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Ocular Changes in Hypertensive Disorders of Pregnancy – A Clinical Study

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Abstract

Aim: To determine the prevalence of ocular changes in hypertensive disorders of pregnancy. *Materials and Methods:* This was a prospective observational study and it was conducted in period of 2years and it consisted of 100 subjects who fulfil the diagnostic criteria of hypertensive disorders of pregnancy. *Results*: Out of 100 patients, 61 patients had gestational hypertension, 23 had preeclampsia, 15 had eclampsia, 2 had chronic hypertension and 1 had preeclampsia superimposed on chronic hypertension. Most of the fundus changes were seen in the 22-25 age group. Fundus changes were observed in 21(21%) patients. Of these 21 patients with fundus changes, 19 patients had Grade I change, 1 patient had Grade II retinopathy change with retinal edema and macular edema and 1 patient had macular edema. Fundus changes were seen in 55.5% of preeclampsic and eclampsic patients. Out of 21 women who had preeclampsia, fundus changes were seen in 52.3% of them. Among 12 women who mild preeclampsia fundus changes were seen in 41.6%. Of 9 women with severe preeclampsia 66.6% had fundus changes. Out of 15 women who had eclampsia, fundus changes were seen 60% of them. Severe retinal changes like macular edema and Grade II retinopathy with retinal edema and macular edema were seen in eclampsic women. Visual disturbances were seen in 2 cases, out of these one patient had macular edema and the other had Grade II retinopathy change with retinal edema and macular edema. Most of the fundus changes (71.4%) were seen when the systolic blood pressure was ≥160 mm Hg. It was found that there was an increased incidence of retinal changes with an increase in systolic BP with a statically significant P value of 0.001. Fundus changes were seen only when the diastolic blood pressure was ≥ 100. It was found that there was an increased incidence of retinal changes with an increase in diastolic BP with a statistically significant P value of 0.0006. In this study out of 37 patients who had proteinuria, 19 patients had proteinuria of 1+ and retinal changes were seen in 5 (26.3%) of them, 14 patients had proteinuria of 2+ and retinal changes were seen in 11 (78.57%) of them and 4 patients had proteinuria of 3+ and retinal changes were seen in all (100%) of them. *Conclusion:* It can be concluded that fundus evaluation should be done in all patients with hypertensive disorders of pregnancy.

Keywords: Gestational Hypertension; Eclampsia; Macular Edema.

Introduction

Hypertensive disorders complicate 5 to 10 percent of all pregnancies, and together they are one member of the deadly triad - along with hemorrhage and infection - that contributes to maternal morbidity and mortality. Hypertensive disorders of pregnancy include gestational hypertension, preeclampsia and eclampsia syndrome, preeclampsia superimposed on chronic hypertension and chronic hypertension. The incidence of hypertensive disorders is 5-10% of all pregnancies [1]. The incidence of preeclampsia in hospital practice varies from 5% to 15% [2]. The

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incidence in primigravidae is about 10% and in multigravidae is 5%. The hospital incidence of eclampsia in India ranges from 1 in 500 to 1 in 30 [2]. It is more common in primigravidae (75%) [2]. Ocular involvement is common in PIH, occurring in as many as 30 to 100% of these patients [3]. Hypertensive disorders affects multiple organ systems that include cardiovascular changes, haematological abnormalities, neurological or cerebral manifestation, hepatic and renal impairment [4]. As the retinal, cerebral and renal vessels are closely related to each other, the eye serves as a window to study the state of vessels in the brain and parenchyma of the kidneys. Several studies have concluded that there is a close correlation between the blood pressure elevation and retinal arteriolar spasm [5]. The degree of vasospasm is considered a better guide to the severity of the hypertensive disorders than presence or even degree of hypertension. Thus, ocular examination of these patients not only helps in diagnosis of eye problems but repeated observations assist in assessing the severity and progression of disease, response to treatment and ultimate outcome or prognosis [6]. Fundoscopy is a simple, non-invasive and cost effective investigative procedure that can be performed in the outpatient department or at the bedside. This study was undertaken to study the ocular changes seen in hypertensive disorders of pregnancy.

