RESEARCH ARTICLE

EVALUATION OF EFFECTIVENESS OF INTRAVENOUS IRON SUCROSE IN ANTENATAL PATIENTS OF IRON DEFICIENCY ANEMIA

Manisha Parmar, Hemali Vaghela, Parul Shah, Rajal Thakar, Kruti Deliwala
Department of Obstetrics & Gynaecology, V S General Hospital, Ahmedabad, Gujarat, India

Correspondence to: Manisha Parmar (parmar.monisha88@gmail.com)

DOI: 10.5455/ijmsph.2013.161120131 **Received Date: 27.10.2013** **Accepted Date: 19.01.2014**

ABSTRACT

Background: Iron deficiency anaemia (IDA) is the most common nutritional deficiency in pregnancy. Prophylactic oral iron is recommended during pregnancy to meet the increased requirement of iron. In India, more than 50% women become pregnant with low baseline haemoglobin level resulting in high incidence of moderate to severe anaemia in pregnancy where oral iron therapy cannot meet the requirement. This study was undertaken for critical evaluation of iron sucrose in terms of efficacy, safety, and feasibility along with any reduction in blood transfusion rate.

Aims & Objective: To evaluate the efficacy of intravenous Iron sucrose in antenatal patients with Iron deficiency anaemia and to study the side effects of intra venous Iron sucrose.

Material and Methods: This prospective study was conducted from Nov 2012 to June 2013 at VS General Hospital, Ahmedabad. 60 antenatal patients found to have anaemia having Hb level < 9 gm% were admitted and given intravenous iron sucrose therapy 100mg alternate day after calculating the dose of the iron requirement.

Results: In patients having moderate anaemia (Hb 7-9 gm%), the rise in Hb found to be 2.17 ± 0.45 gm% from pre-treatment Hb of 7.88 ± 0.58 gm% to 9.9 ± 0.53 gm%. In patients with severe anaemia (Hb < 7 gm%), the rise in Hb was observed up to 2.73 ± 0.51 (SD) gm% after 1 month of iron sucrose treatment. No major side effects or anaphylactic reactions were noted during the study period.

Conclusion: Parenterally administered iron sucrose elevates Hb and restores iron stores earlier and also that intravenous iron administration has led to the reduction in the rate of blood transfusion rate.

Key-Words: Anaemia, Parenteral Iron Therapy; Iron Deficiency Anaemia (IDA); Iron Sucrose Complex (ISC)

Introduction

Iron deficiency anaemia (IDA) is the most common nutritional deficiency in pregnant women. According to WHO, the prevalence of IDA is about 18 per cent in developed countries and 35-75 per cent (average 56%) in developing countries.[1] Globally, the prevalence of anaemia is 55.9 per cent with variations between developed and developing countries. The prevalence of anaemia in South East Asia is around 56% .In India prevalence ranges between 33-89%.[2] According to NFHS-3 (National Family Health Survey), prevalence of anaemia in India is 56%. It affects 2/5 of non- pregnant women and over 1/2 of all pregnant women worldwide. About half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80 per cent of this mortality ratio.[3]

Maternal mortality due to anaemia continues to be a major health problem in the developing world. Nearly 600,000 women die each year as a result of complications of pregnancy and childbirth; most of these deaths could be prevented with attainable resources and skills (WHO 1996).[4,5] In many regions anaemia is a factor in almost all maternal deaths, and it poses a 5 fold increase in the overall risk of maternal death through PPH, cardiac failure, puerperial sepsis, venous thrombosis, pulmonary embolism. The risk of death increases dramatically in severe anaemia. The factors responsible for high incidence of anaemia in our country include early marriage, teenage pregnancy, multiple pregnancies, less birth spacing, phytate rich Indian diet, low iron and folic acid intake and high incidence of worm infestation in Indian population.[6]

