ORIGINAL ARTICLE

MEAN CORD HEMOGLOBIN AND SERUM FERRITIN IN NEONATES BORN TO ANEMIC MOTHERS PRESENTING AT TERM

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ABSTRACT

BACKGROUND: Anemia in pregnant women is a major challenge to obstetric care in developing nations. Maternal iron deficiency is a main reason of maternal and neonatal morbidity and mortality. There is a considerable relationship among maternal and cord hemoglobin and ferritin levels. Objective of this study was to determine mean cord hemoglobin and serum ferritin of neonates and mothers.

METHODS: This descriptive cross-sectional study of 60 women was carried out in the Department of Obstetrics and Gynecology Fauji Foundation Hospital Rawalpindi. The study was conducted from 25-06-2015 to 24-12-2015 Patients admitted at term were selected by consecutive non-probability sampling technique. A thorough history and examination was done for inclusion and exclusion criteria. Enzyme linked immunosorbent assay (ELISA) technique was used for ferritin assay .The maternal and cord blood samples were discarded after analysis.

RESULTS: Mean age of the patients was 32.63±3.58 years; mean gestational age was 38.28±0.90 weeks. Larger part of the patients were having gravidity 2-5 and Para 1-4. Mean±SD of neonatal serum ferritin was 86.15±54.86, mean cord hemoglobin 16.15±2.18, mean maternal hemoglobin was 8.99±1.09 and mean maternal ferritin was 7.33±2.11.

CONCLUSION: Maternal anemia has negative effects on cord blood Hb and serum ferritin in neonates.

KEY WORDS: Anemia, Hemoglobin, Serum ferritin, Neonates.

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INTRODUCTION

Anemia in pregnancy is defined as hemoglobin concentration of < 11 g/dl[1]. As indicated by statistics it influences more than 56 million women all around[1]. Two third of the affected women belong to Asia[1]. The prevalence worldwide in pregnant women is 41.8%. In the reproductive age group women it is 30.2%. The prevalance exceeds 40% in Asian pregnant women[2]. Anemia is less common in European women. (18.7%)[2]. There are different reasons for anemia including infections, heamglobinopathies, poor nutritional status and dietary inadequacy of supplements like iron, B12 and folate[2]. Maternal anemia is related with pre term births,fetal growth restriction and risks of perinatal morbidity and mortality .The reason is impaired oxygen supply to placental tissue[3]. The demand of iron of pregnant women is more, which makes them vulnerable to iron deficiency[3]. Pregnancy causes plasma volume expansion, erythropoiesis is increased and there is increased demand of fetoplacental unit[3]. Hepcidin controls the exchange of iron from maternal plasma to fetal circulation through placenta[3]. The maximum transfer of iron to baby is after 30 weeks of development. This relates to the maximal iron absorption because of falling serum ferritin levels between 12 and 15 weeks presumably because of usage of iron for development of maternal and fetal red cell masses[3].

Serum ferritin is a stable glycoprotein. It reflects the stores of iron in the absence of inflammation[3]. It is the first laboratory test tat becomes abnormal when iron stores dcrease and it is not influenced by iron ingestion[3]. Estimation of serum ferritin levels are considered a good index of iron stores[3]. The requirement of iron of pregnant women is 1000 mg for each dl for satisfying the extending blood volume and fetal blood cell mass[4]. The absorption of iron increases during pregnancy yet 50 percent of women worldwide have anemia and iron exchange to the baby is effected[4].

Iron deficiency anemia, the commonest cause of anemia in pregnancy can be effectively prevented by oral iron supplements in doses of 30-40 mg ferrous iron. It should be taken between meals from pregnancy onset till the delivery of the baby.This study was conducted to determine mean cord hemoglobin and serum ferritin of neonates and mothers.

MATERIAL & METHODS

This descriptive cross-sectional study was carried out in the Depart-

ment of Obstetrics and Gynecology Fauji Foundation Hospital Rawalpindi from 15-6-2015 to 24-12-2015 .Sample size of 60 patients was calculated by taking 95% level of confidence, 12.54±2.54 (population Mean±SD) and precision of 0.012. The study was conducted after approval from hospital ethical and research committee. Informed written consent was taken from the subjects. Subjects in the study were given numbers, rather than using their original names and these numbers and the data kept confidential and used for this study purpose. Patients admitted at term were selected by consecutive non-probability sampling technique. A thorough history and examination was done for inclusion and exclusion criteria. The study included subjects who attended the labour room at 37 to 40 weeks of gestation. Women that were included in the study were assessed and followed up in labour. After delivery of the baby, cord clamped and cut immediately and sample taken for haemoglobin and serum ferritin levels. Five milliliters of blood was collected from pregnant subjects and 2 ml from the cord blood of their newborns into ethylene-diaminetetraacetic acid (EDTA) for haemoglobin and in plain bottles for ferritin levels analysis, respectively. Haemoglobin concentration measured by Sysmex autolyser model KX-21N on same day of collection of sample. For serum ferritin assay blood was centrifuged, sera separated and stored at -40 before analysis. Enzyme linked immunosorbent assay (ELISA) technique was used for ferritin assay .The maternal and cord blood samples were discarded after analysis.

