HAEMATOLOGICAL, BIOCHEMICAL AND IMMUNOLOGICAL PROFILE IN PREGNANCY INDUCED HYPERTENSION AND THEIR RELATIONSHIP TO FOETAL OUTCOME

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SUMMARY

50 patients of pregnancy induced hypertension (PIH) were compared to 20 normal pregnant patients. Various hematological, biochemical and immunological parameters were studied and correlated with foetal outcome. Hemoconcentration correlated significantly with severity of the disease. Bleeding time (BT), clotting time (CT) and clot retraction time (CRT) altered significantly only in eclampsia while a significant decrease in platelet count was noted in all groups of PIH was a significant increase in blood urea, serum creatinine and serum uric acid. Serum glutamic oxaloacetate transaminase (SGOT) was elevated only in eclamptic patients. A significantly decreased T cell count and increased B cell counts were seen. Although, a significant decrease in IgG levels was seen, IgA and IgM levels were unaltered. Delayed cutaneous reactivity to skin test antigen showed a significant negative response. Premature deliveries and low birth weight were more common in PIH patients especially eclampsia. Risk of premature deliveries increased with increasing serum uric acid and hematocrit. No other hematological, biochemical or immunological parameter correlated with foetal outcome.

INTRODUCTION

Pregnancy induced hypertension (PIH), a common complication of gestation contributes significantly to maternal and fetal morbidity and mortality (Sheehan and Lynch, 1973; Chesley 1978). This disorder is characterized by involvement of cardio-vascular, coagulation, renal and hepatic systems. Consequently, various hematological and biochemical parameters are altered in this disorder (Bonner et al 1971, Dunlop et al 1978). Immunological changes are also seen and these may be responsible for the devel-

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opment of this disorder (Redman 1980). The present study was undertaken to evaluate various hematological, biochemical and immunological parameters and to find to out their relation to the foetal outcome.

MATERIALS AND METHODS

50 cases of PIH presenting to the department of Obstetrics and Gynaecology, Safdarjang Hospital were included in the study. These patients had a systolic blood pressure more than 140 mm Hg or 30 mm Hg above the base line values, or a diastolic blood pressure above 90 mm Hg or 15 mm Hg above baseline values, with or without oedema and proteinuria. All patients were of more than 20 weeks of gestation. Patients with the above findings and convulsions were also included. Those patients which presented with neurological disease, epilepsy, renal disease or hypertension present before pregnancy were excluded from study. Predisposing fetal factors including hydatidiform mole and multiple pregnancy were ruled out. A detailed history was taken and physical examination done. Hematological tests done included hemoglobin,packed cell volume (PCV) BT, CT and CRT. Routine urine examination was done. SGOT, SGPT, blood urea, serum uric acid, serum creatinine and serum electrolytes. Immunological tests done included quantitative estimation of IgG, IgA and IgM by single radial immunodifusion and T & B lymphocytes. (Thompson, 1977 and Jondal et al 1972). Delayed hypersensitivity reaction was observed using protein purified derivative (PPD). A follow up was done for

Table I

Hematological profile in study and control groups

	Normal Pregnancy (n = 20) (Mean ± S. D.)	Mild PIH (n = 20) (Mean ± S. D.)	Severe PIH (n = 20) (Mean ± S. D.)	Eclampsia (n = 10) (Mean ± S. D.)
Hb (gm%)	10.4 ± 1.5	10.4 ± 1.5	10.2 ± 2.5	9.0 ± 2.6
PCV (%)	32.3 ± 6.4	33.8 ± 8.7	34.0 ± 7.7	*35.3 ± 4.3 (p 0.05)
BT (sec)	95.5 ± 31.2	94. 2 ± 17.9	95.7 ± 9.0	*120.0 ± 31.6
CT (sec)	250.0 ± 48.9	251.1 ± 60.6	247.9 ± 53.8	261.5 ± 61.7
CRT (min)	46.0 ± 142.	48.7 ± 12.2	50.0 ± 14.5	*57.0 ± 19.6 (p < 0.025)
Platelet Counts (cells/mm3)	1,59.111 ± 17,233	*1,37,500 ± 25,372 (p < 0.0	*1,37,100 ± 2408 (p < 0.01)	*1,306,000 ± 1,978 (p < 0.001)
PT (sec)	19.4 ± 2.8	19.6 ± 2.3	19.2 ± 2.1	19.5 ô 3.1

Hb = Haemoglobin
BT = Bleeding time
CRT = Clot Retraction time
PCV = Packed cell volume
CT = Clotting time
PT = Prothombin time

* Statistically significant

foetal outcome. The foetal maturity and birth weight was correlated with various laboratory parameters using coefficient of correlation 'r'.