WHO defined anaemia as haemoglobin concentration less than 11 g/dl or haematocrit value less than 0.33.[1] Classification of iron deficiency anaemia is: 8-10 gm% as mild, 7-8 g % as moderate and <7 g% as severe anaemia. In absence of interfering factors, serum ferritin < 12-15 µg/l is considered as iron deficiency.[7] The first choice for prophylaxis and treatment of mild iron deficiency anaemia in pregnancy is oral iron therapy. But in patients with moderate and severe anaemia, oral therapy takes long time to increase Hb level and compliance is a big issue in our country. Thus, pregnant women with moderate and severe anaemia should be better treated with parenteral iron therapy and/or blood transfusion depending in individual case (degree of anaemia, haemodynamic status, period of gestation, etc.). Various parenteral iron preparations are available in the market which can be given either intravenously or intramuscularly. Initially, iron dextran or iron sorbitol citrate were used. But test dose was required

to be given before these injections as severe anaphylactic reactions were reported with intravenous iron dextran. Iron sucrose has been reported to be safe and effective during pregnancy.[8] The injection can be given without test dose.[9] The intravenous iron therapy can replace blood transfusion for IDA as there are numerous hazards of blood transfusion including mismatched blood transfusion, infection, and anaphylaxis.[10]

A prospective study, therefore, was conducted in pregnant women with iron deficiency anaemia (haemoglobin between 5-9 g%) from Nov 2012 to June 2013 attending our hospital to evaluate the response and effect of intravenous (iv) iron sucrose complex (ISC) in terms of improvement in haemoglobin status.Inj Iron sucrose 5ml ampule containing 100 mg of iron was used.

Materials and Methods

This study was carried out on 60 antenatal patients of iron deficiency anaemia admitted to antenatal ward in VS General Hospital. Antenatal patients in the second and early third trimester attending ANC OPD were examined clinically and history was elicited. Patients found to be clinically anaemic were investigated primarily by haemoglobin estimation by Sahli's acid haematin method in OPD. The patients found to have Hb < 9 gm% were admitted in antenatal ward for further investigation and treatment of anaemia. The patients who fulfilled the inclusion and exclusion criteria and giving consent were included in this study.

Patient Selection: *(a) Inclusion Criteria:* Age -18 to 40 years old, singleton pregnancy at 20 to 32 weeks, having moderate/severe anaemia, and giving consent for the study. *(b) Exclusion Criteria:* Stool examination reveals parasitic infestation, UTI, Fever, Raised total count, H/o allergy to iron, H/o allergic condition like asthma, H/o Thalassemia, H/o bleeding tendencies, H/o prior blood transfusion within prior 120 days, H/o delivery before 36 weeks, Any associated complication e.g. Hypertension, Diabetes mellitus, Heart diseases, Peptic ulcer.

Protocols for Iron Sucrose Infusion: All patients were hospitalized and investigated for complete blood count, MCV, MCH, MCHC, peripheral smear, serum iron, serum ferritin, TIBC, urine examination to rule out UTI, ESR to rule out any subclinical infection, stool examination for any ova or cysts. Total dose is calculated by,

Total Iron Deficit= {Body Weight (in kg) X [Target Hb gm% – Actual Hb gm%] x 2.4} + 500 mg depot iron

The amount of iron required to correct Hb deficit will be calculated and individualized as per patient. Patients were given injection iron sucrose (100mg) in 100 ml normal saline on alternate day. During whole procedure patients were continuously monitored keeping the emergency drug cart ready for resuscitation if any emergency arises.

Evaluation: Done after 4 weeks by following tests; (a) Hb level; (b) Peripheral smear for Cell morphology.

Results

Majority of patients were in age group of 26-30 years. The mean age of the study population was 25.58 ± 3.61 years (Table 1). Majority of patients (90%) from urban area. 25% had moderate anaemia (7-9 gm%) and 75% had severe anaemia (< 7 gm% Hb). 77% patients of iron deficiency anaemia were multigravida. The minimum dose required was 700 mg and the mean Hb rise was 1.96 gm%. The highest rise in Hb of 3.06 gm% was obtained with 1400 mg of iron sucrose. As shown in table 2, 8 (13.33%) patients had up to 2 gm% increase in Hb from baseline. 43 (71.67%) patients showed up to 3 gm% rise in Hb. Highest rise in Hb up to 4 gm% was observed in 9 patients.

