

OCULAR FUNDUS CHANGES IN PREGNANCY INDUCED HYPERTENSION

KHANOM R¹, FARIDI J², NUR J³, AKTER S⁴, BASU KC⁵

Abstract:

Purpose: Preeclampsia and eclampsia is one of the leading causes of maternal and fetal morbidity and mortality worldwide. Visual disturbances in (pre)eclampsia seem to be frequent phenomena. Therefore, the obstetrician/gynecologist may encounter women with serious, and sometimes debilitating, pathology of the visual pathways.

Methods: This is a cross sectional observational study was conducted over a period of 12 months (January 2016-December 2016) at Dhaka Medical College Hospital, Dhaka, Bangladesh. Patients with severe preeclampsia and eclampsia were included in the study. The association was measured with Chi-squared test and p value of 0.05 was treated as significant.

Results: During this 12-month period, 100 patients with severe preeclampsia and eclampsia were studied the mean age was 26.4 ± 5.5 years. The association between retinal changes and different variables was statistically significant positive association between the presence of retinal changes and blood pressure ($P= 0.0118$), proteinuria ($P= 0.0025$). However, age ($P= 0.7123$), and gravida ($P= 0.7998$) were not associated with occurrence of retinopathy in our study. The most common retinal change was noted and narrowing of arterioles, (83%) that retinal changes were significantly more in patients with severe hypertension, exudate (12%) and haemorrhages (10%) observed in present study. The presence of macular edema (5%) and retinal detachment (2%) are the warning signs for termination of pregnancy to save the vision of the mother.

Conclusion: It is called that eye is the gateway of medicine, so in pregnancy induced hypertension 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.

Keywords: Preeclampsia, eclampsia, Pregnancy induced hypertension (PIH) Retinal changes,

J Dhaka Med Coll. 2019; 28(1) : 94-99

Introduction:

In the fifth century, Hippocrates noted that headache, convulsion, and drowsiness were ominous signs associated with pregnancy. In 1619, Varandaeus coined the term *eclampsia* in a treatise on gynecology.^{1, 2}

Eclampsia the most devastating complication of pregnancy. Now a day, in developed countries, deaths from hemorrhage and infection have almost disappeared and eclampsia has become the prime killer, indicating that death from eclampsia is particularly difficult to prevent.³

Although eclampsia is the third major cause of maternal death in Bangladesh,

According to Bangladesh bureau of statistics, the maternal mortality rate (MMR) is 176 deaths/100,000 live births (2015 est.)⁴ The major causes of Maternal Mortality are - postpartum haemorrhage (31%), Eclampsia / pre-eclampsia (20%), delayed & obstructed labour (7%), Abortion (1%), other direct cause (5%) and indirect cause (35%).

Eclampsia, which is considered a complication of severe preeclampsia, is commonly defined as

1. Dr Rashida Khanom, Associate professor (Obs & Gynae) Dhaka Medical College, Dhaka
2. Dr Jamsed Faridi, Registrar, Department of Ophthalmology. Dhaka Medical College Hospital, Dhaka
3. Dr. Jinnatun Nur, Professor of Obs Gynae. Community based Medical College & Hospital. Mymensingh
4. Dr Sumaiya Akter, Registrar, Department of Obs and Gynae Popular Medical College and Hospital. Dhaka
5. Dr. Kamalesh Chandra Basu, Assistant Professor of Medicine, Dhaka Medical College, Dhaka

Address of correspondence: Dr Rashida Khanom FCPS. Associate professor (Obs & Gynae) Dhaka Medical College, Dhaka. Mobile: 01819-148808. Email: ritum22mmc@gmail.com

DOI: <https://doi.org/10.3329/jdmc.v28i1.45763>

new onset of grand mal seizure activity and/or unexplained coma during pregnancy or postpartum in a woman with signs or symptoms of preeclampsia.^{5, 6} It typically occurs during or after the 20th week of gestation or in the postpartum period.

The clinical manifestations of maternal preeclampsia are hypertension and proteinuria with or without coexisting systemic abnormalities involving the kidneys, liver, or blood. There is also a fetal manifestation of preeclampsia involving fetal growth restriction, reduced amniotic fluid, and abnormal fetal oxygenation.⁷ HELLP syndrome is a severe form of preeclampsia and involves hemolytic anemia, elevated liver function tests (LFTs), and low platelet count.

Most cases of eclampsia present in the third trimester of pregnancy, with about 80% of eclamptic seizures occurring intrapartum or within the first 48 hours following delivery. Other than early detection of preeclampsia, no reliable test or symptom complex predicts the development of eclampsia. In developed countries, many reported cases have been classified as unpreventable.

