# A COMPARATIVE STUDY OF THE NEONATAL AND MATERNAL SERUM ENZYME LEVELS OF INDIANS

by

T. SANTHANAGOPALAN* and S. N. MUKHERJEE**

The increasing importance of the assay of serum enzymes as an aid to clinical diagnosis and prognosis is well known. The study of enzyme distribution in mother and new-born may give indication regarding the site of synthesis and function of these enzymes in pregnancy and neonatal life. The present study is concerned with the simultaneous determination of the activities of the enzymes in the mother's blood and in the new-born at delivery. The enzymes chosen are glutamic oxalactic transaminase (SGOT), glutamic pyruvic transaminase (SGPT), alkaline phosphatase and paraphenylene diamine oxidase (PPD Oxidase).

*Material and Methods*

A group of 100 apparently healthy women, at or near term, constitute the subjects for the present study. The patients belonged to poor socio-economic status living in and around Pondicherry. These were carefully selected and cases of abnormal pregnancy and labour were excluded from the present investigation.

Eighty-five per cent of the total cases were at term, the gestation period varying from 36-41 weeks. About half of the patients belonged to 25-30 year age group. The minimum and maximum ages of the patients noted in this series, were 16 and 39 years respectively. There were 16 cases of primigravidae, rest being multiparae, and the highest parity observed was twelfth. Premature births were excluded from the present study and the birth weight ranged between 2270 gms. to 3650 gms.

Maternal venous blood was obtained during labour without regard to the fasting state. Foetal blood was collected from the umbilical cord soon after birth without separating venous from arterial blood. The sera were separated, immediately refrigerated and determinations done within 24 hours after collection.

(i) SGOT and SGPT were estimated by the method of Reitman and Frankel (1957) and the results were expressed in terms of units of activity, each unit being the activity by 1 ml. of serum that results in the formation of chromogenic material equivalent to 1 microgram per ml. pyruvic acid under conditions of the test.

(ii) Alkaline phosphatase activity was determined by the method of King (1956).

* *Biochemist, General Hospital Pondicherry.*

** *Reader in Obstetrics & Gynaecology, Pondicherry Medical College, Pondicherry.*

(iii) PPD Oxidase activity was measured by the method of Ravin (1956).

*Results and Discussions*

The results are given in Table 1 and illustrated through the scattergrams in figs. 1 to 4.

*Serum Transaminases:*—The mean normal values obtained in our laboratory (concurrently with the present study) for 25 healthy non-pregnant adults were 18 ± 12 units per ml. for SGOT (Range 5-45 units per ml.) and 13 ± 10 units per ml. for SGPT (Range 3-35 units per ml.).

TABLE I

| | MATERNAL SERA | | | CORD SERA | | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Range | Mean | S.D. | Range |
| SGOT .. .. | 41.2 | 15.2 | 10-85 | 54.0 | 19.2 | 10-105 |
| SGPT .. .. | 16.0 | 12.4 | 5-50 (except one at 85). | 17.2 | 15.4 | 5-65 (except one at 90). |
| ALKALINE PHOSPHATASE | 26.8 | 9.1 | 10-55 | 20.7 | 8.0 | 8-44 |
| PPD Oxidase .. | 0.608 | 0.090 | 0.357 -0.854 | 0.084 | 0.039 | 0.027-0.174 (except one at 0.222). |

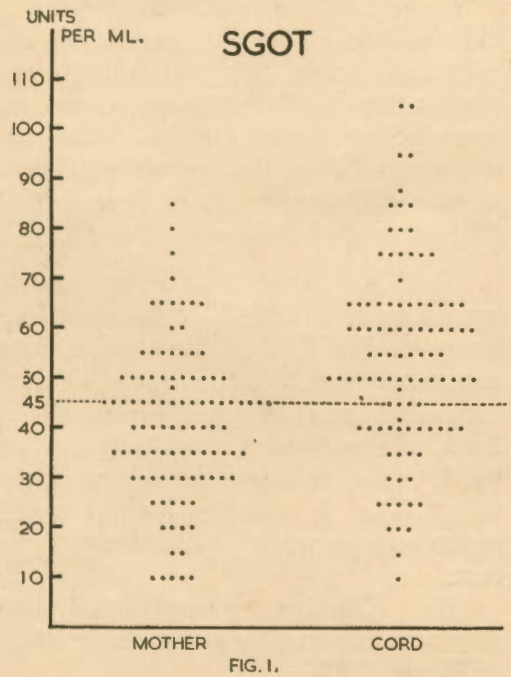

FIG. 1.

