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Original Article

Safety and Efficacy of Iron Sucrose Compared to Blood Transfusion in Iron Deficiency Anemia in Pregnancy

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Abstract

Introduction: Iron deficiency anemia is one of the worst public health issues globally, affecting 52% of pregnant women in developing countries and 23% in developed countries. The iron shortage is the world's most common food shortage disease. Roughly 600–700 million people around the world have severe anemia of iron deficiency.

Aim: The aim of the study was to study the safety and effectiveness of iron sucrose and blood transfusion in iron deficiency anemia in pregnancy.

Methods: From November 2009 to October 2010, this prospectively randomized control analysis was carried out in the Obstetrics and Gynecology Department of Kilpauk Medical College. There were two groups of 100 patient's treated, intravenous (IV) iron sucrose in Group 1 and blood transfusion in Group 2. Data were collected and analyzed.

Results: The mean age was 23.48 and 25.08 in Group A and Group B, respectively. About 47% belonged to Class V socioeconomic status and 46% belonged to Class IV socioeconomic class. Hemoglobin's average rise was 3.44 g/dl and 3.51 g/dl, respectively in Group I and Group II. In Group II, more adverse effects such as headache 2/50 (4%) chills and rigor 12/50 (24%), itching 8/50 (16%) were found. About 10% (5 patients) in iron sucrose group (Group I), and 26% (13 Patients) in the blood transfusion group (Group II) delivered preterm.

Conclusion: IV iron sucrose is as effective as a blood transfusion in treating iron-deficient anemia in pregnancy and healthy compared to blood transfusion without any adverse effects.

Key words: Anemia, Blood transfusion, Iron, Pregnancy

INTRODUCTION

Anemia is identified as a hemoglobin (Hb) concentration <11 g/dL by the World Health Organization during pregnancy. Anemia is a significant contributory cause to motherhood morbidity, motherhood mortality, and higher perinatal mortality rates in under-developed nations, affecting a 52% of pregnant women in developing and a 23% of the pre-determined women in the developed world.[1] Anemia is most commonly (about 80%) caused during pregnancy by iron deficiency and often complex disorders with defects in erythrocyte production or rapid destruction.

Iron, as the oxygen-carrying pigment in the blood, is an essential element of Hb. Pregnant women are required to maintain iron balance by 1000 mg iron all through the pregnancy, that is, 3.5 mg/day. Demand grows to about 6.7 mg a day during the last half of pregnancy and several weeks after birth. In India, the severity of nutritional anemia remains a significant public health issue, despite steps taken in the past two decades to regulate anemia during pregnancy and lactation.[2] Iron is an essential ingredient for Hb, myoglobin, and certain enzymes. It functions as

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an oxygen and electron carrier and acts as an oxygen and hydroxylation catalyst. It can also trap an electron (Fe++/Fe++ cycling) and release it. Iron deficiency anemia during breastfeeding is treated in many ways. These are different forms of iron (oral tablets and parenteral iron), transfusion of blood, and erythropoietin.

Long-lasting oral therapy, in particular digestive effects, can induce non-conformity. Intramuscular (IM) injection parenteral administration is a debilitating option with different degrees of success. The preparation of iron sucrose IV improves hematological hints with fewer side effects and allergic reaction dramatically across the formulations of iron. Most anecdotally, the administration of intravenous (IV) and IM iron indicates an allergy. In comparison to IM iron, IV.[3] The study concluded that blood transfusion, pending preventive blood screening, carries the risk of transmitting parasite or viral infections including HIV, hepatitis, and chagas (trypanosomiasis) diseases. Bovine spongiform encephalitis and viral infections are also likely. Risk of acute lung damage due to transfusion (Transfusion-related acute lung injury) is also present.[4]

Aim

The aim of the study was to study the safety and effectiveness of iron sucrose and blood transfusion in iron deficiency anemia in pregnancy.

MATERIALS AND METHODS

From November 2009 to October 2010, this prospectively randomized control analysis was carried out in the Obstetrics and Gynecology Department of Kilpauk Medical College. A thorough general examination and extensive obstetrical examination were conducted after receiving informed consent. Criteria for participation include ages from 18 to 45 years, singleton pregnancy weeks from 28 to 34 and Hb- 7–8 g/dl. The exclusion criterion is patients with hypertension, gestational diabetes, respiratory failure, peptic ulcers and thalassemia, iron-containing H/o allergy, H/o allergy, asthma, and H/o bleeding.

The two classes had been randomly distributed to patients with iron deficiency anemia that met both conditions Section I and Section II, respectively. There are 50 patients in each group. The iron demand is based on the following formula 2.4 × (target Hb–patient Hb) × Weight of Pre-pregnancy (kg) + 500 (iron storage) = mg of elementary iron. Group I patients had an IV iron sucrose complex that had been injected with 100 mg of elementary iron diluted with 0.9 ml of regular saline for an alternating duration of 15 min before the required dosage was injected. One unit of bundled cell transfusion was given to patients from Group II, and after 48 h, the Hb had reassessed additional transfusions before the requisite Hb had been met.

The following parameters have been observed during the treatment: Critical (pulse, temperature, and blood pressure), adverse effects such as nausea/abdominal pain, and chills. Two weeks after the procedure, we recommended that patients to attend our outpatient department and measured the criteria below, which include symptomatic progress, Hb, hematocrit, and mean corpuscle volume (MCV).

RESULTS

Out of 100 patients, 50 patients included in Group 1 and 50 patients included in Group 2. The mean age of Group 1 is 23.48, and Group 2 is 25.08.