All data was analyzed using software SPSS 22. Descriptive statistics were calculated. Mean and standard deviation along with Coefficient of variation was calculated for quantitative variables that is neonatal serum ferritin, cord haemoglobin, and maternal haemoglobin and ferritin.

RESULTS

Mean age of the patients was 32.63±3.58 years, mean gestational age was 38.28±0.90 weeks (Tables 1-2). Mean±SD of neonatal serum ferritin was 86.15±54.86, mean cord haemoglobin 16.15±2.18, mean maternal haemoglobin was 8.99±1.09 and mean maternal ferritin was 7.33±2.11 (Table-3).

TABLE 1: AGE WISE DISTRIBUTION OF PARTICIPANTS (n=60)

Age (Years)	Frequency	Percentage
25-35	41	68.3
36-41	19	31.7
Total	60	100.0
Mean±SD	32.63±3.58	

TABLE 2: GETATION WISE DISTRIBUTION OF PARTICIPANTS (n=60)

Gestational Age (week)	Patients	Percentage
37-38	33	55.0
39-40	27	45.0
Total	60	100.0

TABLE 3: MEAN VALUES OF NEONATAL AND MATERNAL VARIABLES

Variables	Mean	S.D	C.V
Neonatal serum ferritin	86.15	54.86	63.6%
Cord haemoglobin	16.15	2.18	13.5%
Maternal haemoglobin	8.99	1.09	12.1%
Maternal ferritin	7.33	2.11	28.8%

DISCUSSION

Causes of anaemia during pregnancy in developing countries are multi-factorial. This include nutritional deficiencies (iron, folate and vitamin B12), and parasitic diseases such as malaria and hookworm infestation[6]. However, micronutrient deficiency, especially iron deficiency, is believed to be the main underlying cause for anaemia in pregnancy[7]. Pregnant women are particularly vulnerable to iron deficiency as a result of the increased demand for iron. The expansion of plasma volume, increase in erythropoiesis and increased demand of the foeto placental unit for iron occur throughout gestation and can vary markedly between individuals[8].

Due to haemodilution and mobilisation of iron, serum ferritin concentration in women with adequate iron stores at conception initially rises, then falls progressively by 32 weeks to about 50% pre-pregnancy levels, to rise again mildly in the third trimester[9].

Iron transfer to the fetus occurs maximally after 30 weeks of gestation corresponding to the time of peak efficiency of maternal iron absorption following a considerable fall in serum ferritin level which occurs between 12 and 25 weeks of gestation[10]. This probably occurs as a result of iron utilization for expansion of the maternal and fetal red cell masses[10].

In present study, the mean cord blood haemoglobin concentration which also lower, in the anaemic mothers (16.1±2.1 g/dl). Since iron deficiency usually precedes iron-deficiency anaemia, it may mean that many of the newborns who were not anaemic at birth were born with low iron store which may not be able to sustain the babies through 6 months, accounting for the high prevalence of anaemia in 6-9 month-old children[11].

It is well established that serum ferritin is an indicator of the level of body iron sores[12]. Thus, the lower level of ferritin in newborns delivered from anaemic mothers suggests reduced iron stores in these newborns. Additionally, the newborns delivered from anaemic mothers had a lower

concentration of hemoglobin that might contribute for a decreased amount of recycled heme iron resultantly decreasing its contribution for the iron pool. Here, Terefe et al[13] were not surprised to see no statistically significant difference in prevalence of anemia among newborns of the two groups of mothers. This is because visible difference that can be evidenced in the form of anemia is not expected at such an early stage in life[14]. However, later in life, anemia prevalence could be different among newborns from the two groups of mothers since newborns are highly dependent on the stored iron acquired from the mother during pregnancy till the age of 6 months[15,16].

In this study, we determined that the deleterious effect of maternal anaemia may extend beyond pregnancy, in Pakistani context. This suggests the need for strengthening strategy to improve the maternal iron status. Improving the nutritional status of pregnant women could have a positive impact on improving the iron status of the mothers and also their newborns. The other option might be delayed clamping of the umbilical cord after birth for improving the iron status of young infants[17].

CONCLUSION

In conclusion, we found out that maternal anaemia has negative effects on cord blood Hb and serum ferritin concentrations in neonates.

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CONFLICT OF INTEREST

None declared.

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NIL

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.