



Iron sucrose infusion in pregnancy: made easy

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Abstract

Background: The most common cause of anemia in pregnancy is iron deficiency. Iron deficiency anemia (IDA) is the most common nutritional deficiency disorder in pregnant women. According to WHO, the average prevalence of IDA in pregnant women is estimated to be about 18 % in developed countries, 35-75 % (average 56%) in developing countries and 33-89% in India.

Objective: A retrospective study was conducted in pregnant women with IDA attending hospital in north India to evaluate the effectiveness and safety of iron sucrose infusion in terms of improvement in Hemoglobin (Hb) status.

Methods: Data of one year from July 2013 to June 2014 obtained from antenatal unit of our hospital, a community based non-profit health care facility of 350 beds with ambulatory and in patient services. All patients who diagnosed IDA, received iron sucrose as infusion with the aim to correct the iron deficiency as well as to replenish the iron stores.

Result: During the study period, a total of 445 pregnant women received iron sucrose infusion, out of which 23 fulfilled the inclusion criteria and were included in the study. At the beginning, mean Hb was 7.3 ± 0.67 g/dl (range 6.2-8.7 g/dl). After completion of total iron infusion therapy, mean Hb raised to 10.80 ± 0.58 g/dl (range 9.4-11.9 g/dl). The differences in Hb value were statistically significant ($p < 0.001$).

Conclusion: We concluded that iron sucrose infusion is safe, well tolerated and effective during pregnancy.

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Introduction

The most common cause of anemia in pregnancy is iron deficiency. Iron deficiency anemia (IDA) is the most common nutritional deficiency disorder in pregnant women. According to WHO, the average prevalence of IDA in pregnant women is estimated to be about 18 % in developed countries, 35-75 % (average 56%) in developing countries and 33-89% in India.^[1-4] WHO defines anemia as hemoglobin (Hb) concentration less than 11 g/dl. The Centers for Disease Control and Prevention (1990) defined anemia as Hb less than 11 g/dl in first and third trimester and less than 10.5 g/dl in second trimester.^[5] Consequences of anemia in pregnancy are susceptibility to infection and premature delivery, intrauterine growth restriction, and increased perinatal and maternal morbidity and mortality.^[6,7]

A retrospective study was conducted in pregnant women with IDA (Hb between 6-9 g/dl) attending a community based non-profit tertiary care hospital in north India to evaluate the effectiveness and safety of iron sucrose infusion in terms of improvement in Hb status.

Materials and Methods

We performed a retrospective observational study at Department of Obstetrics and Pathology, Swami Dayanand Hospital, Delhi, India to analyze the tolerability and efficacy of iron sucrose infusion therapy in pregnancy. Data of one year from July 2013 to June 2014 was obtained from antenatal unit of our hospital; a community based non-profit health care facility of 350 beds with ambulatory and in patient services. The study was approved by the local ethics committee.

Pregnant women with IDA attending the antenatal unit over this period were included in the study. All pregnant women between 20-32 weeks of gestation were screened for anemia. IDA was diagnosed on the basis of red cell indices by automated cell counter and peripheral blood examination by pathologists at pathology department of our institute. HbA₂ estimation was done by HPLC, when it was indicated, to exclude beta thalassemia trait.

Inclusion criteria: These included the following: hemoglobin level between 6-9 g/dl (moderate anemia), microcytic hypochromic picture in peripheral blood smear, gestational age between 20-32 weeks, and intolerance to oral iron therapy and need for rapid hemoglobin reconstitution.

Exclusion criteria: These included the following: anemia other than iron deficiency like thalassemia,

hemolytic anemia, macrocytic anemia, anemia of chronic diseases etc; history of any hematological disorder and medical disorder; early pregnancy and history of blood transfusion in current pregnancy.

All patients who were diagnosed IDA, received iron sucrose as infusion with the aim to correct the iron deficiency as well as to replenish the iron stores. Dose was calculated by following formula:

$$\text{Total iron dose} = \text{Body weight (kg)} \times [\text{Target Hb (g/dl)} - \text{Actual Hb (g/dl)}] \times 0.24 + 500 \text{ mg}$$

Iron sucrose infusion was given in a dose of 200 mg in 200 ml 0.9% normal saline over a period of 15-20 min twice or thrice weekly up to the total calculated dose. After test dose, infusion was given by trained nursing staff on outpatient basis in the specific room where equipment for cardiopulmonary resuscitation was available. Patients were observed for side effects or anaphylactic reactions. Any minor or major side effects were documented. All laboratory parameters were repeated after 4 and 8 week of last dose.