Materials and Methods

This was a prospective observational study and it was conducted in department of ophthalmology and department of obstretrics and gynaecology, Mediciti Institute of Medical Sciences, Ghanpur, Medchal, Telangana during a period of December 2014 to July 2016 and it consisted of 100 patients.

Inclusion Criteria was subjects who fulfil the diagnostic criteria of hypertensive disorders of pregnancy attending the obstetrics department of Mediciti Institute of Medical Sciences.

Exclusion Criteria was subjects with the following conditions pre-existing diabetes mellitus, pre-existing renal disease, pre-existing ocular diseases like glaucoma, optic neuritis, uveitis, patients with hazy media which precludes fundus examination, patients who are not willing to give consent.

Age, gravida, gestational period, blood pressure and proteinuria of the patients were documented after taking an informed consent. History of ocular complaints were noted. Anterior segment examination was done using a slit lamp when even the patient was stable. Examination was done under a diffuse torch light in case of unstable patients. Visual acuity was recorded, any improvement with pinhole was noted and retinoscopy was done. Fundoscopy: Fundus examination was done under tropicamide mydriasis. Tropicamide 0.5% eye drops were instilled into the cul-de-sac. After instillation of eye drops patients were advised punctal occlusion for 3 minutes after closing their eyes to avoid systemic absorption. Fundoscopy was done after adequate mydriasis. Both direct and indirect ophthalmoscopy were done. Subjects with ocular changes were advised regular follow up and postpartum ocular examination. Ocular findings were documented and observations were analysed. Subjects with ocular changes were advised treatment was per physician's advice.

The results were analysed using EPI INFO 7.0 software. Chi-square test with Yate's correction was used to determine the association between the various parameters. P value of < 0.05 was taken as significant.

Results

Table 2 shows in the present study of 100 patients, 40% were between 18-21 years of age, 40% were between 22-25 years of age, 13% were between 26-29 years of age and 7% were between 30-33 years of age. The mean age was 22.98 years. 56% were primigravidas (maximum), 25% were gravida II, 13% were gravida III, 5% were gravida IV and 1% belonged to gravida V (minimum). 30% belonged to > 34 weeks of gestation (maximum), 27% were between 30-34 weeks of gestation, 23% were between 25-29 weeks of gestation, 20% were between 20-24 weeks of gestation (minimum). 83% had 6/6 vision, 15% improved to 6/6 with pinhole. 2% of the patients had blurred vision.

Table 1: Shows grading of hypertensive retinopathy (Keith Wagner)[22]

Grade I	Mild generalized retinal arteriolar narrowing, particularly of small branches.
Grade II	Focal arteriolar attenuation and arteriovenous nipping.
Grade III	Grade II + hemorrhages (dot, blot and flame), hard exudates, cotton wool spots.
Grade IV	Grade III + optic disc swelling (papilloedema)

In the present study of 100 patients, 61% had gestational hypertension (maximum), 21% were preeclampsic, 15% were eclampsic, 2% had chronic hypertension, 1% had preeclampsia on chronic hypertension (minimum). Fundus changes were observed in 21 patients, of which grade I retinopathy changes were seen in 19%, grade II with retinal edema and macular edema was seen in 1% and macular edema was seen in 1%.

Table 2: Demographic distribution study

Age Group (Years)	No. of Patients	Percentage
18-21	40	40%
22-25	40	40%
26-29	13	13%
30-33	7	7%
Total	100	100%
Gravida		
G1	56	56%
G2	25	25%
G3	13	13%
G4	5	5%
G5	1	1%
Total	100	100%
Period of Gestational Age		
20-24 weeks	20	20%
25-29 weeks	23	23%
30-34 weeks	27	27%
>34 weeks	30	30%
Total	100	100%
Visual Acuity		
6/6	83	83%
6/9	15	15%
6/18	1	1%
6/36	1	1%
Total	100	100%
Visual Acuity with pinhole improvement		
6/6	15	15%
6/12	1	1%
6/18	1	1%
Total	17	17%

