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ROLE OF IRON DEFICIENCY ANEMIA IN CHILD-BEARING WOMEN ON NEONATAL WEIGHT

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ABSTRACT

Iron deficiency is one of the most common nutritional problems in the world. It is frequently found in both developed and developing countries and mainly affects women of childbearing age. The aim of this study was to investigate the relationship of iron deficiency anemia in pregnant women on neonatal weight. The study subjects were a group of 241 women aged between 20 and 34 years who were divided to anemic (118 subjects as case) and non-anemic (123 subjects as control) groups. Iron deficiency anemia was determined by measurements of plasma ferritin, T.I.B.C., total iron, hemoglobin and hematocrit, and subsequently the weight of the neonate was also determined. Results showed that depleted iron stores in the anemic group has no statistically significant effect on neonatal weight (t-test= 0.73, D.F.= 239, $p>t=$ 0.4654).

Lower, depleted iron stores were observed in the anemic group with high parity and decreased intervals of pregnancy. It is concluded that the occurrence of iron deficiency anemia in pregnant women during the third trimester has no relationship with neonatal weight, but according to some published results this relationship exists during the first trimester.

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INTRODUCTION

Iron deficiency is probably the most common form of nutritional deficiency in both developing and developed countries. It is reported to be the most common cause of anemia. There are relatively few adequate studies on the prevalence of iron deficiency and it's consequences on various populations. It afflicts persons of all ages and economic groups, although it is more common among the very young, among those on poor diets, and among women.[1,2,9]

The most commonly employed screening procedure has been a simple blood hemoglobin determination. Employing this test, the World Health Organization (WHO) defined anemia as a value below 14 g/dL in men, 12 g/dL in nonpregnant women, and 11 g/dL in pregnant women.[9] Such a screening method cannot, by definition, detect latent iron deficiency. Iron deficiency anemia occurs when iron stores of the body are not sufficient for normal erythropoiesis, and erythrocyte production declines as iron stores are depleted. Therefore iron deficiency anemia appears after the occurrence of iron deficiency in the circulation.[7,8] As body iron stores become depleted completely, erythrocytes in the circulation become hypochromic and microcytic; also, plasma iron and ferritin levels decline and percent saturation of transferrin decreases by 15% or more. In most developed countries, iron deficiency anemia has a high prevalence, and based on plasma iron determinations 3% of men, 20% of women and above 50% of pregnant

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women are anemic; based on plasma ferritin determinations, 35% of children, 30% of adults, 30% of menstruating women, 60% of pregnant women and 30% of men are afflicted with iron deficiency anemia.[9]

Normal pregnancy is always accompanied by prominent hematological changes, one of which is an increase of more than 50% in the volume of plasma which occurs mostly in the second trimester of pregnancy. Plasma volume increases more compared to red blood cell mass.[5,6] This increment causes a physiological decrease in hematocrit; therefore the requirment of iron for mother and embryo is increased, and at the third trimester of pregnancy, as the transfer of iron from mother to embryo increases, the requirement of iron again increases for the mother.[2]

The center for control of disease in the United States in 1990 has defined iron deficiency anemia during pregnancy as follows: hemoglobin concentration <11 g/dL, hematocrit<34%, TIBC>400 μg/dL, transferrin percent saturation
and plasma ferritin concentration <10 μg/dL.

Iron deficiency anemia has a strong relationship with decreased energy and iron intake in the first trimester of pregnancy. Low birth weight (L.B.W.) in childbearing women with iron deficiency anemia increases three-fold and premature labor also shows a two-fold increase in comparison to non-anemic pregnant women.[3,4] For a neonate at the onset of birth, normal weight is >2500 grams; therefore a neonate with L.B.W. has a body weight below 2500 grams, which can be a result of iron deficiency anemia in pregnancy.[6]

MATERIALS AND METHODS

Patients

In this study 241 pregnant women were selected from all pregnant women referred to the Kowsar Maternity Hospital in Ghazvin (Iran) during the last 6 months of 1998.

The study subjects were selected based on some factors such as: number of pregnancy (only first and second pregnancy), interval between pregnancies (at least 2.5 years), mother height and weight, history of iron intake and gestational age. All the study subjects were divided into two groups; the iron deficient anemic childbearing women (118 cases) were selected experimentally and the control group were selected from normal non-anemic pregnant women (123 cases).

Serum samples

Blood samples were collected from the study subjects for determination of hemoglobin and hematocrit, serum ferritin, iron, TIBC and transferrin percent saturation. Total serum iron and TIBC were determined spectrophotometrically and the level of serum ferritin was determined by ELISA according to the Syntron Bioresearch method.

Neonatal weight

The neonate's weight (gram) was determined at the time of birth by a balance scale, calibrated by a standard 2000 grams calibration weight.

Statistics

Analytical statistics (mean determination t-test) and chi-square test were used to compare the data obtained for patients and normal control groups.

