

## Clinical Study of Fundus changes in Hypertensive Disorders of Pregnancy.

**Received:** 18 February 2023, **Revised:** 26 March 2023, **Accepted:** 22 April 2023

### Dr. Nidhi Raghav,

PG3 Santosh deemed to be university, Ghaziabad NCR Delhi India,  
E- mail: nidhiraghav2209@gmail.com

### Dr. Sarita Aggarwal,

HOD Dept. of Ophthalmology Santosh medical college.  
E-mail: sarita.doctor@gmail.com, ORCID ID: <https://orcid.org/0000-0002-3042-1194>

### Dr. Somesh Ranjan,

Asst. Prof Dept of Ophthalmology Santosh medical college

### Dr. Poonam Juneja,

PG2Santosh deemed to be university, Ghaziabad NCR Delhi India

### Dr. Acid Dholakia,

PG2 Santosh deemed to be university, Ghaziabad NCR Delhi India

### Dr. Aditi Sinha ,

PG1 Santosh deemed to be university, Ghaziabad NCR Delhi India

**Corresponding author: Dr. Sarita Aggarwal**

### Keywords

Ophthalmoscopy, preeclampsia, pregnancy-induced hypertension, hypertensive diseases of pregnancy, and fundus abnormalities.

### Abstract

The study's objective is to determine the prevalence of fundus changes based on age and the severity of HDP and to establish the value of fundus examination in HDP patients in order to monitor the course of the disease and choose the best course of treatment. A cross-sectional research involving patients who had been diagnosed with HDP upon admission was also included. The case records contained information on age, racial background, gravidity, gestational age, blood pressure, and proteinuria. The fundus examination was performed in the ward itself after dilating the pupils with a direct and indirect ophthalmoscope and obtaining consent and a medical history for any eye problems. On a data sheet, all the findings were recorded and examined. Result : In this study, the age range of 20 to 30 years showed the highest occurrence. majorly primigravida. Of 84 cases, 41 (48.80%) were diagnosed with mild preeclampsia, 28 (33.35%) were of severe preeclampsia and 15 (17.85%) were of eclampsia. . According to the grading, 21 (51.20%) showed category I hypertensive changes. 12(29.26%) were II category changes. Categories III and IV were 6(14.64%) and 2(4.9%) respectively. Out of 41 patients who had mild preeclampsia 8 ( 19.5%) showed positive fundus changes . Out of 28 patients with severe preeclampsia, 23 ( 82.1%) had fundus changes and out total 15 cases of eclampsia , 13(86.6%) cases had positive fundus findings. Conclusion: Fundus changes reveal important objective information in HDP and help in its early detection and treatment.

### 1. Introduction:

Toxemia in pregnancy has been known to cause fatalities and difficulties for more than 2000 years. [1] Hypertensive Disorders of Pregnancy (HDP) can be gestational hypertension, pre- eclampsia, severe pre - eclampsia, and eclampsia. It is a major maternal and

neonatal mortality factor and a fear in the field of obstetrics. 5–10% of all pregnancies are complicated by hypertensive problems.(2)

After 20 weeks of pregnancy ,when there are no other known reasons of high blood-pressure (B.P more than 140/90 mmHg measured twice with at least a 04-hours

# Journal of Coastal Life Medicine

gap), widespread edoema, and/or proteinuria (>300 mg per 24 hours), PIH develops as a hypertensive condition.[3] Gestational hypertension is recognised when the blood pressure rises to 140/90 mm Hg or greater for the 1st time after mid-pregnancy. Preeclampsia is the term for gestational hypertension that is linked to substantial proteinuria (>300 mg/24 hours).Eclampsia is the medical word for preeclampsia that is exacerbated by a generalised tonic-clonic convulsion.

