



FUNDUS CHANGES IN PATIENTS WITH PREGNANCY INDUCED HYPERTENSION AND ITS ASSOCIATION WITH FETAL OUTCOME IN WESTERN INDIA

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ABSTRACT

Aim: To study the association between fundus changes in patients with pregnancy induced hypertension and the fetal outcome. **Methods:** A prospective cohort study was conducted on 50 patients with PIH at a tertiary care hospital in Gujarat, India. Retinal status was evaluated under mydriasis in the antepartum and postpartum period. Fetal outcome was recorded in the form of gestational age at birth, birth weight, live/stillborn, mode of delivery, need for induction of delivery and need for admission to neonatal care unit. **Results:** In this study, PIH induced fundus changes were seen in 48% of the patients. 17(34%) of the fetus were stillborn and 12 of the live born required hospital admission. Mothers of 13(44.82%) of these 29 fetuses with adverse outcome had PIH retinopathy. 14(50%) of the 28 mothers with fetus with low birth weight had abnormal fundi. Serous detachment occurred in 10% of the patients all of which had severe PIH or eclampsia, were primigravida and delivered preterm. Serous detachment resolved over 7-10 days postpartum. **Conclusion:** Presence of PIH retinopathy may be used as an indicator for predicting the fetal outcome in patients of PIH. It is a particularly reliable marker for preterm delivery when serous detachment occurs in primigravida women with severe PIH or eclampsia.

KEYWORDS : Retina; Fundus ; Pregnancy induced hypertension

INTRODUCTION:

Hypertension is the most common medical problem encountered in pregnancy and remains an important cause of maternal and fetal morbidity and mortality.^[1] In a multicenter study^[2], approximately 30% of hypertensive disorders of pregnancy were due to chronic hypertension while 70% of the cases were diagnosed as gestational hypertension/preeclampsia. Sachdeva *et al.*^[3] in Gujarat, reported incidence of pregnancy-induced hypertension (PIH) to be 15% among women of rural background. Ocular involvement is common in PIH occurring in as many as 30-100% of patients.^[4] Visual symptoms may be the precursor of seizures.^[5] Progression of retinal changes correlates with progression of PIH^[6] and also with the fetal outcome especially in terms of low birth weight^[7,8] due to similar vascular ischemic changes in the placenta. Furthermore, there is not much data available in the published literature on the prevalence of retinal changes in PIH in a rural setup of Western India or its association with fetal outcome.

Worldwide, 10 % of all pregnancies are complicated by hypertension, with pre-eclampsia and eclampsia being the major causes of maternal and prenatal morbidity and mortality.^[9] It is also estimated that pregnancy induced hypertension (PIH), one of the hypertensive disorders of pregnancy, affects about 5 - 8 % of all pregnant women worldwide.^[10] Pregnancy induced hypertension (PIH) is defined as BP \geq 140/90 mmHg, taken after a period of rest on two occasions or \geq 160/110 mmHg on one occasion in a previously normotensive woman.^[11] Pre-eclampsia affects 5-7 % of all pregnancies. It is broadly defined by hypertension and proteinuria.^[12] Eclampsia includes pre-eclampsia with the presence of convulsions not attributable to other neurologic disease.

A study done by Rahman *et al.*^[13] revealed that pregnancy-induced hypertension was an independent risk factor for low birth weight. A study conducted in the year 2012 in Zimbabwe showed that of the babies born to mothers with PIH, 16.1 % had low birth weight compared to 6 % among those born to mothers without PIH. Of those women who had PIH, 14.3 % delivered their babies before 37 weeks gestation compared to 8.2 % among women without PIH.^[14] Ranjan *et al.*^[15] in their study in India in 2014 reported that fundus changes in patients of PIH was significantly associated with LBW but was not associated with fetal outcome in terms of gestational period (<37 weeks), 1 min Apgar score (<5), still birth. Statistically significant relationship was found with fundus findings in the

forms of Grade II and Grade III hypertensive retinopathy changes. Another study done in Nepal supported these findings and showed that presence of fundus changes in a patient of pregnancy-induced hypertension was not associated significantly with fetal outcomes in terms of gestational period, 1 minute Apgar score, stillbirth and neonatal death but was associated with low birth weight and it was statistically significant when compared to patients without fundus changes.^[7]

Fundus examination is an inexpensive examination which was carried out as a ritual in earlier times. Now however because of better medical control of the condition this practice is given up. However, in the rural set up this is not applicable. Many studies are conducted around the world to find the association between fundus findings in PIH and fetal outcome however no such study is done in the state of Gujarat. This study will help ascertain the need for fundus examination in patients diagnosed with PIH taking Antenatal care in Primary health care centers and the requirement thus for transferring the patient to a tertiary health care system with fully equipped NICU in a timely manner, thus preventing the complications due to unavailability of the required level of health care in their time of need. Also, in cases where the patient develops hypertensive choroidopathy, papillopathy/ischemic optic neuropathy these changes become an indication for urgent termination of pregnancy to avoid permanent visual disability.

