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ORIGINAL RESEARCH

To evaluate the association of fundus changes in pregnancy induced hypertension

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Abstract
Aim: To evaluate the association of fundus changes in pregnancy induced hypertension.
Methods: We recruited a total of 100 patients based on the following inclusion and exclusion criteria. The research included all individuals who met the diagnostic criteria for PIH. Patients with pregnancy-induced hypertension who fall into any of the aforementioned criteria were chosen for the research. Labour records were kept in accordance with the proforma, and maternal and perinatal outcomes were tracked. Blood pressure was tested at least three times while sitting, and the lowest value was recorded. Keith Wagener classification was used to classify the retinal abnormalities.
Results: In our study fundus changes were more among patients ≤ 25 years old and there is no significant correlation between age and fundus changes in PIH patients in our study. In our study there is no significant correlation between gravidity and fundus changes ($p>0.05$).In our study, there is no significant correlation between fundus changes and period of gestation ($P>0.05$). There is significant correlation between SBP and fundus changes in our study.In our study there is significant correlation between DBP and fundus changes. ($p<0.05$).
Conclusion: Regular fundus examination in all instances of PIH, with a specific focus on younger, primigravida women and patients with early beginning of PIH, leads in an accurate evaluation of the patient's clinical condition. As a result, by doing repeated fundus checks at regular intervals, one may analyse the severity of the condition as well as the response to therapy, so improving the feto-maternal outcome by managing the pregnancy wisely.
Keywords: Pregnancy induced hypertension, Retinal changes, Fundoscopy

Introduction

Pregnancy hypertension is a widespread and major cause of maternal morbidity and death, particularly in underdeveloped countries. They complicate 5-10% of pregnancies in India. According to WHO hypertension disorders in pregnancy, such for 14%of maternal death.[1] Gestational hypertension included the development of blood pressure of 140/90 mm of Hg or more after 20 weeks of gestation.[2] Pre-eclampsia include elevated blood pressure and proteinuria after 20 weeks of gestation and sometimes an associated coagulation abnormality

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or liver disease. Eclampsia is defined as seizures or coma as a result of PIH. [3] The prevalence of pre-eclampsia in the nulliparous population varies from 3% to 10% globally. [4] The incidence of eclampsia in industrialised nations is around one in every 2000 births,[5] as opposed to poor countries,[6]PIH cannot be traced to a single cause since the illness process is multifaceted. Almost every organ system in the body is affected by the illness process, including the cardiovascular, renal, endocrine, and central neurological systems. The degree of systemic hypertension is often, but not always, correlated with alterations in the retinal vasculature. Vasospastic symptoms are reversible, and the retinal vessels revert to normal shortly after birth.[3] There is a scarcity of data on the prevalence of retinal alterations in PIH from India in the published literature. As a result, this research was conducted to investigate the frequency of retinal abnormalities in PIH and the relationship between retinal changes and the severity of PIH. The study's goal is to establish the prevalence of retinal abnormalities in pregnancy-induced hypertension and to investigate the relationship between retinal changes and the severity of the PIH.

Material and methods

The current study, titled "To study the fundus changes and their association with maternal and foetal outcomes in pregnancy-induced hypertension," was a prospective study conducted at the department of Obstetrics and Gynecology, BebeNanki Mother and Child Care Centre, Govt. Medical College, Amritsar. We recruited a total of 100 patients based on the following inclusion and exclusion criteria. The research included all individuals who met the diagnostic criteria for PIH. This research excluded patients with chronic hypertension H-mole, patients with a history of epilepsy, and those with Hazy media.

Methodology

Prior to the commencement of the trial, each patient provided informed consent. During their regular antenatal check-ups, the patients were assessed antenatally for any increase in blood pressure. Patients with pregnancy-induced hypertension who fall into any of the aforementioned criteria were chosen for the research. Labour records were kept in accordance with the proforma, and maternal and perinatal outcomes were tracked. The WHO research committee recommended that blood pressure be monitored. Blood pressure was tested at least three times while sitting, and the lowest value was recorded. The patients were made to sit outside, calm and comfortable, with their forearms firmly supported and horizontal. The utilised cuff was long enough to cover three-quarters of the upper arm. The cuff was positioned at the level of the heart and easily inflated and deflated. Blood pressure measurements were collected in the left lateral locations of the hospitalised individuals. Keith Wagener classification was used to classify the retinal abnormalities (hypertensive retinopathy).

Results

In our study most of patients had eclampsia 33 (33%), 28 (28%) had gestational hypertension, 24 (24%) had pre eclampsia and 15 (15%) had severe preeclampsia.

