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# Optic Fundus Changes in Pregnancy Induced Hypertension and Pre-Eclampsia

Samia Aijaz, Fehmida Parveen Memon, Majida Khan

## ABSTRACT

**Objective:** To determine the frequency of optic fundus changes in patients with pregnancy induced hypertension and pre-eclampsia visited to OPD of tertiary care Hospital. **Study design:** Cross-sectional. **Settings:** Gynae Department of Liaquat University of Medical and Health Sciences. **Duration:** Six months from June 2016 to November 2016. **Methodology:** Total 196 women presenting with pregnancy induced hypertension and Pre-eclampsia were included. Detailed history and physical examination were carried out and urine samples were collected to test for proteinuria. Fundoscopic findings in Keith Wagner Grades were noted, and data was collected on a pre-designed proforma. **Results:** The mean age of the patients was 26.46±4.88 years. Out of 196 cases, fifty-five (28.06%) patients had grade 1 changes. Grade 2 and Grade 3 changes were seen in 15.31% and 3.57% cases respectively, while Grade 4 changes were observed only in 1.53% cases. **Conclusion:** It was concluded that frequency of optic fundus changes in pregnancy induced hypertension and pre-eclampsia was 48.47%, followed by as grade I 28.06%, Grade II 15.31%, Grade III 3.57% and Grade IV 1.53%.

**Keywords:** Pregnancy induced hypertension, Optic fundus changes, Pre-eclampsia

*Corresponding Author*

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**DR. FEHMIDA PARVEEN,** Assistant Professor, Department of Gynecology, Liaquat University of Medical & Health Sciences, Jamshoro-Pakistan
Contact / Email: +92 313-2851728, memonfehmeeda@outlook.com

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## INTRODUCTION

Pregnancy induced hypertension (PIH) is a disorder in pregnancy; where blood pressure raised in the absence of other causes. It is diagnosed with blood pressure >140/90mmHg, rise of 30mmHg of systolic pressure, or, a rise of 15mmHg of diastolic pressure. Blood pressure readings are taken on two events, after taken adequate rest. It can possibly take place along with proteinuria, generalized edema and/or coma.[1,2] If there is substantial proteinuria along with PIH is called preeclampsia and coma or seizures due to PIH is called eclampsia.[2] The pathological variations of this disorder seem to be associated with vascular endothelial failure and its outcomes (capillary leak and generalized vasospasm). The retinal vascular variations usually, however not always, associate with the systemic hypertension's severity. Vasospastic symptoms are reversible and retinal vessels quickly resume to normal following delivery.[2] Pregnancy induced pre-eclampsia and hypertension are rather frequent disorders and key causes of still births as well as maternal mortality and morbidity.[3–5] A study from Civil Hospital Karachi found hypertensive disorder in 150 (5.5%) mothers. Out of these cases; gestational hypertension was found in 30% mothers, toxemia of pregnancy in 58% cases and chronic hypertension was found in 12% cases.[4] In a study from Jinnah Postgraduate Medical Center, Karachi to be the major factors of still birth at 24% of all still births.[3] In another study from a tertiary care university hospital; hypertensive disorders of pregnancy had the second highest odds ratio among obstetric factors associated with still births.[7] The ophthalmoscopic findings are divided into five categories: cotton wool patches (CWP), retinal hemorrhages (RH), hard exudates (HE), yellowish opaque foci (YOF) and serous retinal detachments (SRD). The first three types of findings are considered as hypertensive retinopathy, and the last two as choroidal vascular damage.[8] The level of hypertensive retinopathy among pre-eclampsia females is a reliable and valid prognostic cause in establishing the pre-eclampsia severity.[9] In a study from Germany; Riss et al, found that 52% women with pre-eclampsia had no retinal changes, 32% had grade I hypertensive changes, 10% had grade II and 6% women had grade III or IV retinal changes. They also found that severe retinal variations (III, IV) were correlated with severe or moderate pre-eclampsia and fetal mortality.[10] In a study from India; the retinopathy severity was inversely associated with birth weight of fetus.[11] A study from Nepal showed that eye fundus changes were found in 13.7% of the subjects and optic fundus variations were correlated with low birth weight and low APGAR score.[12] The Optic fundus examination allows the direct assessment of fundal variations and the timely detection of fetal jeopardy and therefore should be considered a part of examination of every pregnant female with PIH and pre-eclampsia.[10] However, local data regarding patterns and involvement of optic fundus changes in hypertensive disorders of pregnancy are lacking and this part of clinical examination is often missed. This study is aimed at estimation of the frequency of optic fundus changes in pregnancy induced hypertension and pre-eclampsia so that better and effective examination and management protocols can be established leading to early detection of severe disease and ultimately to a reduction in maternal morbidity.

