Impact of Maternal Anemia at Term on Neonatal Hemoglobin, Sr.iron and Total Iron Binding Capacity

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ABSTRACT

Introduction: There are hardly any studies to see the relation between maternal anemia and cord blood hemoglobin in south India. This study endeavours to study the relation between maternal anaemia and cord haemoglobin. Objectives of the study was to look for an association between maternal hemoglobin, ferritin and TIBC of term mothers with the corresponding parameters in cord blood samples post delivery.

Material and method: A cross sectional study was done where Maternal and cord blood samples of 149 term mothers chosen by systematic random sampling, delivering at G.H Karaikal between January to April 2015 were collected and assessed for hemoglobin, ferritin and TIBC (Total iron binding capacity). Data was analyzed by SPSS 16.

Results: There was a high prevalence (63.7%), of anemia among the mothers in our study. The comparative mean hemoglobin, ferritin and TIBC levels in cord blood samples of anemic/non-anemic mothers was 8.2/12.3, 120/175 and 512.9/285.4 with a highly statistically significant difference on analysis (p<0.001) for all three parameters.

Conclusion: Maternal iron and hemoglobin levels do have a significant impact on neonatal hemoglobin and serum iron.

Keywords: anaemia; haemoglobin; ferritin; TIBC.

INTRODUCTION

Anemia in pregnancy is a major challenge for obstetric care in developing countries.¹ any of these women may be anaemic before conception. Causes of anemia during pregnancy in developing countries are multifactorial. This include nutritional deficiency (iron, folic acid and B12) and parasitic diseases such as malaria, hook worm infestation.² However micronutrient deficiency, especially iron deficiency anaemia is main cause for anemia in pregnancy.³ Pregnant women are particularly vulnerable to iron deficiency because of increased iron demand. The expansion of plasma volume, increase in erythropoiesis and increase in fetal placental unit for iron throughout gestation and individuals variations are possible. Due to hemodilution and metabolism of iron, serum ferritin concentration in women with adequate iron stores initially rises, then falls progressively by 32 weeks to about 50% pre pregnancy levels, to rise again mildly in the third trimester. The placental transfer of iron from maternal circulation to fetal circulation is controlled by haptoglobin, when haptoglobin concentration are low, iron enters blood plasma at high rate, when hepcidin concentration is high ferroprotein is internalized and iron is trapped in enterocytes, macrophages and hepatocytes.⁴ ⁵ Though fully high values may be found in acute and chronic inflammatory conditions, the measurement of serum ferritin, serum iron and TIBC concentration has been shown to be good index of iron stores. This is preferred for examination of bone marrow appreciates for hemosiderin, a gold standard for iron store. Iron transfer to the foetus occurs maximally after 30 weeks of gestation.⁶ time peak efficiency of maternal iron absorption following a considerable fall in serum ferritin level which occurs between 12 and 25 weeks of gestation. This probably occurs as the result of iron utilisation by maternal and fetal red cell masses. The aim of this study is to establish the mean values for pre delivery hemoglobin,TIBC concentration of anemic and non anemic mother and to compare those values with the cord blood haemoglobin and serum iron and TIBC concentration of their newborn.

MATERIALS AND METHODS

A cross sectional hospital based pilot study was done at GH karaikal- Pondicherry ut between jan to apr 2015, the study was approved by ethics and research committee of VMMC-Kkl.

This study was done with the following objectives to assess the Hb,TIBC and serum iron of pregnant mother, to assess the cord blood Hb,TIBC and serum iron and to compare the both.

200 women were randomly selected. Blood Hb%, Sr.Iron and TIBC were done for the mother at term. At delivery the newborn were subjected for Hb%, Sr.Iron and TIBC estimationthese were done by iron and TIBC kit –ferrozine

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method, corel clinical system. Data was analysed by SPSS 16. Of the 200 mothers who were enrolled for 149 mother-baby pairs blood --- could be done

**Inclusion criteria**

Pregnant women who were clinically anemic, HIV negative, Nonsmoingand who gave consent were chosen randomly based on cut off of Hb conc. (10g/dl). All pregnant women enrolled belonged to the age group of 19 to 37 yrs. This consists of anemic pregnant women (Hb< 10g/d) and non anemic pregnant women (Hb>10g/dl) respectively.

