

THE RELATIVE HAEMATOLOGICAL AND BIOCHEMICAL VALUES IN PARTURIENT WOMEN AND THEIR NEWBORN INFANTS

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The nutrition of the haemopoietic system is dependent upon an adequate supply of the essential haemopoietic factors for which, man depends mostly on exogenous food. The maternal endowment in infancy and the intestinal biosynthesis of some of the vitamins of the B-complex group have only very limited contributions. Our previous study showed that 91 per cent of the pregnant women were having deficiency of iron, vitamin B₁₂ and folate. To observe the reflexion of these deficiencies in the infant, the present study was undertaken.

Material and Method

The subjects of the present study were selected from the labour ward of J. J. Group of Hospitals, Bombay, for haematological studies. Samples of blood were withdrawn from 60 women by vein puncture immediately after delivery. The umbilical cord was divided immediately after birth and samples of the cord blood were taken from the placental side end without milking the cord.

Haemogram was done using standard method (Dacie & Lewis, 1968). Serum

iron and iron binding capacity—Ramsay (1954 and 1957). Serum vitamin B₁₂ was estimated using *Euglena gracilis* Z strain (Ross, G.I.M., 1952).

Herbert's 'Aspetic' method (1966), using *Lactobacillus casei* as test organism was used for serum folate assay. Red cell was assayed by the method of Hoffbrand *et al* (1966).

Results

The relative haematological and biochemical values of mothers and their newborns are presented in Table 1. Twenty-three of the mothers (36.3%) had anaemia as determined by the WHO standards; haemoglobin concentration less than 11 G%. In these cases, nor in the remaining cases was there any correlation between the maternal haemoglobin concentration and the cord haemoglobin concentration.

The average Hb level of 60 mothers was 11.34 G% with the range of 8.12 to 13.63 G%. Corresponding to the Hb level of mothers, Hb level of cord was 16.24 G% ranging from 13.05 to 19.72 G%. The red cell counts were 4.31 and 5.8 million/cmm of mothers and cord bloods, respectively. The packed cell volume was 40.8% in the mother and corresponding packed cell volume of the cord was 51%. The mean corpuscular volume was 84.8 cu. in the mother ranging from 80 to 90.4

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TABLE I
Distribution of the Maternal Haemoglobin Values and the Corresponding Haematological and Biochemical Values in the Maternal and Cord Blood

Hb. in mothers (G%)	No. of mothers	Mean Hb.		Mean serum Iron (mcg%)		Mean iron saturation (%)		Mean serum Vit. B ₁₂ (pg/ml)		Mean serum Folate (ng/ml)		Mean Red cell Folate (ng/ml)	
		M	C	M	C	M	C	M	C	M	C	M	C
<10	12	8.8	16.08	57.5	158.8	11.8	42.6	125	228	3.56	17.2	159	382
10-10.9	11	10.5	15.92	70.2	142	16.3	41.4	148	331	3.84	21.1	183	391
11-11.9	16	11.54	16.09	67.5	140.4	15.9	37.6	159	317	3.75	18.1	198	343
12-12.9	17	12.4	16.08	78.4	161.1	18.7	43.7	148	298	4.03	20.03	192	344
13-13.9	4	13.45	17.04	118	179	29.9	50.3	191	288	3.95	23.7	219	459
	60	11.34	16.24	78.3	156.3	18.5	43.1	154	305	3.83	20.03	190	394

cu. Only one of the mothers had the MCV more than 94 cu. with mean corpuscular haemoglobin concentration, 29 per cent. In this case the biochemical values, including the red cell folate were low. The reflexion of these deficiencies in the corresponding infant was not much. The Hb concentration of the infant was 16.82 G%. The serum iron level was normal but the transferrin saturation was only 32%.

In 22 mothers, the mean corpuscular haemoglobin concentration was less than 30 per cent; in 26 mothers, it was between 30 and 32 per cent; 12 mothers showed the MCHC level more than 32 per cent. On the contrary only one infant showed the MCHC level of 29 per cent. This case had the serum iron level of 74 mcg per cent. Thirty-nine infants showed their MCHC value between 30 and 32 per cent. In 20 infants the MCHC value was more than 32 per cent. The average value of MCHC was 31 and 31.98 per cent in mother and cord blood respectively.

Only 4 mothers had the white blood cells within normal limits (i.e., between 5 and 10 thousands per c.mm.) Others had high count ranging from 10,200 to 22,000 per c.mm. and the average being 13,060 per c.mm. (Physiological increase). Infants had the average count of 26,900 per c.mm. with the range of 16,500 to 39,600 per c.mm.

The serum iron values measured are given in Table II. In 38 mothers the serum iron was less than 80 mcg per cent. The cord serum iron value is dependent to some extent upon the maternal value, and on an average, is twice as high. The average serum iron was 78.3 mcg per cent and 156 mcg per cent in mother and infant, respectively. In the present study there was one infant with low serum iron.

