

Assessment of relationship between Iron deficiency and preterm labor

Nazli Navali

Assistant professor of Obstetrics & Gynecology, Women's Reproductive Health Research Center, Department of Obstetrics & Gynecology, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

navalin@yahoo.com

Abstract: Preterm labor is important in a predication of neonatal mortality. In united state of America it's relieved that the mortality rate of neonates has direct relation with frequency of low birth weight neonates and preterm labor. Neonates mortality and sever morbidity or both, before 26th weeks of pregnancy occur in most of neonates and before 24th weeks of pregnancy occur approximately in all of them. It is prominent that prenatal care cost considered as national cost, for this reason frequent studied design to decrease this costs, neonatal mortality and preterm labor. The aim of this study is to determine the relation between iron deficiency anemia and preterm labor and Lab finding in iron deficiency anemia and preterm labor too. In this study, at 2005 year, 200 pregnant women in Tabriz Al-Zahra and Taleghani OB hospitals with cooperation of Al-Zahra laboratory undergo a cohort and case control study, all women base on delivery type divided into two groups, one 100 women with term delivery and other 100 women with preterm delivery. Assessment of serum iron, total iron binding capacity (TIBC), Ferritin, hemoglobin and hematocrit were done in all women before delivery. Within the main part of study, we determine the frequency of neonate's gender, weeks of pregnancy and age of mothers. In relation between delivery type (preterm or term) and serum iron, hemoglobin and hematocrit, we came out P_Value equal to <0.001, 0.004 and <0.001, respectively that show pregnant women with preterm delivery have low serum iron, hemoglobin and hematocrit in comparison with women with term delivery, but in relation between serum ferritin and TIBC P_Value was 0.987 and 0.930, respectively that had no statistical significance. In group with preterm labor, 62% of neonates were male and 38% was female. The major part of mother of this group is in third's decade of life. Respectively 31%, 19% and 50% of mother with preterm labor had borne her neonate in 26-30, 31-33 and 34-37 weeks. It seems that relation between iron deficiency anemia in pregnancy and delivery type is deniable. However, to show its relation more studies must be performed in this field.

[Nazli Navali. **Assessment of relationship between Iron deficiency and preterm labor.** *Life Sci J* 2012;9(4):1778-1781] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 270

Keywords: Species richness; beta-diversity; taxonomic diversity; forest

1. Introduction

Preterm labor is a major cause of infant mortality and morbidity .Due to unknown causes and mechanisms of preterm labor the primary prevention is not always possible However some studies of has shown its association with the iron deficiency anemia(Scott, 2003).

Iron is an essential element for all cells. In the lack of iron the production of the hemoglobin in erythroid cells will be interfered thus the transfer of the oxygen to the cells decreases

Iron deficiency anemia is the most common cause of acquired anemia in pregnant women and it is seen in 15 to 25 percent of pregnancies .Iron deficiency is suspected when the mean corpuscular volume (MCV) of less than 80 mg/m^2 .

According to Barker et al (1995) Anemia may cause cardiovascular disease in adulthood (Barker, 1995) Kadyrov and colleagues (Kadyrov, 1998) have also provided evidence that maternal anemia can cause changes in the placental vascular structure with changes in the angiogenesis in early pregnancy.

Scanlon and colleague have studied hemoglobin levels of mothers of neonates with preterm labor or neonates with intra uterine growth restriction in 173031 pregnancies in 2000(Scanlon, 2000). the hemoglobin levels less than 2 standard deviation in 12th week of pregnancy was associated with 1.7 fold of increased preterm labor however the high hemoglobin levels (more than 3 standard deviation) in the 12 -18th weeks of was associated with preterm labor with 1.8 fold of increased preterm labor.

2. Material and Methods

In a cross sectional case control study in gynecology department of Tabriz University of medical sciences, we studied the role of iron deficiency anemia in preterm labor of pregnant women.

200 pregnant women divided into two groups randomly. Group 1 (term delivery, control group) and group 2(preterm delivery, case group)

Women with obstetric complications such as multiple pregnancy, polyhydramnios, placenta previa,

diabetes mellitus and preeclampsia were not initially enrolled in the study groups.

Before delivery, venous blood samples of 5 ml were collected from all patients and the following factors were studied: serum iron (SI), hemoglobin (Hg), hematocrit percent (Hct), total iron binding capacity (TIBC) and serum ferritin (SF).

Iron and TIBC kits was made in ZistShimi company, and the normal ranges for the Iron in pregnant women was 40 -155 $\mu\text{g/dl}$, and the normal range for TIBC in the pregnant women was 220-450 $\mu\text{g/dl}$.