Patients were identified by searching records of antenatal unit. Baseline data were collected on maternal age, gestational age, laboratory findings like complete blood count, peripheral blood smear examination before and after treatment, adverse events during and after iron therapy.

Paired student "t" test done for statistical analysis and P-value <0.05 were considered statistically significant.

Result

During the study period, a total of 445 pregnant women received iron sucrose infusion, out of which 234 fulfilled the inclusion criteria and were included in the study. Rest of patients either did not fulfill inclusion criteria or drop out and not received complete calculated doses.

The mean age of women was 26.8 ± 3.75 (range 21-34) years and mean period of gestation at the time of diagnosis was 25.8 (20-32) weeks. Most of the women were multigravida (68%). The required iron dose varied depending upon index/actual Hb level and pre-pregnancy weight or weight at first antenatal visit. Only four (1.7%) patients had mild adverse reaction (like change in taste, giddiness,

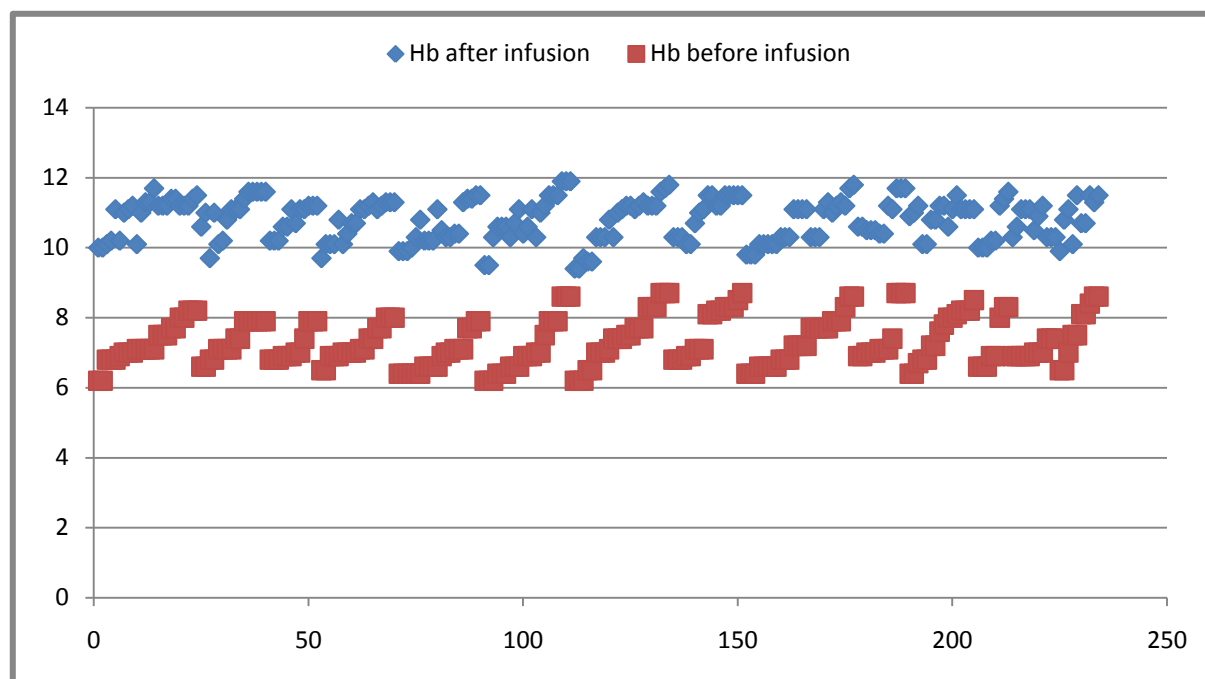


Figure 1: Graphical presentation of pre- and post- iron therapy hemoglobin level

nausea and vomiting) while no one had severe allergic or anaphylactic reaction.

At the beginning, mean Hb was 7.3 ± 0.67 g/dl (range 6.2-8.7 g/dl). Forty seven (20%) women had mild anemia ($Hb > 8$ g/dl) and 187 (80%) had moderate anemia ($Hb = 6-7.9$ g/dl). After completion of total iron infusion therapy, mean Hb raised to 10.80 ± 0.58 g/dl (range 9.4-11.9 g/dl) (figure 1). The differences in Hb value were statistically significant ($p < 0.001$). Of the total patients, 123 (52%) achieved $Hb \geq 11$ g/dl.

