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Research Article

IMPORTANCE OF OPHTHALMOSCOPIC EXAMINATION AND PREVALENCE OF FUNDUS CHANGES IN PREGNANCY INDUCED HYPERTENSION (PIH) IN A TERTIARY CARE RURAL HOSPITAL AT KADAPA

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ABSTRACT

Main aim of the study is to determine prevalence of fundus changes, association between the fundus changes and Blood Pressure, proteinuria, and severity of the disease in PIH. Patients with PIH of >36 weeks of gestation were selected, anterior segment of eye is evaluated with torch light and binocular loop. Fundus examination with direct ophthalmoscope and proteinuria done with dipstick method. All details were recorded in prescribed proforma, and data was compiled, results were analyzed by using chi square test. Out of 100 subjects fundus changes were seen in 24 (24%) with mean systolic and diastolic pressure was 168.16+ 21.91/ 109.08+16.15 mm Hg. Significant association between fundus changes and high proteinuria (p=0.003), severity of disease (p=0.005). Ophthalmoscopy is a simple, non invasive tool in assessing the severity of the disease in cases of PIH and thus planning the line of management accordingly.

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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 (140/90 mmHg) or a rise of 30 mm Hg of systolic pressure or a rise of 15 mm Hg of diastolic pressure taken on two occasions after rest, in combination with generalized edema and/or proteinuria. PIH which includes gestational hypertension, preeclampsia and eclampsia occurs after 20th week of pregnancy. Gestational hypertension is characterized by hypertension without proteinuria and edema. Preeclampsia is characterized by hypertension, proteinuria, and generalized edema. When preeclampsia progresses and convulsions develop, the condition is termed as eclampsia. The pathological changes of this disease appear to be related to vascular endothelial dysfunction and its consequences (generalized vasospasm and capillary leak). Vasospastic manifestations are reversible, and the retinal vessels rapidly return to normal after delivery¹.

PIH complicates 10% of all pregnancies and is an important cause of maternal mortality after haemorrhage and infection². Multiple organs may be involved in PIH³. Ocular involvement is common in PIH occurring in as many as 30 -100% of patients⁴. Most common symptoms are blurring of vision, photopsia, scotomas, diplopia⁵. Visual system involvement is due to the severe toxemia. The most common abnormality seen is a spasm and narrowing of the retinal vessels. The

arteriolar constriction may take some days to develop and may last for weeks to months. This may persist for sometime or may be permanent after the termination of the pregnancy. Vision threatening conditions involve central retinal artery occlusion, secondary optic atrophy, macular tear, central serous retinopathy, retinal detachment, central retinal vein occlusion, choroidal ischemia and haemorrhage. Spontaneous vitreous haemorrhage may occur in cases of HELLP (Hemolysis, Elevated Liver enzymes, Low Platelet count) syndrome⁴.

The retina is a unique site where the vasculature in the human body is visualized directly with the help of ophthalmoscope. The eye serves as a window through which the vessels of the body can be studied. Thus, a change in the retinal arterioles may indicate a similar state of the placenta; hence, it gives a reasonable idea of the state of placental circulation and foetal wellbeing. Foetal and maternal complications can be avoided if PIH is detected early⁶. This study was undertaken to determine the prevalence of retinal changes in PIH and association between the retinal changes and age, parity, blood pressure, proteinuria and severity of the disease.

REVIEW OF LITERATURE

Hypertensive disorders complicate 10% of all pregnancies². Preeclampsia is a clinical syndrome that afflicts 3-5%⁵ of pregnancies and is a leading cause of maternal mortality, especially in developing countries. Eclampsia is an acute and life-threatening complication of pregnancy characterized by the

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appearance of tonic-clonic seizures, usually in a patient who had developed preeclampsia⁷.

Von Graefe⁸ in 1855 reported first case of retinitis in pregnancy with Retinal Detachment.

In a large number of patients with PIH at the Boston Lying – in Hospital, Cheney⁹ (1924) found narrowing of the retinal arterioles in most of those who had marked hypertension, and the constriction was dependent only on the hypertension and not on whether the condition was acute toxæmia or nephritis.

Wagener¹⁰ found spastic constriction of the retinal arterioles in about 70% of women with pregnancy induced hypertension and considered it to be usually the primary sign of retinal involvement.

Fry¹¹ noted serous retinal detachment incidence of 1.2% in preeclampsia and 10.4% in eclampsia.

Jaffe and Schatz⁴ from USA have reported significant correlation between the reduction in A:V ratio, number of focal arteriolar constrictions and severity of preeclampsia.