The effect of hypertension extends to involve the vasculature of the retina, choroids and optic nerve head⁸ At the pathophysiologic level, the primary response of the retinal vasculature to systemic arterial hypertension is vascular narrowing. This response to an increased blood pressure leads to focal or diffuse vasoconstriction. In addition, extravasation of fluid to the extravascular spaces occurs as a result of increased vascular permeability. Resultant retinal changes may manifest as decreased retinal artery to vein ratio, cotton wool spots, hemorrhages, Elschnig spots and serous retinal detachments.^{10,11} Jaffe and Schatz, found a significant relationship between reduced arteriole to vein ratio and preeclampsia, suggesting retinal vasospasm and resistance to blood flow as a possible explanation for visual symptoms.⁷

A measurable narrowing of the retinal arteries can be demonstrated in about 50% of uncomplicated pregnancies with physiologic

increase in blood pressure. This narrowing is functional and disappears with the termination of pregnancy. The degree of narrowing ranges from 10% to 40%, thus it is very difficult to discriminate between a normal and mild preeclamptic patient based on fundoscopy.^{8,10}

Retinal changes due to severe preeclampsia are similar to the changes of hypertensive retinopathy without the organic changes of arteriolosclerosis.⁹⁻¹¹

Severe arteriolar spasm is the most common fundoscopic finding, occurring in 70% of preeclampsia cases. As a result of this spasm, retinal vessels appear like a corkscrew or a beaded pearl necklace. Other fundoscopic features include arteriovenous crossings, hard and cotton-like exudates, retinal hemorrhages and optic head swelling.^{11,12}

The severity of retinal arteriolar changes is more closely related to the degree of underlying vasospasm. Previous studies showed that the level of retinopathy in patients with preeclampsia did not correspond to the severity of hypertension (systolic or diastolic).⁹⁻¹² It has been suggested that retinal changes in preeclampsia may indirectly indicate the level of placental vascular status and, hence, placental insufficiency and fetal birth weight.⁹⁻¹²

Preeclampsia/eclampsia related retinopathy generally resolves soon after delivery and no specific treatment is required.⁹⁻¹²

Visual disturbances in (pre)eclampsia seem to be frequent phenomena. Therefore, the obstetrician/gynecologist may encounter women with serious, and sometimes debilitating, pathology of the visual pathways. Established ophthalmic entities associated with (pre)eclampsia are cortical blindness, serous retinal detachment, Purtscher-like retinopathy, central retinal vein occlusions, and retinal or vitreous hemorrhages. Ensuing visual symptoms include blurry vision, diplopia, amaurosis fugax, photopsia, and scotomata, including homonymous hemianopsia. In general, aside from lowering the blood pressure and preventing (further) seizures with magnesium sulfate, no specific therapy seems

indicated for (pre)eclamptic women who experience visual changes. Although in most cases visual acuity returns to normal within weeks to months after the onset of symptoms, rarely permanent visual impairment can occur. Health care providers such as emergency room physicians, obstetricians, family physicians, neurologists, and ophthalmologists should be aware that acute onset of visual symptoms in pregnant women can be the first sign of (pre) eclampsia. Given that visual changes are a diagnostic criteria for severe preeclampsia, obstetricians should appreciate the significance of these changes and discuss appropriate diagnostic options with the ophthalmologist. Affected women can be reassured that most cases are transient.¹³

Methodology:

This is a cross sectional observational study was conducted over a period of 12 months (January 2016-December 2016) at Dhaka Medical College Hospital, Dhaka, Bangladesh. DMCH has the only dedicated ward and team for eclampsia in Bangladesh. On an average, about 5 to 6 eclamptic patient admitted at DMCH daily during summer but in winter the admission became two fold about 11 patient admitted daily in winter it may be due to there is more vasospasm in cold. All the patients who fulfilled the diagnostic criteria of PIH (>24 weeks of pregnancy, high arterial blood pressure and proteinuria) except who had preexisting diabetes or hypertension or renal disease or hazy ocular fundus media which did not permit fundus visualization were excluded from the study.

After taking history for any eye symptoms, anterior segment was examined with torch light on the bed itself. Both pupils were dilated with 1% tropicamide eye drops with phenylephrine 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, para, gravida, blood pressure, proteinuria was 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 (papilledema)⁷.

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 heat coagulation test method and was graded as + = 0.3gm/L, ++ = 1gm/L, +++ = 3gm/L + + + + >10 gm/L⁸.

The results were analyzed using SPSS program, 17 versions. 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 DMCH.

