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Treatment of maternal anemia by using oral iron drugs combined with diet therapy

Jiang Wenting[1], Chen Junjuan[2], Liu Pingli[3], Jiang Baoe[4], Jiang He[5] and Zhang Xiuqin[6]*

[1]No.2 Obstetric, VIP Obstetric Nursing, Tengzhou Central People's Hospital, Tengzhou, China
[2]Mental Health Center of Tengzhou Dongguo Town, Tengzhou City, China
[3]Static Distribution Center of Tengzhou Central People's Hospital, Tengzhou, China
[4]Public Health Department Preventive Health, Tengzhou Central People's Hospital, Tengzhou, China
[5]Public Health Service Station of Central Hospital of Dongguo Town, Tengzhou City, China
[6]No .2 Postpartum Department, Tengzhou Central People's Hospital, Tengzhou, China

Abstract: Iron deficiency anemia is a common nutritional deficiency disease in women during pregnancy, mainly due to the increased iron requirements of pregnant women and fetuses, resulting in a lack of iron elements necessary for the production of red blood cells, resulting in a decrease in the number of red blood cells and the symptoms of anemia; Causes chronic fetal hypoxia and affects the normal development of some important organs of the fetus. This article explores the clinical value of oral iron drugs combined with diet therapy for maternal anemia. Observed the changes of hemoglobin (Hb), red blood cell count (RBC), average hemoglobin concentration (McHc), serum iron (SI), transferrin saturation (TS) and other indicators of pregnant women before and after treatment and the differences in pregnancy outcomes. Compared with before treatment, the maternal Hb, RBC, McHc, SI, TS and other indicators increased to a certain extent after treatment. Among them, the increase of each indicator in the experimental group is significantly larger than that in the control group. Differences between groups are considered to be meaningful after statistical analysis. ($P<0.05$). Oral iron drugs combined with diet therapy can effectively improve the symptoms of anemia and have a positive impact on pregnancy outcomes.

Keywords: Serum iron, pregnant women, vitamin C, neurotransmitter.

INTRODUCTION

Iron deficiency anemia is a common clinical anemia, especially among pregnant women, with the highest incidence in Southeast Asia and Africa (Bergmann *et al.,*2016). It is listed as one of the four major nutritional diseases in the world. Iron deficiency not only causes anemia, but also affects it (Valladares *et al.,* 2010). A large number of studies have shown that anemia in the fetus and infants can have long-term adverse effects on the nervous system (Patel, 2016). Iron is involved in the formation of myelin sheaths in the brain, metabolism of neurotransmitters and energy metabolism in the brain. Iron deficiency can cause myelinization in the brain (Serra *et al.,* 2017). Abnormalities, changes in the dopaminergic neurotransmitter system and decreased levels of metabolism in different brain regions cause abnormal behavior (Isabel *et al.,* 2019). Therefore, effective iron supplementation during pregnancy becomes particularly important.

Iron deficiency anemia is a common nutritional deficiency disease in pregnant women during pregnancy, mainly due to the increased iron requirements of pregnant women and fetuses, resulting in a lack of iron elements necessary for the production of red blood cells, resulting in a decrease in the number of red blood cells and the symptoms of anemia; Causes chronic fetal hypoxia, affects the normal development of some important organs of the fetus, leads to poor infant intelligence and slow response; it also increases the risk of premature, miscarriage, stillbirth and low birth weight (Ayinuer *et al.,* 2019). Iron is an indispensable element of human hematopoietic. The incidence of iron-deficiency anemia in pregnant women is relatively high. It is related to increased nutritional requirements during pregnancy and insufficient dietary intake due to pregnancy reactions, which can lead to poor pregnancy (Pereira *et al.,* 2018). Anemia pregnant women can generally be relieved by oral iron medications (Flatt, 1970; Evans *et al.,* 2014). Our hospital has explored the clinical value of oral iron medications combined with diet therapy in the treatment of maternal anemia. The results are reported below for clinical reference.

MATERIALS AND METHODS

General information

105 cases of anemia pregnant women who were treated from Mudanjiang Medical College from May 2018 to April 2019 were included in this study. All of them came to the hospital for symptoms of dizziness, fatigue, pale complexion, etc., and Hb <100g / L, RBC $<3.5 \times 10^{12}$ / L, hematocrit <0.30. Subjects excluded iron deficiency anemia, hematological diseases and persistent outbreaks Blood lesions, chronic diarrhea, total gastrectomy or

**Corresponding author:* e-mail: 13963270036@139.com

partial resection, allergies, mental illness, abnormal liver hemosiderin deposits.

