.3%) had grade III hypertensive retinopathic changes, 4 (2.66%) had disc oedema, 30 (20%) eyes had macular oedema, 4 (2.66%) had central serous chorioretinopathy, 2 (1.33%) had exudative retinal detachment and 2 (1.33%) had vascular occlusion. 8 (5.33%) eyes had no fundus changes. Based on pathology of pregnancy induced hypertension fundus changes can be due to arteriolar vasospasm or due to choroidal ischemia (Figure 1).



Figure 1: Preeclampsia patient with visual impairment due to disc oedema.

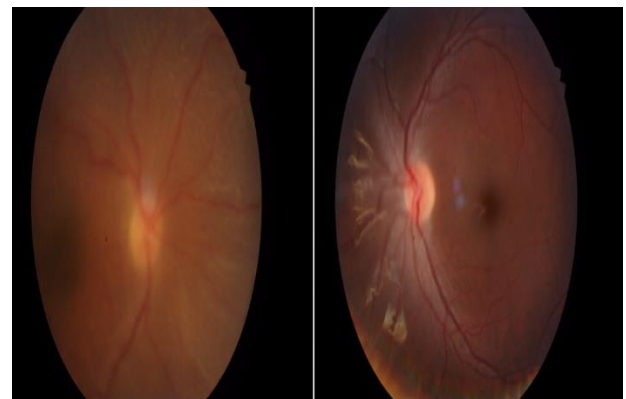


Figure 2: Eclampsia patient with visual impairment due to bilateral serous retinal detachment.

Out of 150 eyes, 108 (72.0%) had fundus changes due to arteriolar vasospasm and only 42 (28.0%) has fundus changes due to choroidal ischemia. 8 (5.3%) out of 150 eyes irreversible visual impairment due to fundus changes in PIH. 7 (9.3%) out of 75 patients had irreversible visual impairment. That is, the prevalence of irreversible visual impairment in patients with PIH was found to be 9.3%. There was significant statistical association between irreversible visual impairment and fundus changes in pregnancy induced hypertension. In gestational

hypertension, 3.8% of patients had irreversible visual impairment. In preeclampsia, 11.8% of patients had irreversible visual impairment. In eclampsia, 60% of patients had irreversible visual impairment. Out of 5 patients with eclampsia, 3 had irreversible visual impairment and the pathology of all 3 were due to choroidal ischemia. The irreversible visual impairment in patients with eclampsia was found to be predominantly due to choroidal ischemia.

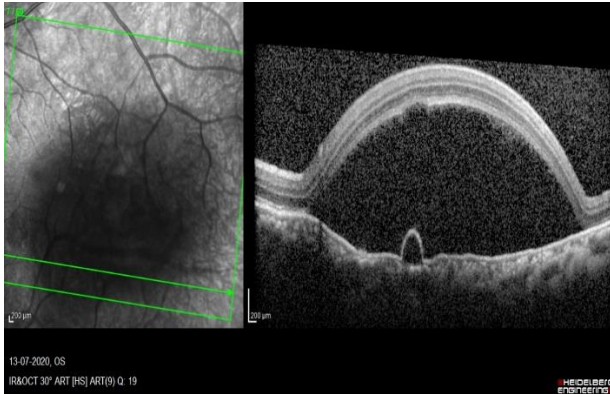


Figure 3: Eclampsia patients with visual impairment due to central serous chorioretinopathy.

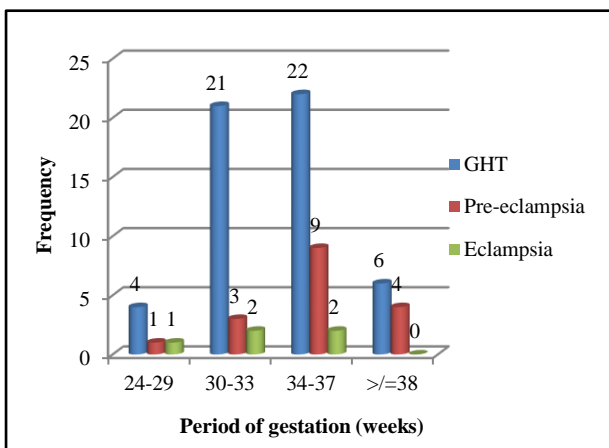


Figure 4: Distribution based on age.

