

## A STUDY OF SERUM PROTEINS IN PARTURIENT MOTHERS AND CORD BLOOD DURING LABOUR BY PAPER ELECTROPHORESIS\*

by

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With the growing knowledge of the composition of blood proteins and of the multitude functions they perform, the fact remains increasingly clear that the early designation of Mulder as "the first thing" was aptly chosen. Plasma proteins, which remain so remarkably constant in normal non-pregnant women, show a wide variation during pregnancy, obviously representing changes within the maternal body beneficial in supplying the needs of the growing foetus.

Various studies on plasma protein concentrations in foetal blood during normal and abnormal pregnancies have shown that the foetus successfully, almost ravenously, feeds for itself to achieve apparently identical supplies of the various protein fractions regardless of the plight of the mother.

The present study aims at studying the serum proteins in the maternal blood during the second stage of labour and in the cord blood with a view to find out the alterations in the values of protein

fractions in both the samples and to find suitable explanations for the same.

### *Material and Methods*

Fifty fullterm normal parturient mothers, who were admitted to the Labour ward of Medical College Hospital, Jabalpur, from 1-5-1971 to 31-10-1972 were selected for the present study. Twenty-five normal non-pregnant women belonging to the same age group and same socio-economic strata, acted as control.

Maternal blood was collected from the antecubital vein during second stage of labour, and the cord blood from the umbilical vein was collected from the placental side. The two samples were analysed by paper electrophoresis. The results thus obtained were scanned on Aplan Densitometer, and the total proteins and their fractions were calculated by planimeter. Estimation of total proteins was done by Van Slyke Copper Sulphate specific gravity method, as described by Wooten.

### *Observations and Results*

Table I shows the distribution of parturient mothers according to age and parity.

Table II gives the absolute and relative values of various fractions of serum proteins in non-pregnant, parturient mothers, and cord blood.

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TABLE I  
Distribution of Cases According to Age and Parity

| Parity         | Age group in years and No. of cases |       |       |       |       |
|----------------|-------------------------------------|-------|-------|-------|-------|
|                | 16-20                               | 21-25 | 26-30 | 31-35 | 36-40 |
| Primipara      | 10                                  | 5     | 1     | -     | -     |
| II Para        | 4                                   | 4     | 2     | 1     | -     |
| III Para       | -                                   | 3     | 3     | 1     | -     |
| IV Para        | -                                   | 1     | 2     | -     | -     |
| V Para & Above | -                                   | 1     | 8     | 3     | 1     |

TABLE II  
Absolute and Relative Values of Various Fractions of Serum Proteins in Non-pregnant Females, Parturient Mothers and Cord Blood of Their New Born Babies

|                    | Total Proteins | Albumin | Globulins |         |       |       | A:G Ratio |
|--------------------|----------------|---------|-----------|---------|-------|-------|-----------|
|                    |                |         | alpha-1   | alpha-2 | beta  | gamma |           |
| Non-pregnant (gm%) | 7.48           | 3.95    | 0.33      | 0.60    | 0.93  | 1.57  | 1.16      |
| Percent            |                | 53.1    | 4.44      | 8.07    | 12.5  | 21.1  |           |
| Parturient (gm%)   | 6.03           | 2.282   | 0.34      | 0.702   | 1.082 | 1.522 | 0.690     |
| mothers            |                |         |           |         |       |       |           |
| Percent            |                | 37.8    | 4.9       | 11.1    | 17.9  | 23.5  |           |
| Cord blood (gm%)   | 5.66           | 2.615   | 0.205     | 0.50    | 0.654 | 1.50  | 1.307     |
| Percent            |                | 47.78   | 3.6       | 8.08    | 10.1  | 26.20 |           |

There was no effect of age or parity of mother on the serum protein values of maternal and cord blood.

#### Discussion

**Total Proteins:** The total serum proteins in the uncomplicated parturient mothers was 1.40 gm% less than in the non-pregnant controls, the respective figures being 6.03 gm% and 7.43 gm%. Similar results have been reported by Brown (1954), Mack (1955), McGillivray, *et al.*, (1957), Menon, *et al.*, (1958), Paaby (1960), Kulkarni, *et al.*, (1960) and Russel, *et al.*, (1961). This alteration is due to haemodilution, poor socio-economic strata, and vegetarian diet which is poor in first class proteins.