According to the order of visits, the odd and even numbers were grouped, and the odd ones were classified as the control group, with a total of 53 cases, aged 22-35 years, with an average age of 27.53±3.28 years; weight 64-70kg, average weight 67.53±2.26kg; 16-28 weeks of pregnancy, The average gestational week was 22.43± 2.14w; 34 cases of primiparous women and 19 cases of postpartum women. The even number were grouped into the experimental group, with a total of 52 cases, aged 21-33 years, with an average age of 27.45±3.16 years; weight 65-71kg, average weight 68.25±2.43kg; gestational week 15-31w, average gestational week 22.64±2.25w; Among them, 35 were primiparous and 17 were postpartum.

Treatment methods

The pregnant women in the control group were treated with iron drugs, ferrous sulfate tablets (produced by Shanghai Huanghai Pharmaceutical Co., Ltd., 0.3g, Sinopharm H31021752) at a dose of 0.3g / time, 3 times / d, after meals. Periodic laboratory inspection during medication, if Hb is greater than 110g / L, the drug should be discontinued.

The pregnant women in the experimental group were given oral iron drugs combined with diet therapy. The treatment types, dosages, and methods of iron supplement drugs were the same as those in the control group. Emphasize to pregnant women the dangers of iron deficiency anemia and the importance of dietary treatment, and pay attention to increasing iron intake in the diet. Guide pregnant women to calculate the required energy according to the gestational week, weight, etc., to carry out a balanced diet, to avoid pregnant women with iron deficiency anemia due to partial or picky eating. Use wok cooking as much as possible to encourage pregnant women to eat more iron-rich foods such as pork liver, lean meat, animal blood, beans, spinach and seafood, eat more fresh fruits and vegetables, and increase intake of vitamin C and folic acid to promote the body's absorption and utilization of iron elements. Avoid taking strong tea, coffee, antacids, etc. while taking iron to avoid affecting iron absorption.

After 4 weeks of continuous treatment, the changes of Hb, RBC, McHc, SI, TS and other indicators of pregnant women in the two groups before and after treatment were observed.

Table 1: Hemoglobin test results of pregnant women in different groups

Group	Number of cases	Red blood cell count(10^{12} /L)		
		Early stage	Middle stage	late stage
Control group	53	118.14±8.72$^{\#*}$	101.57±13.58*	96.83±1031
Experience group	52	115.65±10.89$^{\#}$	106.32±17.99*	113.40±11.57

Table 2: Comparison of laboratory indicators between the control group and the experimental group before and after maternal treatment (x ± s)

Group		Hb (g/L)	RBC (×1012/L)	McHc (%)	SI (μmol/L)	TS (%)
Control group (n=53)	Before treatment	86.35±4.22	2.26±0.56	20.35±1.45	6.68±1.46	9.35±0.87
	After treatment	105.97±5.25#	3.38±0.59#	26.78±1.76#	12.33±2.35#	21.63±0.95#
Experience group (n=52)	Before treatment	88.24±4.26	2.23±0.52	20.43±1.57	6.71±1.40	9.40±0.90
	After treatment	115.63±4.87#*	4.02±0.64#*	30.83±1.84#*	18.05±2.54#*	26.58±1.02#*

Note: # Compared with before treatment, P<0.05; *compared with control group, P<0.05

Table 3: Comparison of the incidence of adverse pregnancy outcomes between the control group and the experimental group [cases (%)]

Group	Premature delivery	Low birth weight	Asphyxia neonatorum	Incidence of adverse outcomes
Control group (n=53)	2 (3.77)	3 (5.66)	6 (11.32)	11 (20.75)
Experience group (n=52)	1 (1.92)	1 (1.92)	2 (3.85)	4 (7.69)*

Table 4: Comparison of the total effective rate of clinical treatment of pregnant women in the two groups

Group	Number of cases	Cure	Effective	Invalid	Total effective rate (%)
Experience group	52	31	19	2	96.15*
Control group	53	14	23	16	79.25

Note: Compared with the control group, * P < 0.05

Ethical approval
All patients were approved by Ethics Committee of our hospital and signed on the informed consent. Ethical approval number as 18TCPHTC6.

STATISTICAL ANALYSIS

Relevant data involved in this study were entered into the SPSS 21.0 statistical software. Measurement data were expressed as mean ± standard deviation (x ± s) during data processing. Counting data was expressed as a rate (%), and comparisons between groups were made using a chi-square test. Differences between groups were considered statistically significant at $P < 0.05$.