In a study of 275 cases of preeclampsia and 125 cases of eclampsia, Reddy *et al*¹². from India has reported retinal changes in 53.4% preeclampsia and 71.2% eclampsia patients (overall 59%, 236 out of 400).

Capoor *et al*¹³. in 1995 reported the presence of white centered retinal haemorrhages in patients with PIH.

Tadin *et al*¹⁴. from Croatia have reported 45% of retinal changes in their study of 40 patients with PIH.

Karki *et al*¹⁵. from Nepal have reported 13.7% of fundus changes in their study of 153 subjects with PIH.

Schultz and O' Brien¹⁶ in 47 cases found normal fundus in 9, arteriolar spasm in 13, vascular sclerosis in 12 and retinopathy in 12 patients.

A.R Rasdi *et al*¹⁷. conducted a prospective study at University Sains, Malaysia between 2008 and 2010 and found that the prevalence rate of retinopathy in hypertensive disorders in pregnancy was 32.5%. Generalized retinal arteriole narrowing was the most common manifestation observed.

Zehra Kurdoglu *et al*¹⁸. investigated 193 cases of preeclampsia for ophthalmoscopic findings over a period of 5 years at Yuzuncu University, Turkey.

S.Chandrasekhara Reddy¹⁹, Sivalingam Naliah and others conducted cross sectional study over a period of eighteen months at hospital TuankuJufar, Seremban.

In Ranjan *et al*²⁰. Study, 75 patients were examined. 60% patients were primigravida. Fundus changes were observed in 40% of patients. The means of systolic and diastolic BP of the patients with hypertensive fundus changes were 179.07 ± 12 mm of Hg and 100.50 ± 12.86 mm of Hg respectively. Retinal changes were found to be associated ($P < 0.05$) with low birth weight (LBW) (<2.5 kg).

MATERIALS AND METHODS

This cross sectional, observational study was conducted over a period of fifteen months (January 2014 – March 2015) on 100

patients admitted into antenatal wards with diagnosed PIH at RIMS Medical College and Hospital, Kadapa.

Inclusion Criteria

Patients with pregnancy induced hypertension with 36 weeks of gestation and above.

Exclusion Criteria

1. Pre-existing hypertension
2. Co-existing diabetes mellitus.
3. Co-existing renal disease
4. Co-existing ocular morbidity like glaucoma, cataract, corneal opacities, history of ocular trauma, surgery or previous laser treatment.

Patient evaluation

After taking informed consent and history for any eye symptoms, visual acuity was evaluated bed side using Snellens charts. A visual acuity of 6/9 or better was considered normal. Anterior segment was evaluated bedside with torch light and loupe, pupils were dilated with 0.5% tropicamide eye drops. Fundus examination was done using direct ophthalmoscope and retinopathy in either one or both eyes was taken as positive. For those patients who were stable and could be mobilized to Ophthalmology department at RIMS Medical College and Hospital, Kadapa, fundus photographs were taken.

The age, B.P. values, gravida, para, severity level of disease were all noted down from the case sheets. The average value of 5 highest readings of B.P. value for the patient were taken. The patients were divided into two groups based on their mean B.P. values into having either greater than or less than 160/110 mm of Hg for analysis. Routine urine analysis for the presence of protein and sugar was done. Blood biochemical investigations like blood urea, S.creatinine, S.uric acid and total proteins were done. Routine hematological investigations like haemoglobin and platelet count were done.

The retinal changes (hypertensive retinopathy) were graded according to Keith Wagener classification into:

Grade I: Mild generalized arterial attenuation, particularly of small branches;

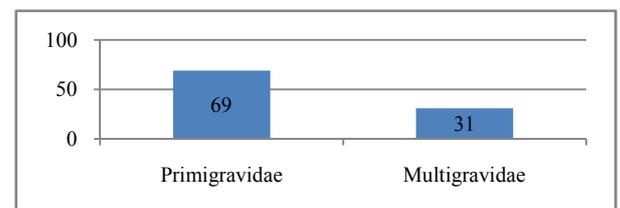
Grade II: More severe Grade 1 + focal arteriolar attenuation;

Grade III: Grade 2 + haemorrhages, hard exudates, cotton wool spots;

Grade IV: Grade 3 + optic disc swelling (papilloedema).