Table 3: Hypertensive disorders of pregnancy in fundus changes

Hypertensive Disorder	No. of Patients	Percentage
Gestational Hypertension	61	61%
Preexclampsia	21	21%
Exclampsia	15	15%
Chronic hypertension	2	2%
Preexclampsia on Chronic hypertension	1	1%
Total	100	100%
Fundus Changes		
No change	79	79%
Grade I	19	19%
Grade II change with retinal & macular edema	1	1%
Macular edema	1	1%
Total	100	100%

In the present study maximum retinal changes (47.6 %) were seen between the 22-25 age group. The P value is 0.512, which is not statistically significant. Maximum changes were seen in gravida I (71.4%) followed by gravida II (19%). The P value is 0.0098, which is statistically significant. Most of the changes were seen in preeclampsic and eclampsic patients. Macular edema and grade II change with retinal edema and macular edema were seen in eclampsic patients. P value is 0.0001, which is statistically significant. 21 patients had preeclampsia and fundus changes (Grade I) were seen in 11 (52.38%) of them.

Mild preeclampsia was seen in 12 patients and fundus changes (Grade I) were seen in 5 (41.6%) of them. Severe preeclampsia was seen in 9 patients and fundus changes (Grade I) were seen in 6 (66.6%) of them.

In the present study, 21 patients had preeclampsia and fundus changes (Grade I) were seen in 11 (52.38%) of them. Mild preeclampsia was seen in 12 patients and fundus changes (Grade I) were seen in 5 (41.6%) of them. Severe preeclampsia was seen in 9 patients and fundus changes (Grade I) were seen in 6 (66.6%) of them.

Table 4: Relationship between age, gravid and fundus change in hypertensive disorders of pregnancy.

Age (Years)	None	Grade I	Grade II	Macular	Total
18-21	33	6	1	0	40
22-25	30	10	0	0	40
26-29	10	2	0	1	13
30-33	6	1	0	0	7
Gravida					
G1	41	13	1	1	56
G2	21	4	0	0	25
G3	12	1	0	0	13
G4	4	1	0	0	5
G5	1	0	0	0	1
Hypertensive changes in pregnancy					
Gestation Hypertension	60	1	0	0	61
Preexclampsia	10	11	0	0	21
Exclampsia	6	7	1	1	15
Chronic Hypertension	2	0	0	0	2
Preexclampsia on chronic hypertension	1	0	0	0	1

Table 5: Severity of hypertensive retinopathy in exclampsia group in relation to blood pressure and proteinuria

Variables	No change	Grade I	Grade II	Macular EDEMA	Total
Systolic blood pressure (mm Hg)					
140-149	66	0	0	0	66
150-159	9	6	0	0	15
160-169	4	10	0	1	15
≥170	0	3	1	0	4
Total	79	19	1	1	100
Diastolic blood pressure (mm Hg)					
90-99	64	0	0	0	64
100-109	13	13	1	0	27
≥110	2	6	0	1	9
Total	79	19	1	1	100
Total Blood pressure (mmHg)					
<160/100	76	5	0	0	81
>160/100	3	14	1	1	19
Total	79	19	1	1	100
Proteinuria					
+	14	5	0	0	19
++	3	11	0	0	14
+++	0	2	1	1	4
Total	17	18	1	1	37

In the present study, 15 patients had eclampsia and fundus changes were seen in 9 (60%) of them. Grade I changes were seen in 7(46.6%) patients, grade II with retinal and macular edema was seen in 1 patient and macular edema in 1 patient. Most of the fundus changes (71.4%) were seen when the systolic blood pressure was ≥ 160 mm Hg. Every patient with systolic blood pressure of ≥170 had fundus changes. The P value is 0.001, which is statistically significant. Fundus changes were seen only when the diastolic blood pressure was ≥100. The P value is 0.0006, which is statistically significant. Most of the fundus changes (73.68%) were seen when the blood pressure was > 160/100 mm Hg. The P value is 0.001, which is statistically significant.