Table 1: Showing Fundus Changes With Age

Age group (Years)	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
		No.	%	No.	%	No.	%	No.	%	No.	%
≤25	67	34	70.8	19	61.3	7	70.0	3	50.0	4	80.0
26-30	24	10	20.8	11	35.5	1	10.0	2	33.3	0	0.0
31-35	7	4	8.3	1	3.2	1	10.0	0	0.0	1	20.0
>35	2	0	0.0	0	0.0	1	10.0	1	16.7	0	0.0
Total	100	48	100.0	31	100.0	10	100.0	6	100.0	5	100.0

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X^2: 18.63; df: 12; P:0.09

In our study, out of 52 patients with retinopathy, 31 patients showed grade I changes out of which 19 (61.3%) were ≤25 years old, 11 (35.5%) were between 26-30 years, 1 (3.2%) was between 31-35 years of age. 10 patients showed grade II changes out of which 7 (70%) were ≤ 25 years, 1 (10%) was between 26 – 30 years, 1 (10%) was between 31-35 years and 1 (10%) was >35 years of age. 6 patients were having grade III changes out of which 3 (50%) were ≤ 25 years, 2 (33.3%) were 26-30 years and 1 (16.7%) was > 35 years old. 5 patients were having grade IV changes out of which 4 (80%) were ≤ 25 years and 1 (20%) was between 31-35 years of age. In our study fundus changes were more among patients ≤ 25 years old and there is no significant correlation between age and fundus changes in PIH patients in our study.

Table 2: Showing association of fundus changes with gravidity in PIH patients

Gravidity	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
		No.	%	No.	%	No.	%	No.	%	No.	%
Primi Gravida	46	18	37.50	17	54.84	6	60.00	2	33.33	3	60.00
Second Gravida	32	17	35.42	6	19.35	3	30.00	4	66.67	2	40.00
Third Gravida	15	11	22.92	3	9.68	1	10.00	0	0.00	0	0.00
Fourth Gravida	5	2	4.17	3	9.68	0	0.00	0	0.00	0	0.00
Fifth Gravida	2	0	0.00	2	6.45	0	0.00	0	0.00	0	0.00
Total	100	48	100.00	31	100.00	10	100.00	6	100.00	5	100.00

X^2: 17.55; df: 16; p: 0.351 (Non significant)

Out of 31 patients with grade I changes, 17 (54.8%) were primigravida, 6 (19.4%) were second gravida, 3 (9.7%) were third gravida, 3 (9.7%) were fourth gravida and 2 (6.5%) were fifth gravida.Out of 10 patients with grade II changes, 6 (60%) were primigravida, 3 (30%) were second gravida and 1 (10%) was third gravida. Out of 6 patients with grade III changes 2 (33.3%) were primigravida and 4 (66.7%) were second gravida. Out of 5 patients with grade IV changes, 3 (60%) were primigravida and 2 (40%) were second gravida. In our study there is no significant correlation between gravidity and fundus changes (p>0.05).

Table 3: Association of fundus changes with period of gestation at the time of delivery

Period of gestation	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
≤28 wks	3	2	4.17	0	0.00	0	0.00	1	16.67	0	0.00
28.1wks – 32wks	9	2	4.17	3	9.68	2	20.00	1	16.67	1	20.00
32.1wks- 34wks	10	5	10.42	0	0.00	2	20.00	1	16.67	2	40.00
34.1wks -36.6wks	16	8	16.67	5	16.13	3	30.00	0	0.00	0	0.00
≥37 weeks	62	31	64.58	23	74.19	3	30.00	3	50.00	2	40.00
Total	100	48	100.00	31	100.00	10	100.00	6	100.00	5	100.00

X^2: 23.9; df: 16; p: 0.09 (Non-significant)

Out of 31 patients with grade I changes, 3 (9.7%) were <28 weeks, 5 (16.1%) were between 34.1 – 36.6 weeks and 23 (74.2%) were term ≥37 weeks.Out of 10 patients with grade II changes, 2 (20%) were 28-32 weeks, 2 (20%) were between 32.1 – 34.4 weeks, 3(30%) were between 34.1 – 36.6 weeks and 3 (30%) were term ≥37 weeks. Out of 6 patients with grade III changes, 1 (16.7%) was <28 weeks, 1 (16.7%) was between 28-32 weeks, 1 (16.7%) was between 32.1 – 34.4 weeks and 3 (50%) were term ≥37 weeks.Out of 5 patients with grade IV changes, 1 (20%) was between 28-32 weeks, 2 (40%) was between 32.1 – 34.4 weeks and 2 (40%) were term ≥37 weeks.In our study, there is no significant correlation between fundus changes and period of gestation (P>0.05).