RESULTS

Hemoglobin and red blood cell count results
The Hb of the early pregnancy group and the control group were significantly higher than those of the anemia group, and the differences were statistically significant ($P<0.05$). Hb in the second trimester prevention group were higher than those in the control group, and Hb in the control group were higher than those in the anemia group and the differences were statistically significant ($P<0.05$). The Hb of the third trimester prevention group were higher than those of the anemia group, and the Hb of the control group was lower than that of the anemia group, and the differences were statistically significant ($P<0.05$). The general data of pregnant women in the two groups were compared, and it was found that there were no significant differences between the two groups in terms of age, weight, gestational week and parity ($P>0.05$) and the two groups had good comparability.

Comparison of laboratory indicators
Compared with before treatment, we found that maternal Hb, RBC, McHc, SI, TS and other indicators increased to a certain extent after treatment. Among them, the increase of each indicator in the experimental group was significantly larger than that in the control group. After statistical analysis, the difference between the groups was considered Meaningful ($P < 0.05$) (table 2).

Incidence of adverse pregnancy outcomes
Compared with the control group, we found that the incidence of adverse pregnancy outcomes in the experimental group was significantly lower, and statistical differences between the groups were considered significant ($P < 0.05$) (table 3).

Comparison of the total effective rate of clinical treatment of pregnant women in the two groups
The total effective rate was 96.15% in the observation group and 74.42% in the control group. There was a statistically significant difference in the total effective rates between the two groups ($P<0.05$) (table 4).

DISCUSSION

The main causes of patients with pregnancy-associated iron-deficiency anemia are due to the unreasonable dietary structure, leading to nutritional imbalances, coupled with the effects of early pregnancy response, greatly reducing dietary intake, resulting in secondary exacerbations of anemia symptoms (Ajami *et al.,* 2016). It is therefore important to strengthen dietary interventions. Maternal anemia can cause fetal growth restriction, intrauterine distress, premature birth, low birth weight or stillbirth (Carroll *et al.,* 2012). Anemia can also cause maternal immune dysfunction, reduced tolerance to childbirth, cesarean section and anesthetics, increasing complications and risks during childbirth (Carloto *et al.,* 2019). Therefore, under the guidance of a doctor, it is very important to carry out scientific and reasonable iron supplementation in combination with his actual situation (Adamska *et al.,* 2018). Oral iron supplementation is often used in clinical practice to treat maternal anemia, but after entering the gastrointestinal tract, it needs to be combined with transferrin in the intestinal cavity before it can be absorbed (Cristina *et al.,* 2018). The absorption rate is low. It is necessary to prevent insufficient iron supplementation, which cannot effectively prevent the occurrence of anemia and prevent excessive supplementation, which affects the fetus and pregnant women's absorption of zinc and other metal elements.

Eat more iron-rich diets. Adjust the diet structure according to the growth and development needs of the fetus at various stages of pregnancy (Cooper *et al.,* 2009). Using iron wok cooking can increase the dissolution of iron ions in the dishes. The iron element in the food has a better absorption and utilization effect. Eating more foods containing vitamin C and folic acid can promote iron. Clinically, iron deficiency anemia is divided into three stages: iron deficiency, iron deficiency erythropoiesis and iron deficiency anemia (Danir *et al.,* 2017). In the first stage of anemia, the phase of iron deficiency, there is only consumption of stored iron in the body, that is, SF decreases. SF reduction is currently recognized as the most sensitive indicator of stored iron consumption (Achamrah *et al.,* 2018). Hb is a classic index for screening body anemia, and it is the first choice for evaluating iron deficiency anemia. However, there is an "overlapping distribution" of Hb measurements in the population between normal subjects and patients with iron-deficiency anemia, especially with the overlapping distribution of Hb values in mild anemia and normal populations (Grant *et al.,* 2009; Joanna *et al.,* 2019). Therefore, it has been suggested to use Hb + SF combined to diagnose iron deficiency anemia. During pregnancy check-up, even if Hb does not decrease significantly, the relevant indicators of iron metabolism, such as SF, should be checked in time in order to detect the iron deficiency anemia of pregnancy in a timely manner, and jointly judge

and observe the treatment effect of pregnancy anemia through the above combined indicators.