Results:

A total of 100 patients were examined. The mean age of patients was 26.4±5.3. The gestation period ranged between 25 and 41 weeks. 42 were primi gravida (first time pregnant), 36 were multi gravida (2-4 pregnancies) and 22 were grand mults (5 or more pregnancies). Only 6 had mild preeclampsia, 72 had severe preeclampsia and 22 had eclampsia.

Blurring of vision was present in 23 cases of severe preeclampsia and eclampsia. Visual acuity was hand movement to 6/12 (Snellen chart) The visual acuity was normal (6/6-6/9 in both eyes) in 77 patients. Retinal changes (hypertensive retinopathy) were noted in 82 patients (Table 1).

Table-I

Retinal changes (hypertensive retinopathy) in pregnancy induced hypertension

Grades of retinopathy	Number of patients with changes
No changes	18
Grade I	36
Grade II	32
Grade III	10
Grade IV (n=100)	4

The association between retinal changes and different parameters is shown in Table 2, 3, 4 & 5. There was statistically significant positive association between the presence of retinal changes and blood pressure (P= 0.0118), proteinuria (P= 0.0025). However, age (P= 0.7123), and gravida (P= 0.7998) were not associated with occurrence of retinopathy in our study.

Table-II

Shows grade of preeclampsia and eclampsia with retinal changes:

Blood pressure	Nil	G: 1	G: 2	G: 3	G: 4	
Mild preeclampsia						
Systolic 140-160 mm mm of Hg	4	2	0	0	0	6
Diastolic: 90 – 110 mm of Hg						
Severe preeclampsia						
Systolic>160 mm of Hg	12	20	30	8	2	72
Diastolic:>110 mm of Hg	2	8	8	2	2	22
Eclampsia						
	18	30	38	10	4	100

$\chi^2 = 8.878$,
df = 2, χ^2 /
df = 4.44,
 $P(\chi^2 > 8.878)$
= 0.0118

Table-III

Association of proteinuria with retinal changes.

Proteinuria	Nil	G: 1	G: 2	G: 3	G: 4	
+	14	17	6	2	0	39
++	4	12	21	3	2	42
+++ /++++	0	1	11	5	2	19
Total	18	30	38	10	4	100

$\chi^2 = 12.016$,
df = 2, χ^2 /f = 6.01.
 $P(\chi^2 > 12.016) =$
0.0025

Table-IV

Association of age of the patients with retinal changes.

Age	NIL	G: 1	G: 2	G: 3	G: 4	
18- 25	9	12	21	5	3	50
26 – 35	7	14	9	3	0	33
36 - 45	2	4	8	2	1	17
Total	18	30	38	10	4	100

$\chi^2 = 0.678$,
df = 2, χ^2 /
df = 0.34, $P(\chi^2 >$
0.678) = 0.7123

Table-V

Association of gravida of the patients with retinal changes.

Gravida	NIL	G: 1	G: 2	G: 3	G: 4	Total	
Primi	7	10	19	6	3	45	$\chi^2 = 0.447, df = 2,$ $\chi^2/df = 0.22, P$ $(\chi^2 > 0.447)$ $= 0.7998$
Multi	9	16	15	3	0	43	
Grand multi	2	4	4	1	1	12	
	18	30	38	10	4	100	

Table-VI

Visual acuity status on the day of admission and discharge among the study population (n=100)

Visual acuity	On admission	On discharge	
Normal > 6/9	77	95	$\chi^2 = 13.455, df = 1,$ $P(\chi^2 > 13.455) = 0.0002$
< 6/9 to HM	23	5	

Table-VII
Fundus changes

1. Arterial narrowing	83
2. Exudate	12
3. Hemorrhage	10
4. Macular edema	5
5. Retinal detachment	2

On admission, 23 of patients had visual impairment, while at discharge only 5 had visual impairment. There was a remarkable improvement of visual acuities between admission and discharge day. This finding was statistically significant (p <0.0002)

Discussion:

Dhaka Medical College Hospital (DMCH) is the only hospital in Bangladesh where dedicated eclampsia unit is working round the year and it has got all the facilities for an eclamptic patient. In comparison to patient load, it is always over crowded, so patient with mild preeclampsia is not admitted, only complicated patients get the chance for admission. Though our study was conducted in DMCH, only six patients with mild preeclampsia were admitted among the 100 patients, so complications with eclampsia was more.

In a study of 275 cases of preeclampsia and 125 cases of eclampsia, Reddy from India has

reported retinal changes in 53.4% preeclampsia and in 71.2% in eclampsia patients which is significantly less than of our study (14). Another study by Dasgupta S & Ray P, B (15) shows the incidence of retinopathy in PIH is 49%.

