

Original article ●●●●

Association between pregnancy-induced hypertensive fundus changes and fetal outcomes

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Abstract

Background: Ocular involvement in pregnancy-induced hypertension (PIH) is common.

Objective: To study the association between pregnancy-induced hypertensive fundus changes and fetal outcomes.

Subjects and methods: A prospective cohort study was carried out including 153 subjects with the diagnosis of PIH. The subjects were evaluated for hypertensive fundus changes. Fetal outcomes were assessed in terms of gestational age, birth weight, 1 minute Apgar score, stillbirth and neonatal death.

Statistics: The chi² test was used to evaluate the association between the various fundus changes and fetal outcomes using SPSS version 10 software program.

Results: Fundus changes were found in 13.7 % of the subjects. The means of systolic and diastolic BP of the subjects with hypertensive fundus changes were 182.86 ± 33.64 and 125.24 ± 21.36 respectively, whereas those values without fundus changes were 150.72 ± 12.86 and 100.07 ± 9.51 . Vitreous hemorrhage, serous retinal detachment and macular star were not found in this study. Fetal outcomes in PIH patients with vascular changes alone were similar to those with no fundus changes. Retinal and optic nerve head changes were found to be associated ($p = 0.016$) with low birth weight (< 2.5 kg). Choroidal changes and optic nerve head changes were associated with low Apgar score.

Conclusion: Retinal and optic nerve head changes are associated with low birth weight. Choroidal changes and optic nerve head changes are associated with low Apgar score. Fundus evaluation in patients with PIH is an important procedure to predict adverse fetal outcomes.

Keywords: PIH, retinopathy, choroidopathy, optic neuropathy, fetal outcomes.

Introduction

Pregnancy-induced hypertension (PIH) is reported to occur in around 16-25 % of first pregnancies and 12-15 % of subsequent pregnancies (Edmonds DK, 1999).

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Ocular involvement in PIH is common occurring in as many as 30 to 100 % of these patients (Hallum AV, 1936, 1947; Hayreh SS et al 1986; Landesman R et al 1951, 1952; Sadowsky A et al 1956; Schultz JF et al 1938; Wagener HP, 1934). Ocular involvement reported in these patients includes conjunctival vascular anomalies, hypertensive retinopathy, exudative retinal detachment, vitreous and preretinal haemorrhage, ischaemic optic neuropathy and hypertensive choroidopathy (Davis and Dana, 2000).



Reversible cortical blindness and extraocular muscle palsy, though rare, have been well documented in the eclamptic patients (Davis and Dana, 2000). The ocular vascular changes have been said to correlate with the severity of hypertension (Hallum AV, 1936; Landesman R et al 1951; Sadowsky A et al 1956; Mussey and Mundell, 1939; Duke-Elder S, 1971; Riss B et al 1983) and this has been used as an indicator for termination of pregnancy (Ober RR, 1989). It has also been documented that there is a clinically-significant association of both gestational hypertension and pre-eclampsia with later hypertensive disorders (Carpenter MW, 2007). With this background, this study was carried out to find if any association between pregnancy-induced hypertensive fundus changes and fetal outcomes existed.

Subjects and methods

This was a prospective cohort study including 153 patients admitted to the obstetrics ward, BPKIHS, with the diagnosis of PIH. The duration of the study was 1 year (Feb. 06 - Jan. 07).

After obtaining an informed consent, the baseline data for all the patients were recorded. All the patients were initially evaluated by an obstetrician.

Detailed history, general physical examination and systemic examination were then done, followed by ocular evaluation which included visual acuity with Snellen’s chart and best- corrected visual acuity (BCVA) (in possible cases after refraction), ocular alignment and motility, pupillary examination and detailed slit-lamp examination (whenever possible). Fundus evaluation under mydriasis (plain tropicamide) was performed. Fundus changes were grouped as: no changes, vascular changes, extra-vascular retinal changes (hemorrhages, cotton wool spots, hard exudates), optic nerve head changes and choroidal changes.

Fetal outcomes were evaluated in terms of gestational age, birth weight, 1 minute Apgar score recordings , stillbirth and neonatal death.

Statistics: Data were entered on “Excel” master sheet. All statistical analysis was performed using a statistical software package (SPSS for windows). Descriptive analysis consisted of mean with standard deviation and range for various maternal and fetal parameters.

Nominal variables were compared using Chi- square test or Fischer’s exact test. Comparisons between groups were performed using analysis of variance (ANOVA). The p-value of < 0.05 was considered as statistically significant.

Ethical issue: The study proposal was approved by the research committee and institutional ethical review committee of the BPKIHS.

Results

The mean age of the subjects with fundus changes was 23.86 ± 5.51 and that of those without the changes was 24.36 ± 5.65 years. The means of systolic and diastolic BP of the subjects with hypertensive fundus changes were 182.86 ± 33.64 and 125.24 ± 21.36 respectively, whereas those values without fundus changes were 150.72 ± 12.86 and 100.07 ± 9.51 (Table 1).

