

Effect of intravenous iron sucrose therapy for moderate-to-severe anemia in pregnancy: A longitudinal study

Nilesh Thakor¹, Samir Bhagora², Unnati Asari³, Ashish Kharadi⁴, Jyotsna Pandor¹, Dipak Prajapati⁵

¹ Department of Community Medicine, GMERS Medical College, Dharpur, Patan, Gujarat, India.

² Department of Physiology, GMERS Medical College, Dharpur, Patan, Gujarat, India.

³ Department of Pediatrics, GMERS Medical College, Dharpur, Patan, Gujarat, India.

⁴ Department of Surgery, GMERS Medical College & Hospital, Sola, Ahmedabad, Gujarat, India.

⁵ Department of Pathology, GMERS Medical College, Dharpur, Patan, Gujarat, India.

Correspondence to: Nilesh Thakor, E-mail: drnileshthakor@yahoo.co.in

Received September 10, 2014. Accepted September 22, 2014

Abstract

Background: Anemia is one of the major public health problems in the developing countries. More than 70% of pregnant women in Southeast Asian region have nutritional anemia, which affects both the mother and the newborn and subsequent child and later adult.

Objective: To evaluate the response and effect of parenteral iron sucrose complex therapy in iron-deficiency anemia in pregnancy.

Material and Methods: A prospective observational study was conducted at VS General Hospital, Ahmedabad, Gujarat, India, from September 2009 to November 2011. A total of 75 Antenatal women, between 26 and 32 weeks of pregnancy with hemoglobin level between 5–9 g%, were selected for study by purposive sampling. They were given intravenous iron sucrose complex in a dose of 200 mg (2 ampoules of 5 ml each) in 100 mL normal saline for 15–20 minutes, on alternate day. Repeat complete blood count was done after 6 weeks.

Results: Of 75 women, 36 (48%) were in age group of 20–24 years and 49 (65.2%) were 27–29 weeks pregnant. The mean hemoglobin level increased from 7.8 ± 0.61 to 10.1 ± 0.73 g% ($p < 0.001$) after 6 weeks of therapy. There was significant rise in mean corpuscular volume levels (from 67.8 ± 5.0 to 79.2 ± 2.3 fL; $p < 0.001$). 91% of patients treated for anemia delivered at full term, either vaginally (65.33%) or by lower segment cesarean section (25.3%). Most of the delivered babies (80%) had birth weight of more than 2.5 kg. No major side effects or anaphylactic reactions were observed in the women during the study period.

Conclusion: Parenteral iron therapy was effective in increasing hemoglobin levels and other hematological parameters in pregnant women with moderate-to-severe anemia. If used in time, this treatment will certainly help to reduce the risk of maternal and fetal complications as well as to reduce the risk of blood transfusion during peripartum period.

KEY WORDS: Anemia, iron deficiency, iron sucrose complex, parenteral iron therapy, MCV

Introduction

Anemia is the most common nutritional deficiency disorder in the World. World Health Organization (WHO) has estimated

the prevalence of anemia in pregnant women to be 14% in developed countries and 51% in developing countries, and 65–75% in India.

According to the WHO criteria, cutoff point for diagnosis of anemia in pregnancy is hemoglobin (Hb) < 11 g%, accompanied by depleted iron stores and signs of compromised supply of iron to tissues.^[1]

About one-third of global populations (over 2 billion) have anemia.^[2] Prevalence of anemia in all groups is higher in India as compared to other developing countries.^[1] Iron-deficiency anemia (IDA) is the most common nutritional deficiency in pregnancy.