SUBJECTS AND METHODS:

A prospective cohort study was conducted on patients admitted to the obstetrics ward at Shree Krishna Hospital, Gujarat, India with the diagnosis of PIH. Patients with any preexisting retinal pathology, preexisting diabetes or hypertension and patients with hazy ocular media were excluded from the study. The duration of the study was 9 months.

After obtaining an informed consent, the baseline data for all the patients was recorded. All the patients were initially evaluated by an obstetrician. Detailed history, general physical examination and systemic examination was done. Age, para, gravida, BP was noted from the case record following which ocular evaluation was done bedside in the antepartum phase and post-partum phase which included visual acuity with Jaegers chart, pupillary examination and fundus evaluation under mydriasis using tropicamide eye drops. Fundus changes were grouped as: no changes(normal fundus), vascular changes, extra-vascular retinal changes

(hemorrhages, cotton wool spots, hard exudates), optic nerve head changes, serous detachment and choroidal changes. Patients with decreased visual acuity, choroidopathy with exudative retinal detachment or ischemic neuropathy were to be evaluated 1 month postpartum. The mode of delivery either caesarean or vaginal and if vaginal whether spontaneous or induced was noted. Fetal outcomes were recorded in terms of gestational age at birth, birth weight and need for admission to neonatal ward/ICU. They were grouped on the basis of gestational age at birth as preterm(<37 weeks), term(37-40 weeks) and post-term(>40 weeks); and on the basis of birth weight as extremely low birth weight(<1kg), very low birth weight(1-<1.5 kg), low birth weight(1.5- <2.5 kgs) and normal weight (≥2.5 kg). Descriptive statistics was used to analyze the recorded data.

RESULTS:

A total of 50 patients were examined. The mean age of patients was 26.76 ± 6.056 (range 19- 44 years). The gestation period ranged between 21 and 41 weeks. 24 (48%) were primigravida (first time pregnant), 21 (42%) were multigravida (2-4 pregnancies) and 5 (10%) were grand multigravida (5 or more pregnancies). The mean systolic blood pressure of patients with PIH induced fundus changes and that without PIH induced fundus changes was 163.2 ± 22.4 mmHg and 156.42 ± 17.7 mmHg respectively. The mean diastolic blood pressure of patients with PIH induced fundus changes and that without PIH induced fundus changes was 104.64 ± 17.84 mmHg and 96.85 ± 11.41 mmHg respectively.

In our study in a total of 24 (48%) cases we detected some abnormality in their fundus. Table No. 1 depicts the frequencies of normal and abnormal fundus in various grades of PIH.

Table No. 1

	Normal Fundus	PIH Retinopathy present	Total
Mild PIH	11	4	15
Moderate PIH	0	1	1
Severe PIH	8	11	19
Eclampsia	7	8	15
Total	26	24	50

Table No. 2 gives the distribution of abnormal fundi based on the groups of retinal changes viz. vascular changes, extravascular/background changes, serous detachment, choroidal changes and optic nerve head changes in various grades of PIH.

Table No. 2

Grades of PIH	Vascular changes		Extravascular changes		Serous Detachment		Choroidal changes		Disc changes	
	N	AbN	N	AbN	N	AbN	N	AbN	N	AbN
Mild PIH	12	3	14	1	15	0	15	0	15	0
Moderate PIH	0	1	1	0	1	0	1	0	1	0
Severe PIH	9	10	13	6	16	3	14	5	19	0
Eclampsia	8	7	12	3	13	2	14	1	15	0
Total	29(58%)	21(42%)	40(80%)	10(20%)	45(90%)	5(10%)	44(88%)	6(12%)	50(100%)	0(0%)

* N = Normal, AbN = Abnormal

21(42%) and 10(20%) females showed vascular and extravascular changes in their fundus respectively. Vascular changes consisted of vessel changes and hemorrhages (Figure 1) and extravascular changes included cotton wool spots.