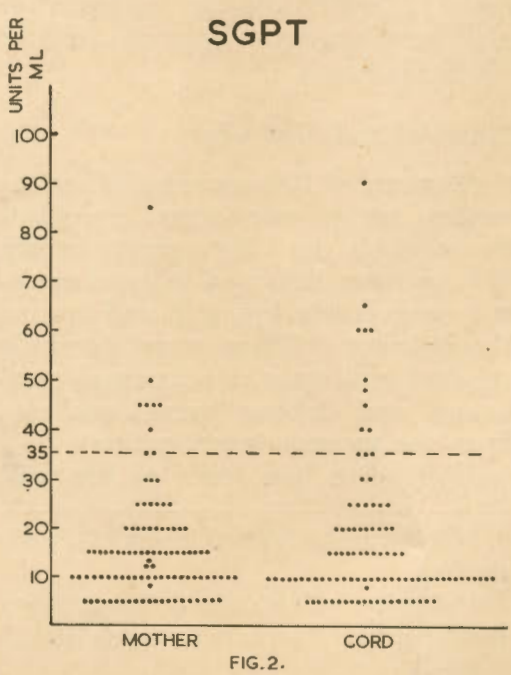

FIG. 2.

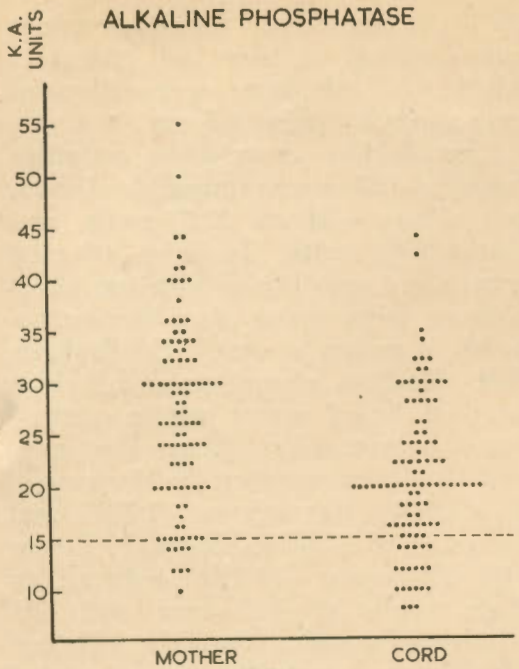

FIG. 3.

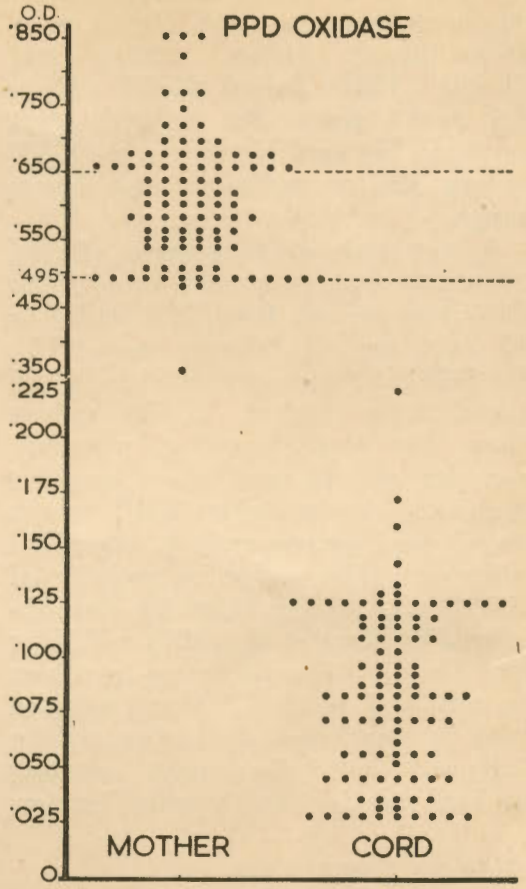

FIG. 4

In the present study of 100 cases of mother's blood at delivery, the mean for SGOT was 41.2 units per ml. (Range 10-85 units per ml.) and the mean for SGPT was 16 units per ml. (Range 5-50 units per ml., except one at 85).

Knutson et al (1958) found that the normal pregnancy did not appear to influence the level of SGOT. The same observation was made by West and Zimmerman (1958) and Rimbach and Bonow (1960) whilst Thiesen et al (1961) found SGOT elevated in 10 of 41 cases and SGPT raised in 7 of 46 cases during labour. Meade and Rosalki (1963) observed that 13% cases had abnormal values for SGOT and 6% cases had abnormal values for SGPT during labour. Roy Choudhury et al (1963) found that there was an increased SGOT activity in accidental haemorrhage (mean 81.2 units) while in normal pregnancy, the SGOT activity had a mean of 40.1 units per ml.

