

Iron Status in Newborns Born to Iron-Deficient Mothers

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Abstract

Background: Iron deficiency anemia is one of the important problems during pregnancy. Iron deficiency has several adverse effects on pregnant women and their newborns.

Objective: To determine the status of iron store in newborns born to mothers with iron deficiency anemia.

Methods: In a cross-sectional study, 90 mothers were categorized into three groups according to their pre-delivery hemoglobin and serum ferritin concentrations. Those with Iron-Deficiency Anemia (IDA) were defined as a hemoglobin concentration (Hb) <11 g/dl and serum ferritin concentration (SF) of <10 ng/ml; those with non-anemic iron deficiency (NIDA) with an Hb of ≥ 11 g/dl and SF of <10 ng/ml; and those mothers with normal Hb and iron status, defined as an Hb ≥ 11 g/dl and a SF ≥ 10 ng/ml, who were treated as normal control. Then cord bloods of the newborn were compared among the three groups.

Results: Significant differences were found in mean Hb ($p < 0.01$) and SF ($p < 0.03$) among normal control and IDA, with the lowest values found in neonates born to mothers with iron deficiency anemia.

Conclusions: Contrary to previous beliefs, the iron status of mothers can influence their babies.

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Introduction

Iron-deficiency anemia in pregnant women continues to remain a major preventable cause of unfavourable perinatal outcome in several developing countries. It has been believed for a long time that maternal iron deficiency has little or no effect on the acquisition of iron by the fetus.^{1,2} However, a number of investigators have found a positive correlation between maternal and newborn iron status, suggesting that the fetus is vulnerable to iron deficiency during the intrauterine life.^{3,4} Poor iron stores at birth may predispose these infants to iron-deficiency anemia in early infancy

that may have long-lasting effects on the development of their cognitive functions.^{5,6} Furthermore, iron deficiency impairs the cell-mediated immune response.⁷

Considering the high prevalence of iron deficiency anemia in Iranian women, particularly during pregnancy, we conducted this study to determine iron stores of newborns of mothers who suffered from iron-deficiency anemia.

Patients and Methods

Ninety mothers and their newborns were randomly selected from Fayyazbaksh Hospital, Karaj, Iran. They mostly belonged to the middle- or low-income groups from an urban population.

Mothers and newborns with hepatitis or renal disorders, mothers with obstetric complications known to affect birth weight and/or gestation, as well as mothers who withdrew from giving a written consent were excluded from the study.

Ninety mothers aged between 17 and 40 years were divided into three groups according to their pre-delivery hemoglobin (Hb) and serum ferritin (SF) concentrations: Mothers with iron deficiency anemia with Hb < 11 g/dl and SF < 10 ng/ml (IDA group); those with non-anemic iron deficiency with Hb ≥ 11 g/dl and SF < 10 ng/ml (NIDA group); and normal control group with Hb ≥ 11 g/dl and SF ≥ 10 ng/ml.

When the mothers were admitted for delivery, blood samples were obtained for measurement of Hb and SF. Concurrently, cord blood was obtained for determination of Hb and SF.

Hb was measured by the standard cyanmethemoglobin technique. SF was estimated by IRMA technique.

Results

There was significant ($p < 0.01$) difference between mean Hb of neonates born to mothers of normal control and IDA groups. A significant difference was also found in mean SF ($p < 0.03$) of newborns born to mothers of normal control and IDA groups, with the lowest values observed in neonates born to mothers with IDA. No significant difference ($p = 0.41$) was observed among mean birth weight of newborns in the three groups.

Discussion

All term infants are assumed to have sufficient iron during the first three months since most of the total body iron is contained within the circulating Hb. After three months of age, iron stores are usually mobilized to meet the erythropoietic demands of an expanding total Hb mass because breast milk is not

sufficient to meet the demands of growth. As a result, the level of plasma ferritin declines. Infants with small iron stores will deplete iron earlier than those with ample iron store. Therefore, anemia during perinatal period may be a risk factor for development of iron deficiency anemia in infancy.^{6,8} Thus, it seems that there is a limit to the otherwise highly efficient mechanism which transports iron from mother to fetus below which the fetus is born with less than optimal iron endowment. On the other hand, active iron transport seems not able to compensate for deficient iron in moderate or severe anemic mothers.

The present study showed that the mean cord Hb and the cord SF were significantly different between normal control and IDA groups. This demonstrated the influence of maternal anemia on iron accretion in the fetus. Similarly, it has been shown by other investigators that with increasing severity of maternal anemia, the fetus accumulates less and less iron as supported by the finding of markedly low levels of Hb and SF in the cord blood of more severe anemic women.^{3,4,9}

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