## METHODOLOGY

**Study Design:** Cross-sectional study.
**Settings:** Liaquat University of Medical and Health Sciences
**Duration:** 6 months from June 2016 to November 2016
**Methods:** All the Patients visiting to Obs/Gyn OPD with pregnancy induced hypertension and Pre-eclampsia, gestational age > 20 weeks and age range with 18 to 40 years were included in the study. All the women with history of hypertension prior to 20 weeks of pregnancy, history of diabetes mellitus or chronic kidney disease, and patients with preexisting retinopathy due to any cause, glaucoma or cataract determined by history, slit-lamp examination and intraocular pressure measurement were excluded. Informed consent was taken from the patients or the next of kin. Detailed history and physical examination were carried out and urine samples were collected to test for proteinuria. Fundoscopic examination of the eye was done by an expert ophthalmologist with at least 3 years of experience in post fellowship. Pregnancy induced hypertension was defined as blood pressure readings > 140 mmHg systolic or >90 mmHg diastolic in a pregnant female at or above 20 weeks of gestation with previously normal blood pressure. Pre-eclampsia was defined as PIH + proteinuria (1+ or more) on urine dipstick. Severe pre-eclampsia was defined as blood pressure >160 mmHg systolic or >110 mmHg diastolic on 2 occasions, at least 6 hours apart, and, proteinuria 3+ on urine dipstick. Ophthalmoscopic examinations were carried out by a qualified ophthalmologist and were graded according to Keith Wagner classification.[14]

**Grade 0:** No changes noted.
**Grade 1:** Presence of any of, arteriolar constriction/ attenuation/ sclerosis -silver wiring and vascular tortuosities.
**Grade 2:** Grade 1 + any of irregularly located, tight constrictions - Known as “AV nicking” or “AV nipping”
**Grade 3:** Grade 2 + any of retinal edema, cotton wool spots and flame-hemorrhages
**Grade 4:** Grade 3 + any of swelling of the optic disk (papilloedema) + macular star

Patient’s age, gravidity, parity, gestational age at the time of diagnosis of PIH and pre-eclampsia, Pregnancy (singleton / twin) assessed by ultrasound, proteinuria, diagnosis and fundoscopic findings in Keith Wagner Grades were noted, and data was collected on a pre-designed proforma. All the data was analyzed by SPSS version 20.

## RESULTS

Total 196 women with pregnancy induced hypertension and Pre-eclampsia were selected. Most of them were between 21 to 30 years of age and the mean age of the patients was 26.46±4.88 years and mean gestational age at the diagnosis of PIH and pre-eclampsia was 32.93±33.37 weeks. Median gravida and parity of the women are also shown in table 1. 67.86% were primigravida and most of the women were nullipara as shown in table 1. All of the patients had proteinuria in which 51.5% had 1+, 36.7% had 2+, 8.7% had 3+ and 3.1% had 4+. There were only 7(3.57%) women with twin pregnancy.

Regarding diagnosis, PIH was observed in 39.8% women, pre-eclampsia 54.6% and severe pre-eclampsia was found in 5.6% women (table 2).