The study of SGOT activity in the neonatal period by Kove et al (1957) showed a wider physiological range than found in normal adults. West and Zimmerman in their study of maternal samples at labour and cord blood in 14 subjects found that the values in cord blood were higher in 13 and equal in 1.

Lapan and Friedmann (1959) obtained significantly higher SGOT values in 157 cord samples when compared with 161 maternal samples. A similar observation was made by Kessel and Politzer (1961) in their

study of European and Bantu cases from South Africa. King and Morris (1961) found SGOT values 1.5 to 2.5 times the normal adult range in 154 cord bloods while SGPT values had a narrower and lower range.

In our study of 100 samples of cord blood, the values ranged from 10 to 105 units per ml. for SGOT and 5 to 65 units per ml. (except one at 90) for SGPT; 68 cases of cord blood had significantly higher SGOT values than the corresponding maternal samples and 40 cord blood samples had significantly higher SGPT values than the corresponding maternal samples. The range of activity of SGOT was wider than the one observed by Kove et al (1957) and King and Morris. The difference in values in cord and maternal blood samples may be explained by assuming the different metabolic states existing on both sides of the placental barrier.

*Alkaline Phosphatase*

The mean for 25 healthy non-pregnant adults was $10 \pm 4.6$ units (King and Armstrong). The values obtained for maternal sera at delivery ranged from 10 to 55 units (Mean 26.8 units). The increase in this enzyme activity in pregnancy is in conformity with the findings of Cayla and Fabre (1935), Meranze et al (1937), Vermehren (1939) Young et al (1946), and Hoch et al (1948). Also, similar observations had been reported by Amritmahal and Banerjee (1950), Speert et al (1950), and Lapan and Friedman (1959). Quite recently, Meade and Rosalki (1963) observed in their study of this enzyme activity in pregnancy, that 35% of cases had elevated values over normal in the last trimester while 97% of cases were elevated over normal during labour.

The alkaline phosphatase activities found in 100 cases of cord blood were as follows:—Mean 20.7 units and Range 8-44 units. In 81 of 100 cord sera, the activities of alkaline phosphatase were lower than the corresponding maternal sera. The findings that alkaline phosphatase activities in cord blood were within normal limits or somewhat lower than normal had been reported by Meranze et al (1937), Vermehren (1939) and Speert et al (1950). Recently Lapan and Friedman (1959) observed in their study of 149 cord and 149 maternal samples that the alkaline phosphatase activities in maternal samples at delivery were at significantly higher levels than in cord specimens and maternal values were significantly above the normal range. Meade and Rosalki (1963) found a mean of 134 units for cord blood while they found a mean activity of 162 units for mother's blood during labour.

The increase in alkaline phosphatase activity in maternal sera compared to that in cord blood may be that the osseous activity in the mother at the end of the pregnancy is at a higher level than in the foetus.

*Paraphenylene Diamine Oxidase (PPD Oxidase)*

The mean normal PPD Oxidase activity for 25 healthy non-pregnant adults done concurrently with the present study was 0.550 (Range 0.495 to 0.650) expressed as optical density at wave length 530 mu. The range

of this enzyme activity in maternal sera was from 0.357 to 0.854 (Mean 0.608) while in cord sera it ranged from 0.027 to 0.174, excepting one at 0.222 (Mean 0.084). The increase in pregnancy has been confirmed by many workers (Lahy et al, Markowitz et al, Scheinberg et al). Holmberg and Laurell (1951) had shown that the difference in oxidative capacity is due to a lack of ceruloplasmin in the newborn and presence of excessive amounts of this metalloprotein in pregnancy serum. It is clear that the ceruloplasmin is not produced during foetal life but is synthesised in the new-born and hence the low activity of serum oxidase in the cord sera.

*Summary*

Enzyme activities (transaminases, alkaline phosphatase and paraphenylene diamine oxidase) were studied simultaneously in 100 cord sera and 100 maternal sera at delivery.

For SGOT the mean activity in cord sera was 54.0 units per ml. while in maternal sera it was 41.2 units per ml. The mean activity for SGPT in cord sera was 17.2 units while in maternal samples, the mean was 16.0 units per ml. for this enzyme. Sixty-eight of 100 samples of of cord blood had elevated values for SGOT over those of the corresponding maternal blood while 40 of 100 cases of cord blood had increased values for SGPT over those of the corresponding maternal blood. The range of activity of SGPT was lower and narrower than SGOT.

The levels of the alkaline phosphattase activity in maternal sera were higher than the corresponding cord sera in 81% of the cases.

The paraphenylene diamine oxidase activity was very low in cord sera, about one-sixth to one eighth of the maternal sera at delivery.

There seems to be no direct correlation between the enzyme levels in cord blood and mothers blood at delivery.

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