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Original Research Article

Effectiveness of intravenous iron sucrose over oral iron therapy for anaemia in pregnancy

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ABSTRACT

Background: Anaemia in pregnancy is very common throughout our country impacting both mother and the newborn. The most common cause of anaemia in pregnancy is iron deficiency. The increased prevalence of iron deficiency anaemia amongst the pregnant women, especially in developing countries is a major cause of significant maternal morbidity and mortality. Intolerance to oral iron, inadequate absorption, and side effects leading to poor compliance are the major shortcomings in oral iron therapy. These factors are significant especially in anaemia near term. To overcome all these limiting factors associated with oral iron therapy, parenteral iron therapy is preferred. Aim of this study was to study effectiveness of intravenous iron sucrose over oral iron therapy for anaemia in pregnancy.

Methods: This prospective study was taken up to compare the effectiveness of intravenous iron sucrose over oral iron therapy for anaemia in 30 antenatal women attending antenatal outpatient Department of Obstetrics and Gynaecology belonging to gestational age group of 28-34 weeks with anaemia in pregnancy.

Results: Majority of pregnant women belonged to age group of 22-25 years. 67% were primigravidas. The period of gestation varied from 28-34 weeks. In this study, the mean baseline haemoglobin was 8.4 g/dl before start of treatment and after iv iron sucrose treatment haemoglobin showed a mean value of 10.8g/dl. The mean baseline MCV was 70 fl/cell. Post treatment MCV after 4 weeks showed a significant mean rise of 12 fl/cell in the present study with no major side effects.

Conclusions: Intravenous iron sucrose is highly effective over oral iron therapy for anaemia in pregnancy. It enables rapid correction of anaemia with minimal side effects.

Keywords: Haemoglobin, Iron deficiency anaemia, Mean corpuscular volume, Packed cell volume

INTRODUCTION

Anaemia in pregnancy is very common throughout our country impacting both mother and the newborn. It affects nearly half of all pregnant women in the world.^{1,2} The most common cause of anaemia in pregnancy is iron deficiency.³ The increased prevalence of iron deficiency anaemia amongst the pregnant women, especially in developing countries is a major cause of significant

maternal morbidity and mortality. It contributes to about 20% of all maternal deaths and 9% of peri-natal mortality.^{4,6} Anaemia in pregnancy is significantly associated with preterm births, IUGR, PPH, failure of lactation, perinatal mortality and increased risk of infections.^{7,8} Correction of anaemia reduces maternal morbidity significantly and promotes better neurological development of new born/infants and improve the health status of women.

Oral iron therapy has been the first line treatment modality for anaemia in pregnancy. Intolerance to oral iron, inadequate absorption, and side effects leading to poor compliance are the major shortcomings in oral iron therapy. These factors are significant especially in anaemia near term. To overcome all these limiting factors associated with oral iron therapy, parenteral Iron therapy is preferred.

According to the World Health Organisation (WHO), technical group working on the prevention and treatment of anaemia parenteral iron therapy produces a rapid and complete correction of iron deficiency anaemia than oral iron therapy.¹ Amongst all the parenteral iron preparations available today, iron sucrose appears to be efficient, safe and overcomes the problems of absorption and compliance as compared to iron dextran, iron gluconate and also blood transfusion.^{9,10}

Pharmacology of iron sucrose¹¹

Chemical formula

[Na₂Fe₂₀₈ (OH)₃(H₂O)]_n. m(C₁₂ H₂₂ O₁₁). Iron sucrose is a brown, sterile, aqueous complex of polynuclear iron (III) hydroxide in sucrose containing 20mg elemental iron per ml with an osmolarity of 1250mosm/l.

Molecular weight

34,000-60,000 daltons.

Mechanism of action

Following intravenous administration, it is dissociated into iron and sucrose by reticuloendothelial system and iron is transferred from the blood into pool of iron in the liver and bone marrow. Ferritin sequesters iron in a nonionic form from which iron is easily available.

Method and route of administration¹²

Either as a bolus dose undiluted over 5-10 min (1ml/min) on outpatient basis (Rapid push) or as an Infusion for a short duration of 15-20 min, 200mg in 200ml of Normal Saline only (as other crystalloids cause precipitation or drug interaction) immediately after dilution. Maximum cumulative doses 1600mg in pregnancy (200mg twice per week to a target Hb of 11g/dl or for a maximum of 4 weeks).

Prompt and adequate treatment of Iron deficiency anaemia in pregnancy is essentially important to reduce the anaemia related morbidity and mortality.

METHODS

The present prospective study was taken up to compare the effectiveness of intravenous iron sucrose over oral iron therapy for anaemia in 30 antenatal women attending

antenatal outpatient department at INHS Patanjali. Total duration of the study was 6 months.

Inclusion criteria

- Singleton pregnancy with gestational age of 28-34weeks.
- Haemoglobin concentration of more than 8 g/dl and less than10.5g/dl.

Exclusion criteria

- Pregnancy associated with comorbidities like Diabetes, heart disease, renal and hepatic disorders.
- Obstetrical complications like PIH, APH.
- Pregnancy with anaemia other than iron deficiency.
- Multifoetal gestation.

Materials used for the study

A total of 30 antenatal women in the age group of 20-30 years, who satisfied the inclusion criteria were included in the present study.