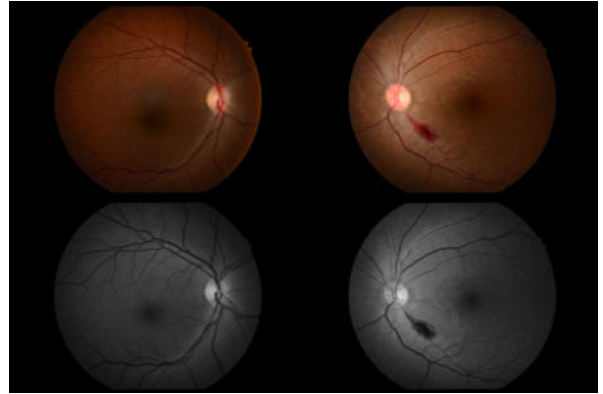


Figure 1: Colour and red-free fundus photos showing subretinal hemorrhage.

5(10%) had exudative retinal detachment out of which 3 cases were of extensive retinal detachment involving the macula(Figure 2) and causing significant diminution of vision. 100% subjects with exudative retinal detachment were primigravida 3 of which had severe PIH and the remaining 2 had eclampsia. 3 of the 5 cases with retinal detachment had still born babies and all the patients went into preterm labor. 4 of which were induced and 1 was spontaneous. Both the live born babies had normal weight and did not require hospital admission.

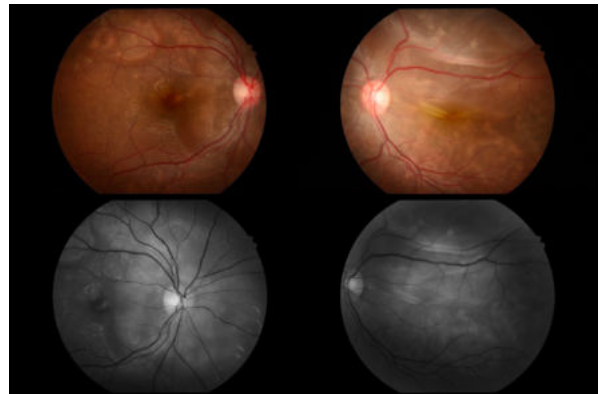


Figure 2: Colour and red free fundus photo showing extensive bilateral exudative detachment involving the macula.

All of the patients with choroidal changes had preterm labor. (Figure 3) 5 of these were induced, primary indication of induction being fetal distress and 1 underwent Caesarian section. 3(50%) of the 6 cases with choroidal changes had still born babies of the ones born alive two babies had normal birth weight and 1 had low birth weight. None of these babies required hospital admission.

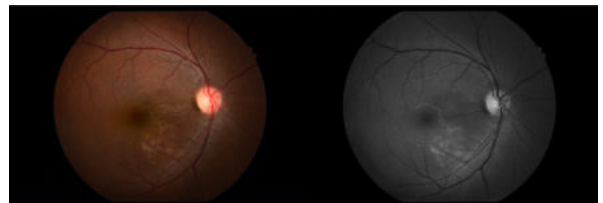


Figure 3: Colour and red free fundus photo showing choroidal ischemia and some amount of serous detachment in resolving phase.

Anterior segment examination was normal in all cases. Visual acuity was significantly affected in only the 3 patients that had developed extensive exudative retinal detachment involving the macula which returned to normal within 7-10 days as the serous detachment resolved.

None of the pregnancies in the current study were multiple pregnancies. Of the 50 fetuses, 17(34%) were still born and 33(66%) were live born. Of these 33 babies 12 required admission to the neonatal care unit. However, only 4 out of these 12 mothers had an abnormal fundus. Of the 17 still born babies a total of 13 babies belonged to mothers with either severe PIH or eclampsia groups. 5 of the babies requiring neonatal care were discharged against medical advice and all 5 of these babies belonged to mothers with either severe PIH or eclampsia and were all preterm low birth weight babies that would have required prolonged care and support but were unfortunately lost to follow-up.

24(48%) of the 50 cases required a caesarian section 19 of which were live born and 7 of these required NICU admission. 26(52%) were delivered by vaginal delivery of which only 14 were live born, 5 of which required NICU admission. 11 of the vaginal deliveries required induction. 8(72.72%) of the cases where induction was required had an abnormal fundus.

The mean birth weight was 2029.64 ± 810.926 grams and the mean gestational age of fetus at birth was 33.97 ± 4.884 weeks. The mean birth weight among the live born babies was 2238 ± 654.055 grams and the mean gestational age of fetus at birth among them was 36.08 ± 2.783 weeks.

Table No. 3 gives the frequency distribution of presence of PIH retinopathy in mothers of the 50 fetus under this study.