In 16 cord sera, transferrin saturation was less than 33 per cent.

TABLE II
Serum Iron

Serum iron in mothers mcg%	No. of mothers	Average serum iron in infants (mcg%)
<50	16	128.8
50-59	9	137.7
60-69	7	161.1
70-79	6	157.9
80-89	6	145.0
90-99	4	138.5
>100	12	175.5

The distribution of the serum vitamin B₁₂ values in mothers and corresponding infants is given in Table III. The average serum vitamin B₁₂ level was 154 pg per ml. in mothers ranging from 40 to 360 pg/ml and the cord blood showed an average of 305 pg/ml, ranging from 102

TABLE III
Serum Vitamin B₁₂

Serum vit. B ₁₂ in mothers (pg/ml)	No. of mothers	Average vit. B ₁₂ in infants (pg/ml)
<100	17	218.3
100-149	16	324.1
150-199	11	287.7
200-249	10	375.2
>250	6	398.8

to 650 pg/ml. Seventeen (28.3%) of the mothers had B₁₂ deficiency. The serum B₁₂ in cord blood was higher than in maternal blood.

The distribution of serum and red cell folate in mother and cord blood is presented in Table IV. In 42 (70%) of the mothers, the serum folate was deficient. The average serum folate of the mother was 3.83 ng per ml. ranging from 0.4 to 11.2 ng per ml. and the corresponding cord blood showed an average of 20.03 ng per ml. ranging from 4.2 to 39.8 ng/ml. The serum folate content in the cord blood was on an average 6 times that in the maternal blood. In the cord blood only one case was encountered with serum folate value below 5 ng per ml. The serum folate of the corresponding mother was 1.6 ng per ml. In 16 mothers, the red cell folate was less than 140 ng per ml. The red cell folate was found less than 140 ng per ml. in one infant where the serum folate also was found low. The average red cell folate in mother was 190 ng/ml. ranging from 66 to 375 ng per ml. and the average value in cord blood was 384 ng per ml. ranging from 121 to 678 ng per ml.

Discussion

The iron content of the new born infant is approximately 75 mg per kg of

TABLE IV
Serum and Red Cell Folate

Serum folate in mother (ng/ml)	No. of mothers	Serum folate in infants (ng/ml)	Red cell folate in mother (ng/ml)	No. of mothers	Red cell folate in infants (ng/ml)
<3	26	15.0	<140	16	300
3-4.9	16	19.3	140-199	21	332
5-5.9	7	23.9	200-299	18	403
>6	11	27	300-399	5	574

body weight, as determined by carcass analysis of stillbirths (Iob and Swanson, 1934; Widdowson and Spray 1951). Studies performed during various stages of pregnancy indicate that the iron content and the weight of the foetus increase proportionately with age; thus, throughout gestation the foetus tends to maintain a constant iron content of about 75 mg/kg (Osgood, 1955). In the foetus, iron is present in three forms, haemoglobin iron, tissue iron and storage iron. The bulk of it is present in haemoglobin iron.

The serum iron levels in the new born are considerably higher than maternal levels, and the transferrin is more nearly saturated. Controversy still exists as to the role maternal iron deficiency may play in the iron endowment of the foetus. The haemoglobin concentration in the cord blood of infants born to anemic, iron deficient mothers does not differ from that of infants born to iron sufficient mothers (Fullerton, 1937; Woodruff and Bridgeforth, 1953; Lanzkowsky, 1960). But Sisson and Lund (1957) found that the red cell volume and total haemoglobin mass were significantly reduced.

Both serum folate (Grossowicz *et al*, 1960; Zachau-Christiansen *et al*, 1962; Shojana and Gross, 1964) and serum vitamin B₁₂ levels (Killander and Valquist, 1954; Boger *et al* 1957; Baker *et al* 1960, Zachau-Christiansen *et al*, 1962) are elevated at birth and in the early neonatal period. Values in the new born are generally considerably higher than the maternal levels and there appears to be a certain degree of positive correlation in the levels of iron, B₁₂, and folate in the mother and her infant.

Summary

The haematological and biochemical values of 60 mothers and the cord blood

of their infants were studied. The haemoglobin level was less than 11 G% in 23 mothers (36.3%). The average Hb level was 13.34 and 16.24 G% in the mother and in the infant, respectively.

The serum iron was deficient in 38 (63.3%) mothers. The average serum iron level was 78.3 and 156.3 mcg% in the mothers and in the infants, respectively. The transferrin saturation was 18.5% in the mothers and 43.1% in the infants.

Serum vitamin B₁₂ was deficient in 17 (28.3%) mothers. The average serum B₁₂ level was 154 pg/ml in the mothers and 305 pg/ml in the infants.

In 42 (70%) of the mothers folate deficiency was observed. The folate level was 3.83 and 20.03 ng/ml. in the mother and the infant, respectively.

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