Table-1: Age distribution in study population

Age of Patients (years)	No. of cases
≤ 20	3
21-25	25
26-30	29
30-35	3

Table-2: Analysis of rise in haemoglobin level after treatment with iron sucrose

Rise in Hb (gm %)	No. of cases
<1	0 (0%)
1 – 2	8 (13.33%)
2.1 – 3	43 (71.67%)
3.1 – 4	9 (15%)
4.1 – 5	0 (0%)
5.1 – 6	0 (0%)

Table-3: Side effects observed during and after therapy

Side Effects	No. of cases
Phlebitis	2 (3.33%)
Muscle pain	12 (20%)
Headache	9 (15%)
Injection site pain	9 (15%)
Injection site soreness	3 (5%)
Chest pain	1 (1.6%)

Table-4: Pretreatment and post treatment Hb level

	Hb Level (gm% in Mean ± SD)		
	Pre-Treatment	Post Treatment	Rise
Moderate Anaemia	7.88 ± 0.58	9.99 ± 0.53	2.17 ± 0.45
Severe Anaemia	5.58 ± 0.61	8.43 ± 0.56	2.73 ± 0.51

Table-5: Analysis of haemoglobin levels in the study

	N	Mean	SD
Baseline Hb (gm %)	60	6.33	1.07
After 4 weeks	60	8.82	0.88
Rise in Hb (gm%)	60	2.587	0.7

SE (standard error): 0.37; CI (confidence interval): 95%; Z-test: 6.89; P-value < 0.05

Table-6: Comparison with other study

Mean Value	Present Study	Kurshid R et al study	Bhupesh D et al study
Pre-treatment Hb (gm%)	6.33 ± 1.07	7.5	7.34 ± 1.43
Hb after 4 weeks (gm%)	8.82 ± 0.88	11	9.56 ± 1.06
Rise in Hb	2.58 ± 0.7	3.5	2.22
P value	< 0.05	< 0.5	< 0.0001

Minor side effects like phlebitis, injection site pain and soreness was observed in 3 to 10% cases. Around 16% patients reported muscle pain and headache the day after administering iron sucrose. The severity of these side effects was negligible and not requiring any treatment. No other serious side effects requiring active treatment was documented (Table 3). As shown in table 4, in patients having moderate anaemia the rise in Hb found to be 2.17 ± 0.45 gm% from pre-treatment Hb of 7.88 ± 0.58 gm% to 9.99 ± 0.53 gm%. In patients with severe anaemia, the rise in Hb was observed up to 2.73 ± 0.51 gm% after 1 month of iron sucrose treatment.

As shown in table 5, the mean rise in haemoglobin after treatment with inj. Iron sucrose is 2.58 (95% CI, $p<0.05$). Statistically Significant change in Haemoglobin levels indicate the efficacy of Iron Sucrose in the treatment of Iron deficiency anaemia.

Discussion

The mean age of women was 25.5 ± 3.61 (range 20-35) year. This observation is because the study is undertaken on pregnant females who are in the reproductive age group of 15 to 45 years. Khurshid R et al also shows mean age of 30 years with a range from 21 to 35 years. Majority (77%) of patients were multipara. Khurshid R et al study shows comparable results as our study. This shows that multiparity is an important etiological factor in iron deficiency anaemia. Repeated short interval pregnancies predisposes the pregnant female to suffer from iron deficiency anaemia as increase demand in pregnancy is not met with the supply due to faulty dietary habits.

Period of gestation (PDG) at the time of diagnosis was between 20-32 wk. 25% women had moderate anaemia (7-9 gm%) and 75% had severe anaemia (< 7 gm%). The efficacy of iron sucrose therapy in both groups were compared and results shows there is mean rise in haemoglobin 2.5 gm% in both groups.

Changes in haemoglobin level before and after treatment: At the beginning, mean Hb was 6.33 ± 1.07 gm%. After completion of therapy, mean Hb raised to 2.58 ± 0.7 gm%. As shown in table 6, Khurshid R et al amd Bhupesh D et al also showed mean rise in Hb 3.5 and 2.2 respectively. So our results were comparable with other studies and were statistically significant. Thus, the efficacy of Iron sucrose therapy is proved in our study. Of the total women, 15 % achieved Hb > 4 gm%. Complete dosage schedule was done in 60 women. Two women was lost to follow up after five doses. Limitations of our study was lack of control group (intramuscular iron therapy). Large randomized controlled trials are required to compare the efficacy and safety of intravenous iron sucrose complex over intramuscular iron therapy.

In our study, minor side effects e.g. phlebitis, injection site pain and soreness and headache were recorded in 3% to 10% of cases. Which were treated symptomatically. No serious side effects such as anaphylactic reaction was noted in our study. Bhupesh D et al study showed iron sucrose induced side effects were infrequent and self-limited in up to 4.19% of patients of the total study population. The reported side effects were pain at the injection site (1.4%), nausea (2.15) and fever (0.7%).The safety of Iron sucrose is well established in our study as reported by other authors.

