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Original Research

Role of prophylactic parenteral iron sucrose administration to antenatal patients at 5th and 7th month of gestation in preventing anemia at term

Shweta Rai

Associate Professor, Department of Obstetrics & Gynaecology, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India

ABSTRACT:

Aim: The present study was aimed to evaluate the safety and efficacy of prophylactic parenteral Iron sucrose administration in 5th and 7th trimester month of gestation in preventing anemia at term. **Materials and method:** This prospective randomized clinical study was conducted after Approval was taken from the institutional Ethical Committee. Written and Informed Consent was obtained from all patients. The investigations were done in all patients at the beginning of the study (CBC, Iron studies, RBS, VDRL, HCV, HIV, HBsAg, routine urine microscopy, analysis of urine, Ultrasound and per abdominal examination that assessed the placental position, any contraction if present, fetus presentation, expected baby weight, FHR). On admission baseline CBC with RBC indices and iron studies was done. Repeat CBC with RBC indices and iron studies was done 2 weeks after giving injection Iron Sucrose. **Results:** The mean Hb level increased significantly from before giving Injection Iron sucrose to after 2 weeks of Injection Iron sucrose to after 4 weeks of Injection Iron sucrose. **Conclusion:** According to the findings of our study, the intravenous administration of iron sucrose treatment was a successful method of preventing anemia in pregnant women at term. It is well known that intramuscular preparations are linked to the development of local adverse effects. The adverse effects of the iron sucrose complex intravenous treatment were almost non-existent.

Keywords: Parenteral iron, sucrose, Anemia

Corresponding author: Shweta Rai, Associate Professor, Department of Obstetrics & Gynaecology, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India

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INTRODUCTION

India has always been a country with a high prevalence of anemia. Anaemia affects more than 2 billion people globally accounting for over 30% of the world's population making it the most common public health problem especially in low-income countries with the Africa and South East Asia, bearing the maximum burden.[1]

Anemia during pregnancy is commonly caused by iron deficiency and can have severe consequences for both the mother and the developing foetus.[2,3] It is mostly due to nutritional causes, of which iron deficiency is predominant. Many women have low or empty iron stores already at the start of pregnancy. Woman of reproductive age are particularly at risk owing to blood loss or increased iron demand attributed to menstruation, pregnancy and lactation. Iron deficiency anemia (IDA) is associated with adverse cognitive function, physical activity, immune response and pregnancy outcome.[4,5]

In a singleton gestation, maternal need for iron averages about 1000mg. Of this, 300mg is for the fetus and placenta, 500mg for maternal Hb mass expansion and 200mg that is shed normally through gut, urine and skin. According to WHO data, the prevalence of IDA in pregnancy ranges from an average of 14% in developed countries to an average of 56% in developing countries.[6,7]

About 20% of maternal deaths worldwide can be attributed to anemia. In India, about 36% of the total maternal deaths are attributable to postpartum hemorrhage or anemia. In healthy women after normal delivery, the prevalence of anemia 1-week postpartum is 14% in iron-supplemented women and 24% in non-supplemented women.[1]

Anemia in pregnancy is an important indirect cause of maternal death in developing countries.[8] During pregnancy, the needs of the growing fetus and placenta as well as the increasing maternal blood volume and red cell mass, impose such a demand on maternal iron stores that iron supplementation is

required from 16 weeks of gestation onwards as it can't completely prevent the depletions of maternal iron storage at term.[9] This is further aggravated by blood loss during pregnancy and delivery. The delivery by caesarean section is associated with more blood loss than normal vaginal delivery. All these make women vulnerable for peri-partum blood transfusion, chronic iron deficiency anemia and iron storage depletion.[9]

IDA in pregnancy can be associated with serious maternal complications. Studies have shown that low Hb during pregnancy is associated with increased risk of low-birth weight and preterm birth and the incidence of which increases as severity of anaemia increases. New approaches are leading to be more effective management of this condition.[9]

IDA is associated with significant maternal, foetal and infant morbidity. Women with iron deficiency are at increased risk of medical interventions such as red blood transfusion. They are also at increased risk of cardiovascular problems, reduced physical and cognitive performance, reduced immune function weakness and increased depressive episodes.[10] In foetus and neonate it can cause preterm birth, foetal growth restriction, intrauterine foetal demise, low Apgar scores and increased risk for infections.[11]

In pregnant women, oral iron is often used for prophylaxis of iron deficiency and is recommended as first-line treatment for pregnant women with iron deficiency anemia. However, oral iron substitution has major drawback of reduced compliance owing to poor tolerability and side effects.[5] The G.I. adverse effects includes indigestion, constipation, nausea, vomiting, and reflux esophagitis.[5] This is particularly ineffective in acute or chronic medical conditions like iron deficiency syndromes, iron-restricted erythropoiesis etc.

Intravenous (i.v.) iron preparations provide greater and more rapid repletion of iron stores than oral iron therapy without the gastro intestinal side effects associated with oral iron. The development of dextran free parenteral iron formulation with an improved safety profile and rapid delivery time has revolutionized use of this modality for treatment of iron deficiency anaemia and it should be considered main stay treatment for moderate to severe IDA.[12]

With this background, the present study was aimed to evaluate the safety and efficacy of prophylactic parenteral Iron sucrose administration in 5th and 7th trimester month of gestation in preventing anemia at term.