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Table 4: Association of fundus changes with systolic blood pressure

SBP (mmHg)	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
140-160	82	42	87.50	23	74.19	10	100.00	5	83.33	2	40.00
161-180	10	3	6.25	6	19.35	0	0.00	0	0.00	1	20.00
181-200	6	3	6.25	1	3.23	0	0.00	1	16.67	1	20.00
≥200	2	0	0.00	1	3.23	0	0.00	0	0.00	1	20.00
Total	100	48	100.00	31	100.00	10	100.00	6	100.00	5	100.00

X^2: 28.47; df: 12; p: 0.005

Mean SBP, in our study with normal fundus was 151.0±14.69 and mean SBP with fundus changes was 158.03±19.44.Out of 31 patients with grade I changes, 23 (74.2%) were having SBP, between 140-160 mmHg, 6 (19.4%) patients were having SBP between 161 – 180 mmHg, 1 (3.2%) was with SBP 181-200 and 1 (3.2%) was having SBP more than 200.Out of 10 patients with grade II changes, all were having SBP between 140-160 mmHg. Out of 6 patients with grade III changes, 5 (83.3%) were having SBP, SBP between 140-160 mmHg and 1 (16.7%) was having blood pressure between 181-200 mmHg.Out of 5 patients with grade IV changes, 2 (40%) were having SBP between 140-160 mmHg, 1(20%) was having SBP between 161-180 mmHg, 1 (20%) was having SBP between 180-200 mmHg and 1 (20%) was having SBP >200 mmHg. There is significant correlation between SBP and fundus changes in our study.

Table 5: Association of association of fundus changes with DBP

DBP (mmHg)	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
80-100	76	36	75.00	26	83.87	8	80.00	4	66.67	2	40.00
101-120	21	11	22.92	4	12.90	2	20.00	2	33.33	2	40.00
121-140	2	0	0.00	1	3.23	0	0.00	0	0.00	1	20.00
≥140	1	1	2.08	0	0.00	0	0.00	0	0.00	0	0.00
Total	100	48	100.00	31	100.00	10	100.00	6	100.00	5	100.00

X^2: 25.4; df: 12; p: 0.013

Mean DBP in our study, without fundus changes was 100.62±9.83, mean DBP with fundus changes was 103.28±12.29 mmHg.Out of 52 patients with retinopathy31 were having grade I changes, out of which26 (had DBP between 80-100mmHg, 4 (12.9%) patients had DBP between 102-120 mmHg and 1 (3.2%) had DBP between 121-140 mmHg.Out of 10 patients with grade II changes 8 (80%) were having DBP between 80-100 mmHg, 2 (20%) had DBP between 101-120 mmHg.Out of 6 patients with grade III changes 4 (66.7%) had DBP between 80-100 mmHg and 2 (33.3%) had DBP between101-140 mmHg.Out of 5 patients with grade IV changes 2 (40%) patients had DBP between 80-100 mmHg, 2 (40%) had DBP between 101-120 mmHg and1 (20%) had DBP between 120-140mmHg.In our study there is significant correlation between DBP and fundus changes. ($p<0.05$).

Table 6: Association of fundus changes with mortality seen in PIH patients

Causes of Mortality	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
Pulmonary Oedema	1	0	0	0	0	0	0	1	100.0	0	0
HELLP Syndrome	1	0	0	0	0	0	0	0	0	1	100.0
Aspiration Pneumonia	1	0	0	0	0	1	100.0	0	0	0	0
Total	3	0	0	0	0	1	100.0	1	100.0	1	100.0

In our study 3 out of 100 patients died, 1 each with Pulmonary Odema, HELLP Syndrome, Aspiration Pneumonia. All the patients had fundus changes. Patient who died due to

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Pulmonary Odema had grade III fundus changes and the one with HELLP Syndrome had grade IV and the one with Aspiration Pneumonia had grade II fundus changes.

Table 7: Association of fundus changes with sex of babies born to mothers with PIH

Baby sex	Total	Fundus changes									
		Normal		Grade I		Grade II		Grade III		Grade IV	
Male	60	27	56.25	19	61.29	6	60.00	4	66.67	4	80.00
Female	40	21	43.75	12	38.71	4	40.00	2	33.33	1	20.00
Total	100	48	100.00	31	100.00	10	100.00	6	100.00	5	100.00

In our study 60% were males and 40% were females. In mothers with male babies fundus changes were seen in 33% patients and in mothers with female babies fundus changes were seen in 19% patients. Fundus changes were more in mothers of male babies.

