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Research Article

Comparative Study of Serum Iron and Hemoglobin Levels of Cord Blood of Normal Neonates and that of Maternal Blood in Federal Medical Centre Owerri

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Abstract

This work was done to compare the serum iron and hemoglobin level of cord blood of normal neonate and that of their mother in federal medical center Owerri. 30 pregnant women confirmed to be registered in federal medical center Owerri, were delivered of their babies alive (both mother and child) were recruited for this study. The serum and hemoglobin level of both mother and child were determined using colorimetric method with chromazurol respectively. The results obtained were as follows: Hb level of Cord blood of normal neonate calculated (14.64 ± 0.01 mg/dl), Hb level of mothers calculated (11.52 ± 0.01 mg/dl). The Hb of the new born was seen to be significantly higher (P<0.05) when compared with that of their mothers. The level of Fe in cord blood of normal neonates calculated was (106.61 ± 13.40pg/dl), Fe level of mothers (85.13 ± 41.51pg/dl); it was also noticed that the Fe level of normal neonates is significantly higher (P- <0.05) when compared with that of their mothers; but are all within the normal range of reference. During this study, it was observed that one of the mothers hemoglobin level was lower than the normal range (8.8g/dl); however this affected the Hb level of the baby (12.2g/dl).This shows that an anemic mother is likely to deliver an anemic baby, also both mother and child could be iron deficient.

Keywords: serum iron; haemoglobin; neonates; maternal blood

Introduction

Iron is an absolute requirement for most forms of life, in the formation of cells, most bacterial and plant species also require iron. Iron can be found worldwide in varieties of food sources; such as:

Meat and poultry: lean beef, veal, pork, lamb, chicken, turkey, liver etc.

Sea food: fish, mussels, shellfish etc.

Vegetables: all kinds of green, sweet peas, bean sprouts, tomatoes, potatoes, green beans, corn, cabbage, etc [1].

Iron is needed in the hemoglobin of red cells, in order to transport oxygen from the lungs to the tissues, it is also an essential component of myoglobin to store and diffuse oxygen in muscle cells. Pregnant women are most likely to be iron deficient. This is because of the developing foetus in the womb. The mother shares every quantity of food taken with the foetus, and even the placenta; therefore if she is not placed on a regular supply of food rich in iron, the baby ends up taking up the little which is available, while the mother ends up not getting enough for stores. In a situation such as this, when the infant depends on the iron acquired from the mother before birth, such a demand leaves the infant susceptible to iron deficiency. The Iron content in the new born infant is an important source for haemoglobin formation in the first few months of life, therefore the baby needs a higher level of iron at birth, especially, since it has been discovered that the iron content of breast milk is low [2].

The placenta is an organ attached to the womb during pregnancy. It is a very important organ in pregnancy. It keeps the foetal blood supply separate from that of the mother as well as providing a link between the two, this link enables the unborn baby carry out functions that the baby cannot perform for its self. It is linked to the baby by the umblical cord. It is located in the uterus during pregnancy and is peculiar in mammalian eutherian. Cord blood contains young stem cells that can renew themselves and become specialized and rich in iron and hematopoietic stem cells which are precursors of, elements found in the whole blood (blood cells); red cells white cells, and also platelets, it can be used to treat hemapoietic and genetic disorders. These young stem cells have been proven in treatment to help children replace damaged blood cells with healthy once and strengthen their immune system because of its amazing healing cells [3].

However later studies have questioned this believe and suggested that maternal iron deficiency can cause depletion of fetal iron stores [4, 5]. No consensus regarding this

subject has been reached thus far.

The study was done to determine the relationship between the total iron and hemoglobin level of the cord blood of normal neonates and that of their mothers.

Materials and Method

Study Area

The study was conducted in Owerri municipal (Federal Medical Center), the capital of Imo state.

Study Population

Subjects: The subjects were made up of 60 subjects; 30 mothers who were delivered of their babies successfully within the age bracket of 20-40; and 30 normal neonates, 0-2 minutes of age.

Advocacy, Mobilization and Pre-Survey Contacts

With a letter of introduction from my Head of department and a detailed proposal stating the purpose of my research including its benefits to the population, I met with the medical director and the head of laboratory department of medical laboratory science federal medical center Owerri respectively. I collected all necessary ethical clearance from the authorities as well as informed consents from the prospective study subjects. This involved series of contacts to have schedules for sample collection.

Selection Critaria

Every patient of these 30 samples was confirmed to be pregnant mothers that were delivered of their babies. Informed consent was obtained from all the subjects selected for the study. The patients' personal data such as name, age, etc were recorded.

Exclution Critaria

Non pregnant mothers and those below 9 month (that were not due for delivery). Mothers whose babies were still born, mothers who refused us access to their body and that of their babies.

Specimen Collection

About 5mls of blood sample was collected from subjects (mothers) using a standard clean veno-puncture technique. Cord blood was collected from the baby using a technique known as "closed technique" which is similar to standard blood collection techniques. Using this method, the vein of the severed umblical cord was canniculated using a needle and syringe; then about 5mls of blood sample was drawn. The blood of both mother and child was immediately dispensed into a dry test tube respectively and allowed to clot and separate. The blood for hemoglobin estimation was collected via venopuncture; about 1ml of blood was collected from both mother and baby.