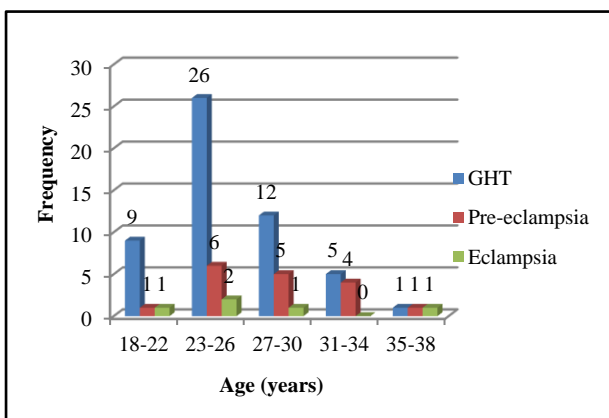


Figure 5: distribution based on period of gestation.

DISCUSSION

In this study, out of 75 patients with PIH, all the patients had varying degree of fundus changes in one or both eyes. Bakhda et al in their study of 300 patients, 38% showed isolated arteriolar vasospasm, 11.7% had grade III hypertensive retinopathy, 0.33% had grade IV changes. 1% of patients had retinal detachment and 21.67% had retinal edema. This correlates with our study.⁴

During visual acuity assessment before delivery 119 eyes had vision more than 6/12 and 31 eyes had vision less than 6/18 which is considered as significant visual impairment. 20.66% of patients had defective vision in our study. This correlates with the study by Tharihalli et al which had visual impairment of 21%.⁵

Varija et al, stated that the severity of PIH increases the odds of women developing retinopathy, more in patients with eclampsia.⁶

In our study, all eyes with isolated arteriolar vasospasm (grade I and grade II hypertensive retinopathy) recovered completely 6 weeks after delivery.

Patients with grade III hypertensive retinopathic changes doesn't not have irreversible visual impairment. Most of the patients had very few hard exudates and flame shaped haemorrhages in less the 2 quadrants, which was resolving during the final visit.

Out of 30 patients with various degree of macular oedema, almost all patients had complete resolution of macular oedema and there was improvement of vision more than 6/12 except one patient where there was complete resolution of macular oedema but there was no improvement in the visual acuity.

Hence there was good visual recovery in patients with grade I, II, III and macular oedema.

In 4 (2.66%) patients with unilateral CSCR, 50% had significant visual impairment. There was no complete absorption of subretinal fluid in these patients during fundus examination. Patient with bilateral ERD does not have complete resolution in fundus and had less than 2 lines improvement in visual acuity (Figure 2).

4 (2.66%) eyes with grade IV changes out of which one eye had significant visual impairment with persistence of enlarged blind spot. Also, both the patients with unilateral vascular occlusion had significant visual impairment even after delivery (Figure 3).

Among these 7 patients with significant visual impairment, 6 patients had unilateral irreversible visual impairment and one had bilateral. Based on the pathology of the fundus changes (arteriolar vasospasm and choroidal ischemia) patients with irreversible visual impairment were categorised as follows (Table 1).

Table 1: distribution of PIH based on pathology of fundus changes.

Pathological changes in 75 patients	PIH			Total
	Gestational hypertension	Pre-eclampsia	Eclampsia	
Arteriolar vasospasm	42 (79.2%)	12 (70.6%)	0 (0.0%)	54 (72.0%)
Choroidal ischemia	11 (20.8%)	5 (29.4%)	5 (100.0%)	21 (28.0%)
Total	53 (100.0%)	17 (100.0%)	5 (100.0%)	75 (100.0%)

Table 2: Distribution of irreversible visual impairment based on the pathology of fundus changes.