Table No. 3

	Gestational Age at birth			Birth Weight				Discharge /DAMA/ Still born			Mode of delivery	
	P r e t e r m	T e r m	P o s t T e r m	E L B W *	V L B W *	L B W *	N o r m a l w e i g h t	D I S M A	D A M A	S t i l l b o r n	L I V E	V a g i n a l
PIH Retinopathy present	19	5	0	2	2	10	10	14	1	9	15	9
PIH Retinopathy absent	16	9	1	4	4	6	12	14	4	8	11	15
Total	35	14	1	6	6	16	22	28	5	17	26	24

*ELBW = Extremely low birth weight, VLBW= Very low birth weight, LBW= Low birth weight

DISCUSSION:

In our study a total of 50 patients of pregnancy-induced hypertension (PIH) were included which consisted of 35 (i.e.70%) pre-eclamptic patients and 15 (30 %) eclamptic patients. The prevalence of PIH induced fundus changes was found in 16(45.71%) preeclamptic patients, 8 eclamptic patients(53.33%) and overall in 24(48%) patients. This was less than that reported in a study of 275 cases of preeclampsia and 125 cases of eclampsia conducted by Reddy^[15] from India which reported retinal changes in 53.4% preeclampsia and 71.2% in eclampsia patients (overall 59%, 236 out of 400). The most common retinal changes noted were vascular changes in 42% cases which was comparable to the study done by Reddy^[15] where he reported 45% patients with vascular changes. Tadin et al^[16] from Croatia have reported 45% of retinal changes in their study of 40 patients with PIH which is comparable to our study.

However, Karki et al.^[17] from Nepal in 2010 have reported 13.7% of fundus changes in their study of 153 subjects with PIH which is far less as compared to our study. In a study by Rasdi et al^[17], showed a prevalence of 21.5%. In a study by Javadekar et al^[18], from India observed retinal changes in 42% of patients of PIH.

We observed a high incidence of advanced retinal changes in our study. 5(10%) patients in our study had serous detachment and 6(12%) had choroidal changes. A study of 75 patients done by Ranjan et al^[8] and that of 153 patients done by Karki et al^[17] reported no cases of serous detachment.

Jaffe and Schatz^[19] from USA have reported significant correlation between the reduction in arteriole to vein ratio, number of focal arteriolar constrictions and severity of preeclampsia. They did not find any hemorrhages, exudates, cotton wool spots or retinal detachment in their study of 17 mild preeclampsia and 14 severe preeclampsia patients.

Davis and Dana^[20] reported that visual symptoms are generally not very frequent in patients of PIH. Out of the visual symptoms blurred vision is most common followed by photopsia, scotomata and diplopia.

In our study, we did not come across any patient complaining of photopsia or scotoma, but 3 of the 5 patients with serous detachment where the macula was involved complained of diminution of vision.

Anterior segment examinations including extraocular movements and pupillary responses were normal in all our patients.

There was a difference between mean diastolic and systolic blood pressure and retinopathy changes, which was also observed in study by Tadin et al.[16]

A lot of studies in the literature have used the Keith Wagner classification for defining the fundus changes in the patients in their study. However, since the classification doesn't hold true for PIH retinopathy we grouped our cases as mentioned in methods and hence comparing our results with those studies is difficult.

Literature research shows that the progression of retinal vascular changes is a sign of increasing severity of PIH and have correlated them with fetal mortality.^[21,22] Our study showed that presence of fundus changes in patients of PIH was not significantly associated with LBW (P < 0.05), mode of delivery, live/still born or with fetal outcome in terms of gestational period. 28 out of the 50 babies born had low birth weight however the fundus of only 14(50%) of the mothers of these LBW babies showed some abnormality. Our study thus doesn't support the study done by Ranjan et al^[8] and Karki et al^[17] where a positive association between fundus changes and LBW was noted. Both of these studies however, did report no association between fundus changes and fetal outcome in terms of gestational and still/ live born age just like our study. 17 of the 50 babies in this study were still born with mothers of only 9 of these showing some PIH associated fundus retinopathy.

The outcome of the fetus depends on the placental circulation. Fundus evaluation of mother's fundus may give a clue to microcirculation changes in the placenta and indirectly to the fetal well-being.^[7] In our study, all the babies born to mothers with serous detachment and choroidal changes were preterm, 55% of these were still born and 100% of the live born babies required immediate advanced medical attention. We recommend a similar study PIH patients with advanced fundus changes only to find the association with fetal outcome.

We also recommend routine fundus evaluation for all patients with PIH, especially at primary health care centres and especially in those with severe PIH or eclampsia. It is an inexpensive and important procedure to predict adverse fetal outcomes and it would help to predict need for transferring patients taking Antenatal care in Primary health care centers to a tertiary health care system with fully equipped NICU in a timely manner, thus preventing the complications due to unavailability of the required level of health care in their time of need.

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