For quantitative measurement of the serum ferritin we used immunoassay method with the Ferritin kits made by RADIM company, the normal ranges of ferritin was 17-390 ng/ml for men, 10-90 ng/ml for premenopausal women and 10-150 ng/ml for menopause women.

All the collected data was analyzed with SPSS software version 13 .we used independent sample t-test for analyzing association between type of the delivery with the serum iron level, TIBC, serum ferritin and hematocrit, we also used chi square test for defining the neonate weight with maternal age and the delivery weeks . P value less than 0.05was considered significant, and it was assumed highly significant less than 0.001.

3. Results

In a case control study we studied 200 pregnant women in the form of two groups, group 1 100 women with term delivery and group 2,100 women with preterm delivery.

The mean serum iron in all studied cases was $287.59 \pm 308.19 \mu\text{g/dl}$ in the range of 22 -1361 $\mu\text{g/dl}$. The mean serum iron in women with term pregnancy was $407 \pm 386.30 \mu\text{g/dl}$ and in women with preterm pregnancy was $168.18 \pm 113.52 \mu\text{g/dl}$ which was significantly higher in women with term pregnancy ($P < 0.001$). This indicates that serum iron level in pregnant women is a risk factor for preterm delivery.

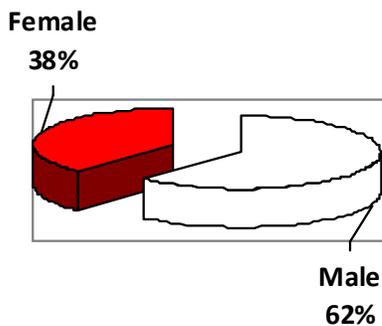


Chart 1. Gender of infants with preterm labor

The mean TIBC level for all studied cases was $111.61 \pm 327.27 \text{ mg/dl}$, the mean TIBC level in the term group was $111.24 \pm 362.65 \text{ mg/dl}$ and the preterm delivery group was $111.98 \pm 289.45 \text{ mg/dl}$,there was not significant difference between two groups in TIBC levels($P=0.987$).

The mean ferritin in the all studied cases was $22.92 \pm 2.0008 \text{ ng/ml}$.the mean ferritin levels was $23.05 \pm 22.99 \text{ ng/ml}$ in the women with term delivery and $22.8 \pm 16.6 \text{ ng/ml}$ in the preterm delivery group which was not significantly different($p=0.930$) which indicates no relationship between Ferritin level and type of the delivery.

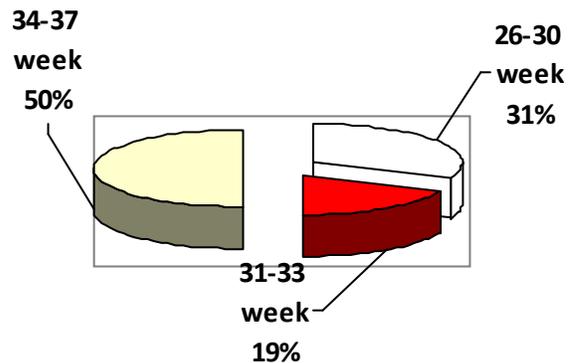


Chart 2. Frequency pregnancy age of patients with preterm labor

The mean hemoglobin level in all the women we studied was $13.022 \pm 1.15 \text{ gr/dl}$. The mean hemoglobin level in the group with term delivery was $13.324 \pm 0.94 \text{ gr/dl}$ and in the group with preterm delivery was $12.69 \pm 1.25 \text{ gr/dl}$.

The mean hematocrit in all 200 cases was 39.80 ± 3.4 percent and the hematocrit mean level in women with term delivery was $40.5 \pm 2.94 \text{ gr/dl}$ and in the preterm delivery it was $39.1 \pm 3.8 \text{ gr/dl}$ which was significantly higher in the term delivery group ($p=0.004$).

Gender of infants with preterm labor was shown in chart 1. Frequency pregnancy age of patients with preterm labor was shown in chart 2.

In this study, infant sex, birth weight, maternal age, birth week, was found only in patients with preterm labor. Average age of the mothers with preterm delivery was 26.81 ± 5.38 years. The offspring of pregnant women with preterm labor 62 baby boys and 38 baby girls that male to female ratio (M / F) in women with premature labor was 1/6 respectively. Mean weight gain of preterm delivery, $2054.1 \pm 619.66 \text{ gr}$ results suggest that the relationship between sex and birth weight of infants

was not significant ($P=0.791$). Relationship between sex and gestational age was not significant ($P=0.543$).