		Arteriolar vasospasm/choroidal Ischemia		Total
		Arteriolar vasospasm	Choroidal ischemia	
Pregnancy induced hypertension	Gestational hypertension (54)	1	1	2 (3.7%)
	Pre-eclampsia (16)	2	0	2 (12.5%)
	Eclampsia (5)	0	3	3 (60%)
Total		3	4	7

Out of 7 patients, 3 (42.85%) had irreversible visual impairment due to arteriolar vasospasm, and 4 (57.15%) due to choroidal ischemia. Among the 4 patients with choroidal ischemia, 3 (75%) were in the group of eclampsia and 1 (25%) in gestational hypertension (Table 2).

It is important to note that all three patients with eclampsia had visual impairment due to choroidal ischemia.

There are some limitations for this study as the log MAR visual acuity of all the pregnant woman prior to pregnancy was not available on record. There was a lot of difficulty in shifting the patients with severe form of PIH to the ophthalmology department to do qualitative and quantitative assessment of even subtle visual impairment as most of the time we need to depend on bed side examination method to determine the level of visual impairment. Portable fundus photography was of some use than conventional fundus photography in these patients. CT scan and MRI scan could not be performed in patients due to social and financial constraints. If the duration of the study is extended and more patients were recruited in the study with large sample size, reduced deviation and increased confidence level we could have differentiated the pathology of fundus changes better.

CONCLUSION

In our study choroidal ischemia is found to be associated with irreversible vision loss in patients with eclampsia. Apart from blood pressure monitoring, urine protein level, other blood parameters, ophthalmological findings will also help in deciding the necessity of termination of pregnancy. This will also help us decide which patients will have central nervous system (CNS) complications. Almost all the patients with isolated type I and type II hypertensive retinopathic changes in our study did not have significant visual impairment. Hence it is not necessary to decide on premature termination of pregnancy in these patients unless includes other

complications. This will result in unnecessary termination of pregnancy more so in precious babies.

Early recognition of pathology of fundus changes in PIH helps to reduce infant mortality rate (IMR). Early recognition of hypertension during pregnancy should be made in primary health care level. Tele ophthalmology screening in such patients will help to pick-up fundus changes as early as possible. Also, awareness regarding the ocular changes in the pregnancy induced hypertension should be explained to the patients and advise them to have a regular follow up in the ophthalmology clinics.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Hallum AV. Eye changes in hypertensive toxemia of pregnancy a study of three hundred cases. JAMA. 1936;106(19).
- Naderan M. Ocular changes during pregnancy. J Curr Ophthalmol. 2018;30(3):202-10.
- Cheung A, Scott IU. Ocular changes during pregnancy. EyeNet Magazine. 2021.
- Bakhda RN. Clinical study of fundus findings in pregnancy induced hypertension. J Fam Med Prim Care. 2016;5(2):424-9.
- Tharhalli C, Giraddi RV. Study of renal and ophthalmic manifestations in hypertensive disorders of pregnancy and its outcome. Int J Reprod Contracept Obstet Gynecol. 2017;6(3):993-1002.
- Varija T, Vanaja D, Bellara R. A study of prevalence and association of fundus changes in pregnancy induced hypertension. Int J Reprod Contracept Obstet Gynecol. 2016;5(5):1375-80.
- Rezai S, LoBue S, LoBue T, Giovane R, Carney M, Henderson C. Ophthalmic complications and ocular

changes in pregnancy- a review. *Obstet Gynecol Int J.* 2016;4(1):00093.

8. Braunthal S, Brateanu A. Hypertension in pregnancy: Pathophysiology and treatment. *SAGE Open Med.* 2019;7:2050312119843700.

Cite this article as: Dharmalingam V, Kala R. A prospective observational study to analyse the relationship between fundus changes in pregnancy induced hypertension with visual impairment and its reversibility. *Int J Reprod Contracept Obstet Gynecol* 2021;10:4272-7.