Our results showed that intravenous iron sucrose therapy was effective to treat moderate and severe anaemia in pregnant women. Intramuscular preparations are known to be associated with local side-effects. Iron sucrose complex iv therapy was with negligible side effects. It caused rapid rise in haemoglobin level and the replacement of stores was faster. Intravenous iron is superior to oral iron with respect to faster increase in Hb and faster replenishment of body iron stores.[11] Also, it reduces the need of blood transfusions[12], and it can be given at outpatient basis.

Conclusion

During the study period from November 2012 to June 2013, 62 cases were taken for study. 2 cases were excluded due to loss of follow up. So, finally 60 cases were analysed at the end of the study. All patients (N=60) received injection iron sucrose intravenous infusion according to requirement. Mean age of the study group was 25 ± 3.61 years and ranging from 20 to 35 years. 77% of patients were multipara. Multiparity is one of the factors for iron deficiency anaemia. Repeated pregnancies at short interval can cause depletion of iron storage in the body and iron intake can't meet the iron requirement due to faulty dietary habits.

Post-partum haemorrhage is most common cause of maternal mortality. Anaemic females are more prone to suffer from consequences of PPH. So, it is necessary to build

up the haemoglobin level in every antenatal patient. Maternal mortality due to anaemia continues to be a major health problem in the developing world. Overall risk of maternal death through PPH, cardiac failure, puerperal sepsis, venous thrombosis, pulmonary embolism increases with severe anaemia. So I.V iron sucrose therapy is useful in reducing maternal morbidity and mortality arising from iron deficiency anaemia. In conclusion, our results showed that intravenous iron sucrose therapy was effective to treat moderate and severe anaemia in pregnant women. Intramuscular preparations are known to be associated with local side-effects. Iron sucrose complex iv therapy was with negligible side effects. It caused rapid rise in haemoglobin level and the replacement of stores was faster.

References

1. Dutta DC. Anaemia in pregnancy. Text book of obstetrics including perinatology & contraception, 6th ed. Calcutta: New Central Book Agency (P) Ltd.; 2004. p. 262-7.
2. Ezzati M, Lopez AD, Rodgers A, Vander Hoorn S, Murray CJ; Comparative Risk Assessment Collaborating Group. Selected major risk factors and global and regional burden of disease. Lancet. 2002;360(9343):1347-60.
3. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, et al. Prevalence of anaemia among pregnant women and adolescent girls in 16 districts of India. Food Nutr Bull. 2006;27(4):311-5.
4. Viteri FE. The consequences of Iron deficiency and anaemia in pregnancy on maternal death. SCN News. 1994;(11):14-8.
5. DeMaeyer E, Aaiels–Tegman M. The prevalence of anemia in the world. World Health Statistics quarterly. 1985;38:302–316.
6. Toteja GS, Singh P. Micronutrient Profile of Indian Population. New Delhi, India: Indian Council of Medical Research; 2004.
7. Kalaivani K. Prevalence & consequences of anaemia in pregnancy. Indian J Med Res. 2009; 130:627-33.
8. Silverstein SB, Rodgers GM. Parenteral iron therapy options. Am J Hematol. 2004; 76 : 74-8
9. Charytan C, Levin N, Al-Saloum M, Hafeez T, Gagnon S, Van Wyck DB. Efficacy and safety of iron sucrose for iron deficiency in patients with dialysis-associated anaemia: North American clinical trial. Am J Kidney Dis. 2001; 37 : 300-7.
10. Bhandal N, Russell R. Intravenous versus oral iron therapy for postpartum anemia. BJOG. 2006; 113:1248–52.
11. Bashiri A, Burstein E, Sheiner E, Mazor M. Anaemia during pregnancy and treatment with intravenous iron: review of the literature. Eur J Obstet Gynecol Reprod Biol. 2003; 110: 2-7.
12. Hallak M, Sharon A, Duikman R, Auslender R, Abramovici H. Supplementing iron intravenously in pregnancy. A way to avoid blood transfusions. J Reprod Med. 1997; 42: 99-103.

Cite this article as: Parmar MM, Vaghela H, Shah PT, Thakar RV, Deliwala KJ. Evaluation of effectiveness of intravenous iron sucrose in antenatal patients of iron deficiency anemia. Int J Med Sci Public Health 2014;3:173-176.
Source of Support: Nil
Conflict of interest: None declared