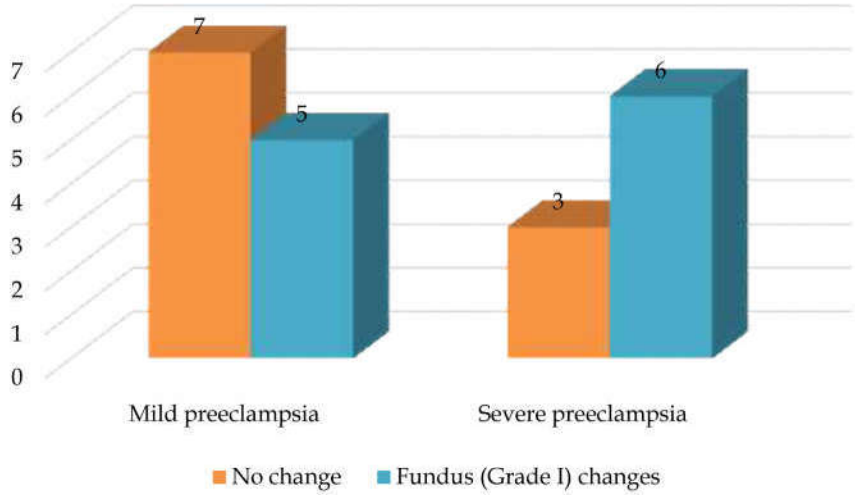

Fig. 1: Relationship between fundus changes and severity of preeclampsia group

In the present study, most of the fundus changes were seen when the proteinuria was ≥ 2+. The P value is 0.001, which is statistically significant. Visual acuity changes (< 6/6 with pin hole) and complaints of blurred vision (in women with no ocular complaints) were seen in 2 patients. In both cases macula was involved.

Discussion

This hospital based prospective observational study was done on 100 patients with hypertension disorders of pregnancy.

Hypertensive Disorders of Pregnancy

In the present study of 100 patients, majority had gestational hypertension (61%), followed by preeclampsia (23%) which was followed by eclampsia (15%). Chronic hypertension was seen in 2% whereas preeclampsia superimposed on chronic hypertension was seen in only 1%. This is comparable to the study by Shah et al [7] where gestational hypertension was seen in 61.33%, preeclampsia was seen in 32% and eclampsia was seen in 6%. This indicates that gestational hypertension is the most prevalent of hypertensive disorders of pregnancy, followed by preeclampsia which is followed by eclampsia.

Age

In the study by Tadin et al [9] of 40 women, the average age was 29.1 years. In another study by Jaffe and Schatz [8], the mean age was 28 years. The mean age was 25.1 years in the study by Shah et al [7] of 150 patients. In the present study the mean age was 22.98. In the present study of 100 patients, 47.6% (10 out of 21 changes) of fundus changes were seen in the 22-25 years age group. The P value was 0.512 indicating insignificant association between age and retinal changes. This is comparable to the studies by Sagili Chandrasekhara Reddy et al [10](P=0.41), Shah et al [7](P=0.865) which also indicate there is no significant association between age and retinal changes.

Gravida

Young and nulliparous women are particularly vulnerable to developing preeclampsia. In the present study of 100 patients with hypertensive disorders of pregnancy, 56% were primigravidas. In the study by Reddy et al [11], 55.3% were primigravidas. In the study by Shah et al 50.67% [7] were primigravidas. 65% were found to be primigravidas in a study by Rajalaxmi et al [12]. The present study is correlating with the other studies in indicating that primigravidas are more susceptible to hypertensive disorders. In the present study of 100 patients maximum fundus changes were seen in primigravidas (71.4%), followed by gravida II (19%). This indicates that the primigravidas are more susceptible to hypertensive retinopathy with a statistically significant P value of 0.0098.

Fundus Changes

In the present study fundus changes were seen in 21 (21%) patients. Of these Grade I retinopathy changes were seen in 19 patients (90.4%), Grade II

