



ORIGINAL RESEARCH PAPER

Physiology

Comparative Studies of Biochemical and Nutritional Parameters in Cord and Mothers Blood During Delivery

KEY WORDS: Pregnancy, Foetus, Vitamin A, Retinal, carotene Cord blood, Apgar score

Priyanka Pahari

M.Sc Asst.Prof, Department of Physiology K.P.C Medical College & Hospital, Jabalpur Kolkata-700032

Salil Kumar Mandal

MD,PhD Prof & Head, Department of Physiology K.P.C Medical College & Hospital, Jabalpur Kolkata-700032

Julie Bhattacharya

M.Sc ,PhD Asso.Prof, Department of Physiology K.P.C Medical College & Hospital, Jabalpur Kolkata-700032

ABSTRACT

We want delivery of normal live birth baby. The term live birth is used to record a birth whenever the newborn at or after birth, spontaneously shows any sign of life such as heart beat or definite spontaneous movement of voluntary muscles. Heart beats are distinguished from transient cardiac contractions, and respirations are differentiated from flweting respiratory efforts or gasps.It is better-known from the Apgar score. Proper nutrition of the mother is essential to give birth to a normal child. To know the influence of nutrients on the normal birth of baby, measurements of Vit A, Retinal, Protein Carotene, total fat are estimated in mother & foetus. Though there is very limited placental transfer of large protein but protein are essential nutrition's of the foetus. There are important exceptions e.g.: crossing the placenta in large amount via endocytosis but it's not measured in the present investigations. Protein content in the mother blood & cord blood were found to be (4.8 gm%, 3.5gm%) respectively, Vit A conc. is marginally higher in the mother plasma than the foetus plasma. It's known that renal binding protein is transfer from the maternal compartment across the syncytium.Retina content in mother's blood was0.113µg/gm & cord blood was 0.05µg/gm.We reported the retinal content in mother and foetus plasma 1st time in the world from our laboratory. Carotene was also measured in mother plasma and foetus plasma. Total fat is marginal higher in mother blood than the cord blood.

INTRODUCTION:

Various studies all over the world emphasize on the haematological and nutritional status to be intently related to child growth and development. The role of vitamins especially vitamin A and proteins, the lipid profile and other haematological parameters of a pregnant woman may serve as markers to assess the nutritional and developmental status of a newborn. This study intends to describe the status of the aforesaid parameters in various trimesters of pregnancy as well as cord blood and their relation to child development.

Foetal growth is primarily dependent on the nutritional status of the mother. Inadequate maternal diet is unable to meet with the growing demands of pregnancy and may be disastrous to foetus [1 - 3]. To analyze the role of the nutrients in gestation, it is necessary to quantitate them in mother, in cord as well as in placenta.[4]

Placenta is well recognized as the organ of nutritional support for the foetus and monitors nutrient exchange between the mother and the offspring[5-6]. Martin in 1973 observedthat serious under nutrition during pregnancy increases the risk of intrauterine growth retardation, prematurity and abortion [7,8] all of which reflect to cellular malfunction.[8-10] Various studies have also indicated the association of low birth weight with infant mortality,[11].And observed reduced foetal growth a contributing factor for risk of diseases in later life[12]. A pregnant woman who has adequate nutrition available in the form of a standard diet will provide the vitamins required for the foetus for normal development. This study is intended to analyze the various haematological and nutritional parameters in the mother's blood, placenta as well as cord blood. Foetal development will be analyzed observing birth weight(BW), Birth length (BL) and Head circumference (HC) and Apgar score [13] . Quantitation of these parameters in a pregnant woman may serve as a marker to assess the nutritional and developmental status of the new born. All these investigations may provide some light on the transport and absorption of the nutrients from mother to the foetus.

MATERIALS AND METHODS

Maternal consent to participate in the study was obtained at the time of enrolment.

Materials: Maternal venous blood (7.5ml) was collected in EDTA vials from the pregnant woman when they came to hospital for

delivery. Serum was prepared by the standard method and kept at -20 degree for further analysis.

Cord blood was obtained immediately post parturition from the umbilical vein after clamping of the cord before separation from placenta.

Blood was drawn into the centrifuge tubes and centrifuged at 1000xg at 4 degree centigrade for 15 minutes. The whole process was done within 15 minutes of collection and plasma stored at -20 degree till further analysis.

Before centrifuge TC, DC and Hb estimation was done from blood while the other parameters like Apgar score, blood sugar, lipid profile, vitamin A, vitamin A aldehyde, vitamin E,vitamin D,calcium was obtained from the serum.

Haematological parameters as total count of RBC and WBC was done by the standard laboratory technique using Hayems fluid and Turks fluid respectively.

