PROTEINS IN PRE-ECLAMPSIA

(Agar-Gel Electrophoretic Study)

by

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Many cases of pregnancy may be associated with primary hypertension. Clinicians often find it difficult to differentiate these cases from those of toxaemia of pregnancy. There are no definite clinical means to differentiate between these two entities except the history. The present study was undertaken to see if electrophoresis of serum proteins can give some clue to this differentiation.

Methods and Material

Cases were divided into four groups.

Group (I) 25 normal healthy females between the ages of 18-40 years.

Group (II) 25 females between the ages of 18-40 years, having primary hypertension.

Group (III) 25 cases of normal pregnancy in the third trimester.

Group (IV) 25 cases of high blood pressure in the last trimester of pregnancy.

Serum of these patients was studied for total proteins and by high tension electrophoresis on agar-gel for differential proteins. The technique utilized was the same as described in an earlier communication (Agarwal 1964).

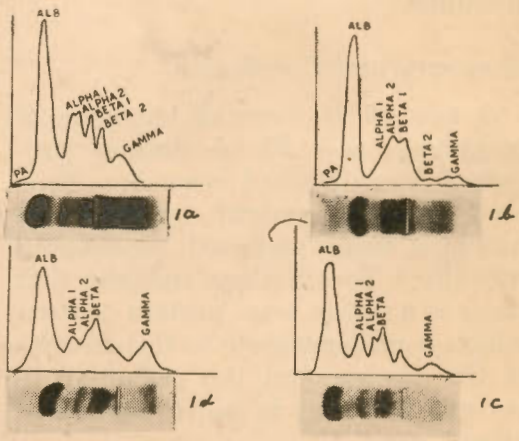
Observations

Group (I)

The results of electrophoresis of serum in this group reveal seven fractions. Mean values for different fractions, are as under.

Pre-albumin .09 gm.%; albumin 3.73 gm.%; Alpha-1 globulin 0.67 gm.%; alpha-2 globulin 0.96 gm.%; beta-1 globulin 1.13 gm.%; beta-2 globulin 0.16 gm.%; and gamma globulin 0.47 gm.%.

Figure 1(a) shows a typical electrophoretic pattern and analysis of this pattern by densimetery from this group.



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Received for publication on 25-9-64.

Group (II)

The results of electrophoresis of serum in this group reveal mean values for different fractions as under: Pre-albumin 0.08 gm.%; albumin 3.65 gm.%; alpha-1 globulin, 0.96 gm.%; alpha-2 globulin 0.72 gm.%; beta-1 globulin 0.75 gm.%; beta-2 globulin 0.36 gm.%; and gamma globulin 0.57 gm.%.

Figure I (b) shows a typical electrophoretic pattern and analysis of this pattern by desimetery from this group.

Group (III)

The results of electrophoresis of serum in this group reveal values for these fractions as albumin 2.48 gm.%; alpha-1 globulin 0.64 gm.%; alpha-2 globuin 0.62 gm.%; beta globulins 0.93 gm.% and gamma globulin 0.57 gm.%.

Figure 1 (c) shows a typical electrophoretic pattern and the analysis of this pattern by densimetery from this group.

Group (IV)

The results of electrophoresis of serum in this group reveal two types of patterns. One type resembles closely the figures obtained in groups II and III (7 cases). Mean values for different fractions are: albumin 2.52 gm.%; alpha-1 globulin 0.59 gm.%; alpha-2 globulin 0.64 gm.%; beta-globulins 0.86 gm.%; and gamma globulin 0.62 gm.%. The other pattern reveals a distinct rise in beta and gamma globulins. Mean values for different fractions in this group are albumin 2.11 gm.%; alpha-1 globulin 0.35 gm.%; alpha-2 globulin 0.86 gm.%; beta globulins 1.08 gm.% and gamma globulin 1.00 gm.%.

Figure 1 (d) shows typical electrophoretic patterns from the group, in which pregnancy seems to be the cause of hypertension.

All the observations have been tabulated in Table I.

Discussion.

