

## INTERRELATION BETWEEN MATERNAL AND CORD BLOOD CONSTITUENTS WITH BIRTH WEIGHT

by

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### Introduction

It is known that the birth weight of newborn depends mainly on the nutritional status of the mother. The foetus is getting its nutrient from the mother through the cord blood. It has been reported that the concentration of serum calcium and magnesium of the maternal and cord bloods can be correlated with the birth weight of the babies (Widdowson and Spray, 1951). Many studies have been conducted to find out the changes in various constituents in the maternal and cord blood at different stages of pregnancy (Menon, 1965; Sinha and Mukerjee, 1967; Shah *et al*, 1970; Olatunbosun *et al*, 1975). However, the efforts to correlate the organic and inorganic constituents in the maternal and cord blood with birth weight are scanty and controversial (Newman, 1957; Mendenhall, 1970; Tan and Raman, 1972; Stein, 1975). Hence the present study was undertaken.

### Material and Methods

The study was carried out in 47 normal delivery cases at Medical College, Calicut. Maternal blood was collected from the superficial vein of the arm and the cord blood was collected from the foetal side of the cord. The serum was separated and the following investigations were carried out as early as possible.

1. Serum calcium by the method of Clark and Collip (1925)
2. Serum inorganic phosphorus by the method of Fiske and Subba Row (1925)
3. Serum, magnesium by the method of Neill and Neely (1956)
4. Alpha-amino nitrogen by the method of Russel (1944)
5. Serum proteins by biuret method, Reinhold (1953)

### Results

The result of the biochemical investigations in the cord and maternal bloods is given in Table I.

Serum calcium, inorganic phosphorus and alpha-amino-nitrogen were higher in the cord blood compared to the maternal blood. The concentration of alpha-amino nitrogen and serum proteins were

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TABLE I  
Concentration of Serum Calcium, Magnesium, Inorganic Phosphorus, Alpha-amino-nitrogen and Proteins in the maternal and cord blood

Sample	Calcium mg/dl	Magnesium mg/dl	Inorganic phosphorus mg/dl	Alpha-amino- nitrogen mg/dl	Total Proteins g/dl	Albumin g/dl
Maternal Blood	9.4 ± 0.13 (8.0 — 12.0)	1.78 ± 0.04 (1.4 — 2.4)	4.1 ± 0.17 (3.0 — 6.9)	3.8 ± 0.07 (3.0 — 4.6)	6.6 ± 0.10 (5.5 — 7.8)	4.0 ± 0.10 (3.6 — 4.5)
Cord Blood	10.4 ± 0.14 (8.0 — 11.6)	1.75 ± 0.42 (1.2 — 2.3)	5.7 ± 0.16 (4.2 — 10.8)	4.6 ± 0.10 (3.3 — 6.6)	6.7 ± 0.24 (5.0 — 8.4)	4.1 ± 0.20 (3.7 — 4.7)

All values are mean ± S.E. The range is given in Parenthesis

almost the same in both the maternal and cord bloods. The relationship between birth weight and gravida is given in Table II.

TABLE II  
Relationship Between Birth Weight and Number of Gravida

Group	Gravida	No. of cases	Birth weight Mean ± S.E.
I	Primi	20	2695 ± 164.5
II	2-3	14	2833 ± 131.08
III	4-11	13	2970 ± 131.05

The relationship between maternal age and birth weight is given in Table III.

TABLE III  
Relationship Between Maternal Age and Birth Weight of New Born

Groups	Age	No. of cases	Birth weight Mean ± S.E.
I	15 - 20	16	2923 ± 309
II	21 - 25	12	2845 ± 137
III	26 - 30	10	2783 ± 70
IV	31 - 35	9	2911 ± 123

#### Discussion

The growth of the foetus in the uterus is influenced by the concentration of various constituents in the foetal blood. Analysis of maternal and cord bloods were undertaken by several groups of workers in the past. Widdowson and Spray (1951) observed a steady increase in the concentration of serum calcium, magnesium and inorganic phosphorus in foetal blood with increase in birth weight of the newborn. Desmond and Sweet (1949) and Saito *et al* (1956) estimated total serum proteins in cord blood. They observed that the birth weight of babies increased with increasing concentration of proteins in cord blood. Newman (1957) reported that the concentration of serum

calcium, phosphorus, magnesium and total proteins in the cord blood was higher than that in the maternal blood. In the present study, it was observed that only calcium and phosphorus concentrations were higher in the cord blood compared to the maternal blood, whereas the concentrations of proteins remained unaltered, the magnesium concentration was higher in the maternal blood. The concentration of the above constituents had no influence on the birth weight.

A higher protein concentration in the cord blood were reported by Sinha *et al* (1967), and Mendenhall (1970). On the other hand, Brown *et al* (1959) found that the protein concentration in the maternal and cord blood is the same, which is in agreement with the present findings. We observed higher concentration of serum alpha-amino-nitrogen in the cord blood compared to the maternal blood. This finding is in agreement with that of Butterfield *et al* (1962) and Lindblad and Zetterstrom, (1968).

According to John and Sullivan (1965) age and parity had no significant influence on the birthweight. Our findings also agree with those of the above workers. While, Banerjee *et al* (1961) and Abolins (1961) have reported that both age and parity of the mother exert a significant influence on the birth weight of babies.

#### Summary

Serum calcium, magnesium, inorganic phosphorus, proteins and alpha-amino nitrogen were estimated in the maternal and corresponding cord blood of 47 normal delivery cases. The concentrations of serum calcium, inorganic phosphorus and alpha-amino nitrogen in the cord blood were higher than that of the correspond-

ing maternal blood. However, these have no influence on the birth weight of babies. There was no change in the concentration of magnesium in the maternal and cord bloods. Magnesium concentration was found to be lower in the cord blood of babies with higher birth weight. The serum proteins concentration was almost same in both the maternal and cord bloods. There was no correlation between the birth weight of babies and the concentration of serum proteins. Birth weight of the babies were independent of the age and parity of the mother.

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