Out of 196 cases, 51.53% of cases had no retinopathy findings (grade 0). Fifty-five (28.06%) patients had grade 1 changes. Grade 2 and Grade 3 changes were seen in 15.31% (30/196) and 3.57% (7/196) respectively; while Grade 4 changes was observed in 1.53% (3/196) as shown in (table 2)

**Table 1: Descriptive statistics of characteristics n=196**

| | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| ≤20 | 15 | 7.65% |
| 21 to 30 | 134 | 68.37% |
| 31 to 40 | 47 | 23.98% |
| Age Mean ± Std | 26.46±4.88 years | |
| **Gravida** | | |
| Multigravida | 63 | 32.14% |
| Primigravida | 133 | 67.86% |
| **Parity** | | |
| Nuliparous | 133 | 67.86% |
| Primiparous | 29 | 14.80% |
| Multiparous | 34 | 17.35% |
| **Pregnancy** | | |
| Single | 189 | 96.43% |
| Twin | 7 | 3.57% |

**Table 2: Patients distribution according to diagnosis and Optic fundus changes n=196**

| | Frequency | Percentage |
|---|---|---|
| **Diagnosis** | | |
| PIH | 78 | 39.8% |
| Pre-eclampsia | 107 | 54.6% |
| Severe Pre-ecalmpsia | 22 | 5.6% |
| **Retinopathy changes** | | |
| Grade 0 | 101 | 51.53% |
| Grade 1 | 55 | 28.06% |
| Grade 2 | 30 | 15.31% |
| Grade 3 | 7 | 3.57% |
| Grade 4 | 3 | 1.53% |

**Table 3: Frequency of optic fundus changes in patients with respect to diagnosis n=196**

| Diagnosis | Outcome | | | | | Total | P-Value |
|---|---|---|---|---|---|---|---|
| | Grade 0 | Grade 1 | Grade 2 | Grade 3 | Grade 4 | | |
| PIH | 45 | 21 | 10 | 1 | 1 | 78 | 0.479 |
| | 57.7% | 26.9% | 12.8% | 1.3% | 1.3% | | |
| Pre-eclampsia | 50 | 34 | 17 | 4 | 2 | 107 | 0.652 |
| | 46.7% | 31.8% | 15.9% | 3.7% | 1.9% | | |
| Severe Pre-eclampsia | 6 | 0 | 3 | 2 | 0 | 11 | 0.021 |
| | 54.5% | .0% | 27.3% | 18.2% | .0% | | |

Stratification analysis was performed and it was observed that frequency of optic fundus changes was not significant among different age group and gestational age at diagnosis of PIH and pre-eclampsia as shown in table 3.

Frequency of optic fundus changes was not significant with single and twin pregnancy, and diagnosis while Grade 3 and 4 changes were significantly high in protenurai 3+ and 4+ as shown in table 4.

**Table 4: Optic fundus changes in patients with respect to proteinuria**

| Proteinuria | Outcome | | | | | Total | |
|---|---|---|---|---|---|---|---|
| | Grade 0 | Grade 1 | Grade 2 | Grade 3 | Grade 4 | | |
| + | 63 | 29 | 9 | 0 | 0 | 101 | |
| | 62.4% | 28.7% | 8.9% | .0% | .0% | | |
| ++ | 38 | 22 | 12 | 0 | 0 | 72 | |
| | 52.8% | 30.6% | 16.7% | .0% | .0% | | |
| +++ | 0 | 4 | 9 | 4 | 0 | 17 | |
| | .0% | 23.5% | 52.9% | 23.5% | .0% | | 0.0005 |
| ++++ | 0 | 0 | 0 | 3 | 3 | 6 | |
| | .0% | .0% | .0% | 50.0% | 50.0% | | |
| Overall | 101 | 55 | 30 | 7 | 3 | 196 | |
| | 51.5% | 28.1% | 15.3% | 3.6% | 1.5% | | |

Chi-square = 191.95

## DISCUSSION

In pregnancy induced hypertension, the numerous pathological variations in various body organs can be examined by directly visualization of ocular fundus and can possibly provide a true index of variations within vascular system of retina and brain[13] Pregnancy provoked hypertension is accountable for maternal mortality, particularly among underdeveloped countries. Rasdi et al,[14] investigated a group of subjects with hypertensive conditions of pregnancy (eclampsia/preeclampsia, chronic hypertension, gestational hypertension, chronic hypertension along additional eclampsia/preeclampsia). The retinal variations were noticed among 5(21.5%) cases of eclampsia / preeclampsia. They established generalized arteriolar narrowing 17.85%, hemorrhage 3.57%, cotton wool spot 3.57% and serous retinal detachment 3.57%. They noticed the resolution of every above-mentioned retinal variation except arteries narrowing in the course of puerperium period. In current study, the patients' mean age was 26.46±4.88 years. As per the study of Badageri et al,[15] the patients' mean age was 30.2±6.2 years (ranged 21-45 years).