with retinal edema and macular edema was seen in 1 patient and macular edema was seen in 1 patient. Rasdi et al [13] found 32.5% fundus changes in their study on hypertensive disorders of pregnancy. In the present study, amongst 61 patients with gestation hypertension, fundus change was seen only in one patient. Rest of the 20 fundus changes were seen in preeclampsic and eclampsic patients. In the present study, 55.5% of preeclampsic and eclampsic patients had fundus changes. This correlates with the studies reported by Sagili Chandrasekhara Reddy et al [10] (59%), Rajalaxmi et al [12] (60%). Tadin et al [9] reported 45% changes. In the present study, 21 women had preeclampsia and fundus changes were seen in 52.3% of them. All the patients with fundus changes had grade I retinopathy changes. Among 12 women who had mild preeclampsia, fundus changes were seen in 41.6%. Of 9 women with severe preeclampsia, 66.6% had fundus changes. This correlates with the observations of the study by Tadin et al [9], which states that the degree of retinopathy was directly proportional to severity of preeclampsia. Landesman R et al [14] have also found a correlation between the degree of retinopathy and severity of preeclampsia. Jaffe et al [8] found a statistically significant correlation between reduction of A:V ratio and a diagnosis of severe preeclampsia. In the present study, 15 women had eclampsia and fundus changes were seen in 60% of them. Severe retinal changes like Grade II retinopathy with retinal edema and macular edema and another case with macular edema were seen in eclampsic women. In the present study the severity of retinal changes was significantly (P= 0.0001) associated with the severity of the hypertensive disorder as was seen in previous studies. In the present study, absence of hemorrhages, exudates, cotton wool spots or retinal detachment is supported by the studies of Jaffe et al [8], Sagili Chandrasekhara Reddy et al [10], Shah et al [7]. Exudative retinal detachment thought to be caused by choroidal ischemia is seen rarely in PIH patients. Retinal pigment epithelial lesions, called Elschnig spots, may also be found in preeclampsic patients with choroidal infarcts. The prognosis in these cases is good, with visual symptoms and retinal pigment epithelial changes resolve spontaneously within weeks of delivery. Retinal detachment is seen in 1-2% of all patients with PIH. In the present study, Grade II retinopathy change with retinal edema and macular edema was seen in 1 case and isolated macular edema without any grade of retinopathy was seen in another case. In both cases pregnancy was terminated. Bhandari et al [15] in their study found 5 cases with isolated ocular findings like retinal and macular edema, which were not associated with any grade of retinal vascular changes. Termination was carried out in those cases. According to Sagili Chandrasekhara Reddy et al [10] the presence of macular edema, papilledema or retinal detachment are the warning signs for termination of pregnancy to save the mother's vision. The patients with fundus changes were followed up and fundus examination repeated. All fundus changes reverted by 10th day postpartum. In the present study the prevalence of hypertensive retinopathy was higher that Shah et al [7] (12%) and Karki et al [16] (13.7%), but was lower than Sagili Chandrasekhara Reddy et al [10] (59%), Tadin et al [9] (45%), Rajalaxmi et al [12] (60%). Comparatively lower incidence of retinopathy with the absence of hemorrhages, exudates, cotton wool spots and retinal detachment can be attributed to good antenatal care and early detection and good management of hypertensive disorders of pregnancy.

Visual Disturbance

Visual symptoms are few in patients with PIH and often absent unless the macula is involved. In the present study of 100 patients , 83% had visual acuity of 6/6, 15% had visual acuity of 6/9 and all of them improved to 6/6 with pinhole and had previous history of refractive errors. Blurred vision was complained by 2 patients . Of these one patient had visual acuity of 6/36 with an improvement of 6/18 with pinhole. This patient had Grade II retinopathy with retinal edema and macular edema. Another patient had visual acuity of 6/18 with a pinhole improvement of 6/12. This patient had macular edema. This indicates the role of macular edema as a cause of visual disturbance in hypertensive disorders of pregnancy. Cortical blindness appearing late in pregnancy or shortly after delivery is an uncommon complication of severe preeclampsia and eclampsia. None of the patients in this study had cortical blindness which is similar to the studies by Shah et al [7], Karki et al [16], Reddy et al [11], Sagili Chandrasekhara Reddy et al [10]. In the present study visual disturbance was seen in 2% which is less than Smitha et al (11.9%) [17] and Mithila et all (14%) [18]. This low incidence of visual disturbance may be attributed to early detection and better management of cases.