RESULTS

In this study 241 pregnant women (control and anemic, who were identified experimentally) were studied. Both groups matched each other by factors such as mother's age, number of pregnancies, pregnancy inter- <15%
vals, and height and weight of the mother.

In Table I, neonate weight is shown in iron deficient anemic childbearing women and the normal control group. In the control group, mean neonatal weight was 3227.92g with an S.D. of 457.15 and in the anemic group this was 3185.36g with an S.D. of 446.37.

In Fig. 1. the infant weight of anemic childbearing women is compared with the normal control group. Results showed no significant statistical difference between

Table I. Neonate weight in anemic and normal control groups.

Neonate weight (g)	Normal control group		Anemic group	
	No.	Percent	No.	Percent
<2500 g	8	6.5	8	8.77
2501-3000g	43	34.95	39	33.05
3001-3500g	45	36.58	38	32.2
>3501g	27	21.95	33	29.96
Total	123	100	118	100

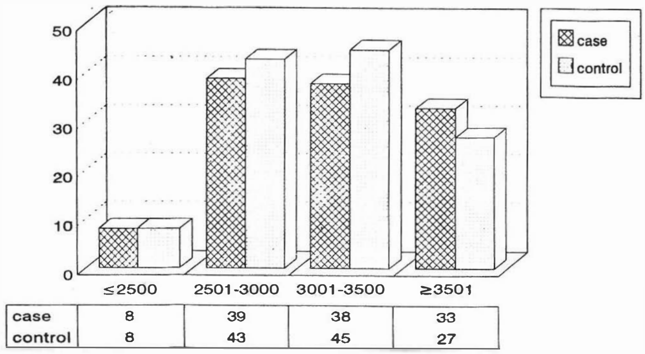

Fig. 1. Neonate weight in anemic and normal control groups.

normal and anemic patients ($p>t= 0.4654$ and t-test= 0.73 with D.F.= 239).

Table II. Gestational age of anemic and normal control groups.

Gestational age (week)	Anemic group		Normal controls	
	No.	Percent	No.	Percent
<37	6	5.08	7	5.69
38	7	5.93	8	6.5
39	19	16.1	17	13.82
>40	86	72.88	91	73.98
Total	118	100	123	100

In this study the gestational age was also investigated. Table II shows the gestational age in anemic and normal control groups. In the anemic group the mean gestational age was 39.77 weeks with a D.F. of 1.29 and the mean gestational age for the normal control group was 39.81 weeks with a D.F. of 1.55.

There was no significant statistical difference between gestational age among anemic and non-anemic childbearing women ($p> t= 0.8208$ and t-test= 0.23 with a D.F.= 239).

Table III. Distribution of pregnancy number in anemic and normal control groups.

Number of pregnancy	Anemic group		Normal controls	
	No.	Percent	No.	Percent
1	46	38.98	69	56.1
2	72	61.02	54	43.9
Total	118	100	123	100

In the anemic group (118 cases), 46 anemic pregnant women with their first pregnancy and 72 anemic pregnant women with their second pregnancy were identified while in the control group (123 cases), 69 women had their first and 54 women had their second pregnancy (Table III).

In the normal control group the mean pregnancy number was 1.4 and for the anemic group this was 1.6 (the Pearson chi-square was 7.4234 and $p= 0.006$). Therefore, there was no significant statistical difference between the number of pregnancies in the anemic and normal control groups.

DISCUSSION

Iron deficiency is reported to be the most common cause of anemia in both developing and developed countries. Iron deficiency anemia has diverse devastating effects on various organs. In this investigation, we have studied the effect of iron deficiency anemia on neonatal weight in 241 pregnant women, 118 with anemia and 123 non-anemic normal controls. Our results indicate that iron deficiency anemia in childbearing women at the third trimester of pregnancy has no effect on the neonate's weight. Some investigations indicate that iron deficiency anemia can cause premature labor, but our finding is supported by other studies which suggest that iron deficiency anemia in the third trimester of pregnancy has no effect on producing premature labor or an L.B.W. neonate.[3,4] It has also been shown that iron deficiency anemia in the first trimester may increase the risk of L.B.W. and premature labor.

It should be borne in mind that high parity with short intervals causes wasting and depletion of calories in childbearing women, which may result in anemia, and such a person may also deliver an L.B.W. neonate.[4] In this study, the parity in each individual of anemic and normal control groups was considered. The results showed that as the parity increases, the prevalence of anemia also increases. As mentioned earlier, the mean pregnancy number in normal control and anemic groups was 1.4 and 1.6, respectively. This little difference indicates that childbearing women with high parity pregnancies are shifted to the anemic group.

As the fetus obtains it's requirements for erythropoiesis from the mother's stores, this condition can affect the mother and the neonate's weight in high parity pregnancies and should be elaborated by more investigations.

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