The new born were grouped into haemoglobin concentration via non anemic and anemic, the cutoff value for serum iron (35 -145) for that pregnant women and (150 -220µ/dl) for the newborn cutoff values for TIBC (250 - 400µ/dl) for both pregnant and neonate.

**Exclusion criteria**

The pregnant women with history of chronic illness such as Sickle cell disease, Renal disorder, hepatitis and those with obstetric complication such as pre term labour, placenta previa, pih, gdm, hiv infection and vaginal bleeding during pregnancy were excluded.

**Blood sampling**

Five millilitres(5ml) of blood collected from each women before labour and three millilitre(3ml) was collected from the cord of their new born into ethylenediaminetetraacetic acid (EDTA) tube for full blood count analysis. the same amount of blood was collected from each participant in to plain tube for serum. Iron and TIBC assays. blood sample was collectedimmediate after the pregnant women admitted into the labour ward at 38 week of gestation. haemoglobin concentration was measure using the autoanalyser mode on the same day of collection. while blood for sr.iron and TIBC was done using iron and TIBC -kit ferrozine method. The iron and TIBC kit was manufactured by coral-clinical system.

**STATISTICAL ANALYSIS**

Analysis were performed using SPSS-version-16. The descriptive data were expressed as mean±SD. A probability value of P<0.05 was considered to indicate statistically significant.

**RESULTS**

There was a high prevalence of 63.7%, of anemia among the mothers in our study. The comparative mean hemoglobin, ferritin and TIBC levels in cord blood samples of anemic/non-anemic mothers was 10.873/16.99, 120/175 and 512.9/285.4 with a highly statistically significant difference on analysis (p<0.001) for all three parameters.

Table 1 describes pregnant mother haemoglobin, Sr.iron, TIBC parameter between anemic and non anemic group. SD, mean, minimum and maximum level of each shows significant p-value P<0.001. Table 2 describes parameter of newborn of anemic and non anemic mothers-SD, mean hemoglobin and significant p-value P<0.001. Table 3 describes Pearson coreation – coefficient between maternal and foetal-Hb, Sr.iron, TIBC and shows significant p-value. P<0.001

**DISCUSSION**

The mean cord hemoglobin in newborns among cases was 16.99g/dl. The cord hemoglobin appears to show a linear relationship with maternal hemoglobin, with cord hemoglobin being less in newborn whose mothers have anemia. Mothers who had more severe anemia had babies with lower cord hemoglobin.

Mothers who had anemia were more likely to deliver anemic babies i.e. babies with cord hemoglobin<14 g/dl. Such babies would be more likely to develop significant anemia.
at an earlier age than babies born to non-anemic mothers.\textsuperscript{1,6-9} In contrast to our study some previous investigators have failed to find a relationship between maternal and cord hemoglobin, thus leading to the conclusion that the fetus continues to extract iron efficiently from the mother regardless of her iron status.\textsuperscript{2,3} It is thought that iron is actively transported from mother to fetus.\textsuperscript{4,5} In the iron deficiency state, there is up regulation of iron transport proteins in the placenta thus ensuring an adequate iron supply to the growing fetus even in the anemic mother. Our study thus gives a new insight regarding anaemia in newborn. There are some limitations in our study. We did not assess the sr.ferritin status of the mother and baby directly and it was assumed that iron deficiency was the cause of anemia. However, it is likely that mothers who were anemic during labor had poor iron intake throughout their pregnancy and that this was reflected in the cord hemoglobin. Further studies from this area which assess the maternal and fetal sr.ferritin levels would help to give a more accurate idea of the dynamics of iron accumulation in the fetus.

**CONCLUSION**

Anemia is frequently observed during pregnancy. The study enabled the research to identify the association between maternal haemoglobin level and pregnancy outcome. Based on statistical findings, it is evident that maternal iron and hemoglobin levels do have a significant impact on neonatal hemoglobin and Sr. iron.

**REFERENCES**