Blood Pressure

In the present study , most of the fundus changes (71.4%) were seen when the systolic blood pressure was ≥ 160 mm Hg. Every patient with systolic blood pressure of ≥170 mm Hg had fundus changes. This indicates an increased incidence of retinal changes

with an increase in systolic BP with a statically significant P value of 0.001. In the present study, fundus changes were seen only when the diastolic blood pressure was ≥100. This indicates an increased incidence of retinal changes with an increase in diastolic BP with a statistically significant P value of 0.0006. Tadin et al [16] found a statistical correlation between blood pressure and hypertensive retinopathy. Mussey and Mundell found a correlation between frequency of retinal changes and level of blood pressure. In the study by Smitha et al, the mean systolic and diastolic BP of the subjects with hypertensive fundus changes were 178.07 mm of Hg. with standard deviation of 12.10 and 100.63 mm of Hg. with standard deviation of 12.86 respectively.

In the study by Sagili Chandrasekhara Reddy et al [10] of 78 patients, 49 (62.82%) cases had BP < 150/100 mm of Hg and 29 (37.18%) had BP > 150/ 100 mm of Hg. Retinal changes were seen in 21 (42.85%) cases when BP < 150/100 and 25 (86.21%) cases when BP > 150/100 mm of Hg. They found a statistically significant (P value =0.001) association between retinal changes and concluded that the higher the BP the more severe the retinal changes.

Bhandari et al [15] suggested that the higher the BP greater the retinal vascular changes with a statistically significant P value of < 0.05. In the study by Shah et al of 72 patients who had <160 mm Hg systolic BP and <100 mm Hg diastolic blood pressure, 4 (5.56%) patients had developed hypertensive retinopathy changes while out of 78 patients who had >160 mm Hg systolic and >100 mm Hg diastolic blood pressure, 14 (17.95%) patients developed hypertensive retinopathy.

They found a statistically significant (P value = 0.037) association between retinopathy changes and blood pressure readings. In the present study of 100 patients. Out of 81 patients who had <160 mm Hg systolic and <100 mm Hg diastolic BP, 5 (6.1%) patients developed retinal changes and out of 19 patients who had >160 mm Hg systolic and >100 mm Hg diastolic BP, 14 (73.68%) developed retinal changes. Macular edema and Grade II retinopathy change with retinal edema and macular edema were seen in patients who had BP >160/100 mm Hg.

There was a statistically significant (P value = 0.001) association between retinal changes and blood pressure readings in the present study which is similar to Sagili Chandrasekhara Reddy et al [10], Tadin et al [10], Karki et al [16].

Proteinuria

Proteinuria is an important sign of preeclampsia and eclampsia. Tadin et al found a statistical correlation between proteinuria and hypertensive retinopathy. In the study by Shah et al, out of 58 patients with proteinuria, 13 (22.41%) developed retinopathy compared to 5 (5.43%) patients from 92 who did not have proteinuria. Proteinuria was significantly associated with retinopathy (P value = 0.0005) in their study. In the study by Bhandari et al, it was found that 79% of women with urine albumin >2+ had retinal changes as compared to 33% of women with urine albumin ≤ 2+.They found the difference to be statistically significantly (P value <0.05).They also found a significant association between severity of proteinuria and grades of retinopathy. In the study by Sagili Chandrasekhara Reddy et al [10], of 40 patients with +1 proteinuria retinal changes were seen in 18 (40%) patients, of 14 with +2 proteinuria retinal changes were seen in 7 patients (50%) and all 12 patients with +3 proteinuria has retinal changes. They found a statically significant association between retinal changes and proteinuria. (P value = 0.018). In the present study of 37 patients who had proteinuria, 19 patients had proteinuria of 1+ and retinal changes were seen in 5(26.3%) of them, 14 patients had proteinuria of 2+ and retinal changes were seen in 11(78.57%) of them and of 4 patients with proteinuria of 3+ and retinal changes were seen in all (100%) of them. Macular edema and Grade II retinopathy changes with retinal edema and macular edema were seen in patients with 3+ proteinuria. This indicates a statistically significant association between retinal changes and proteinuria with a P value of 0.001. This correlates with the above studies.

Conclusion

It can be concluded that fundus evaluation should be done in all patients with hypertensive disorders of pregnancy. Observations such as "most patients having gestational hypertension (61%), fundus changes seen only in 21% and most changes being only Grade I retinopathy" indicate increased awareness regarding antenatal check-ups and improved standard of management of cases.

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