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Original Research Article

Importance of parenteral iron sucrose therapy in correction of iron deficiency anemia during pregnancy

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ABSTRACT

Background: Iron deficiency anemia (IDA) is described as decrease in the hemoglobin and/or the amount of red blood cells in the blood due to iron insufficiency in the body. The aim of the study was to measure the efficacy and tolerability of iron sucrose in iron deficiency anemia in pregnant women.
Methods: This was the prospective study of 50 pregnant women with iron deficiency anemia (Hb- 5 g/dl to 8 g/dl) between 20-34 weeks of gestation, who were given intravenous iron sucrose as per their requirements and follow up measurement of Hb was done.
Results: Mean rise in Hb was seen by 2.2 g/dl. Minor side effects were seen in 6 out of 50 participants.
Conclusions: Parenteral iron sucrose therapy can be used effectively and safely in pregnant women with iron deficiency anemia

Keywords: Iron deficiency anemia in pregnancy, Parenteral iron therapy, Intravenous iron sucrose in pregnancy

INTRODUCTION

Iron deficiency anemia (IDA) is defined as decrease in oxygen carrying capacity of blood due to decrease in red cell mass, decrease in Hb concentration or decrease in PCV.[1]

Definition

The WHO defines anemia in pregnancy as hemoglobin level below 11 g/dl. The Centers for Disease Control and Prevention (CDC) recommends that Hb cut-off for anemia should be taken as 11 g/dl in the first and third trimesters and below 10.5 g/dl in the second trimester. The ICMR classification of anemia in pregnancy according the severity: (a) normal- 11 g/dl or higher; (b) mild- 10-10.9 g/dl; (c) moderate: 7-10 g/dl; (d) severe: 4-7 g/dl; (e) very severe<4 g/dl. Anemia is a major public health problem worldwide. According to the latest WHO report, the global prevalence of anemia during pregnancy is 50.1%.[2]

The situation is grave in Southeast Asian countries where about half of the all- global maternal deaths are due to anemia. India alone contributes to about 80% of the maternal deaths due to anemia in south Asia.[2] Iron deficiency anemia (IDA) is the most common type of anemia affecting pregnant women.

Iron deficiency starts in childhood, worsens in adolescence, and gets aggravated in pregnancy. In India, factors leading to high incidence of anemia include malnutrition, teenage pregnancy, multiparity, previous menorrhagia, less inter-pregnancy interval, phytate rich diet, dietary insufficiency, faulty food habits, inadequate absorption, high incidence of worm infections, hemolysis due to malaria and sickle cell anemia in endemic areas,

chronic infections and intestinal disorders like chronic diarrhea.[4]

Iron requirement during pregnancy is increased, which is to be met by adequate iron intake and mobilizing from the iron stores. So, in pregnancy, deficient iron stores are prone to develop IDA.

There is increased requirement of iron during pregnancy for growing fetus, placenta, red cell mass expansion, obligatory basal losses and blood loss at delivery. Treatment of IDA in pregnancy depends upon the period of gestation, severity of anemia, associated obstetric complications like antepartum hemorrhage, medical co-morbidities and maternal condition.[5]

Various oral, intramuscular and intravenous iron preparations have been used for treating IDA in pregnancy.

Parenteral iron sucrose is an intravenous iron preparation. It is very effective in correcting IDA in a short duration of period. Blood transfusion is given to severely anemic patients or in patients where intravenous iron infusion is contraindicated.

Objective

The study of this study was to evaluate the efficacy and the tolerability of iron sucrose in iron deficiency anemia in pregnant women belong to 20 to 34 weeks of gestation.

METHODS

This was a prospective study at Sardar Vallabhbhai Patel Institute of Medical Sciences and Research (SVPIMSR), a tertiary care center in Ahmedabad, India during July to December 2021.

Out of various patients suffering from anemia- who were undergone for various diagnostic evaluation for typing of anemia including complete blood counts, peripheral smear study, etc and randomly we have taken 50 pregnant women suffering from IDA having Hb between 5 g/dl to 8 g/dl.

We have classified them according to their gestational weeks into 3 groups mentioned in table for the better understanding.

Total dose of iron was calculated by Ganzoni's formula.[6]

$$\text{Total iron requiremet (mg)} = 2.4\left[\left(\text{target Hb} - \text{actual Hb in}\,\frac{\text{g}}{\text{dl}}\right)\right] \times \text{Bodyweight} + 500\ \text{mg}*$$

Note: *-500 mg for the replenishment of stores.

Inclusion criteria

Pregnant women with hemoglobin level between 5 g/dl to 8 g/dl. Pregnant women diagnosed with iron deficiency anemia on the basis of laboratory investigations- blood reports, peripheral smear study and clinical features.

Exclusion criteria

Pregnant women who are not willing for participation in the study. Pregnant women with <20 weeks of gestation and >34 weeks of gestation. Pregnant women in whom parenteral iron is contraindicated. Pregnant women who are having a history of hypersensitivity to IM or IV iron. Pregnant women with a known case of hemochromatosis. Pregnant women having active systemic infections, nephritis, chronic renal failure, hemoglobinopathies, any neoplasm. Anemia due to any other reason except iron deficiency. Hb <5 g/dl or >8 g/dl.

Parenteral iron sucrose was given to the pregnant women according to their calculated required dose of iron and were closely monitored for any adverse effects. Follow up of the participants was taken after 4 weeks by measuring blood hemoglobin level, and percentage of rise in Hb calculated.

The data was analyzed in MS excel 2010 software.