Investigations like complete haemogram, with all indices Haemoglobin (Hb%), Packed Cell Volume (PCV), Mean corpuscular Volume (MCV), M.C.H.C, Reticulocyte count, Platelet count, Liver function tests, Serum Creatinine, blood urea, bleeding time, clotting time, and Random Blood Sugar (RBS) and Ultrasonography (USG) were being carried out to rule out exclusion criteria. Detailed history was elicited along with clinical examination. The Study group received iron sucrose intravenously, the dose was calculated using the following formula,

$$2.4 \times \text{Hb deficit in gm\%} \times \text{body weight in kgs} + 500 \text{ mg.}^{12,13}$$

Extra 500 mg was to replenish iron reserves. Thus, obtained dose is given in divided doses, 300mg each time with minimum 48 hrs apart. Each ml contains 20 mg of elemental iron. Every 5 ml of it is dissolved in 200ml of 0.9% of Normal saline per day. All these antenatal women were reviewed after 3-4 weeks with emphasis on improved sense of wellbeing, compliance and adverse effects if any. The blood indices were repeated to assess the response to parenteral iron therapy during the review.

RESULTS

The results were analysed as improvement in Blood indices, before and after taking I.V. Sucrose along with the mean rise in Haemoglobin (hb), MCV and Heamatocrit (PCV)from baseline. Demographic data is shown in (Table 1).

As Shown in Table 1, mean weight of the study group was 48 kgs and most of them belonged to age group of

22-25 years. The mean gestational age in the present study was of 30 weeks.

Table 1: Demographic data.

Parameter	Minimum	Maximum	Mean
Weight	40	60	48
Age	20	30	24
Gestational age	28	34	30

As shown in Table 2, 67% of the antenatal women were Primi gravida. Only 10 in the study group were second gravidas.

Table 2: Distribution of Parity.

Gravida	Number	Percentage
PRIMI	20	67 %
G-2	10	33%
Total	30	100.00%

The above table shows us the improvement of MCV following parenteral iron therapy.

There has been a significant increase of 17% in MCV following IV iron sucrose.

Table 3: Distribution and comparison of MCV before and after treatment.

Group	At	Min.	Max.	Mean
IV Sucrose	Before treatment	60	80	70
	After treatment	80	90	82

Table 4: Distribution and comparison of mean haemoglobin before and after treatment.

Group	At	Minimum	Maximum	Mean
IV Sucrose	Before	8.0	9.0	8.4
	After	10.0	12	10.8

10.8 g% after treatment and therefore a rise by 2.4g% in 4 weeks. This is highly significant rise in mean Hb as shown in Table 4.

Table 5: Distribution and comparison of mean PCV (haematocrit) before and after treatment.

Group	At	Min.	Max.	Mean
IV Sucrose	Before	20	30	26.0
	After	30	40	34.0

Thrombophlebitis and pain at the site of injection are the adverse effects seen with iron sucrose injections. These adverse effects were not seen in any of the antenatal women in this study group.

DISCUSSION

Iron deficiency anaemia is the one of the most common and important public health problem globally, affecting about 56% of pregnant women in developing countries and 18% of women from industrialized countries. Anaemia in pregnancy is a leading cause of maternal and perinatal mortality. Anaemia is a known risk factor for preterm births, IUGR, PPH, failure of lactation and infections in post-partum period. Prevention and prompt correction of anaemia in pregnancy is vital for healthy and safe motherhood.

The conventional treatment modalities for anaemia in pregnancy include oral iron therapy and blood transfusion, especially in anaemia near term. This treatment options have serious limiting factors. High doses of oral iron frequently cause side effects like constipation, diarrhoea and noncompliance is very common. Oral iron supplementations is not sufficient enough to treat anaemia effectively, owing to the limited absorption, the gastrointestinal symptoms and the poor compliance.

Inherent risk of infections (bacterial, viral, prions) and immune modulation associated with allergenic blood products, especially in this young and otherwise healthy population, transfusions are used only in the most severe cases and particularly in life threatening situations. Therefore, intravenous iron has been considered as an highly effective alternative in the management of iron deficiency anaemia in pregnancy with a known safety profile.

In the present study, Majority of women were in the age group of 22-25 years. Mean age of the patients in other studies were approximately similar to present study.

In all other studies maximum number of patients were primigravidas. In the present study 67% were primi gravidas. This is explained by high prevalence of iron deficiency anaemia in adult non pregnant women, when these anaemic women become pregnant their anaemia will be aggravated by increased need of iron during pregnancy. Thus, it is extremely important to screen for iron deficiency anaemia in all non-pregnant women belonging to reproductive age group.

In the present study the mean gestational age at the time of inclusion in the study group is comparable (30 weeks) to the mean gestational age in the study by Aggarwal R S et al where it was 28.2 weeks. The mean baseline MCV was 70 fl/cell. Post treatment MCV after 4 weeks showed a significant mean rise of 12 fl/cell in the present study.

In this study, the mean baseline haemoglobin was 8.4g/dl before start of treatment and after iv iron sucrose treatment haemoglobin showed a mean value of 10.8g/dl.

In the present study, the average rise of haemoglobin is 2.4g/dl which is comparable to the study by Aggarwal R S et al, where the average rise of haemoglobin was 5.03 g/dl in intravenous group.¹⁴

Similarly, in the study conducted by Kharde et al, the average rise of haemoglobin was 3.54 g/dl and 5.3 g/dl in oral and IV group respectively with no major side effects in any of the cases.¹⁵

With all these studies, it is clearly evident that there is an effective rise in hemoglobin level with Intravenous iron Sucrose. The mean base line haematocrit (PCV) is 26% and post treatment mean PCV improved to 34% which is highly reassuring.

There were no major side effects in the study group. Similar observations were reported in other studies by Khade et al.¹⁵⁻¹⁷

CONCLUSION

Intravenous iron sucrose is highly effective over oral iron therapy for anaemia in pregnancy. It enables rapid correction of anaemia with minimal side effects. Known safety and a better efficacy profile, makes it an effective alternative for oral iron in treatment of anaemia in pregnancy.

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

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