An ophthalmoscope can be used to observe the human body's vasculature clearly at the retina, which is a particular location. The eye can act as a window to view the blood vessels of the body. The health of the placenta and the foetus can be reasonably inferred from a modification in the retinal arterioles, which may depict a change in the placenta's condition. [4]

Visual disturbances are a fairly rare presenting symptom of HDP. Other, less frequent signs include amaurosis, flashes of light, scotoma, double vision, chromatopsia, and hemianopia. However, the conjunctiva, choroid, optic nerve, and visual cortex can also be impacted. Retinal and retinal vascular anomalies are the most common.

In HELLP syndrome instances, there may be spontaneous vitreous bleeding. Most retinal abnormalities go undiagnosed most of the time. Seizures may be preceded by visual symptoms. Due to comparable vascular ischemia alterations in the placenta, the evolution of retinal abnormalities is correlated with the progression of HDP as well as with foetal mortality. [5]

Hypertension has an impact on the choroid, the optic disc, and the retinal vascular system. The main pathophysiologic response of the retinal vasculature to systemic arterial hypertension is vascular constriction. This response to high B.P causes regional or generalised constriction of vessels. Additionally, increased vascular permeability causes fluid to extravasate into nonvascular regions. Retinal changes that could occur include decreased retinal a/v ratio, cotton wool spots, haemorrhages, Elschnig spots, and serous retinal detachments, to name a few.[6]

The spasm and narrowing of retinal vessels is the most frequent anomaly in HDP but the Vasospastic symptoms can be reversed if diagnosed early.

Pregnancy-related hypertension is a major global public health concern. Ophthalmoscopy assists in the diagnosis of the ailment as well as the assessment of its severity, course and helps in early treatment and better prognosis.

The goal of this research is to make a diagnosis for any fundus changes in the pregnant females with hypertensive disorders as early as possible so that appropriate action can be taken in the patient on time for good prognosis of the mother as well as the fetus .[7]

## 2. Material and Methods:

The university's ethical review board approved the current research work.

In the ophthalmology Department of Santosh Medical College and Hospital, Ghaziabad, a cross-sectional study was carried out.84 patients of age group 18-24 yrs were taken as a sample size during a period of November 2020 to August 2022 based on :

$$n = Z^2 P(I-P)/d^2$$

$$Z=1.96 \text{ at } 5 \text{ percentage level of significance}$$

P= Prevalence of 53.29% ( Based on the study conducted by N.Rama Bharathi, N. Ramya Seetham and Krishna Mayee at King George Hospital, Vishakhapatnam).

$$d = \text{Relative error (20\% of P)}$$

After obtaining written informed consent from each individual, the study included them all. The study included all expectant women who met the HDP criteria, were willing to participate, and had a gestational age of at least 28 weeks. Women who were expecting were not included in the study if they had preexisting or chronic hypertension, diabetes, hepato-renal illness, ocular morbidity such cataract, corneal opacities, or glaucoma, or if their media were too cloudy for fundal examination.

Every time, a thorough obstetric history was obtained, including a thorough prenatal history. The patient underwent a general examination as well as any necessary pathological testing, such as a CBC, HIV and HBs-Ag tests, renal function tests, etc. Every time, Tropicamide 1% eye drops were used to dilate the pupil. A thorough ophthalmic examination was

# Journal of Coastal Life Medicine

performed, with a focus on direct and indirect ophthalmoscopy, as well as a slit lamp examination of the anterior chamber.

Fundus findings such as changes in the disc's colour, its periphery, its physiological cup, its arterio-venous (AV) ratio, its vascular light reflex, its location at A-V crossings, its macula, its background, its overall appearance, and the presence of haemorrhages, exudates, or any pathology were all carefully noted. (8) The modified Keith- Wagner, and Barker classification was used for grading of fundus alterations. The prognosis for visual acuity and life (mortality) was evaluated. (8-14)

## Statistical- Analysis :

Data was manually gathered and collated in a Microsoft Windows Excel sheet. The information was all provided as numbers and percentages.