Differential leukocytes count was estimated by using Leishman's stain following the standard laboratory technique.

Hemoglobin concentration was estimated by using Sahlis method. Total Protein was measured by Lowry method where serum is treated with Arsenomolybdate solution and measured in spectrophotometer at 420 nm. [14]

Blood sugar was measured by glucose-oxydase method [15] Vitamin A was extracted by mixing 2ml of petroleum ether in 1 ml of Serum of maternal and cord blood then 3ml of absolute alcohol was added gradually & mixed. 4ml of petroleum ether was added to it after that and the whole mixture is shaken vigorously. It was then allowed to settle down.

Upper part was taken and carotene was measured directly at 440 nm or by HPLC [16,17]

Same solution was evaporated to dryness in water bath or evaporated in an inert medium. Then the residue was dissolved in 0.5ml 100% pure chloroform then this chloroform dissolved residue was mixed with 2.5 ml standard solution of Trichloro acetic acid (TCA) in chloroform and immediately reading was taken at

530 nm for measurement of vitamin A.[18, 19]

Vitamin A aldehyde was measured in serum by thiobarbituric acid. [20]

RESULTS

Table I: ESSENTIAL MEAN PARAMETERS OF BABY

PARAMETERS	BABY
WEIGHT	2.75 Kg
HEAD CIRCUMFERENCE	30.12cm
APGAR SCORE	1 st minute -9
	5 th minute -10

Table II: MEAN VALUE OF THE VARIOUS HAEMATOLOGICAL PARAMETERS AND APGAR SCORE OBSERVED IN PREGNANT WOMAN

PARAMETER	MOTHERS BLOOD(N=5)	CORD BLOOD(N=5)
	Mean	Mean
HAEMOGLOBIN	11.6gm%	15.2gm%
BLOOD SUGAR	102mg/dl	70mg/dl
BLOOD GROUP	B+,O+,AB+,A+,B+	A+,A+,B+,B+,B+
TSH	3.5µl/ml	

Table III: SHOWS THE MEAN VITAMIN A, RETINAL, CAROTENE, PROTEIN, FAT IN MOTHERS BLOOD & CORD BLOOD DURING DELIVERY (MEAN± SD± SE± T-TEST& P VALUE

PARAMETER	MOTHERSBLO OD(N=5)		CORD BLOOD(N=5)		STATISTICAL PARAMETERS	
	Mean± SD	SE	Mean± SD	SE	t-test	P value
Vit A(µg/gm)	0.66±0.513	0.229	0.62±0.576±0.257	0.257	5.00	0.01*
Retinal(µg/gm)	0.113±0.107	0.061	0.05±0.03±0.015	0.015	3.0714	0.02*
Carotene(µg/gm)	0.16±0.063	0.028	0.2±0.179±0.08	0.08	13.001	0.0051*
Protein(gm/100gm)	4.8±0.15	0.057	3.5±0.216±0.108	0.108	14.000	0.0051*
Fat(gm/100gm)	0.4±0.141	0.1	0.3±0.141±0.1	0.1	3.061	0.02*

- * Significant
- ** Highly Significant

DISCUSSION

Vitamin A is essential for growth and differentiation of a number of cells as well as tissues. Notably during pregnancy vitamin A has an important role in healthy development and maturation of foetus [21]

Here we have found vitamin A more in Mothers blood (.66±0.0513) compared to cord blood (0.62±0.576). We have also found retinal in mothers blood(0.113±0.107) and cord blood (0.05±0.03). Protein and Fat were estimated in mothers blood i.e. (4.8±0.115),(0.4±0.141) respectively more than the cord blood (3.5±0.21),(0.3±0.14). We found carotene more in cord blood i.e. (0.2±0.179) than mothers blood (0.16±0.063).

In this study we have also estimated some haematological parameter like Hb which is cooperatively more in baby (15.2 gm %) than mothers blood (11.6 gm %) and blood sugar more in mothers blood (162 mg/dl) than cord blood (70 mg/dl).

Apgar score is the physical condition of a newborn baby. In our study we obtained mean Apgar score of baby were 9 points in first minute and 10 points in fifth minutes.

In the present study we measured several variable, linked to vitamin A status in maternal and cord blood of Indian women with normal pregnancy and adequate vitamin A status. We found retinal- carotene concentration equal to or higher than those found in well nourished pregnant women. (Ref 22,23,24) Retinal

content in the cord and mothers blood were rarely investigated. In conclusions our findings show that well nourished healthy pregnant woman & newborn have a normal vitamin A status although an understanding of mechanism of these transfer is to be explored, so that the involvement of vitamin A in obstetrics pathology such as intrauterine growth retardation can be investigated in future.

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