

Comparison of the Effectiveness of Weekly and Daily Iron Supplementation on Hemoglobin and Serum Ferritin Concentration among Pregnant Women under Control of Rural Health Centers of Mazandaran Province in 2004

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Abstract: Iron deficiency and its related anemia is a major and common problem during pregnancy in different countries such as Iran. Despite of Iron sulfate administration as a supplement drug, anemia is still a common problem in our country. The aim of this study was comparing the effectiveness of weekly and daily iron supplementation on hemoglobin and serum ferritin indexes among pregnant women under supervision of rural health centers of Mazandaran province. This is a randomized controlled field trial study. One-hundred fifty pregnant women were selected among pregnant mothers referred to rural health centers of Mazandaran province. Then they divided in two weekly and daily iron supplementation equal groups. The daily supplemented group received one ferrous sulfate tablet containing 50 mg of elemental iron. The weekly supplemented group, received 2 ferrous sulfate tablets once a week containing 100 mg of elemental iron. Hemoglobin and serum ferritin concentration were measured before and after the intervention and then after 12 weeks of supplementation. Background variables such as previous history of delivery, pregnancy, abortion and anemia and education level were matched between the groups. Collected data were analyzed by SPSS 10 software using single and pair t-test. After 12 week of iron supplementation, the mean hemoglobin changes were 0.45 ± 0.57 mg dL⁻¹ in the weekly supplemented group and 0.49 ± 0.76 mg dL⁻¹ in the daily supplemented group. The difference noted between the groups was not significant ($p > 0.05$). The mean ferritin changes in weekly and daily iron supplemented groups were 6.8 ± 1.37 and 6.39 ± 1.40 , respectively ($p > 0.05$). According to the results and tendency of women to the weekly regimen and less consumption of ferrous sulfate pills in this group, weekly regimen is recommended for supplementation.

Key words: Anemia, pregnant women, iron supplementation

INTRODUCTION

Nowadays, iron deficiency is one of the most common and widespread nutritional disorders among pregnant women in many developing countries around the world like Iran (Schol and Reilly, 2000; World Health Organization, 2000; Kalantari *et al.*, 2001).

Anemia during pregnancy is an important risk factor of morbidity and mortality. Furthermore, it increases the rate of low birth weight and prematurely (Vejdani, 1996; Schol *et al.*, 1992). Pregnant women are needed 5-6 mg/dL/d extra iron supplementation, because of the extra iron required by the fetus, placenta and increased maternal red cell mass in second and third trimester (Fakhri *et al.*, 1999; Yasaei *et al.*, 1987). The ability of the body for supplementation of increased

requirement is depended to several factors such as the amount of iron in daily regimen, quality and bioavailability of iron, absorption efficiency and restoration of iron before pregnancy (Schol and Reilly, 2000; James *et al.*, 2003). Although the absorption of iron is increased during pregnancy (Solomon, 1995) the evidence has been shown that the dietary iron is not sufficient for iron requirements of pregnant women (Sajadi *et al.*, 2001; Bosaghzadeh, 1993). World Health Organization (WHO) has recommended iron supplementation during second trimester of pregnancy as main strategy against iron deficiency anemia during pregnancy in developing countries (De Maeyer *et al.*, 1989). WHO has recommended daily 50-60 mg d⁻¹ of elemental iron for all pregnant women (Stoltzfus and Dreyfus, 1998). From 1983, prescription of iron supplementation during

antenatal period was routine by primary health care services (Ministry of HBI, 2000). Statistical reports of WHO have been shown that, in spite of oral iron supplementation, anemia has remained an important nutritional problem among pregnant women in developing countries (Rebecca, 2001; George, 2000; Yip *et al.*, 1998). One of the reason of giving up or incomplete use of iron supplements by pregnant women is gastrointestinal side effects such as nausea and vomiting. For this reason, in recent years, several studies were done to assess the effectiveness of weekly and daily iron supplementation in pregnancy and among different populations such as pregnant and non-pregnant, children less than 8 year old and preschool aged, with or without decreasing the efficiency (Beard, 1998; Goonewardene *et al.*, 2001; Mumtaz, 2000; Haidar *et al.*, 2003; Gomber *et al.*, 2003; Lopes *et al.*, 1999). The aim of this study was to compare the efficiency of weekly and daily iron consumption among pregnant women under supervision of rural health care centers. If the results of study support weekly regimen, we will recommended this regimen for pregnant women, especially for whom giving up iron supplements due to the side effects.

MATERIALS AND METHODS

This study was a randomized controlled trial. The studied population was 150 pregnant women of Sari Township/Iran that referred to rural health care centers between December 2003 and August 2005 according to a time cycle program planning. After communication with health care center of Sari Township, the antenatal care centers were selected randomly among rural health care centers. Inclusion criteria were pregnant women with 15-16 weeks gestational age, no previous history of blood disorders or anemia. Exclusion criteria were drug intolerance, give up or incomplete drug intake and migration. Then eligible participants who completely informed and signed the letter of satisfaction, were randomly divided in 2 equal groups; 75 cases in each weekly and daily iron supplementation. Background variables such as previous history of delivery, pregnancy, abortion, past history of anemia and education level were matched. Initial measurement of Hemoglobin and serum ferritin concentration was performed for all studied women at the end of first trimester (10-12 w). Measurement of ferritin was done using Radio immune assay (Kite of Iran Kavoshyar Co. and Genesis 5000 set manufactured by American LPI Co). Hemoglobin concentration was determined by Coulter P840 counter set manufactured by U.S.A. Iron prescription was started from 16 weeks of gestation. The control group for daily regimen received

one ferrous sulfate tablet containing 50 mg elemental iron. The weekly regimen group received two tablet of ferrous sulfate containing 100 mg elemental iron. Totally 28 ferrous sulfate tablets (each containing 50 mg elemental iron) were given to daily regimen group and eight tablets to weekly group for one month. After 12 weeks of iron supplementation, the second measurement of serum ferritin and Hemoglobin was performed in both groups. Collected data analyzed by SPSS 10 software and compared using single and pair t-test.