Discussion

IDA gets aggravated by increased requirements during pregnancy. There is a great demand for iron to meet the requirement of red blood cell mass expansion in the mother, fetal and placental blood and blood loss at delivery.^[8,9] This is aggravated by poor absorption of iron due to pregnancy induced nausea, vomiting, motility disorder with indigestion and phytate rich Indian diet.^[8,9] Other factors responsible for high incidence of IDA in India include early marriage, teenage pregnancy, multiple pregnancies, less birth spacing, low iron and folic acid intake and high incidence of hook-worm infections in Indian population.^[10]

During pregnancy average requirements are: basal iron (280 mg), expansion of red cell mass (570 mg), transfer to fetus (200-350 mg), for placenta (50-150 mg), blood loss at delivery (100-250 mg). The total requirement of iron during pregnancy is

approximately 1000 mg. As absorption is less than 10%, for a minimum of 4-6 mg absorption, at least 40-60 mg of iron should be available in the daily diet.^[11]

Diet alone cannot supply such amounts of iron in developing countries making iron supplementation a necessity in all pregnant women.^[12] The choice of prophylaxis for IDA in pregnancy is oral iron supplement because it is safest and least expensive.

In view of the high prevalence of anemia in pregnancy and serious adverse consequences in both mother and baby, management of anemia in pregnancy was accorded a very high priority. Compulsory screening for anemia at every antenatal visit became the 'routine' in all obstetric clinics. There are various forms of treatment for IDA. Over the past years, various oral, intramuscular and intravenous preparations of iron have been used for correction of IDA in the pregnant patients.^[13,14,15]

Oral iron is the preferred route of administration for mild anemia. Treatment with iron preparations is used routinely in pregnancy. However, oral iron supplementation often leads to adverse effects, such as nausea, vomiting, constipation, epigastric discomfort and abdominal pain.^[16] Even patients who respond well to oral iron therapy require a many months to reach target hemoglobin.^[17]

Management of severe anemia detected late in pregnancy, through blood transfusion and parenter-

al iron therapy became the hallmark of good obstetric practice.^[18]

Parenteral (intramuscular or intravenous) iron therapy is effective alternative to oral iron and prompt increase in hemoglobin level with rapid restoration of iron stores in a limited time-period when patient is approaching the term and reduce blood transfusion with associated risks near term. Major disadvantages are cost, need for hospitalization or an outpatient setting and invasive nature of procedure.^[17,19]

Recently, many studies have stressed that intramuscular iron therapy should be discouraged because of its adverse effects which include pain, irregular absorption, staining and malignancy.^[15,17]

Intravenous iron preparations are promising, especially in cases of severe anemia. They provide a greater and more rapid iron supply than oral iron therapy without the gastrointestinal side effects of oral substitution.^[19]

Iron sucrose is a complex of polynuclear iron III – hydroxide in sucrose. The molecular mass of iron sucrose is 34,000–60,000 daltons. Iron sucrose is administered by intravenous injection or infusion. Its intravenous route makes availability of elemental iron for incorporation at the pro-erythroblast stage and hence it can provide quick rise in Hb within 5 to 7 days.^[20] Rate of iron delivery is a major factor in the regulation of marrow proliferation, so it produces a more rapid increase in hemoglobin concentration than oral iron and iron dextran.^[21] The recommended schedule is to administer 100 mg intravenously over 5 min, 1–3 times weekly until 1,000 mg has been administered. A test dose is usually not required and is at the physician's discretion.^[22]

Iron carboxymaltose and Iron isomaltose are new intravenous iron preparations which have advantage of giving large amount in single dose but data is not available regarding their use in pregnancy.^[21]

In present study, only three (1.7%) of the 234 patients had mild side effects and none had anaphylaxis or serious adverse drug reactions, thus showing the safety of the drug in the pregnant women.

However, our study has good sample size. Drawbacks of our study were lack of control group and non-randomized trial. Large randomized controlled trials are required to compare the efficacy and safety of intravenous iron sucrose complex over other iron therapy. The effects of parenteral iron

therapy on the baby should be investigated in further studies.

Conclusion

We concluded that iron sucrose infusion is safe, well tolerated and effective during pregnancy. Another advantage is simple mode of administration in an outpatient setting under observation and no need of admission. In our country, where IDA is very common in pregnancy with less health awareness and low compliance, iron sucrose infusion is very helpful in management of IDA in pregnancy, especially in late gestation.

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Competing Interests

None declared.

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