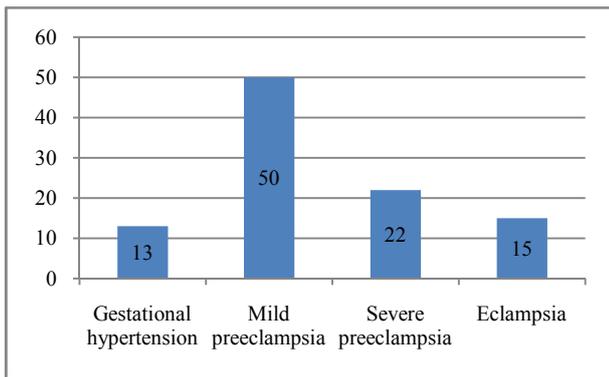
Proteinuria was tested using dipstick method and was graded as (+ = 30 mg/dL), (++) = 100 mg/dL, (+++ = 300 mg/dL), (++++ ≥ 2000 mg/dL) as provided by manufacturer. The findings were objectively recorded as per the proforma.

OBSERVATIONS AND RESULTS



Graph-1 Gravida Distribution

Most of the cases, that is, 69 (69%) were primigravidae and 31 (31%) were multigravidae.

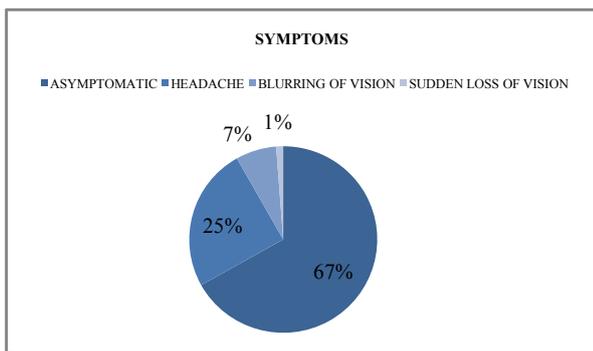


Graph-2 Severity of Disease

Out of 100 cases, 13 (13%) had gestational hypertension, 50 (50%) had mild preeclampsia, 22 (22%) had severe preeclampsia and 15 (15%) had eclampsia.

Symptoms

Most are asymptomatic. Headache was the most common complaint reported in 25 (25%) cases. Blurring of vision (intermittent/constant) was reported in 7 (7%) cases. Sudden loss of vision was reported in 1 (1%) case.



Graph-3

Table-1 Fundus Changes

Fundus changes	Number
TOTAL	24 (24%)
Grade-I Hypertensive Retinopathy	15 (15%)
Grade-II Hypertensive Retinopathy	5 (5%)
Grade-III Hypertensive Retinopathy	3 (3%)
Grade-IV Hypertensive Retinopathy/Serous RD	1 (1%)

76 cases had no changes. Fundus findings were seen in 24 cases (24%). The most common was generalised narrowing of the arterioles (Grade-I Hypertensive Retinopathy) seen in 15 cases (15%).

Table-2 Gravidawise Distribution of Changes

Gravida(Number)	No. of cases with changes	No. of cases without changes
Primigravidae (69)	22 (31.88%)	47 (68.11%)
Multigravidae(31)	2 (6.45%)	29 (93.54%)

$\chi^2=7.5851, p=0.005$

A significant association of changes was found in association with primigravidae ($p=0.0058$).

Table-3 Severity Wise Distribution

Severity of disease	No. of cases with changes	No. of cases without changes
Gestational Hypertension	0	13 (100%)
Mild preeclampsia	7 (14%)	43 (86%)
Severe preeclampsia	10 (45.45%)	12 (54.54%)
Eclampsia	7 (46.66%)	8 (53.33%)

$\chi^2=16.6235, p=0.0008$

A significant association was found with severity of disease ($p=0.0008$).

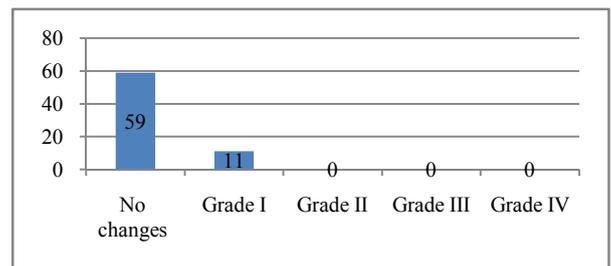
Table-4 B.P. Values

Mean presenting B.P values	No. of cases with changes	No. of cases without changes
<160/110 mm of Hg	11 (15.17%)	59 (84.28%)
>160/110 mm of Hg	13 (43.33%)	17 (56.66%)