Total proteins were lower in cord blood as compared to the maternal values, be-

ing 5.66 gm%.

**Albumin:** Plasma albumin concentrations, with individual variation in degrees, declined during labour. The respective figures for parturient mothers and non-pregnant controls being 2.282 gm%, and 3.95 gm%. Thus, there was a fall of 15.3%. During pregnancy and labour there is a tendency for albumin to decrease, while globulin tends to increase. This reduction in the levels of serum albumin is due to increased demand of foetus, hemodilution or increased stress due to pregnancy causing increased A.C.T.H. secretion and, probably, due to disturbed liver functions. Similar findings were reported by Dieckman and Wagner (1934), Coryell, *et al.*, (1950), Christenson (1946), Brown (1954), Mack (1955), Kulkarni, *et al.*, (1960), Paaby

(1960), Khanijo and Jungalwala (1963), and Agarwal (1964).

Cord blood contained more albumin than maternal blood, its value being 2.615 gm%. The higher albumin content is explained by diffusion of albumin from the mother to the foetus across the placenta and its synthesis in the foetal liver.

#### Globulins

(a) *Alpha-1, alpha-2, and Beta-globulins*: They were higher during labour as compared to non-pregnant levels, their respective values being 0.34 gm%, 0.702 gm%, 1.082 gm%, and 0.33 gm%, 0.60 gm%, and 0.93 gm%. Similar findings were observed by Oberman, *et al.*, (1956), Kuhns, *et al.*, (1956), and Lee, *et al.*, (1957). Their increase may be related to pregnancy lipaemia or to some other little known factor.

Alpha-1, alpha-2, and Beta globulins in cord blood were lower than in the maternal blood, their values in cord blood being, 0.205 gm%, 0.50 gm%, and 0.654 gm% respectively. Similar results were reported by Oberman, *et al.*, (1956), Kuhns, *et al.*, (1956), Lee, *et al.*, (1957), Coryell, *et al.*, (1950), Viergiver, *et al.*, (1962), Jasani and Pandya (1964) and Sita Devi (1969).

(b) *Gamma-globulin*: Levels of gamma globulins showed a decrease during pregnancy, their values in parturient and non-pregnant females being 1.52 gm%, and 1.57 gm% respectively. This difference is not significant. Gamma globulins participate in an important form in the organism defences. Clinical significance of their decrease during pregnancy remains within the field of speculation. It may partly be accounted by the transfer of antibodies from the mother to the foetus.

There was a relative increase in the gamma globulin values in the cord blood.

The values in the maternal and cord blood were 23.5% and 26.2%, respectively. Similar results were reported by Longworth (1945), Mack (1955), and Gelfaud, *et al.*, (1960).

Lower concentrations of globulins with the exception of gamma globulin, on the foetal side suggests that larger molecular size of these fractions may be deterrent to their free diffusion across the placental barrier. The higher levels of gamma globulin in the foetal blood can be explained by selective filtration by the placenta, and partly due, probably, to an independent synthesis by the foetus.

*A:G Ratio*: A:G Ratio during labour was lower than in the non-pregnant state, their values being 0.690 and 1.16, respectively. This change in the A:G ratio is due to an increased concentration of total globulins and reduction in albumin concentration during pregnancy.

The higher albumin and lower globulin levels in the cord blood were demonstrated by a higher A:G Ratio which in the present series was 1.306.

Thus, selective permeability of the placental barrier and synthesis of gamma globulin by the foetus accounts for the alterations in the levels of various fractions of serum proteins in the cord blood, as compared to their levels in the parturient mothers.

#### Summary

1. Serum proteins and their fractions were studied in the blood of parturient mothers and the cord blood of their new borns in 50 patients by paper electrophoresis.

2. Total proteins in the maternal blood during labour were lower than in the non-pregnant females. There was a fall in the albumin level and a rise in the total globulin levels in the parturient mothers.

3. Total serum proteins in the cord blood were lower than in mother, but the values of albumin was higher and total globulins was lower than in the parturient mothers. Gamma globulin levels of the cord blood were higher than in the maternal blood.

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