Table 1
Mean values of different maternal variables

Variables/parameters	Fundus changes present n=21	Fundus changes absent n=132
Age (years)	23.86 ± 5.51	24.36 ± 5.65
Gravida	1.71 ± 1.27	1.70 ± 1.19
Parity	0.62 ± 1.07	0.58 ± 1.11
Systolic BP (mmHg)	182.86 ± 33.64	150.72 ± 12.86
Diastolic BP (mmHg)	125.24 ± 21.36	100.07 ± 9.51

Table 2
Predominant fundus changes

Fundus changes	No. of subjects	Percentage
1. Vascular changes	2	9.52
2. Retinal changes	6	28.57
3. Optic nerve changes	8	38.09
4. Choroidal changes	5	23.80

Table 3
Fetal outcomes in patients with and without fundus changes

Fetal outcomes	With fundus changes n=21		Without fundus changes n=132		P values
	n	%	n	%	
Gestational age<37 wks	5	23.80	41	31.06	0.501
LBW (<2.5kgs)	11	52.38	35	26.51	0.016
1 min Apgar score<5	5	23.80	19	14.39	0.270
Still birth	1	4.76	6	4.54	0.965
NND	0	0	2	1.5	0.570

Low birth weight (<2.5 Kg) was significantly more prevalent in the subjects with pregnancy-induced hypertensive fundus changes.

Table 4
Association of fetal outcomes with various fundus changes

F C	LBW (<2.5kgs)			Gestational age (<37 wks)			1 min Apgar score<5			Still birth		
	n	%	p value	n	%	p value	n	%	p value	n	%	p value
VC (n=2)	1	50	0.526	1	50	0.536	0	0	0.529	0	0	0.755
RC (n=6)	4	66.66	0.046	2	33.33	0.858	2	33.33	0.225	1	16.66	0.148
ONC (n=8)	5	62.5	0.039	1	12.5	0.265	2	25	0.483	0	0	0.524
CC (n=5)	1	20	0.617	1	20	0.617	1	20	0.821	0	0	0.618

FC = Fundus changes, VC = Vascular changes, RC = Retinal changes, ONC = Optic nerve changes, CC = Choroidal changes

Discussion

A total of 153 patients of pregnancy-induced hypertension (PIH) were included in this study which consisted of 110 (i.e.71.9%) pre-eclamptic patients and 43 (28.1 %) eclamptic patients. The prevalence of hypertensive fundus changes was found to be 13.7 %. This is a little less than reported by another study (Tadin et al 2001). The prevalence of ocular changes

Table 5
Mean values of fetal outcomes in various fundus changes

Fundus changes	Mean gestational age	Mean birth weight	Mean 1min Apgar score
Vascular changes	37.00 ± 2.83	2.950 ± 0.788	6.50 ± 0.71
Retinal changes	36.67 ± 2.88	2.467 ± 0.532	5.83 ± 2.86
Optic nerve changes	37.38 ± 1.51	2.425 ± 0.362	5.25 ± 1.39
Choroidal changes	38.20 ± 1.64	2.880 ± 0.589	5.40 ± 2.51

in PIH patients as described in literature varies from 30 to 100 % (Hallum, 1936 and 1947; Hayreh et al 1986, Landesman R et al 1951 and 1952; Sadowsky et al 1956; Schultz et al 1938; Wagener,1934).

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 (Davis and Dana, 2000). In our study, we didn't come across any patients complaining of significant visual disturbances. Most of the patients in our study had visual acuity between 6/6 and 6/9.

Mild arteriolar spasm involving the bulbar conjunctival vessels has been observed in normal pregnancy, but in PIH, as reported in literature, the vasospasm can be severe and result in local ischemia (Landesman R et al 1954). Anterior segment examinations including extra-ocular movements and pupillary responses were normal in all our patients.

Fundus changes and association with fetal outcomes

Literature studies have considered the progression of retinal vascular changes a sign of increasing severity of PIH and have correlated them with fetal mortality (Bill A, 1962; Beeson & Duda, 1982; Fry W, 1929; Mabie & Ober,1980).

Tadin I et al (2001) showed statistically significant relationship between the degree of hypertensive retinopathy and Apgar score in their study on "Hypertensive retinopathy and pre-eclampsia".

Our study 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. (Table 3).

Among the fetal outcomes, birth weight was the one factor which had a statistically significant relationship with fundus findings in the forms of extra vascular (retinal) changes and optic nerve head changes (Table 4). Choroidal changes and optic nerve head changes were found to be associated with lower Apgar score (Table 5). Only two neonatal deaths were present in our study, both of them belonging to mothers without any fundus changes.

Though reported in literature, vitreous hemorrhage, serous retinal detachment, Purtscher's like retinopathy were not encountered in our study; nor did we find any case of cortical blindness (Prado et al 2002).

Conclusion

Fetal outcomes in PIH patients with vascular changes alone are similar to those with no fundus changes. Retinal and optic nerve head changes are associated with low birth weight. Choroidal changes and optic nerve head changes are associated with low Apgar score. Fundus evaluation in patients with PIH is an important procedure to predict adverse fetal outcomes. Fundus evaluation can be recommended for all patients with pregnancy-induced hypertension, considering the presence of the changes to be an indirect marker of severity of PIH.

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