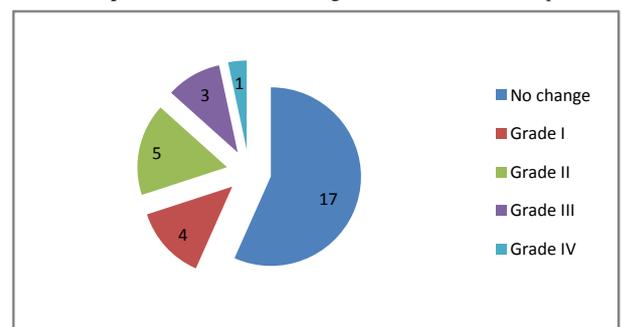
Table-5 Proteinuria

Proteinuria	No. of cases with fundus changes	No. of cases without fundus changes
Nil	0	10 (100%)
1+	10 (18.51%)	44 (81.48%)
2+	8 (30.76%)	18 (69.23%)
3+	4 (57.14%)	3 (42.85%)
4+	2 (66.66%)	1 (33.33%)

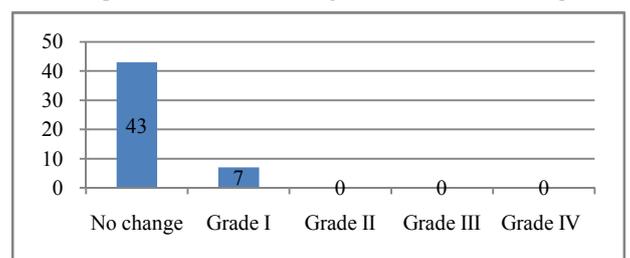
Patients had proteinuria of varying severity ranging from Nil to +4, patients with severe proteinuria having greater chance of developing retinopathy $p=0.02$, result was significant at $p<0.05$.



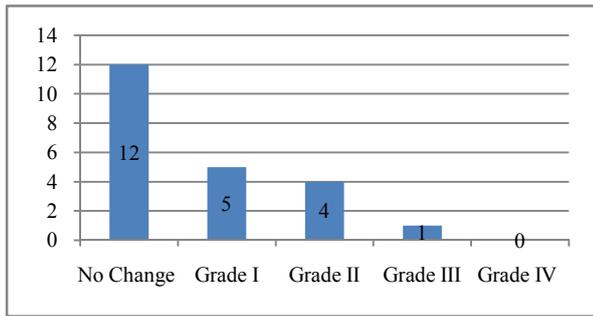
Graph-4 Distribution of changes in the Mild B.P Group



Graph-5 Distribution of Changes in the Severe B.P Group



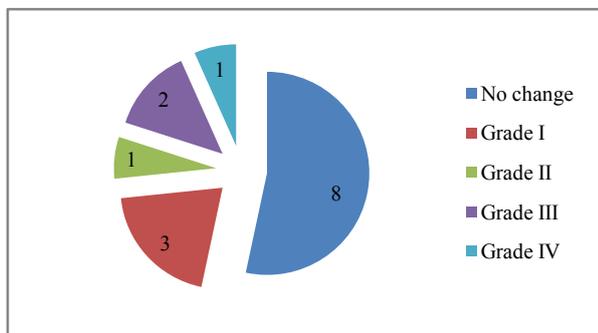
Graph-6 Fundus Changes Seen In Mild Preeclampsia



Graph-7 Fundus changes seen in severe preeclampsia

Table-6 Fundus Changes Seen In Eclampsia

Severity of disease	No change	G-I	G-II	G-III	Serous RD/G-IV
Eclampsia	8 (53.33%)	3 (20%)	1(6.66%)	2(13.33%)	1(6.66%)



Graph-8 Fundus Changes Seen In Eclampsia

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 pregnancies². Pregnancies complicated by hypertension are associated with increased risk of adverse foetal, neonatal and maternal outcomes, including preterm birth, intrauterine growth restriction (IUGR), perinatal death, acute renal or hepatic failure, antepartum haemorrhage, postpartum haemorrhage and maternal death. Preeclampsia is an obstetric disease that affects approximately 5% of pregnant women. Eclampsia is an acute and life-threatening complication of pregnancy characterized by the appearance of tonic-clonic seizures, usually in a patient who had developed preeclampsia.

In fact, the maternal mortality rate in preeclampsia and eclampsia is upto 1.8% in developed countries. Maternal mortality in eclampsia is very high in India and varies from 2–30%, much more in rural based hospital than in the urban counterpart. However, if treated early and adequately, the mortality should be even less than 2%.

