IMMUNOGLOBULIN G AND COMPLEMENT C_3 LEVELS IN PREGNANCY INDUCED HYPERTENSION

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ABSTRACT

The immunoglobulin G (IgG) and complement C_3 (C_{β}) were measured in the maternal as well cord Hood sera of 30 cases of pregnancy induced hypertension (PIH) as well as 9 controls with nortnotensive pregnancy. A depression of IgG as well as C_3 level was observed in the maternal as well as cord sera of the mothers with PIH. These findings suggest decreased immunological status of both mother and her offspring in PIH, irrespective of the gestation and intrauterine growth status.

Key words: *Immunoglobulin, Complement, Toxemia of pregnancy, Pregnancy induced hypertension.*

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Pre-eclampsia has remained a 'disease of theories' and the possibility that immunological as well as endocrine and genetic mechanisms are involved in the genesis of pre-eclampsia is intriguing. Immunologic factors may play an important role in the development of pre-eclampsia. The phenomena in pre-eclampsia include absence of blocking antibodies, decreased cell-mediated immune responses, activation of neutrophils and involvement of cytokines(l). Immunofluorescent studies have localized deposits of immunoglobulin and complement in the glomeruli of patients. There also appears to be a certain degree of hyperactivity in pre-eclamptic patients, but it is not clear how this is related to the etiology, severity or prognosis of the disease. Several reports describe the level of activity of various immunoglobulins and complement factors in pre-eclampsia but the findings are conflicnng(2). The present study was an endeavour to estimate IgG and C_3 levels in maternal and cord serum in cases with pregnancy induced hypertension (PIH) with particular reference to gestation and intrauterine growth status of offsprings, severity of hypertension and presence of convulsions.

Material and Methods

Thirty consecutive cases with PIH without any other complication and nine normotensive uncomplicated pregnancy controls were recruited from the Labor Ward of the University Hospitals, Banaras Hindu University, Varanasi.

The newborns having congenital malformation, intrauterine infection or intrauterine death were excluded from the study. The gestation was calculated

by enquiring into the first day of mother's last menstrual period and was confirmed subsequently by Dubowitz's criteria(3). The newborns were classified as regards their intrauterine growth status using the standard curve for the local population(4). Paired cord and maternal blood samples were collected aseptically in sterile test tubes and allowed to clot at room temperature for 30 minutes. The serum was separated by centrifuging at 1500 rpm for 3 minutes. All sera were stored at —20°C after adding 0.1 ml of 0.1% sodium azide. The Solugen plates (obtained from Immunodiag-nostic Pvt. Ltd., New Delhi) were used for estimation of IgG and C_3. The reference standard for IgG was 14.5 mg/ml and the same for C_3 was 0.9 mg/ml. Estimation of serum immunoglobulin G (IgG) and C_3 complement were carried out by Mancini's (modified by Fahey) radial diffusion method(7,8).

Results

There were 30 cases with pregnancy induced hypertension which included 11 cases of pre-eclampsia and 19 cases with eclampsia. With respect to intrauterine growth status of newborns, 15 were Term-Appropriate for gestational age (Term-AGA: between 10th to 90th percentile), 8 Term-Intrauterine Growth Retarded (Term-IUGR: less than 10th percentile) and 7 were preterm (less than 37 weeks) gestation. The nine uncomplicated pregnant women and their normal offsprings at term and appropriate for gestational age constituted the controls.

Immunoglobulin G Levels

The levels of mean immunoglobulin G and complements C_3 in the maternal and cord sera in cases with PIH as well as normotensive pregnant women who delivered term appropriate for gestational age newborns are depicted in *Table I.* The IgG level in both maternal and cord sera were lower in the cases complicated with PIH when compared to normotensive controls.

As it is evident from the data in *Table*

TABLE I— *Maternal and Cord Sera IgG and C_3 level in PIH and Normotensive Controls with Term-AGA Newborns*

Groups		Numbers	Serum IgG (mg/dl)		Serum C_3 (mg/dl)	
			Maternal	Cord	Maternal	Cord
A.	PIH (pre-eclampsia; eclampsia)	15	1253.0 ±176.5	892.0 ±365.0	59.9 ±17.7	53.8 ±14.5
B.	Controls (normotensive)	9	1397.2 ±267.5	1069.4 ±233.0	73.0 ±22.0	47.2 ±11.9
A *vs* B 't'			2.44*	NS	NS	NS

NS = Not significant; * $p < 0.05$. All values are mean ± SD.