## 3. Result:

Out of the 84 patients , the majority was between 20 and 30 years of age and the majority of them were primigravida. In this study of 84 HDP patients , 41 (48.80%) were diagnosed with mild preeclampsia, 28 (33.35%) were of severe preeclampsia and 15 (17.85%) were of eclampsia as shown in table 1.

DISEASE	PATIENTS INCLUDED	PERCENTAGE
MILD PREECLAMPSIA	41	48.80%
SEVERE PREECLAMPSIA	28	33.35%
EECLAMPSIA	15	17.85%
TOTAL	84	100%

**TABLE 1: GRADING OF THE PATIENTS ACCORDING TO DIAGNOSIS**

Ocular symptoms are not very common in hypertensive disorders of pregnancy. Out of total of 84 patients 38.09 % patients were symptomatic mainly complaining of head ache and diminision of

vision and 61.91% were the ones who did not have any complains as shown in table 2. Of all the symptomatic patients 44% had diminision of vision and 56% had some grade of headache associated.

SYMPTOMATIC PATIENTS	32	38.09%
ASYMPTOMATIC PATIENTS	52	61.91%
TOTAL PATIENTS	84	100%

**TABLE 2 : DISTRIBUTION OF SYMPTOMATIC AND ASYMPTOMATIC PATIENT**

The modified Keith, Wagner, and Barker classification of hypertensive retinopathy was used to grade the 84 patients who were a part of the study, and it revealed that 41 patients, or 48.80%, had positive fundus alterations. The largest number of patients, 21,

or 51.20 percent, showed grade I hypertensive alterations. 12 (29.26%) had alterations of grade II. The percentages for grades III and IV were 6 (14.64%) and 2, respectively. ( as shown in table 3).

GRADING	PATIENTS INCLUDED	PERCENTAGE
GRADE I	21	51.20%
GRADE II	12	29.26%

# Journal of Coastal Life Medicine

<b>GRADE III</b>	6	14.64%
<b>GRADE IV</b>	2	4.9%
<b>Sum Total</b>	41	100%

**Table 03: DISTRIBUTION ACCORDING TO GRADING OF RETINAL CHANGES IN PATIENTS**

Table 4 depicts the relation of retinopathy grading with the age. It demonstrates that patients who are young are more susceptible to hypertensive problems of pregnancy. Variations in retinal grading were observed in 41 patients with retinopathy alterations. In the age range of 20 to 30 years, 18 patients had retinopathy with a grade of 1, 12, 5, 2, and 4, respectively. Two women in the 30 to 40 year age

range had grade 1 retinopathy, while the other two had grade 2 retinopathy. Only one patient in the over-40 age group showed grade 1 retinopathy, whereas there were no fundus findings in the under-20 age group, presumably because there were fewer patients in that age group. The age range of 20 to 30 years has the most retinopathic alterations because this is when most pregnancies take place.

AGE GROUPS	NORMAL	GRADE I	GRADE II	GRADE III	GRADE IV	PERCENTAGE
<20	2.0(4.66%)	0.0(0%)	0.0	2(28.57%)	0	3.67%
20-30	33(76.74%)	18(85.57%)	12(85.71%)	5(71.33%)	2(100%)	79.97%
30-40	8.0(18.60%)	2(9.53%)	2(14.28%)	0	0	14.88%
>40	0	1(4.76%)	0	0	0	1.48%

**Table 04: AGE RELATIONSHIP AMONG PATIENTS BASED ON RETINOPATHY GRADE**

Table 5 shows that with the increase in the severity of the hypertensive disorder the incidence of positive fundus change increases. The grading also differed with the type of disease. Out of 41 patients who had mild preeclampsia 8 ( 19.5%) showed positive fundus changes . Out of which 5(12.19%) showed grade 1 retinopathy and 3(7.31%) showed grade 2 retinopathy. Out of 28 patients with severe pre eclampsia , 23 ( 82.1%) had positive fundus changes and out of which 14(50.0%) showed grade1, 8( 28.57%) showed grade

2 and 1( 3.56%)female showed grade 3 retinopathy . Out of total 15 cases of eclampsia , 13(86.6%) cases had positive fundus findings. Only 2(13.33%) showed grade 1 and 3(20.0%) showed grade 2 and 6(40.00%) showed grade iii retinopathy and one patient with eclampsia had grade 4 retinopathy changes. Table 5 shows the various gradings of hypertensive retinopathy seen in various diseases of hypertensive disorders of pregnancy.