Analysis of these observations reveals that there is no significant difference in total proteins and electrophoretic patterns in group III from groups I and II which suggests that primary hypertension is not associated with any changes in serum proteins. Analysis of serum protein fractions in group IV revealed two types of cases. In 7 cases from this group the electrophoretic pattern resembled that of groups II and III, while 18 cases show a definite rise in beta and gamma globulins. From this we surmise that seven cases were in reality the cases of pregnancy associated with primary hypertension and whatever changes were demonstrated in the serum proteins, are probably due to pregnancy itself. But rise of gamma globulins in the remaining 18 cases cannot be explained on the basis of normal pregnancy. These cases were probably the true cases of pre-eclamptic toxaemia of pregnancy.

Why gamma globulins show a rise in pre-eclamptic toxaemia of pregnancy is a difficult question to answer as the etiology of pre-eclamptic toxaemia itself is obscure. According to our present knowledge we know that gamma globulins are con-

TABLE I

Proteins and their Fractions in Pregnant and Non-pregnant Women

Electrophoretic fractions		Normal (non-pregnant)	Hypertension, non-pregnant	Normal pregnant	Non-toxaemic hypertension	Toxaemic hypertension
Total proteins gm%	MEAN	7.00	7.10	5.24	5.13	5.40
	S.E.	0.145	0.123	0.160	0.098	0.127
Pre-albumin gm%	MEAN	0.09	0.08	—	—	—
	S.E.	0.02	0.03	—	—	—
Albumin gm%	MEAN	3.73	3.65	2.48	2.52	2.11
	S.E.	0.071	0.064	0.058	0.068	0.048
$Alpha_1$ globulin gm%	MEAN	0.67	0.96	0.64	0.59	0.35
	S.E.	0.090	0.060	0.071	0.086	0.120
$Alpha_2$ globulin gm%	MEAN	0.96	0.72	0.62	0.64	0.86
	S.E.	0.086	0.056	0.072	0.053	0.110
$Beta_1$ globulin gm%	MEAN	1.13	0.75	—	—	—
	S.E.	0.565	0.250	—	—	—
$Beta_2$ globulin gm%	MEAN	0.16	0.36	0.93	0.86	1.08
	S.E.	0.020	0.022	0.047	0.041	0.072
Gamma globulin gm%	MEAN	0.47	0.57	0.57	0.62	1.00
	S.E.	0.018	0.023	0.016	0.030	0.014

cerned with antibody formation in the body. Is it, then, that some immunological process is playing a role in the causation of toxaemia of pregnancy? Egorov (1934), Kneper (1934), Jegorow (1935) Junghans (1939), Schwartz and Levine (1943) held that eclampsia is most easily explained as an allergic phenomenon. Duke (1936) states that there are few toxins as potent as an allergen in a highly sensitive patient and remarks that a mother's kiss can be dangerous to an egg-sensitive infant, if given shortly after she has taken an egg. Kaku (1953) has claimed to have isolated a placental polysaccharide which he considers to possess an auto-antigenicity and which provokes toxaemic symptoms in pregnant rabbits. From this it appears that auto-immune phenomenon has been postulated as one of probable aetiological factors in the toxaemia of pregnancy. Rise in beta and gamma globulin ratios indicates the probability of toxaemia having an auto-immune base.

This study may serve as a guide to differentiating cases of pregnancy in hypertensive patients (almost normal electrophoretic protein patterns) from cases of pre-eclamptic toxaemia i.e. in which the pregnancy is the cause of hypertension (electrophoretic patterns showing increase in the beta and gamma globulin ratios). The material for study is rather small for dogmatic conclusions but perhaps indicative enough.

Summary and Conclusion

1. Total and differential proteins were studied in normal females, females suffering from primary hypertension, females in third trimester of normal pregnancy and in females coming with hypertension in third trimester of pregnancy.

2. Serum proteins were found to be normal in primary hypertension.

3. An attempt has been made to differentiate cases of pregnancy associated with primary hypertension from cases of toxaemia of pregnancy, (pregnancy causing hypertension). It has been observed and recorded in toxaemia that beta and gamma globulins were raised.

4. On the basis of these studies, it has been suggested that toxaemia of pregnancy may be an auto-immune reaction in the body.

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