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Role Of Iron Sucrose Infusion In Correction Of Iron Deficiency Anemia During Pregnancy.

Gynaecology

KEYWORDS: Anemia in pregnancy, Iron deficiency anemia, Parenteral iron, Iron sucrose

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ABSTRACT

Background: Iron deficiency anemia (IDA), is defined as decrease in the amount of red blood cells (RBCs) or hemoglobin in the blood due to insufficient iron in the body. We carried out this study to measure the efficacy of iron sucrose in iron deficiency anemia in pregnant women.
Methods: In our prospective study 100 patients were included. All of them were having USG maturity between 15-34 weeks. All of them were given iron sucrose IV according to their requirements and follow-up was taken after 4 weeks by measuring Hb level.
Results: Hb level improved significantly (2.1 grams) within a short duration of interval. 14% patients suffered from minor side effects.
Conclusions: Iron sucrose has been found very useful for correction of iron deficiency anemia in antenatal patients.

INTRODUCTION

Iron deficiency anemia (IDA), is defined as decrease in the amount of red blood cells (RBCs) or hemoglobin in the blood due to insufficient iron in the body.[1]

Anemia is estimated to affect nearly two thirds of the pregnant women in developing countries. Iron deficiency anemia is responsible for 95% of the anemias during pregnancy. According to WHO, the prevalence of IDA is about 18 % in developed countries and 35-75 % (average56%) in developing countries.[2]Globally, the prevalence of anemia is 55.9 % with variations between developed and developing countries. In India, prevalence ranges between 33-89 %.[3] About half of the global maternal deaths due to anemia occur in South Asian countries; India contributes to about 80 % of this mortality ratio.[4]

During 10th Five Year Plan (2002-2007),6 there was a study conducted by ICMR (Indian Council of Medical Research) [6] showed that the prevalence of anaemia was highest among pregnant women (50-90%) and that of moderate (<8 g %) and severe anemia (<5 g %) was persistently high. Prevalence was high in all States of the country with considerable variations in moderate to severe anemia.[7] Other factors that were responsible for high incidence of anemia in our country include high incidence of worm infections in Indian population, early marriage, teenage pregnancy, multifetal pregnancies, less birth spacing, low iron and folic acid intake.[8]

WHO defines anemia as hemoglobin (Hb) <11 g %.2

In India, **the ICMR classification** of iron deficiency anemia is:

10.0-10.9 gm % : mild
7-9.9gm % : moderate
<7 gm % : severe
<4gm%: very severe.

In absence of interfering factors, serum ferritin <12-15 µg/l is considered as iron deficiency.[5]

IDA is the most common nutritional deficiency in pregnant women. The factors producing IDA generally precedes the pregnancy, including diet poor in iron content coupled with menstrual losses and a rapid succession of pregnancies in which supplemental iron was not provided. Most women begin their pregnancy with partially or completely depleted iron reserves. Thus, the severity of the anemia is inversely related to the amount of iron reserves. 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 during delivery time. Iron deficiency is exaggerated because of the ability of fetus to extract its requirement. This is aggravated by poor absorption of iron due to adverse effects of pregnancy on the gastrointestinal tract, which include nausea and vomiting, motility disorder with reflux esophagitis and indigestion.

In underdeveloped countries, anemia is a major contributory factor to maternal morbidity and mortality. Inadequate antenatal care along with poor knowledge of dietary needs of pregnant woman, and poor socio- economic conditions are responsible for this in our country. It is also associated with high perinatal mortality rate in our region. A recent study reported a fetal mortality rate of 50% at 5 month, 28% at 7 months and 24% at 9 months of gestation.

Over the past years, various oral, intramuscular and intravenous preparations of iron have been used for correction of IDA in the pregnant patients. However, they are associated with significant side effects and it is not possible to achieve the target rise in Hb level in a limited time-period when patient is approaching the term. Recently, iron sucrose complex (ISC) is a relatively new drug, which is used intravenously for the correction of IDA. Parenteral injections of iron-dextran /sorbitol complex have its own limitations and disadvantages. Blood transfusion is the last resort and can be used only in severe cases of anemia in symptomatic patients.[9,10] On the other hand, blood transfusion, although it can promptly and reliably treat anemia, entails a lot of dangers like cross reactions and viral infections. Considering the advantages and limitations of the available options, intravenous iron sucrose therapy is reported to be safe, convenient and more effective than I/M or I/V iron - dextran/sorbitol therapy in treatment of iron deficiency anaemia.[11,12] Iron sucrose has been able to raise the Hb to satisfactory level when used in severely anemic iron deficient pregnant women. The aim of this study was to assess the efficacy and tolerability of ISC in pregnant patients with IDA seen at our institution.

Iron sucrose is a form of the mineral iron. Iron is important for many functions in the body, especially for the transport of oxygen in the blood. Iron sucrose injection is used to treat iron deficiency anemia and is usually given with another medication to promote the growth of red blood cells.

Pharmacokinetics:

Half-life elimination: 6 hour
Volume of distribution: 7.9-10 L
Clearance: 1.2 L/ hour
Excretion: Urine (5%)

METHODS

This was a prospective study in V.S. General Hospital, Ahmedabad, India during May to October 2016. We had included 100 patients in our study who were suffering from iron deficiency anemia (Hb 6-8 gm %). They all were given iron sucrose infusion according to their requirement.