DISEASE ENTITY	NORMAL	GRADE I	GRADE II	GRADE III	GRADE IV	Total cases	% with positive fundus findings
<b>MILD PREECLAMPSIA</b>	33(80.48%)	5.0(12.19%)	3.0(7.31%)	0	0	41	8(19.5%)



# Journal of Coastal Life Medicine

<b>SEVERE PREECLAMPSIA</b>	5(17.85%)	14(50.00%)	8(28.57%)	1(3.56%)	0	28	<b>23(82.1%)</b>
<b>ECLAMPSIA</b>	2(13.33%)	2(13.33%)	3(20.0%)	6(40.00%)	2(13.33%)	15	<b>13(86.6%)</b>

**TABLE 5:** Diagnosis Related to Grading Of Retinopathy

FUNDUS CHANGES	PATIENTS NUMBER	PERCENTAGE
<b>NORMAL</b>	43	51.19%
<b>ABNORMAL:-</b>	41	48.81%
<b>GRADE I</b>	21	51.22%
<b>GRADE II</b>	12	29.27%
<b>GRADE III</b>	6	14.74%
<b>GRADE IV</b>	2	4.77%

**TABLE 6 :** Individual Fundus Findings in the Patients

According to Table 6, there are 43 (51.19%) cases of normal fundus, 21 (51.22%) cases of arterial attenuation, 12 (29.27%) cases of modifications to

arterio-venous crossing, 6 (14.74%) cases of haemorrhages and exudates, and 2 (4.77%) cases of papilloedema.

GRAVIDA	NORMAL FUNDUS	WITH POSITIVE FUNDUS FINDING
<b>PRIMI GRAVIDA</b>	28	30(35.71%)
<b>MULTI GRAVIDA</b>	3	9(10.71%)
<b>GRAND MULTI GRAVIDA</b>	2	2(2.38%)
<b>SUM TOTAL</b>	43	41((48.80%)

**TABLE 7 :** FUNDUS CHANGES ACCORDING TO GRAVIDA

Out of the total of 41 (48.80%) patients with findings, Table 7 shows that 30 (35.71%) patients were primigravida, 9 (10.71%) were multigravida, and 2 (2.38%) were grand multigravida. The majority of females with fundus changes in hypertensive disorders of pregnancies are primigravida.(15,16)Hence more ophthalmic work up is a need for primigravidas.

In our study, majority of the 21 cases (51.22%) had vascular attenuation, which was temporary and vanished after 8 to 12 days of PIH management or delivery. [8-10,17]

#### 4. Discussion

According to several reports, the degree of hypertension correlates with the changes in retinal blood vessels. Numerous investigations have linked the evolution of retinal vascular alterations with fetal mortality and regarded them to be indicators of HDP that is becoming more severe.

The age group included in this study was 18-42 years. Out of all the 84 patients in this research, age category of less than 20 years included 3 (3.57%) patients. The age range 20 to 30 years had the highest percentage of

# Journal of Coastal Life Medicine

patients, which was 68 (80.95%). According to a study on fundus changes in PIH by Nupur Pednekar et al. (17), The largest percentage of patients in the 20–30 year age range in our study was 82.3% of the total number of patients.