Among the 50 patients in Group I, 36% were booked and 64% were unbooked. In Group II, 52% were booked and 48% were unbooked. There was no significant change in both groups. About 48% of patients in Group I and 48% of patients in Group II, were primigravida, while only 4% in group and 7% Group II were gravid 4. Both primi and multipara were equally distributed in both the groups

Out of 100 patients, in Group 1, based on socioeconomic status, two patients are in Class 3, 23 patients are in Grade 4, and 25 patients are in Level 5. In Group 2, five patients are in Class 3, 23 patients are in Grade 4, and 22 patients are in Class 5 [Table 1].

Table 1: Socioeconomic status

Socioeconomic status	Group 1	Group 2
Class 1	0	0
Class 2	0	0
Class 3	2	5
Class 4	23	23
Class 5	25	22

Table 2: Blood parameters

Variables	Group 1			Group 2		
Blood parameters	Hb	Hematocrit	MCV	Hb	Hematocrit	MCV
Pretreatment	7.4±0.3	28.4±1.39	69.19±3.70	7.5±0.3	30±1.5	69.03±2.58
Post treatment	10.9±0.3	33.9±1.56	86.69±1.86	11.09±0.5	38±1.25	86.01±1.90

Hb: Hemoglobin, MCV: Mean corpuscle volume

The average rise of Hb was 3.44 g/dl and 3.51 g/dl, respectively, in Group I and Group II ($P = 0.417$), which was statistically not significant. The average rise of Hb was 3.44 g/dl and 3.51 g/dl, respectively, in Group I and Group II ($P = 0.417$), which was statistically not significant. The average gain in MCV was 17.49 fl and 17.09 fl in Group I and Group II, respectively [Table 2].

Out of 100 patients, in Group 1 based on symptoms 27 patients had easy fatigability and pallor, five patients had breathlessness and pallor, 13 patient's pallor of skin and mucus membrane, five patients had easy fatigability pallor and breathlessness. In Group 2 based on symptoms 22 patients had easy fatigability and pallor, four patients had breathlessness and pallor, 19 patient's pallor of skin and mucus membrane, and five patients had easy fatigability pallor and breathlessness [Table 3].

Out of 100 patients, in Group 1, no patient had an adverse effect. In Group 2, 12 patients had chills and rigor, eight patients had itching, and two patients had a headache [Table 4].

Out of 100 patients, in Group 1, based on gestational age at delivery, five patients had a preterm delivery, and 45 patients had correct term delivery. In Group 2, 13 patients had a preterm delivery and 37 patients had accurate term delivery [Table 5].

Table 3: Comparison of symptoms

Symptoms	Group 1	Group 2	*P*-value
Easy fatigability and pallor	27	22	0.0627
Breathlessness and pallor	5	4	
The pallor of skin and mucous membrane	13	19	
Easy fatigability pallor and breathlessness	5	5	

Table 4: Adverse effect

Adverse effect	Group 1	Group 2	*P*-value
Chills and rigor	0	12	<0.0001
Nausea and vomiting	0	0	
Itching	0	8	
Joint pain	0	0	
Headache	0	2	
Anaphylactic reaction	0	0	
Thrombophlebitis	0	0	

Table 5: Gestational age at delivery

Gestational age at delivery	Group 1	Group 2	*P*-value
Preterm	5	13	0.018
Term	45	37	

DISCUSSION

In our sample, the highest proportion was for the 20–25-year age team. In our sample, 47% of women were socioeconomic in Class V and 46% were socioeconomic in Class IV. Many women in a low socioeconomic community had iron deficiency anemia.

In the study, both the iron sucrose group and blood transfusion groups were improving symptomatically in all patients (100%). For the two groups tested, there was no statistical difference.

Our survey indicates an average improvement of 3.44 g/dl–3.51 g/dl ($P = 0.417$) in Hb, which was not statistically relevant for pre-treatment and post-treatment comparisons. Close to Bayoumeu *et al.* (2005),[5] our analysis of iron sucrose achieves the target levels within a brief period apart from being more compelling. Related experiments have demonstrated a Hb improvement between 3.8 g/dl and 3.2 g/dl by Wali *et al.*[6] and European Journal of Obstetrics and Gynaecology.

The time needed to achieve maximal Hb level was significantly shorter in the iron sucrose complex group as compared with the control group (6.9 ±1.8 weeks vs. 14.9 ±3.1 weeks).[7]

The average increase in hematocrit in pre- and post-treatment comparisons was 5.51% and 8.0%, which was also not statistically significant for the iron sucrose and blood-transfusion groups. His study showed an increase in hematocrit as well, by Breymann *et al.*[8] and Dede *et al.*[9]

In our analysis, the average improvement in MCVs for the pre-treatment/post-treatment contrast was 15,886 fL and 17,09 fL, which was similarly not important for Group I and Group II. A thesis by Raja *et al.*, Pakistan Medical Association newspaper, Vol. 28 demonstrated a mean MCV pre-treatment of 65 fL, a mean MCV 3 weeks after treatment of 75 fL, and a mean improvement in MCV of 10 fL with statistically meaningful $P < 0.10$.[10]

There were no adverse reactions to the treatment of iron deficiency anemia in women treated with iron sucrose in our research. In Group II; however, other side effects were found for patients infected with blood transfusion. Iron sucrose is costlier than OI and requires a hospital setting for administration.[11] Other related studies reported by Hoigne *et al.*,[12] Al,[13] and Al Momen *et al.*[7] and also found no adverse reactions.

In our study, the frequency of preterm delivery was high in patients treated with blood transfusion relative to the iron sucrose group.

CONCLUSION

IV iron sucrose is as effective as a blood transfusion in the treatment of iron-deficient anemia in pregnancy and healthy compared to blood transfusion without any adverse effects.

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