Table: 2, 3, 4 & 5, shows the association between retinal changes and different parameters. There was statistically significant positive association between the presence of retinal changes and blood pressure (P= 0.0118), proteinuria (P= 0.0025). However, age (P= 0.7123), and gravida (P= 0.7998) were not associated with occurrence of retinopathy in our study. Which is consistent with Reddy S,C (16) where 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, race was not a variable because in Bangladesh there is no racial discrepancy.

In our study, normal visual acuity was 6/6 to 6/9 (normal vision) in both eyes in 77 patients. The visual acuity was below 6/9 in 23 patients. while at discharge only 5 had visual impairment. There was a remarkable improvement of visual acuities between admission and discharge day. This finding was statistically significant (p <0.0002).

The most common retinal change noted was narrowing of arterioles, (83%) that retinal changes were significantly more in patients with severe hypertension, exudate (12%) and haemorrhages (10%) observed in present study. The presence of macular edema (5%) and retinal detachment (2%) are the warning signs for termination of pregnancy to save the vision of the mother¹⁸. 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. But in most cases visual acuity was improved after delivery spontaneously before discharge and only 5 patients were advised to consultant ophthalmologist when vision was compromised

Conclusion:

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, as well as risk of mother's life.

References:

- Gabbe. Obstetrics: Normal and problem pregnancies. Hypertension. 5th ed. Churchill Livingstone. An imprint of Elsevier. 2007
- ACOG. ACOG practice bulletin: Diagnosis and management of preeclampsia and eclampsia. The American college of Obstetricians and gynecologists. Number: 33, Jan 2002
- Redman C. Eclampsia still kills. Br Med J. 1988; 296:1209-1210. [PMC free article] [PubMed]
- Bangladesh Demographics Profile 2018. https://www.indexmundi.com/bangladesh/demographics_profile.html
- Mattar F, Sibai BM. Eclampsia VIII. Risk factors for maternal morbidity. *Am J Obstet Gynecol*. 2000 Feb. 182(2); 307 – 12
- Warrington JP. Placental ischemia increases seizure susceptibility and cerebrospinal fluid cytokines. *Physiol Rep*. 2015 Nov 3 (11)
- Douglas KA, Redman CW. Eclampsia in the United Kingdom. *BMJ* 1994 Nov 26, 309(6966). 1395-400.
- Gupta A., Kaliaperumal S., Setia S., Suchi S.T., Rao V.A. Retinopathy in preeclampsia: association with birth weight and uric acid level. *Retina*. 2008; 2:1104–1110. [PubMed]
- Rodriguez N.A., Zurutuza A. Ophthalmological manifestations of arterial hypertension. *An Sist Sanit Navar*. 2008; 31:13–22. [PubMed]
- Saito Y., Tano Y. Retinal pigment epithelial lesions associated with choroidal ischemia in preeclampsia. *Retina*. 1998; 18:103–108. [PubMed]
- Ryan SJ, Sunness JP. Pregnancy and retinal disease. In: Ryan SJ, editor. *Retina*. vol. 2; 1994. p. 1393–403.
- Roberts CL, Algert CS, Morris JM, et al. Hypertensive disorders in pregnancy: a population based study. *Med J Aust* 2005; 182: 332-35.
- Visual disturbances in (pre)eclampsia. Roos NM¹, Wiegman MJ, Jansonius NM, Zeeman GG. Visual disturbances in (pre)eclampsia. *Obstet Gynecol Surv*. 2012 Apr;67(4):242-50
- Reddy SC. Ocular fundus changes in toxemia of pregnancy. *The Antiseptic*. 1989;86(7):367–372.
- Dasgupta S, Ray P, B. Association between ophthalmoscopic changes and obstetric outcomes in pre-eclampsia and eclampsia. *Int J Reprod Contracept Obstet Gynecol*. 2015 Dec;4(6):1944-1949
- Mushumbusi EF1, et al Ocular manifestations among patients with pre-eclampsia and eclampsia at Muhimbili National Hospital; magnitude and presentations. *J Ophthalmol East Cent & S Afr*. July 2016; 20(1): 2-7
- Reddy S,C, Nalliah, S, Rani S, George K and Who T, S. Fundus changes in pregnancy induced hypertension. *Int J Ophthalmol*. 2012; 5(6): 694–697.
- Reddy SC. Raghavamma TV. Retinal detachment in preeclampsia- A case report. *J Obstet Gynaec of India*. 1981;31(3):501–503.