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 pre-eclampsia and eclampsia. χ^2 at

table 2&3 (χ^2) and Probability values (p) were used and p-value < 0.01 was considered statistically significant.

Gravida Distribution

In our study, 69 (69%) were primigravidae and 31 (31%) were multigravidae. Of 69 patients who were primigravida, 22 (31.88%) patients developed hypertensive retinopathy while out of 31 patients who were the multigravida, 2 (6.45%) patients developed hypertensive retinopathy.

Retinopathy was common in primigravida than multigravida in our study and the result was statistically significant (P = 0.005). In *Utman et al.* study, gravida associated with retinopathy result was statistically significant (p<0.05) and was similar to our study. Gravida was associated with retinopathy changes in our study which is not similar to the results of *Reddy et al*¹². and *A.P.Shah*⁶ studies (p=0.34).

Visual Symptoms

Visual symptoms are generally not very frequent in patients of PIH. In our study, 25% of patients had headache as one of the complaints while 7% of patients complained of blurred vision and 1% patients complained of sudden loss of vision.

In our study, no patients presented with symptoms of flashes of light or black spot in visual field, diplopia. Anterior segment examinations including extraocular movements and pupillary responses were normal in all our patients.

Severity of Disease

In our study, 13 (13%) had gestational hypertension, 50 (50%) had mild preeclampsia, 22 (22%) had severe preeclampsia and 15 (15%) had eclampsia.

In the present study, fundus findings were seen in 24 (24%) cases of which 7 (14%) of mild preeclampsia patients, 10 (45.55%) of severe preeclampsia patients, 7 (46.66%) of eclampsia patients had fundus changes.

In our study, there was a statistically significant correlation (p=0.003) between the retinopathy changes and the severity of the disease. *S.C.Reddy et al*¹⁹. Found a statistical correlation between hypertensive retinopathy and severity of disease. The degree of retinopathy was directly proportional to severity of preeclampsia with which our study was in accordance. *Tadin I et al*¹⁴. Found that the degree of retinopathy was directly related to the blood pressure and to the severity of disease. They stated that hypertensive retinopathy is a valid and reliable prognostic factor in determining the severity of preeclampsia.

Prevalence Rate

The prevalence rate of fundus changes found in our study is 24% which is lesser than *Tadin et al*¹⁴. From Croatia which reported 45% of retinal changes in their study of 40 patients with PIH. *Reddy et al*¹². In a study of 275 cases of preeclampsia and 125 cases of eclampsia found an incidence of 53.4% in preeclampsia and 71.6% in eclampsia of hypertensive retinopathy.

*S.C. Reddy et al*¹⁹. Studied 78 cases with PIH and found a prevalence rate of 59%. *Zehra Kurdoglu et al*¹⁸. Studied 148 cases of PIH retrospectively and prevalence rate of

hypertensive retinopathy in their study was 48%. In Javadekar³⁴ study, prevalence rate was 72%.

Our prevalence rate was higher than Karki *et al*¹⁵. From Nepal which reported 13.7% of fundus changes in their study of 153 subjects with PIH. Rasdi *et al*¹⁷. From Malaysia found prevalence of retinopathy of 21.5%. In Vidyadhar *et al.* study, overall incidence of PIH was 8.9% which includes preeclampsia in 7.26% and eclampsia in 1.70%. In Bhattacharya *et al.* study, overall incidence of PIH was 15.5%. Shalini *et al.* study has reported preeclampsia in 7%-10% and eclampsia in 0.7%-1.80%. In Kaur *et al.* study, out of 50 patients with PIH, retinal changes (hypertensive retinopathy) were noted in 13 (26%) patients similar to our study.

Table No. 7 Table showing Comparison of prevalence rate in various studies

Study name	Prevalence rate
Tadin <i>et al.</i>	45%
S.C.Reddy <i>et al.</i>	59%
Reddy <i>et al.</i>	53.4%
Rasdi <i>et al.</i>	21.5%
Zehra Kurdoglu <i>et al.</i>	48%
Javadekar <i>et al.</i>	72%
Karki <i>et al.</i>	13.7%
Present study	24%

Hypertensive retinopathy

In our study, grade I changes were seen in 15 cases (15%), Grade II changes were seen in 5 cases (5%) and Grade III changes were seen in 3 cases (3%). Bilateral serous retinal detachment (grade-IV) was seen in 1 case (1%).

