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

Pagadpally Srinivas[1], Srinivasan P[2], Rajalakshmi L[3]

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 anaemaia 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 womenmay be anaemic before conception.

Causes of anemia during pregnancy in developing countries are multifactorial. This include nutritional deficiencyie (iron, folic acid and B12) and parasitic diseases such as malaria, hook worm infestation.[2] However micronutrient deficiency, especialy iron deficiency anemia is main cause foranemia 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 possibe.

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 hepicidin, when hepicidin concentration are low, iron enters blood plasma at high rate, when hepicidin concentration is high ferroprotein is internalized and iron is trepped 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.[5] 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 hemogoblin,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.

MATERIAS 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 asses the Hb,TIBC and serum iron of pregnant mother, to asses the cord blood Hb,TIBC and serum iron and to compare the both.

200 women were randomy 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

[1]Associate Professor and Head, [2]Post Graduate (DCH), Department of Paediatrics, [3]Lecturer, Department of Pathology, Vinayaka Missions Medical College and Hospital, Karaikal, Pondicherry State, India

Corresponding author: Dr. Pagadpally Srinivas, 27, Vellai Pillaiyar Koil Street, Kottucherry, Karaikal, Pondicherry State, India.

How to cite this article: Pagadpally Srinivas, Srinivasan P, Rajalakshmi L. Impact of maternal anemia at term on neonatal hemoglobin, sr.iron and total iron binding capacity. International Journal of Contemporary Medical Research 2016;3(1):160-162.

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

Inclusion criteria

Pregnant women who were clinicalyanemic**,** HIVnegative**,** Nonsmoingandwho 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 consist 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 cuttoff value for serum iron (35 -145) for that pregnant women and (150 -220µ/dl) for the newborncutoff 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 collectedimmediatey after the pregnant women admitted into the labour ward at 38 week of gestation. haemoglobin concentration was measure using the autoanalyser modeon 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-verson-16.The descriptive data were expressed as mean±SD. A probability value of P<0.05 was considered to indicate statisticaly 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 haemoglobin and significant p-value P<0.001. Table 3 describes Pearson coreation –coefficent 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

	Anemic group	SD	Non-anemic group	SD
Mothers Hb				
Mean	8.2		12.3	
Minimum Hb	7		10	
Maximum Hb	9	0.71	14.8	1.6
Mothers serum iron				
Mean	31.8		114.04	
Maximum Hb	12		49	
Maximum Hb	40	5.27	200.4	31.84
Mothers TIBC				
Mean	489.23		284.15	
Minimum Hb	402		256	
Maximum Hb	800	82.98	458	28.64
P-vaue <0.001				

Table-1: Pregnant mother haemoglobin,sr.iron, tibc parameter

Haemogobin	Mean	SD	P-Value
Anemic	10.873	1.16	
Non-anemic	16.959	1.5	P<0.001

Table-2: Parameter of newborn of anemic and non anemic mothers

	Coreation between	Pearson coreation -coefficent	P-vaue
1	Maternal Sr.iron and Hb	0.945	P<0.001
2	Maternal Sr.iron and TIBC	-0.739	P<0.001
3	Foetal Sr.IRON and TIBC	-0.820	P<0.001
4	Maternal Sr.Iron and foetal Sr.iron	0.779	P<0.01
5	Foetal Sr.iron and Hb	0.836	P<0.01

Table-3: Pearson coreation – coefficent between maternal and foetal Hb, Sr.iron, TIBC

at an earlier age than babies born to non-anemic mothers.[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.[2,3] It is thought that iron is actively transported from mother to fetus.[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 thatmaternal iron and hemoglobin levels do have a significant impact on neonatal hemoglobin and Sr. iron.

REFERENCES

1. World Health Organization. The prevalence of anaemia in women: a tabulation of available information. 2nd ed. Geneva: World Health Organization, 1992.
2. Kapil, U, Pathak, P, Tandon, M, Singh, C, Pradhanb, R & Dwivedi, SN. Micronutrient deficiency disorders amongst pregnant women in three urban slum communities of Delhi. Indian Pediat 1999;36:983–989.
3. Agarwal KN, Agarwal DK, Mishra KP. Impact of anaemia prophylaxis in pregnancy on maternal hemoglobin, serum ferritin and birth weight. Indian J Med Res 1991;94:277–80.
4. Evans P1, Cindrova-Davies T, Muttukrishna S, Burton GJ, Porter J, Jauniaux E. Hepcidin and iron species distribution inside the first-trimester human gestational sac. Mol Hum Reprod 2011;17:227-32.
5. Harris ED. New insights into placental iron transport. Nutr Rev 1992;50:329–31.
6. Al-hilli N.M. The Effect of Maternal Anaemia on Cord Blood Haemoglobin & Newborn Birth Weigh Karbala. Journal of Medicine 2010;2:8-9.
7. Reihaneh H, Norimah AK, Poh BK, Firoozehchian F, Raheleh H, Akaberi A. Haemoglobin and serum ferritin levels in newborn babies born to anaemic Iranian women: A cross-sectional study in an Iranian hospital. Pakistan J Nutr 2010;9:562–6.
8. Akaberi A. Haemoglobin and serum ferritin levels in neworn babies born to anaemic Iranian women.Pakistan J Nutrition 2010;9:562.
9. AdewumiAdediran, Abidoye Gbadegesin, Titilope A. Adeyemo, Akinsegun Akinbami, Vincent Osunkalu, Ann Ogbenna, and Alani S. Akanmu. Cord blood haemoglobin and ferritin concentrations in newborns of anaemic and non-anaemic mothers in Lagos, Nigeria. Niger Med J 2013;54:22–26.
10. Kilbride J., Baker T.J., Parapia L.A., Khoury S.A., Shuquaidef S.W., Jerwood D. Anemia duringpregnancy as a risk factor for iron-deficiency anemia in infancy: a case-control study in Jordon. Int J Epidemiol 1999;28:461–468.
11. Sareen A, Mahajen K, Singh S. 2013. Maternal anemia and its effect on cord hemoglobin. Indian Medical Gazette.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 03-12-2015; **Published online**: 17-12-2015