Our study indicated that 58 women (69.04%) were primigravidas and the remaining 30.96% were multigravidas, which is consistent to the results of the study by Upadhy D et al. HDP develops more commonly in primigravidas and second gravidas than in multigravidas due to the juvenile retinal vessel's increased susceptibility to higher blood pressure. The multigravida women frequently visit antenatal clinics since they are aware of pregnancy complications. Those who had several pregnancies experienced the second high peak.

In our study of 84 participants 48.80% patients had mild Preeclampsia, 33.35% participants were found with severe Preeclampsia and 17.85% participants were found to have eclampsia. There is slight discrepancy in the results due to larger sample size in a study by Shah AP et al. (4)

In our analysis of 84 patients, 41 patients—or 48.80% of the total—had favourable retinal alterations. Numerous research have been conducted to determine the frequency of fundus alterations in people with hypertensive diseases of pregnancy, also known as pregnancy-induced hypertension. Similar findings regarding the prevalence of fundus alterations were seen in a research by Tadin et al. (18) from Croatia. They found favourable fundus findings in 45% of the research participants. Another investigation by Varija T et al. (19) 42.7% and another study by Rasdi et al. (20) 53.4% patients were observed with retinal changes which was again statistically comparable to our study.

In our study, 21 patients out of 41 positive fundus cases patients i.e. 51.22% had grade I hypertensive retinopathy. 29.27% (12) had retinal changes that corresponded to grade II hypertensive retinopathy. 14.64% and 4.77% individuals were observed to have grade III and grade IV changes respectively. 1 patient had serous retinal detachment who had grade 4 changes of hypertensive retinopathy and the blood pressure was more than 160/110 mmHg. Termination of pregnancy was advised in the patient and after 4 weeks of termination no disc edema was present. The

most frequent retinal alterations in hypertensive disorders during pregnancy were artery attenuation and haemorrhages. S.C. Reddy et al.'s study (21) found that grade 1 hypertensive retinopathic changes were evident in 52.46 percent of patients with hypertension disorders of pregnancy and grade 2 changes were present in 6.4% of patients. The proportion of females included in the grade 1 category of fundus changes was comparable because the majority of patients lie in this category of retinal changes.

The current study's findings showed a very significant relationship between fundus anomalies and the degree of hypertension. This is comparable to the work of Tadin et al. (18), which discovered that the degree of retinopathy (11) was directly linked to the severity of pre-eclampsia and proteinuria. According to them, the fundus examination is an important and significant diagnostic procedure in pregnant ladies with pre-eclampsia, and hypertensive retinopathy is a real and trustworthy prognostic factor in assessing the severity of pre-eclampsia. Additionally, they noticed a noteworthy association between the development of edoema and hypertensive retinopathy.

According to our study and other investigations, fundus alterations were more frequently associated with grade 1 hypertensive retinopathy. Our study had a 48.80% prevalence of fundus discoveries, which is comparable to other studies.

In cases with PIH, the obstetrician can use the results of both direct and indirect ophthalmoscopy to determine the severity of the condition. It is commonly accepted that retinal haemorrhages and changed retinal arterioles are signs of the same placental changes. Ophthalmoscopic dilated examination of the mother's fundus may reveal information about similar placental microcirculation changes and, indirectly, about the health of the mother and foetus. This is so because the placental circulation affects the fetus's health. Therefore, the fundus examination becomes a crucial clinical assessment for PIH patients in order to forecast a poor result for the foetus.

## References

- [1] ACOG Committee on Obstetric Practice. ACOG practice bulletin. Diagnosis and management of preeclampsia and eclampsia. Number 33, January 2002. American College of