Various modalities of management of IDA such as oral, intramuscular, and intravenous preparations of iron have been

Access this article online

Website: <http://www.ijmsph.com>

DOI: 10.5455/ijmsph.2015.100920145

Quick Response Code:



used in the pregnant patients, but efficacy of oral iron therapy may be limited in many patients because of dose-dependent side effects, noncompliance, and poor absorption, and it may not be possible to achieve the target rise in Hb level in a limited period when patient is approaching the term. Iron sucrose complex (ISC) is a relatively new drug, which is used intravenously for the correction of IDA.^[4,5] It has been able to raise the Hb to satisfactory level when administered in pregnant women with severe iron-deficiency anemia.^[6,7]

Recent evidence suggests that iron sucrose can be detected in high levels in liver circulation and marrow within 5 min after intravenous administration.^[8] Also, the accumulation of iron sucrose in organic parenchyma is much lower compared with iron-dextran and iron-gluconate.^[9] Thus, iron sucrose has revolutionized anemia management in pregnancy. This study was undertaken to evaluate the response and effect of parenteral ISC therapy in IDA in pregnancy.

Methodology

A prospective observational study was carried out at VS General Hospital, Ahmedabad, Gujarat, India, from September 2009 to November 2011. A total of 75 Antenatal women, between 26 and 32 weeks of pregnancy with hemoglobin levels between 5 and 9 g%, were selected for the study by purposive sampling. After admission in hospital wards, written informed consent was taken before screening enrolment. After excluding other causes of anemia (e.g., thalassemia, hemolytic anemia, hypersplenism, infection, inflammation, liver or renal disease), subjects were administered parenteral iron sucrose therapy. All the patients received ISC in infusion form with the aim to correct the iron deficiency and to replenish the iron stores. The aim was to bring the Hb level of the patients to 10 g%.

The following formula was used to calculate the iron requirement of the patient to fulfill the deficit and to replenish the iron stores:

Amount of iron deficit (mg) = Body weight (kg) × Hb deficit (g%) × 0.24 + 500

ISC was administered as 200 mg elemental iron in 100 mL of 0.9% normal saline infusion over 1 h on alternate days up to the total calculated dose. A test dose of 1 mL iron sucrose infusion was administered followed by a 15 min window period, during which no infusion was given and patient was observed for any allergic reactions. If no reactions occurred, the rest of the infusion was administered. Repeat complete blood count was done after 6 weeks.

Monitoring during infusion: A set of observations (BP, pulse, temperature) were made before the start of the infusion, after 15 min, and at the end of the infusion. Similar clinical observations were made as and when required during blood transfusion, that is, looking for symptoms or signs of any adverse reaction. The subjects were allowed to go home 4 h after the infusion if all observations were stable. Mild allergic reactions were managed by stopping the administration of ISC and slowly injecting chlorpheniramine 10 mg intravenously.

The infusion was then restarted at a slower rate and the women were observed closely.

Mean values of Hb and mean corpuscular volume (MCV) levels were used to compare pre- and posttreatment parameters. *p*-Value of less than 0.5 was considered to be significant. The data were compiled and standard tests of significance (*p*-value) were applied.

Results

Of 75 women tested, 36 (48%) were in age group of 20–24 years [Table 1] and 49 (65.2%) were 27–29 weeks pregnant [Table 2]. Thirty (40%) women had Hb <8 g% before treatment. Forty-nine (65.4%) women achieved Hb of 10 g% after treatment. The mean Hb increased from 7.8 ± 0.61 to 10.1 ± 0.73 g% (*p*<0.001) after 6 weeks of therapy. There was a significant rise in MCV levels (from 67.8 ± 5.0 to 79.2 ± 2.3 fL; *p*<0.001) [Table 3].

No major side effects or anaphylactic reactions were observed in the women during the study period. 91% of patients treated for anemia delivered at full term, either vaginally (65.33%) or by lower segment cesarean section (25.3%) [Table 4]. Most of the delivered babies (80%) had birth weight of more than 2.5 kg [Table 5].