Our study correlates with previous studies that arteriolar narrowing is the most common fundus finding in patients with PIH. Bilateral, serous, non-rhegmatogenous retinal detachment is a rare complication of toxemia of pregnancy. In the vast majority of the cases, the detachment occurs concomitantly with hypertensive retinopathy. In our study, there was 1 case (1.3%) out of 15 cases of eclampsia (4.3%) which hailed from a remote village and did not have any antenatal care. It is thought to be caused by choroidal ischemia. Presence of retinal detachment is a warning sign. The management of serous retinal detachment is the termination of pregnancy after controlling blood pressure and vision can be saved in the affected eye.

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

Our observations regarding retinal detachment in eclampsia group matches with Fry W¹¹ and Fastenberg studies.

In this present study, we did not find any case of cortical blindness and Purtscher's like retinopathy, similar to studies by Prado and Reddy *et al*¹². which did not report any cases with vitreous haemorrhage, serous retinal detachment, Purtscher's like retinopathy or cortical blindness.

Blood Pressure

Mean systolic BP in the group without changes with normal fundi was 150.73 ± 13.80 mm of Hg and mean diastolic BP was 99.23 ± 10.28 mm of Hg. In the group with findings, the mean systolic BP was 168.16 ± 21.91 mm of Hg. And the mean diastolic BP was 109.08 ± 16.15 mm of Hg.

In Sajith *et al.* study, mean Systolic Blood Pressure was 156.6 mm Hg. while the mean Diastolic Blood Pressure was 101.4 mm Hg. The mean BP level in Z.Kurdoglu *et al*¹⁸. Study was 174/107 mm Hg. In Javadekar *et al.* study, means of systolic and diastolic BP of the subjects with fundus changes were 178.07 ± 12.10 mm of Hg. and 100.63 ± 12.86 mm of Hg. respectively whereas those values without fundus changes were 146.17 ± 4.94 mm of Hg and 93.13 ± 2.40 mm of Hg

Our study matches with Sajith *et al.*, Ranjan *et al*²⁰, Javadekar *et al.*, karki *et al*¹⁵, A.P.Shah⁶ studies where mean systolic and diastolic BP was higher in patients with fundus changes.

Proteinuria

Proteinuria is an important sign of pre-eclampsia. The minimum criteria for diagnosis of pre-eclampsia are hypertension and proteinuria which may be minimal or severe. In our study, 90 patients had proteinuria ranging from 1+ to 4+ on the dipstick. Of 90 patients, 24 (26.66%) patients developed retinopathy changes. Of these, 3 patients had proteinuria of 4+ on dipstick, and of them, 2 (66.66%) developed hypertensive retinopathy changes. Patients with severe proteinuria (4+) have greater chance of developing retinopathy than less severe proteinuria.

Proteinuria was significantly (P = 0.02) associated with retinopathy which is similar as reported by Reddy *et al*¹², Karki *et al*¹⁵, Reddy.S.C *et al*¹⁹, A.P.Shah⁶ and A.J.Bhandhari studies.

Preeclampsia/eclampsia is one of the 3 leading causes of maternal morbidity and mortality worldwide. During the past 50 years, there has been a significant reduction in the rates of eclampsia, maternal mortality and maternal morbidity in the developed countries. In contrast, the rates of eclampsia, maternal complications and maternal mortality remain high in the developing countries. These differences are mainly due to universal access to prenatal care, access to timely care, and proper management of patients with preeclampsia-eclampsia in the developed countries. In contrast, most of maternal deaths and complications are due to lack of prenatal care, lack of access to hospital care, lack of resources and inappropriate diagnosis and management of patients with preeclampsia-eclampsia in the developing countries. Preeclampsia/eclampsia is associated with substantial maternal complications, both acute and long-term. Clear protocols for early detection and management of hypertension in pregnancy at all levels of health care are required for better maternal as well as perinatal outcome. This is especially important in the developing countries.

CONCLUSION

Ophthalmoscopy is a simple, noninvasive, safe and reliable procedure which can be done at the bedside or in the outpatient department any number of times. A change in the retinal vasculature could also reflect a similar disease in the placental microcirculation and predict foetal prognosis. It should be done routinely in all cases of PIH to interpret vascular changes.

Though definitive management will depend on other factors, suggestive diagnosis by funduscopy will guide the obstetric management of the patient. 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. Finally after the analysis of the data, it was concluded that ophthalmoscopy is a simple tool that can help the obstetrician in assessing the severity of disease in cases of PIH, considering the presence of the changes to be an indirect marker of severity of PIH and thus planning the line of management accordingly.

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