OBSERVATIONS

The 50 patients of PIH included 20 cases of mild PIH (diastolic blood pressure ≤100 mm of Hg), 20 cases of severe PIH (diastolic blood pressure > 100 mm of Hg) and 10 cases of eclampsia. Ages of the patients ranged from 16-32 years. The parity of the patients was 0-2 and the gestational age was 28-40 weeks.

The hematological profile in study was control groups is shown in Table I. The PCV, BT and CRT was found to increased gradually with the severity of PIH. However, the increase was significant only in eclampsia. Platelet count show statistically significant decrease in all groups of PIH.

Table II shows the biochemical profile in study and control groups. There was statistically significant increase in blood urea, serum creatinine and serum uric acid in severe PIH and eclampsia. No difference was found in the levels of serum sodium and potassium. Eclampsia showed a satistically significant rise in SGOT.

The immunological profile in study and control groups is depicted in Table III. There is decrease in T cell percentage and in B cell percentage with the severity of PIH and is statistically significant. IgG levels were seen to be decreasing with increasing severity of the disorder. This decrease was statistically significant. However, no statistically significant change could be found in IgA and IgM study groups.

Table II

Biochemical profile in study and control groups

	Normal Pregnancy (n = 20) (Mean ± S. D.)	Mild PIH (n = 20) (Mean ± S. D.)	Severe PIH (n = 20) (Mean ± S. D.)	Eclampsia (n = 10) (Mean ± S. D.)
Blood urea, (mg%)	21.1 ± 3.8	22.3 ± 6.0	*23.4 ± 6.1 (p 0.025)	*29.1 ± 8.6 (p 0.0005)
Serum Creatinine (mg%)	0.53 ± 0.21	*0.71 ± 0.21 (p < 0.005)	*0.71 ± 0.331 (p < 0.005)	*0.82 ± 0.20 (p < 0.005)
Serum Electrolytes (meq/1)				
Na +	136.6 ± 2.9	136.3 ± 2.1	136.4 ± 2.1	136.4 ± 2.2
K +	3.9 ± 0.2	4.0 ± 0.2	4.0 ± 0.4	4.0 ± 0.4
Serum Bilirubin (mg%)	0.6 ± 0.2	0.6 ± 0.2	0.6 ± 0.2	0.6 ± 0.2
SGOT (IU/L)	34.1 ± 15.8	35.6 ± 10.8	41.7 ± 26.8	*51.6 ± 24.4 (p 0.02)
SGPT (IU/L)	27.8 ± 16.7	28.0 ± .1	303. ± 18.8	28.6 ± 8.16

SGOT = Serum Glutamate Oxatoacetate Transaminase
SGPT = Serum Glutamate Pyruvate Transaminase

* Statistically significant

Table III

Immunological Profile in Study group and control

	Normal Pregnancy (n = 20) (Mean ± S. D.)	Mild PIH (n = 20) (Mean ± S. D.)	Severe PIH (n = 20) (Mean ± S. D.)	Eclampsia (n = 10) (Mean ± S. D.)
T cells (%)	63.3 ± 3.7	*60.3 ± 4.2 ($p < 0.025$)	*59.3 ± 5.0 ($p < 0.005$)	*57.4 ± 5.3 ($p < 0.0005$)
B cells (%)	15.5 ± 2.6	17.0 ± 3.8	*18.6 ± 4.4 ($p < 0.01$)	*18.5 ± 3.9 ($p < 0.01$)
IgA (mg%)	260.5 ± 72.6	262.1 ± 22.7	253.4 ± 75.3	254.0 ± 70.5
IgM (mg%)	*268.9 ± 52.8 ($p < 0.025$)	237.6 ± 63.5	233.6 ± 48.6	227.3 ± 37.3
IgG (mg%)	1377.5 ± 126.9	*1286.6 ± 258.5 ($p < 0.052$)	*1209.8 ± 252.9 (p 0.005)	*1046.9 ± 102.4 (p 0.0005)
Skin Allergy (%) (-ve response)	70	*70 ($p < 0.05$)	*75 ($p < 0.025$)	*80 ($p < 0.025$)

* Statistically significant

Table IV

Correlation between severity of PIH and foetal outcome

Parameter	Normal Pregnancy (n = 20) (Mean ± S. D.)	Mild PIH (n = 20) (Mean ± S. D.)	Severe PIH (n = 20) (Mean ± S. D.)	Eclampsia (n = 10) (Mean ± S. D.)
Foetal weight (gms)	2910.8 ± 378.2	*2487.3 ±10.9 ($p < 0.05$)	*23.76.9 ± 618.5 ($p < 0.01$)	*1940.0 ± 398.2 ($p < 0.001$)
Foetal maturity	38 ± 0.6	*37.1 ± 2.0 ($p < 0.05$)	*36.9 ± 1.9 ($p < 0.025$)	*34.3 ± 2.5 ($p < 0.005$)
Perinatal Mortality	0%	10%	15%	*70%

* Statistically Significant.