# Journal of Coastal Life Medicine

- Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 2002;77:67-75
- [2] Bakhda, R. N. (2016). Clinical study of fundus findings in pregnancy induced hypertension. *Journal of family medicine and primary care*, 5(2), 424.
- [3] Davey DA, MacGillivray I. The classification and definition of the hypertensive disorders of pregnancy. *Am J Obstet Gynecol*. 1988;158:892-8.
- [4] Shah AP, Lune AA, Magdum RM, Deshpande H, Shah AP, Bhavsar D. Retinal changes in pregnancy-induced hypertension. *Med J DY Patil Univ* 2015;8:304-7
- [5] Jayashree, M. P., et al. "Ocular Fundus changes in pregnancy induced hypertension—A case series study." *Journal of Clinical Research and Ophthalmology* 5.2 (2018): 037-041.
- [6] Khanom, R., Faridi, J., Nur, J., Akter, S., & Basu, K. C. (2020). Ocular Fundus Changes in Pregnancy Induced Hypertension. *Journal of Dhaka Medical College*, 28(1), 94-99.
- [7] Singh S, Chauhan SS, Ranjan R. A cross-sectional study on the incidence of retinal changes and its correlation with variables like blood pressure, liver function tests, kidney function tests, proteinuria, and pedal edema in patients of pregnancy-induced hypertension in a rural setting.
- [8] Dekker G, Sibai B. Primary, secondary and tertiary prevention of pre-eclampsia. *Lancet* 2001;357:209-15.
- [9] Ballatyn AJ, Michaelson IC. *The fundus of the eye*. Baltimore: Williams and Wilkins; 1970. p. 182-3.
- [10] Hallum AV. Eye changes in hypertensive toxemia of pregnancy. A study of 300 cases. *JAMA* 1936;106:1649-51.
- [11] Jaffe G, Schatz H. Ocular manifestations of pre-eclampsia. *Am J Ophthalmol* 1987;103:309-15.
- [12] Gibson GG. The clinical significance of retinal changes in hypertensive toxemia of pregnancy. *Am J Ophthalmol* 1938;21:22.
- [13] Prachakvej P. Retinal changes in toxemia of pregnancy. *J Med Assoc Thai* 1971;54:552-8.
- [14] Schultz JF, O'Brien CS. Retinal changes in hypertensive toxemia of pregnancy. A report of 47 cases. *Am J Ophthalmol* 1938;21:767-74
- [15] Khateeb, D., Sadiq, T., & Sadiq, S. (2022). To evaluate the fundus changes in patients with hypertensive disorders of pregnancy: Gestational hypertension, preeclampsia, eclampsia. *European Journal of Molecular & Clinical Medicine*, 9(1), 67-73.
- [16] Gaikwad, C. ., Khune, A. ., Mahadik, S. ., & Balwir, D. (2022). A Study of Ocular Fundus Findings in Hypertension during Pregnancy in a Tertiary Care Hospital. *MVP Journal of Medical Sciences*, 163-170. <https://doi.org/10.18311/mvpjms/2021/v8i2/317>
- [17] Nupur Pednekar, Vijay Bhanudas Barge, Deepak Phalgune, Ajab Dhabarde. A clinical study of fundus changes in pregnancy induced hypertension in tertiary health care Centre in Sevagram, Wardha, India. *Int J Med Ophthalmol* 2021;3(2):116-119. DOI: 10.33545/26638266.2021.v3.i2b.106
- [18] Tadin I, Bojić L, Mimica M, Karelović D, Dogas Z. Hypertensive retinopathy and preeclampsia. *Coll Antropol*. 2001;25(Suppl 0):77-81.
- [19] Varija, T., D. Vanaja, and Raghavenda Bellara. "A study of prevalence and association of fundus changes in pregnancy induced hypertension." *International Journal of Reproduction, Contraception, Obstetrics and Gynecology* 5.5 (2016): 1375-1380
- [20] Rasdi AR, Nik-Ahmad-Zuki NL, Bakiah S, Shatriah I. Hypertensive retinopathy and visual outcome in hypertensive disorders in pregnancy. *Med J Malaysia*. 2011;66(1):42-47.
- [21] Reddy SC. Raghavamma TV. Retinal detachment in preeclampsia- A case report. *J Obstet Gynaec of India*. 1981;31(3):501-503.