Requirement of iron = 2.3 x [(12-pt's Hb) x wt.] + 500 mg.

Iron sucrose infusion was given on alternate day. A single dose consisted of 200 mg iron sucrose in 100 ml normal saline.

Exclusion criteria

Patients not willing to participate in the study
Patients with history of hypersensitivity to iron preparations
Pt having USG maturity <15 weeks or >34 weeks
Pt having Hb <6 gm or >8 gm
Anemia resulting from other causes
Patients with infection, nephritis, CRF, hemoglobino pathies and chronic bleeding due to any cause other than menstrual disorders
Patients with any neoplastic condition or having other diseases (inclusive of cardiac failure, renal failure) along with anemia

Follow up was taken after 4 weeks, by measuring Hb level.

RESULTS

Thus in our study almost 50% of the patients were having their maturity between 26-30 weeks.

Patients having least Hb level were amongst the lowest maturity group (15-20 weeks).

This results conclude that the highest rise (after 4 weeks) in Hb level was seen among patients with 15-20 weeks maturity, followed by early third trimester (31-34 weeks).

Table 1: Distribution of patients according to USG maturity.

Maturity in weeks	No. of Patients (in %)
15-20	12
21-25	24
26-30	48
31-34	16

Table 2: Average Hb level in different groups.

Maturity in weeks	Hb (in %)
15-20	6.3
21-25	7.33
26-30	7.4
31-34	7.1

Table 3: Average increase in Hb level.

Maturity in weeks	Average increase in Hb (in gm %)
15-20	2.6
21-25	1.8
26-30	1.8
31-34	2.3

Table 4: Side effects.

Side Effect	No of patients (in %)
Mile (nausea, Vomiting, Constipation)	10
Moderate (diarrhoea, itching)	4
Severe (bronchospasm)	0
Discontinuation of therapy	0

DISCUSSION

The fetus and placenta require about total 500 mg of iron and a similar amount is needed for red cell increment. An average postpartum blood loss and lactation for six months each accounts for about 180 mg. From total of 1360 mg, 350 mg may be subtracted (saved as a result of amenorrhea) to give an actual extra demand for about 1000 mg. This is unlikely to be provided by dietary iron but may be mobilized from full iron stores (about 1000 mg). It is the state of stores that largely determine whether or not a pregnant woman becomes anemic. The smaller her stores, the earlier the anemia occurs.

Table 5: Change in lab values in iron deficiency anemia.

Change	Parameter
Decrese	Ferritin, Hemoglobin, MCV
Increase	TIBC, Transferrin, RDW

Treatment of IDA has included oral iron, intramuscular iron, iron dextran, ISC, recombinant erythropoietin and blood transfusion. However, most of these have their disadvantages. Even patients who respond well to oral iron therapy require a long time (months) to reach target Hb compared with weeks required in case of treatment with ISC. The compliance is always a problem and to improve this, even iron-rich natural mineral water has been tried to treat IDA in pregnant women.

The use of intramuscular iron preparations in IDA is discouraged because of pain, irregular absorption and staining. Iron preparations in higher/excess dose following intravenous administration might cause liver necrosis, renal, suprarenal and pulmonary damage. The slow release of elementary iron from the complex can lead to the mild allergic. The minimal undesirable effect observed in the treated patients can be easily managed. In addition, the tissue accumulation of iron-sucrose in arenchymatous organs is much lower as compared to iron- dextran/ sorbitol complex. Iron sucrose complex gets rapidly incorporated into the bone marrow for erythropoiesis in comparison to other iron complexes.[13, 15, 16] Unlike intravenous iron-dextran/sorbitol complex, anaphylactic reactions are virtually unknown with iron sucrose.[14,15]

In present study, only 10 of the 100 patients had mild side effects and none had anaphylaxis, thus showing the safety of the drug in the pregnant women. Side effects were limited in the present study because the total dose of ISC was administered at intervals and it was given in diluted form and slowly. Thus our study showed that iron sucrose complex can be used in the pregnant patients with iron deficiency anemia. Intravenous iron is superior to oral iron with respect to faster increase in Hb and faster replenishment of body iron stores.[15] Also, it reduces the need of blood transfusions.[17]

Table 6: Effects of Iron therapy in pregnant women.

Type	Oral iron	I.M. Iron (Iron dextran)	Iron Sucrose
Duration of therapy	Long	Short	Short
Compliance	Less	Less	More
Side Effects	More (Constipation, staining, Vomiting)	More (Staining, Itching, Pain)	Less (Nausea, Vomitting, Constipation, Diarrohea, Itching

CONCLUSIONS

Out of 100 patients maximum number of patients were between 26-30 weeks maturity. In all of them Hb level improved by an average of 1.8 grams.

In our study we found maximum improvement in Hb level during early second trimester (15-20 weeks). Hb level has not increased up to the targeted level, but it has improved by average 2.1 Grams within a short duration (4 weeks).

Moreover only 14% pts suffered from minor side effects. This study showed significant improvement of Hb and iron stores in pregnant women given calculated dose of ISC infusion. It was safe and well tolerated. In our country with frequent IDA found in pregnancy, this type of treatment may be helpful in management of these patients.

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