A negative response to skin allergy tests using PPD was seen to be significantly higher in various PIH groups as compared to the control.

Table IV shows the correlation between severity of PIH and foetal outcome. The birth weight and foetal maturity of the babies was found to decrease significant with increasing severity of the disease. The risk of perinatal deaths also increased with increasing severity of the disorder.

Foetal outcome was correlated with those laboratory findings which were significanty altered in PIH. This correlation

Table V

Correlation of Immuno-hematological and biochemical parameters with the fetal maturity and birth weight

Parameter	Foetal weight			Foetal maturity		
	'r' value	't' value	'p' value	'r' value	't' value	'p' value
PCV	- 0.0420	0.2557	NS	- 0.4010	2.6626	$p < 0.01$
Platelet Count	0.0157	0.0955	NS	0.1406	0.8638	NS
Blood Urea	0.0021	0.0129	NS	0.2125	1.3237	NS
S. Creatinine	0.002	—	NS	0.2650	1.6715	NS
S. Uric Acid	0.0006	0.0039	NS	- 0.5050	3.5589	$p < 0.001$
T cells	0.0008	—	NS	0.2533	1.593	NS
IgG	0.1277	0.7725	NS	0.1072	0.6559	NS

r = coefficient of correlation.
NS = Not significant statistically.

is depicted in Table V. The PCV and serum uric acid show a significant negative correlation with fetal maturity implying an increase in premature delivery with increase in PCV and serum uric acid. No other hematological, biochemical or immunological parameter showed any correlation with foetal weight or maturity.

DISCUSSION

PCV showed a gradual rise with increasing severity of PIH although the values are statistically significant for eclamptics only ($p < 0.05$). This findings is in confirmation with that of Dieckman (1952), who observed that hematocrit is increased in severe PIH and is a useful index of the severity and the progress of disease. He thought it to be due to hemoconcentration. Pritchard and coworkers (1984) thought that it was the result of generalized vasoconstriction or increased vascular permeability. The BT showed an increased vascular permeability. The BT showed an increase with increasing severity of disease although it was statistically significant only in case of eclampsia. Similar findings were also reported by Dube et al (1975) and Takiar & Deshmukh (1988). The latter also reported increasing CT and CRT with increasing severity of the disease. We also observed similar increase in these two parameters although CRT increase was significant only in eclamptics. There was a progressive decrease in platelet counts with increasing severity of disease. Other authors have also reported a similar change (Dube et al 1975, Mathur et al 1982, Takiar and Deshmukh 1988). The prothrombin values were not significantly altered in PIH cases as compared to normal pregnant control. Similars results were obtained by Dube et al (1975) and Sibai et al (1982).

Blood urea, serum uric acid and serum creatinine showed progressive increase with increasing severity of disease. This observation is in confirmation with that reported by other workers. Dickman 1952, Takier and Deshmukh 1988, Sibai et al 1982).

Serum bilirubin and PT did not change significantly in PIH although there was significant rise in SGOT in cases of eclampsia. These findings are similar to those obtained by Sibai et al (1982).

In PIH the T cell values were seen to decrease significantly. Sridama et al (1983) also found a similar decrease. There was concomitant increase in B cells. These findings are in confirmation with these of Khan et al (1986). The higher levels of B cells could be due to persistent antigenic stimulation leading to altered immunological response. However, IgA and IgM levels were unaltered in PIH as compared to control group. There was a gradual decrease in IgG with increasing severity which was statistically significant. This was seen by Khan et al (1986) who also noted a below normal response to PPD in a pregnancy who later developed preclampsia. In our series also there was significant depression in delayed cutaneous hypersensitivity.

The foetal birth weight was decreased significantly with increasing severity of disease. This observation is similar to that of Mathur et al (1982). The foetal maturity also decreased significantly with increasing severity of PIH.

Interestingly, none of the hematological, biochemical or immunological parameters correlated with foetal weight. However, a significant negative correlation was found between PCV and serum uric acid and fetal maturity. These two parameters can be used to predict the foetal outcome.

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