4. Discussions

The present study is designed to the measurement of parameters of the iron deficiency anemia in preterm delivery and its aim was the answer to the question that is there a relationship between iron deficiency anemia and preterm labor?

Lieberman and colleague stated that in black women there is straight relationship between low hematocrit levels and the rate of preterm labor is also found that anemia is an indicator of nutritional deficiencies Anemia may be associated with fetal growth restriction (Lieberman, 1987). In our study there was a significant relation between the hematocrit level and the type of the delivery

Klebanoff and colleagues examined the association between hematocrit and risk of preterm delivery, stated that the Incidence of preterm delivery in women was almost twice (adjusted odds ratio=1.9) (Klebanoff, 1991).

In the study of Lu et al, it has been stated that in the first half of the pregnancy hematocrit (less than 37%) is associated with the high incidence of the preterm labor in a weekly manner(Lu, 1991).

The results of this study differ from the results of our study in the hematocrit level. in our study women with preterm labor had a low levels of hematocrit that can be due to the low population of our study and also this can be as a result that in our study only 3 women with preterm labor had high levels of hematocrit and in the term delivery group 2 women had a high levels of the hematocrit.

In the study of Murphy and colleague in Wales it has been stated that low levels of hemoglobin is associated with higher risk of the preterm labor (Murphy, 1986).

In our study the women was not controlled exactly from the beginning of the pregnancy and blood sampling was done before the delivery. So we can not evaluate the association of anemia and hemoglobin levels and the type of the delivery and we can just state that women with preterm labor only have Low levels of hemoglobin and hematocrit.

Scholl and colleague have studied that women with iron deficiency anemia is at the risk of preterm labor two times more than other normal women(odds ratio=2.66)while there was not a relationship between other causes of the anemia(Scholl, 1992).

In our study all the factors associated with the iron deficiency anemia, especially serum ferritin levels are studied. But the women were not categorized upon the anemia, and they were divided into two groups upon their type of the delivery. As a result women with preterm labor had low levels of

the hemoglobin and hematocrit, but the data was not meaningful about the serum ferritin and there was not a significant relationship.

The ferritin levels were so similar in two groups of the delivery and there was not a significant relationship between ferritin levels and the type of the delivery.

In a study by the Anupam Goel and his colleague, its is stated that in women with preterm labor there was a low level of the serum Iron while the difference between the two groups was not significant in their ferritin levels(Goel, 2003).

In our study similar the above study the serum iron levels was lower in the women with preterm labor and there was not significant difference in the ferritin levels in two groups.

In a study that was done in the USA in 2000, it is stated that the risk of birth of a preterm neonate in women with low hemoglobin is increased in first and second trimester. These data consider the significance of anemia and High levels of hemoglobin as an indicator for adverse pregnancy outcome (Lieberman, 1987).

In our study, the mean hemoglobin level for women with term delivery was 13.23 while this parameter was 12.69 for women with preterm labor and was significantly lower for these women (preterm labor).

Scholl & Hediger and colleagues stated that there is no relationship between the iron deficiency anemia and the preterm labor in this time (Scholl, 2005).

Zhou and colleague examined the contributing factors in the preterm labor and stated that there is a U shape relationship with the hemoglobin of mothers in the early pregnancy and the risk of the preterm labor, and when the hemoglobin level is considered in the 5 to 8 months of the pregnancy and proper treatment plans is made, the risk of the preterm labor is reduced significantly (Scholl, 1994).

Klebanoff and colleague with examining the 35000 pregnant women have stated that there is a relationship between the low hemoglobin levels in early pregnancy and high hemoglobin level in late pregnancy and the risk of the preterm labor (Garn, 1981).

The findings of this study was different from our study in the results of the last trimester of the pregnancy which stated that low hemoglobin levels was associated with preterm labor even in presence of high hematocrit levels.

The results of the study conducted by Singh and colleague reveals that the prevalence of the preterm labor is higher in women with anemia in comparison without anemia. This study also states that there is not significant difference in other neonatal complications between two groups (Singh, 1998).

The results of this study were matched with the results of our study and the time of measuring the parameters indicating the anemia was similar in two studies.

Conclusion

In the mothers with preterm labor the serum iron levels was lower in comparison with mothers with term labor, hemoglobin and hematocrit levels was also lower in women with preterm labor.

Serum TIBC and Ferritin levels was not different in women with preterm labor and women with term delivery indicating that these factors has no effect on the result of delivery.

Corresponding Author:

Dr. Nazli Navali

Women's Reproductive Health Research Center, Department of Obstetrics & Gynecology, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

E-mail: navalin@Yahoo.com

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9/29/2012