Research Journal of Biological Sciences 3 (2): 229-232, 2008
ISSN: 1815-8846

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

[1]Mohamad Khademloo, [2]Abolghasem Ajami, [3]Alireza R. Khalilian and [4]Niloofar Motamed
[1]Department of Community Medicine, [2]Department of Immunology,
[3]Department of Statistical Sciences, Mazndaran University of Medical Sciences, Sari, Iran
[4]Department of Community Medicine, Booshehr University of Medical Sciences, Sari, Iran

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; Yasaee *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 efficiecy 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

Corresponding Author: Dr. Mohamad Khademloo, Department of Community Medicine, Mazndaran University of Medical Sciences, Sari

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 efficiecy (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 efficiecy 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 ferittin 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 ferittin 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 ferittin 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 Mean±SD	Weekly Mean±SD	t-value	p-value
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 ferittin changes before and after intervention in both weekly and daily groups in studied pregnant women

Variables	Daily Mean±SD	Weekly Mean±SD	t-value	p-value
Ferittin 1st	17.79±3.2	15.89±5.5	0.73	0.46
Ferittin 2nd	24.08±6.5	22.76±5.5	1.22	0.22
Ferittin 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 ferittin and hemoglobin levels. The results showed that there was no significant difference in mean of serum ferittin and hemoglobin between the groups. In Muslimatum (2001), Gomber (2003) and Goonewardene (2001) studies, there were no significant differences in serum ferittin and hemoglobin changes in weekly and daily iron supplementation among pregnant women (Goonewardene *et al*., 2001; Gomber *et al*., 2003; Muslimatun *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 effectivness of weekly and daily iron supplementation in pregnant women. Against prior studies, the results indicated a significant difference in serum ferittin 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.

ACKNOWLEDGEMENT

This study completed by financial support of Mazandaran University of Medical sciences that thanks them sincerely. In addition, the authors offer Personals of health care centers of Mazandaran province their profound thanks because of their liberal cooperation.

REFERENCES

Beard, J.L., 1998. Weekly Iron intervention: The case for intermittent iron supplementation. Am. J. Clin. Nutr., 68: 209-212.

Bosaghzadeh, A., 1993. Prevalence of Iron deficiency anemia among pregnant women referred to family planning centers of Ahvaz. MS_c scholarship of nutritional Sciences Shahid Beheshti University of Medical and Health Sciences.

De Maeyer, E.M. *et al*., 1989. Preventing and controlling iron deficiency anaemia through primary health care. Geneva, World Health Organization.

Ekström, E., S.M. Ziauddin and R. Mushtaque, 2002. Efficacy and trial effectiveness of weekly and daily iron supplementation among pregnant women in rural Bangladesh. Am. J. Clin. Nutr., 76: 1392-1400.

Emami, M. and A. Emsaki, 1979. Iron deficiency anemia. National nutrition and food technology research institute. Isfahan Nutr. Res. Center, 4: 20-22.

Fakhri, M., F. Mansouri and A. Almasy *et al*., 1999. Assessment of anemia status among population under education of community medicine in 1999. First national congress of public health and medicine in Kerman shah. Electronic book of Abstracts.

Family Health Guidelines, 2001. Pregnant women's care guidelines. Method of Iron tablet prescription. Ministry of HBI.

George, H., 2000. Iron needs during pregnancy: Do we need to rethink our targets? Am. J. Clin. Nutr., 72: 265S-271s.

Gomber, S., K.N. Agarwal, C. Mahajan and N. Agarmwal, 2003. Impact of daily versus weekly hematinic supplementation on anemia in pregnet woman. Indian Pediat., 40: 273.

Goonewardene, M., C. Liyanage and R. Fernando, 2001. Intermittent oral iron supplementation during pregnancy. Ceylon Med. J., 46: 132-135.

Haidar, J., Omwega, Am, Muroki Nm and G. Ayana, 2003. Daily versus weekly iron supplementation and prevention of iron deficiency anemia in lactating women. East Af. Med. J., 80: 11-16.

James, R. Scott, Ronald S. Gibbs, Y. Beth, Karlan, Arthur F. Haney, 2003. Danforth's Obstet. Gynecol. 9th Edn., 17: 273-274.

Kalantari, N., N. Karimabadeh, F. Samadian, M. Jamshidian and B. Golestan, 2001. Evaluation of validity of Iron supplementation protocol among pregnant women presented by primary health care doctrine of ISfahan province. National nutrition and food technology research institute. Shahid Beheshti University of Medical and Health Sciences.

Lopes, M.C., L.O. Ferreira and M. Batista Filho, 1999. Use of daily and weekly ferrous sulfate to trial anemic child bearing-age women, cad saude publica, 15: 799-808.

Mumtaz, Z., S. Shahab, N. Butt, M.A. Rab and A. DeMuynck, 2000. Daily iron supplementation is more effective than twice weekly iron supplementation in pregnant women in Pakistan in a randomized double-blind clinical trial. J. Nutr., 130: 2697-2702.

Muslimatun, S., M.K. Schmidt and W. Schultink *et al*., 2001. Weekly supplementation with iron and vitamin A during pregnancy increases hemoglobin concentration but decreases serum ferritin concentration in Indonesian pregnant women. J. Nutr., 131: 85-90.

Nutrition for Health and Development, 2000. A Global Agenda for Combating Malnutrition, World Health Organization, NHD/00.6, pp: 9-21.

Rebecca, J., 2001. Defining iron-deficiency anemia in public health terms: A time for reflection. J. Nutr., 131: 565-567.

Ridwan, E., W. Schultink, D. Dillon and R. Gross, 1996. Effects of weekly iron supplementation on pregnant Indonesian women are similar to those of daily supplementation. Am. J .Clin. Nutr., 63: 884-890.

Sajadi, P., H. Alaodolehee and F. Sadighian, 2001. Prevalence of Iron deficiency anemia and it's relationship with some nutrition among high school girls of Babol. Abstract of articles presented in second international congress of public health and preventive medicine. Kerman shah University of Med. Hlth. Sci., pp: 66.

Schol, T.O., M.L. Hediger, R.L. Fischer and J.W. Shearer, 1992. Anemia Vs Iron deficiency: Increased risk of preterm delivery in a prospective study. Am. J. Clin. Nutr., 55: 985-988.

Schol, T.O. and T. Reilly, 2000. Anemia, Iron and pregnancy outcome. J. Nutr., 130: 4435-4475.

Solomon, N.W., 1995. Weekly versus daily iron administration: are we asking the right question? Nutr. Rev. 53: 326-327.

Stoltzfus, R.J. and M.D. Dreyfus, 1998. Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia. INCG/ WHO/ UNICEF. Washington, ILSI Press.

Tapiero, 1. and L. Gate,2001. Iron: Deficiencies and requirements. Biomed. Pharmacotherapy, 55: 324-32.

Vejdani, F., 1996. Assessment of Iron status in pregnant women. MS_c scholarship of nutritional Sciences. Tehran University of Medical Sciences.

Yasaee, M., M. Kimiagar and F. Farahi, 1987. Nutritional Anemia in a group of pregnant women in Tehran. Medical Faculty Journal, Shahid Beheshti University of Medical Sciences, 11: 47-51.

Yip, R., I. Porvanta and M.E. Cogswell *et al*., 1998. Rc Commendation to Prevent and control iron deficiency in the united states. Morbidity and mortality weekly report, 47: 5-7.