RESULTS

From 150 enrolled pregnant women, 135 completed the study course. Fifteen of the women were excluded during the study period because of the drug side effects, low economic, incomplete drug consumption, migration. From 135 remainders, 65 entered in daily supplemented group and 70 in weekly supplemented group. There was no significant difference between daily and weekly iron supplemented groups from viewpoint of level of education, previous history of abortion and pregnancy ($p>0.05$). Mean serum ferritin and Hemoglobin were not significant differences between the groups ($p>0.05$). Mean Hemoglobin concentration after 12 weeks in the daily regimen increased from 11.53 ± 0.7 - 12.02 ± 0.6 mg dL⁻¹, which was no significant difference statistically ($p>0.05$). At the same time, the mean ferritin in daily group changed from 17.97 ± 3.2 - 24.08 ± 6.5 mg dL⁻¹ that was not significant statistically. The mean changes of ferritin and Hemoglobin in weekly group was not significant statistically ($p>0.05$) (Table 1 and 2). After 12 weeks, the mean changes in daily and weekly groups were 0.49 ± 0.76 and 0.45 ± 0.57 mg dL⁻¹, respectively that were not significant between two groups. The mean changes of ferritin in daily and weekly groups were 6.39 ± 1.40 and 6.8 ± 1.37 mg dL⁻¹, respectively that were not significant between 2 groups ($p>0.05$).

Table 1: Hemoglobin changes before and after intervention in both weekly and daily groups in studied pregnant women

Variables	Daily	Weekly	t-value	p-value
	Mean±SD	Mean±SD		
Hb-1st	11.53±0.7	11.41±0.6	1.85	0.85
Hb-2nd	12.02±0.6	11.86±0.5	0.98	0.32
Hb changes	0.49±0.76	0.45±0.57	0.18	0.84

Table 2: Serum ferritin changes before and after intervention in both weekly and daily groups in studied pregnant women

Variables	Daily	Weekly	t-value	p-value
	Mean±SD	Mean±SD		
Ferritin 1st	17.79±3.2	15.89±5.5	0.73	0.46
Ferritin 2nd	24.08±6.5	22.76±5.5	1.22	0.22
Ferritin changes	6.39±1.4	6.80±1.37	0.20	0.84

DISCUSSION

The aim of this study was to compare the effect of weekly and daily iron supplementation on serum ferritin and hemoglobin levels. The results showed that there was no significant difference in mean of serum ferritin and hemoglobin between the groups. In Muslimatum (2001), Gomber (2003) and Goonewardene (2001) studies, there were no significant differences in serum ferritin and hemoglobin changes in weekly and daily iron supplementation among pregnant women (Goonewardene *et al.*, 2001; Gomber *et al.*, 2003; Muslimatum *et al.*, 2001). Of course, in the study of Goonewardene (2001), the incidence of anemia in weekly group was more than daily group at the end of survey (Goonewardene *et al.*, 2001). In our study, the prevalence of anemia was not difference between the groups. Mumtaz *et al.* (2000) compared the effectiveness of weekly and daily iron supplementation in pregnant women. Against prior studies, the results indicated a significant difference in serum ferritin and hemoglobin concentration between two groups, as daily administration of iron is superior to weekly administration. The basis of this study and the similar series, that their case groups are pregnant women, other non-pregnant women, children under 2 years old and preschool children is the mucosal-block concept (Ridwan *et al.*, 1996; Ekström *et al.*, 2002). According to the hypothesis, the first dose of iron would load the mucosa of intestinal epithelium with iron and blocked subsequent doses from absorption. By regeneration of the intestinal mucosal cells, iron absorption can begin again. It usually occurs at 5-6 days later (Tapiero and Gate, 2001). Although a series of studies with radiolabeled iron in rats confirmed this hypothesis, it far accepted in human. Namely, initial absorption of iron will be decreased severely the further absorption of iron by intestinal epithelial cells in following doses, indicating incomplete blockage of iron absorption by intestinal epithelial cells. In the other hand, pregnant women, because of lower gastrointestinal side effects, will support a weekly dosage schedule. Furthermore, it is more economical than daily regimen because of less consumption of ferrous sulfate pills (about 28% of daily regimen). In daily regimen, exclusion the women who consumed ferrous sulfate pills 5 days or less weekly, reject the hypothesis; less intake of the tablets in daily regimen, causes no difference between the groups. It seems that the amount of iron in a weekly regimen is sufficient for maximum effect and daily iron consumption is not necessary. Therefore, the weekly regimen will prevent of unnecessary iron consumption. Such as others similar studies, our results indicate that the weekly iron supplementation is a choice replacement method especially which whom leave iron intake due to side effects of it.

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