Laboratory Methods and Procedures

Quantitative Determination of Iron in Serum

Procedures

Fresh serum was separated from clot without delay;

Three test tubes were arranged as follows; Blank, Test and Standard. About 1000ul of reagent A (Fe CAB) was introduced accordingly into test tubes labeled; Blank, Test, and Standard. About 50ul of distilled water was added into the tube labeled blank, then 50ul of the patients serum was added into the tube labeled Test, then 50ul of the Fe standard reagent was added into the test tube labeled Standard. The test tubes were mixed properly and incubated for 4minutes at 37^{0c}The absorbance of the sample and standard were read at a wave length of 623nm.

Calculation

$$\text{Iron ug/dl} = \frac{Absorbance\ of\ Test\ (AT)}{Absorbaance\ of\ Standard} \times \frac{100}{1}$$

Normal values:

For Fe:

Women: 37-145ug/dl (6.6 – 26umol/l).

Neonates: 100- 250ug/dl.

For Hb:

Women: 11.5-16.5g/dl.

Neonates: 17.5 – 22.5g/dl.

Statistical Analysis:

All values were expressed as mean ± SD. The statistical analysis was carried out using the students T-test distribution to detect differences between the experimental group of heamoglobin level and iron level. Test with probability value <0.05 were considered artistically significant while test with probability value >0.05 were considered statistically not significant.

Results and Analysis

A total of 60 individuals were worked on, 30 mothers and 30 babies, the Hb of both mother and child were done, together with their serum iron. The result of their serum iron and Hb are presented in the table below:

Parameter	Cord blood of normal infants n = 30	Blood of normal mother n = 30	p- value
Hb (g/dl)	14.64 ± 0.01	11.52 ± 0.01	P < 0.05

Table 1: *Shows the mean values of Hb level in maternal and cord blood of infants*

The above table shows the mean plasma concentration values ofhaemoglobin level of cord blood of normal infant and that of maternal blood. From the result obtained there is a significant difference ($p < 0.05$) between the Hb of the cord blood of normal infants and that of maternal blood.

Parameters	Iron level of normal infant cord blood N = 30	Iron level of normal maternal blood N = 30	p-value p = 0.05
Fe (ug/dl)	106.61 ± 13.40	85.13 ± 41.5	P < 0.05

Table 2: *Shows the total iron (fe) level of cord blood of normal infant and that of maternal blood*

The table above shows the mean serum value of total iron (Fe) level of cord blood of normal infant and that of maternal blood. From the result obtained, there is a significant difference ($P < 0.05$) between the total iron level of normal infant blood and that of maternal blood.

Discussion

Iron is an element essential to life, it is important in the formation of hemoglobin which aids in the transportation of oxygen round the body; it is an essential element in the human body. The result presented in table and 2 of this study shows the calculated mean and standard deviation of the hemoglobin level and the iron level of normal infants and their respective mothers in federal medical center Owerri. There is a significant difference between the Hb and Fe of cord blood of normal infant and

that of maternal blood. The fetal Hb is slightly higher than the maternal Hb but are both normal because they fall within the normal range; likewise their Fe level; This slight difference in the level of Hb and Fe is due to the fact that, iron-related hematological and biological parameters are markedly higher in umbilical cord than maternal blood [6]. The result shows that both mothers and their children are not iron deficient, but in the case of one of the mothers (the 4th on my list), whose Hb was (8.8g/dl), the Hb of the childl2.2g/dl) fell below the normal range. This was due to the fall in the mothers hemoglobin level. In this case the mother and child will be placed on iron supplements, and iron rich diets. The rest (mothers and their babies) on my list are normal; their iron level falls within the normal ranges.

Findings pertaining to the serum level of iron in both maternal and normal fetal cord blood observed in this study were in close agreement with results reported by other researchers. The foetus feeds indirectly from the mother; it (foetus) receives iron indirectly from the maternal circulation through a rapid and unidirectional process. It is well established that physiological, metabolic and hormonal changes during pregnancy affects the metabolism and body needs for micronutrients and minerals. Iron deficiency is the most common nutritional deficiency in pregnancy and has an important impact on maternal and fetal morbidity and mortality iron-related hematological and biological parameters are markedly higher in umbilical cord than maternal blood [6]. Based on this research, it is shown that maternal iron nutritional status, whether high, low, or normal will affect the fetal iron and Hb level.

Conclusion

The findings from this study have shown with significant proof that there is a relationship between the total iron level on the cord blood of normal infants and that of their mothers. Also that iron transport from maternal compartment down to the fetus does not occurs independently, rather is dependent on maternal iron level, therefore a mother who is iron deficient is likely to deliver an anemic child, but a healthy mother; such as those in this study except the 4th mother and child with Hb: 8.8g/dl and 12.2g/dl; Fe:38.0g/dl and 90.0pg/dl respectively on my list, will deliver a healthy and normal child . It has also been able to reveal that, there is slight difference in the level of Hb and Fe which may be due to the fact that..

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