RESULTS

In our study, 48% of the pregnant women belonged to 25-29 weeks of gestation. Pregnant women between 20-24 weeks of gestation were having lowest mean Hb (g/dl) at the beginning of the study.

The maximum rise in Hb% was noticed as 2.4 g/dl in 20-24 weeks of gestational age group, followed by 30-34 weeks of gestational age group. In our study, only 12% of pregnant women had mild to moderate side effects.

None had severe side effects as all pregnant women were given total dose after the test dose.

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Table 1: Distribution of pregnant women according to gestational age in weeks.

Gestational age (weeks)	No. of pregnant women
20-24	15
25-29	24
30-34	11

Table 2: Mean Hb% at the beginning of the study.

Gestational age (weeks)	Mean Hb (g/dl)
20-24	6.1
25-29	6.9
30-34	7.7

Table 3: Mean rise in Hb (g/dl) at the end of the study.

Gestational age (weeks)	Mean rise (g/dl)
20-24	2.4
25-29	2.0
30-34	2.2

Table 4: Adverse effects due to injection iron sucrose therapy.

Adverse effect	Number of pregnant women
Mild- nausea, headache, constipation	4
Moderate- vomiting, diarrhea, skin rashes	2
Severe- anaphylactoid reaction- angioedema, bronchospasm	-
Discontinuation of therapy	-

DISCUSSION

Average iron requirement is 6 mg/day throughout pregnancy varying from 2.5 mg/day in early pregnancy, 4-6 mg/day in mid pregnancy to 10 mg/day from 32 weeks of gestation onwards.[7]

Main causes of IDA during pregnancy are faulty dietary habits, deficient absorption and low iron stores.

Total about 1000 mg of iron is required during pregnancy: 500 mg for RBC expansion, 300 mg for foetus and placenta and the rest for the growing uterus.[7]

As a result of amenorrhea there is saving of about 150 mg of iron and therefore about 850 mg of extra iron is required during pregnancy. 20% of total iron is in the stores (Reticuloendothelial system- liver, spleen, bone marrow).

Majority of women in the childbearing age have deficient iron stores due to blood loss during menstruation. In multigravida, repeated childbearing does not give them time to replenish iron stores in between the pregnancies.

IDA can affect pregnancy in various ways like infection, preterm deliveries, cardiac failure, maternal exhaustion during labor pain, puerperal sepsis, failure of lactation, delayed wound healing.[8]

Diagnosis of iron deficiency anaemia

Signs and symptoms included fatigue, weakness, pallor, pica, irregular heartbeats, shortness of breath, dizziness or light-headedness, chest pain and headache.

Table 5: Change in the lab parameters.

Changes	Parameters
Decrease	Hb Ferritin Serum iron Transferrin saturation Reticulocyte MCV
Increase	TIBC Soluble transferrin receptors Mentzer index RDW

Iron sucrose complex is a relatively safer option for intravenous usage.[9] Ferric carboxymaltose (FCM) is also a newer option for intravenous usage, but is quite costly compared to iron sucrose complex. So, in developing countries like India, iron sucrose complex is more preferred. Iron sucrose complex is effective because of the rapid removal from the plasma and the availability of iron for erythropoiesis. After a bolus dose of iron sucrose, the plasma peak occurs in 10 minutes. Twenty-four hours after administration, the plasma level is negligible, indicating rapid bone marrow uptake as has been shown by positron emission tomography studies. Studies have shown that 70-97% of the iron is used for erythropoiesis, with only a 4-6% elimination rate.[10,11] Use of iron sucrose complex also reduces the need of blood transfusion in pregnancy.[12,13] Iron sucrose can be administered through intravenous infusion by diluting 200 mg in 300 ml normal saline over 30 minutes (maximum 600 mg/week can be given).

Test dose is given in the labor room or ward keeping emergency tray ready with antihistaminics and adrenaline injection. After that, the full dose can be given without any significant side effects. In our study, only 4 participants had mild side effects and only 2 participants had moderate side effects. The side effects were limited in the present study, because we have administered the iron sucrose in diluted form and very slowly. So, our study showed that iron sucrose can be used effectively and safely in pregnant women with iron deficiency anemia.

There were few limitations of this study due to the number of participants in the present study are limited, so the outcome of the treatment and its impact cannot be applied on a generalized basis.

Moreover, follow up evaluation of rise in Hb after 4 weeks also depends on the various other factors like the participant's dietary habits, any bleeding due to obstetric reasons like- antepartum or postpartum hemorrhage etc.

CONCLUSION

In our study, the following conclusions have been drowned. Maximum rise in Hb% after treatment is seen in the pregnant women between 20-24 weeks of gestational age group, with the mean rise in Hb of 2.4% in a short duration of 4 weeks. Out of 50 participants, the maximum number of participants belonged to the gestational age group of 25-29 weeks, whose, mean Hb was 6.9%, and among them the rise of mean Hb% after treatment was 2%. Among 50 participants, minor side effects were noted in 6 participants. The study showed that iron sucrose complex infusion was well tolerated and safer option for the treatment of IDA in pregnancy in comparison with the oral iron preparations having GIT side effects, intramuscular iron having local side effects and Blood transfusion with its own limitations. Thus, this study concludes that parenteral iron sucrose therapy is one of the most effective and safe treatment option in the patients of Iron deficiency anemia during pregnancy. It caused a rapid rise in hemoglobin level and the replacement of stores was faster. All pregnant women should be counseled properly about the requirement of iron during pregnancy, available resources, effective contraception right after delivery and following interventions of 'Anemia Mukt Bharat' to decrease the most burdened complication of pregnancy in India.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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