Fetal blood circulation is established 3 weeks after fertilization, and the yolk sac produces a large number of red blood cells. At this time, the body begins to rapidly consume iron (Latino *et al.,* 2012). By the 10th week of gestation, the liver begins to produce blood, after which the bone marrow and spleen gradually become hematopoietic. It can be seen that iron consumption has begun in the first trimester (Lu *et al.,* 2017). Increasing blood volume during pregnancy and the physiological changes of various organs require a lot of iron. In this group of data, the majority of pregnant women in the anemia group were mildly anaemia, which may be related to the relatively developed economy and higher living standards of the people (Tappy, 2003; Porter *et al.,* 2009). At the same time, it was found that despite the active and sufficient iron supplementation, in the early to mid-pregnancy stage, the above four indicators of the three groups of pregnant women were significantly reduced (Landsberg *et al.,* 2013). This aspect indicates that the iron demand during pregnancy is large, and the total iron needed to increase during pregnancy is 1000 mg, which is nearly three times that of non-pregnant women of childbearing age (Muller *et al.,* 2014; Mozaffarian *et al.,* 2016). On the other hand, iron is consumed rapidly in pregnant women during the early-mid pregnancy period, but some pregnant women still suffer from nausea, poor appetite and other reactions, which affects the compliance of iron supplements, resulting in insufficient iron intake, which is also a deficiency of pregnant women. Therefore, we should strengthen the publicity of health knowledge of pregnant women during early-mid pregnancy and emphasize the importance of iron supplementation during pregnancy (Danir *et al.,* 2017). At the same time, it is necessary to strengthen dietary iron supplementation during early pregnancy and middle pregnancy (Zobel *et al.,* 2009). Encourage more foods rich in iron, such as eggs, pork liver, chicken blood, spinach, soybeans, etc., and supplement foods rich in folic acid, vitamin B_{12}, and vitamin C (Gatter *et al.,* 2015). In this article, the Hb and RBC of pregnant women in the prophylactic and anemia groups who actively supplemented with iron in the middle and late stages of pregnancy showed a rising trend. It can be seen that the effect of oral iron is related to the dose and duration of iron supplements. In the anemia group, Hb was more than 100g / L in the third trimester, and RBC was close to 3.5×10^{12} / L, while the control group still showed a downward trend. Hb was less than 100g / L in the third trimester, and RBC was less than 3.5×10^{12} / L. This shows that dietary iron intake cannot meet the iron demand during pregnancy.

Iron in the blood accounts for 0.8% of the total iron in the body, and about 27% of the iron is stored in the form of ferritin and hemosiderin in monocyte-macrophage systems such as liver, spleen, and bone marrow. Serum ferritin reflects the amount of iron stored in the body, and 1μg / L serum ferritin is equivalent to 8-21 mg of stored iron. It is generally believed that serum ferritin <20μg / L indicates reduced iron storage, and <12μg / L indicates iron storage depletion. In this group of data, the SF of both groups of pregnant women showed a progressive decline throughout pregnancy, suggesting that iron in the body during pregnancy is continuously consumed (Cooper *et al.,* 2009). Except for the prevention group in the third trimester, the SF in the other two groups was far below 12 μg / L. In the third trimester, pregnant women have insufficient iron reserves. If they experience postpartum hemorrhage during the postpartum period, iron deficiency anemia is still prone to occur postpartum, which will affect the postpartum recovery (Stutzmann *et al.,* 2009). Therefore, it is suggested that iron supplementation should still be strengthened during puerperium. Iron reserve in the third trimester directly affects iron reserves in the newborn, which is an important factor in determining whether iron deficiency occurs during infancy (Latino *et al.,* 2012). If the newborn's iron reserves are insufficient and they are not replenished in a timely manner, the chance of iron deficiency anemia in the future will greatly increase. Although we gave a larger dose of iron in the anemia group, its indicators in the early, middle, and late stages of pregnancy were still lower than those in the prevention group ($P<0.01$), indicating whether anemia before pregnancy means that the body has sufficient iron reserves before pregnancy, which is pregnancy anemia. A very important factor in the effect of treatment. Anemia before pregnancy is one of the important risk factors for anemia in early, middle and late pregnancy. Women taking iron folate preparation once a week before pregnancy can effectively prevent anemia during pregnancy.

CONCLUSION

In this study, all the maternal Hb, RBC, McHc, SI, TS and other indicators increased to some extent after iron supplementation. This result suggests that timely iron supplementation for anemia pregnant women can help alleviate the symptoms of anemia. Among them, the improvement of various indicators of oral iron drugs combined with diet therapy was significantly better than those of oral iron therapy alone. This result suggests that diet therapy helps to promote iron absorption and is beneficial to the improvement of maternal anemia symptoms. The incidence of adverse pregnancy outcomes in patients treated with oral iron medications combined with diet therapy was significantly lower than those with oral iron medications alone. This result suggests that diet therapy can help reduce or avoid adverse pregnancy outcomes. The results of this study indicate that the treatment of maternal anemia with oral iron drugs

combined with diet therapy can effectively improve the symptoms of anemia and have a positive impact on pregnancy outcomes.

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