Discussion

In the study by Kriplani *et al.*^[10], the mean age of women was found to be 27.8 ± 3.9 (range 21–34) years and the mean parity of 1.3; mean period of gestation at the time of diagnosis was found to be 25.69 ± 4.82 (14–32) weeks. At the beginning, mean Hb level was 7.63 ± 0.61 g%. Thirty-two

Table 1: Distribution of women according to age

Age (Years)	No. of patients
20–24	36 (48)
25–29	30 (40)
≥30	09 (12)
Total	75 (100)

Table 2: Distribution of women according to gestational age (USG maturity)

USG maturity (weeks)	No. of patients
26	5 (6.6)
27	17 (22.6)
28	15 (20)
29	17 (22.6)
30	09 (12)
31	08 (10.6)
32	04 (5.33)
Total	75 (100)

Table 3: Rise in hemoglobin and MCV levels

Hb (g%)		No. of patients		Mean Hb (g%)		Mean rise in Hb (g%)	Mean MCV (fL)		Mean rise in MCV (fL)
Pre treatment	Post treatment	Pre treatment	Post treatment	Pre treatment	Post treatment		Pre treatment	Post treatment MCV	
6.0–6.9	9.0–9.9	09 (12)	20 (34.6)	7.8 ± 0.61	10.1 ± 0.73	2.3 ± 0.12	67.8 ± 5.0	79.2 ± 2.3	11.3 ± 7.3
7.0–7.9	10.0–10.9	21 (28)	43 (57.4)						
8.0–8.9	11.0–11.9	45 (60)	06 (8.0)						

Table 4: Distribution of women according to the outcome of pregnancy

Outcome	No. of patients
FTD	49 (65.3)
FTCS	19 (25.3)
PTD	07 (9.3)
Total	75 (100)

(32%) women had mild anemia (>8 g%) and 68% had moderate anemia (5–7.9%). After completion of the therapy, mean Hb level raised to 11.20 ± 0.73 g%. Of 75 women, 67% achieved Hb ≥ 11 g%.^[10]

In the study by Patel *et al.*^[11] intravenous iron sucrose was found to be effective in achieving target Hb of 10 g/dL in 80% of the patients. They showed that intravenous iron sucrose significantly ($p < 0.001$) increased Hb levels within 4 weeks. No major adverse reactions were observed.

Nils *et al.*^[12] found the rise in mean Hb level to be 2.3 g%.^[12] According to Al-Momen *et al.*, the rise in mean Hb level was 2.5 g% and that in mean MCV to be 10 fL.^[5] In the study by Kiran *et al.*^[13], the rise in mean Hb level was found to be 2.53 g%. In the work by Raja *et al.*^[14], the rise in mean Hb was found to be 3.5 g% and that in mean MCV to be 10 fL. According to Halimi *et al.*^[15], the mean Hb level increased from 9.2 ± 1.69 to 12.65 ± 1.06 g% after 30 days of therapy.

Conclusion

Parenteral iron therapy was effective in increasing Hb levels and other hematological parameters in pregnant women with moderate-to-severe anemia. If used in time, this treatment will certainly help to reduce the risk of maternal and fetal

Table 5: Distribution of women according to birth weight of delivered child

Birth weight of delivered child (kg)	No. of women
<2.05	07 (9.33)
2.0–2.4	08 (10.6)
2.5–2.9	42 (56.0)
≥ 3.0	18 (24.0)
Total	75 (100)

complications, and to reduce the risk of blood transfusion during peripartum period. It is safe and well-tolerated treatment. In our country with high prevalence of IDA during pregnancy, this type of treatment may be helpful in management of these patients.

There is definitely a need for well-planned, large-scale studies using standardized methodologies to evaluate patient satisfaction and quality of life, impact on costs and hospital stay, impact on blood transfusion frequency and mortality rate, and finally impact on other factors such as breast-feeding behavior and neonatal outcome such as birth weight, prematurity, and neonatal iron stores.

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How to cite this article: Thakor N, Bhagora S, Asari U, Kharadi A, pandor J, prajapati D. Effect of intravenous iron sucrose therapy for moderate-to-severe anemia in pregnancy: a longitudinal study. *Int J Med Sci Public Health* 2015;4:11-14

Source of Support: Nil, **Conflict of Interest:** None declared.