In our study, the incidence of PIH is more common in primipara and second gravida than multigravida because the young retinal arterioles are more sensitive to high blood pressure. The multigravida women are aware of complications of pregnancy and so they attend antenatal clinic regularly. The second-high peak was seen in patients having multiple pregnancies. Similar result was also reported in a study of Bakhda et al[16] as; the incidence of positive fundus findings is most common in primi gravida (55.80%) and secondly in gravida (50.79%), and then in multi gravida, i.e. third gravida (41.38%), fourth gravida (45.45%), and fifth gravida (38.46%).

In this study, 51.53% of cases had no retinopathy findings. Similar studies conducted elsewhere showed that the prevalence of retinopathy in PIH patients ranges from 38.46%, to 60%.[17-19] In Varija et al study,[20] PIH patients were studied among hypertensive retinopathy, changes were noted in 181 cases, particularly as; fifty-five (28.06%) patients had grade 1 changes. In the present study, the grade I retinopathy (narrowing of retinal arterioles) was the commonest fundoscopic finding, grade III and IV changes were noted in few patients. These findings were inconsonance with other studies conducted elsewhere.[18,19] Shah AP et al[21] reported that "hypertensive retinopathy" was among 12% cases, followed by Grade I in 8% and Grade II in 4%, while hemorrhages or exudates or retinal detachment not found in any case.

Karki et al.[12] from Nepal in their study of 153 PIH cases documented 13.7% of fundus variations. They evaluated fetal outcome among these cases and established that optic nerve head and retinal variations were correlated with low birth weight; optic nerve head and choroidal variations were correlated with low APGAR score; and fundus assessment among PIH patients is a significant procedure to forecast adverse fetal outcomes. However, with the current methods of early diagnosis and treatment the incidence of such severe retinopathy changes has come down. Though, Rasdi et al[14] documented a serous retinal detachment case from Malaysia. Janjua MI et al[22] reported that hypertensive retinopathy was found among 51.78% cases as; Grade 1 among 30.4%, grade II in 16.7%, grade III in 3.0% and grade IV was among 1.8% patients, while CSCR found among 1.8% patients.

## CONCLUSION

Frequency of optic fundus changes in pregnancy induced hypertension and pre-eclampsia were 48.47%, followed by grade I 28.06%, Grade II 15.31%, Grade III 3.57% and Grade IV 1.53%. Regular fundus examination in all cases of PIH should be done. It is a helpful diagnostic tool for prediction of severity

and thereby improving the maternal outcome by managing the pregnancy judiciously and providing timely termination.

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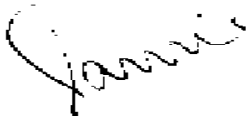
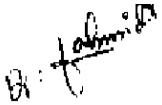
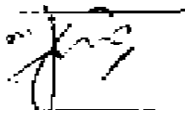
## AUTHORSHIP AND CONTRIBUTION DECLARATION

| AUTHORS | Contribution to The Paper | Signatures |
|---|---|---|
| **Dr. Samia Aijaz**<br>Registrar, Gynecology<br>Liaquat University of Medical and Health Sciences, Hyderabad-Pakistan | Data collection and write manuscript |  |
| **Dr. Fehmida Parveen Memon**<br>Assistant Professor, Gynecology<br>Liaquat University of Medical and Health Sciences, Hyderabad-Pakistan | Write and review manuscript |  |
| **Dr. Majida Khan**<br>Assistant Professor, Gynecology<br>Liaquat University of Medical and Health Sciences, Hyderabad-Pakistan | Data analysis and participate in manuscript writing |  |