TABLE II— *Maternal and Cord Serum IgG and C_3 levels in Relation to Severity of Pregnancy Induced Hypertension (PIH)*

Cases of PIH subgroups	Numbers	Serum IgG (mg/dl)		Serum C_3 (mg/dl)	
		Maternal	Cord	Maternal	Cord
(*i*) Mild (BP diastolic 90-99 mm Hg)	7	1250.0 ±192.7	933.9 ±370.6	56.83 ±17.0	54.00 ±11.7
(*ii*) Moderate (BP diastolic 100-109 mm Hg)	4	1237.8 ±201.5	968.8 ±446.9	61.0 ±22.8	61.5 ±16.7
(*iii*) Severe (BP diastolic > 110 mm Hg)	4	1250.0 ±154.0	740.6 ±169.0	56.0 ±10.9	42.0 ±7.7
(*i*) vs (*ii*)		NS	NS	NS	NS
(*i*) vs (*iii*)		NS	NS	NS	2.38*
(*ii*) vs (*iii*)		NS	NS	NS	2.12*

NS = Not significant; * $p < 0.05$.

II, no statistically significant difference was observed in the mean maternal IgG levels in relation to severity of the PIH as judged by increasing diastolic blood pressure. The cord serum IgG levels was lower if diastolic blood pressure was more than 110 mm Hg, but this difference was not statistically significant.

When the maternal and cord sera IgG values were compared between the cases of pre-eclampsia and eclampsia at various intrauterine growth status of the neonates it was observed that there was no statistically significant difference in relation to presence of convulsion in Term-AGA and Term-IUGR subgroups. However, in preterm groups the maternal and cord IgG levels were lower in eclamptic mothers (682.5 mg/dl and 975 mg/dl, respectively) when compared to pre-eclamptics (1150 mg/dl and 306 mg/dl, respectively).

Complement C_3 Levels

The means for maternal C_3 levels were lower in PIH as compared to the controls in mothers delivering fullterm appropriate for gestational age. Though the means for cord C_3 levels were higher in PIH cases as compared to controls the difference was not statistically significant *(Table I)*. There was no differences in the means of maternal C_3 levels in relation to increasing diastolic blood pressure in mothers with pregnancy induced hypertension. However, cord serum C_3 levels was significantly low if the maternal diastolic blood pressure was more than 110 mm Hg compared to the other two groups *(Table IT)*.

When maternal and cord C_3 serum levels were compared in relation to eclamptic and pre-eclamptic mothers, there was no significant difference in the Term-AGA group. But in the Term-IUGR groups and preterm groups there was a significant rise in the maternal C_3 serum levels of the eclamptic mothers, when compared to non-eclamptics. Similarly, there was no statistically significant difference in the cord serum C_3 levels of the babies born to mothers with eclampsia and pre-eclampsia in relation to any of the three subgroups of intrauterine growth status. However, the maternal C_3 level was higher in eclamptic mothers in the term-IUGR and preterm subgroups (66.3 mg/dl and 59.2 mg/dl, respectively) when compared to the pre-eclamptic mothers (60.0 mg/dl and 54.5 mg/dl, respectively).

Discussion

The observation in the present study clearly demonstrated decrease in maternal and cord IgG serum levels in PIH when compared to mothers without toxemia of pregnancy. Similar observations have been reported by earlier studies(7-ll). The lower levels of maternal serum IgG in PIH probably suggests associated immunosuppression or could be due to increased urinary losses of immunoglobulin specially the intermediate group of macroglobulins or due to depression of IgG synthesis or formations of immune complexes(7,10,12,13).

The cord serum IgG levels were low as compared to maternal serum IgG levels even in normotensive controls. Most of the workers have reported higher cord serum IgG levels as compared to maternal serum IgG levels(14,15). High serum IgG levels have been attributed to very selective active transplacental process called pinocytosis involving the Fc fragment of IgG molecule(8,12,13).

It was further noted that in eclamptic patients, cord serum IgG levels did not differ significantly in fullterm appropriate for gestational age and fullterm intrauterine growth retardation. However, in preterm babies the maternal and cord IgG serum levels were significantly low amongst eclamptic mothers. However, it has been reported by earlier studies that there is a significant lower level of IgG in the cord blood of preterm babies and the possible explanation could be immature liver functions in preterms and inadequate transfer of IgG across the placenta(16,17).

Complement levels in toxemia of pregnancy have been studied by many investigators but no consistent results have been obtained. Some showed decreased complement, others could not demonstrate the difference(7,11). In the present study, a decrease was observed in maternal serum C_3'levels in term-AGA and term-IUGR as well as in preterm baby groups as compared to the controls. On the other hand, the cord serum C_3 levels were higher in fullterm appropriate gestational age and preterm baby group of toxemia of pregnancy. However, there was no change in fullterm intrauterine growth retardation group. No suitable explanation for the above can be offered at this stage. The possible explanation could be that the chronic stress in toxemia of pregnancy may stimulate fetal liver to synthesise more of the complement. Like the IgG

levels in relation to increase maternal diastolic blood pressure levels, no significant alteration have been observed in the C_3 level. Similarly, in relation to convulsions no significant changes were observed in the C_3 level.

Thus, the findings of the present study clearly suggest decreased immunological status of both mother and her offspring in PIH, irrespective of the gestation and intrauterine growth status and hence need special attention.

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