Discussion

Preeclampsiaisamultisystemhypertensivedisorderwhichisaclinicalsyndromethatafflicts3-5%ofpregnancies and is a leading cause of maternal mortality,especiallyindevelopingcountries.Inpregnancyinduced hypertension, the various pathological changes indifferentorgansofthebodycanbestudieddirectlyvisualizing the ocular fundusandmay give a true indexofchangesinvascular system ofbrainandretina.[7]In our study of 100 patients, majority of patients had eclampsia 33(33%), 28(28%) had gestational hypertension, 24(24%) had preeclampsia and 15(15%) had severe preeclampsia. Majority of patients had no antenatal check up until they first presented with complications.

Out of 100 patients, fundus changes were present in 52 (52%) patient which correlate with Other study, who had reported fundus changes in 53.4% patients of PIH.Out of 100 patients in our study, majority 67 (67%) were $\leq$25 years and 46(46%) were primigravida. Out of 52 patients with retinopathy, 52.8% fundus changes were seen in primigravida and 63.5% were $\leq$ 25 years old. This observation was in accordance with the findings of Kamath RK et al,[8] who evidenced retinal changes 59% in the same age group patients as ours and observed retinal changes in primigravida to an extent of 63.7% and they found no significant correlation with age and parity with fundus changes.

Mean age of patients was 24.86$\pm$4.05 in our study and there is no significant correlation between gravidity and age with severity of PIH and grades of fundus changes which correlates with studies by Kamath RK et al,[8] Shah AP et al,[9]Savitha HC et al,[10]by Das KA et al,[11]Janjua MI et al.[12] Mean age of patients in study done by Shah AP et al[9]was 25.1 years and in this study age and gravida was not associated with fundus changes. In study by Savitha HC et al[10] the mean age of patients was 24 years (range 18-38 years) and there is no significant correlation between gravidity and age with severity of PIH and grades of fundus changes. In study by Das KA et al,[11]it was found that there was a statistically significant association of parity and severity of PIH with the fundus changes , however the age of the patient was not significant.Out of 100 patients in our study , majority (62%) were term $\geq$ 37 weeks. Out of 52 patients of with retinopathy 31 (59.6%) were $\geq$ 37 weeks, out of which, 31 patients with grade I changes, 23 (74.2%) were $\geq$ 37 weeks. Out of 10 patients with grade II changes , 3 (60%) were $\geq$ 37 weeks. Out of 6 patients with grade III changes, 3 (50%) were $\geq$ 37 weeks. Out of 5 patients with grade IV changes, 2 (40%) were $\geq$ 37 weeks. In our study there is no significant correlation between period of gestation with fundus changes in PIH patients but fundus changes were seen more in patients with gestational age $\geq$37 weeks. In our study mean SBP was 154$\pm$17.64mmHg and DBP was101.33$\pm$11.06 mmHg. Raised SBP and DBP was seen more in severe preeclampsia and eclampsia patients. In patients without fundus changes mean SBP was 141.0 $\pm$ 14.69 mmHg and DBP was 100.62 $\pm$ 9.83 mmHg In patients with fundus changes mean SBP was158.03 $\pm$19.44 mmHg and DBP was 103.28 $\pm$12.2 mmHg. In our study there was significant correlation between SBP and DBP with

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grades of fundus changes. ($p<0.05$, significant) as observed in previous studies of Tandin I et al[13], Reddy SC et al[14], Karki P et al,[15] Mithila R et al,[16]Badageri S et al.[17] There was significant correlation between grades of fundus changes with birth weight ($p<0.05$, significant) in our study , as seen in other studies done by Badageri S et al,[17]and Savitha HC et al.[10]

According to the literature, the foetal wellbeing is dependent on placental circulation, and it is believed that the presence of changes in the retinal arterioles and retinal haemorrhages can indicate vascular changes in the placenta, and thus ophthalmoscopic examination of the mother's fundus may give a clue to similar micro-circulation changes in the placenta and, indirectly, to the foetal wellbeing. In individuals with PIH, fundus examination is a crucial clinical assessment for predicting bad foetal outcomes. [18]

Conclusion

Regular fundus examination in all instances of PIH, with a specific focus on younger, primigravida women and patients with early beginning of PIH, leads in an accurate evaluation of the patient's clinical condition. As a result, by doing repeated fundus checks at regular intervals, one may analyse the severity of the condition as well as the response to therapy, so improving the feto-maternal outcome by managing the pregnancy wisely.

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