MATERIALS AND METHOD

This prospective randomized clinical study was conducted after Approval was taken from the institutional Ethical Committee. Written and Informed Consent was obtained from all patients.

STUDY POPULATION

The study included 100 pregnant patients without anaemia at 5 months and followedto 7 months and at term. The subjects were selected at >13 weeks of gestation as determined by correlating last menstrual period (LMP) and clinical examination.The study included all pregnant patients with gestational age between 20-28 weeks and above with hemoglobin ≥ 10 gm/dl, patients willing to give consent and take the injection and patient with oral iron intolerance.

The study excluded Women in 1sttrimester of pregnancy with mild anaemia, Pregnant women not willing to take injection, any history of allergy among pregnant patients to previous treatment of any iron preparation and Pregnant patients of severe anaemia who approaching EDD within a couple of days.

STUDY PROCEDURE

Complete general, physical, systemic and obstetric examination was done in all patients at the beginning of the study and following delivery, the neonatal outcomes of the all patient was noted. Relevant investigation was carried out mode of delivery and any antenatal, intra natal and postnatal complication of mother and foetus was recorded in a preformed performa.

The investigations were done in all patients at the beginning of the study (CBC, Iron studies, RBS, VDRL, HCV, Analysis of urine, Ultrasound and per abdominal examination (Uterus size, contraction, lie of fetus, presentation, expected baby weight, FHR). On admission baseline CBC with RBC indices and iron studies was done. Repeat CBC with RBC indices and iron studies was done 2 weeks after giving injection Iron Sucrose.

STATISTICAL ANALYSIS

SPSS version 25.0 analyzed the Excel data when it was loaded. Quantitative (numerical variables) data was given as mean and standard deviation, whereas qualitative (categorical variables) data was provided as frequency and percentage. The student t-test was used to compare the two groups' mean values, while the chi-square test analyzed their frequency differences. If p0.05, it was statistically significant.

RESULTS

Table 1: Distribution of study population according to

		Frequency	Percent
Age (yrs)	19-25 years	32	53.3%
	26-30 years	21	35.0%
	> 30 years	7	11.7%
Gravida	1	26	43.3%
	2	13	21.7%

	3	10	16.7%
	4	8	13.3%
	5	2	3.3%
	6	1	1.7%
Parity	0	29	48.3%
	1	21	35.0%
	2	8	13.3%
	3	2	3.3%

Majority of the study population belonged to 19-25 years (53.3%) followed by 26-30 years (35.0%) and > 30 years (11.7%). Of study population, 26 (43.3%) were gravida 1, 13 (21.7%) were gravida 2, 10 (16.7%) were gravida 3, 8 (13.3%) were gravida 4, 2 (3.3%) were gravida 5 and 1 (1.7%) were gravida 6. Of study population, 29 (48.3%) were parity 1, 21 (35.0%) were parity 2, and 2 (3.3%) were parity 3.

Table 2: Distribution of study population according to Hb level

Hb level	Mean	Std. Deviation	p-value
Before giving Injection Iron sucrose at 5th month	10.04	1.95	0.001*
After 2 weeks of 1stInjection Iron sucrose	10.74	1.72	
After 4 weeks of 1stInjection Iron sucrose	10.98	1.85	
Iron sucrose at 7th month	11.12	1.98	
After 2 weeks of 2nd Injection Iron sucrose	11.58	1.80	
After 4 weeks of 2ndInjection Iron sucrose	12.07	2.03	

The mean Hb level was compared between before giving Injection Iron sucrose at 5th month, after 2 weeks of Injection Iron sucrose,after 4 weeks of Injection Iron sucrose and at term using the Repeated measures ANOVA test. The mean Hb level increased significantly from before giving Injection Iron sucrose to after 2 weeks of Injection Iron sucrose to after 4 weeks of Injection Iron sucrose to at 7th month to after 2 weeks of 2nd Injection Iron sucrose and after 4 weeks of 2nd Injection Iron sucrose.

Table 3: Distribution of study population according to

	Number	%
Muscle cramps	6	6.0%
Diarrhea	10	10.0%
Nausea & vomiting	13	13.0%
Metallic taste	11	11.0%
Constipation	8	8.0%
Headache	5	5.0%
Dizziness	7	7.0%
Pain and swelling at the site	10	10.0%

The complications reported among study population was Muscle cramps (6.0%), Diarrhea (10.0%), Nausea & vomiting (13.0%), Metallic taste (11.0%), Constipation (8.0%), Headache (5.0%), Dizziness (7.0%) and Pain and swelling at the site (10.0%).

DISCUSSION

The World Health Organization (WHO) suggests that antenatal and postnatal intake of the iron supplements.[13] The use of oral iron is hampered by gastrointestinal side effects and poor patient compliance, whilst the use of older IV iron preparations is associated with the danger of allergic reactions (iron dextran) and the requirement of numerous doses for the correction of anaemia (iron sucrose, sodium ferric gluconate). Blood transfusions are often reserved for the most severe cases and scenarios in which a patient's life is in danger. This is because there is a risk of infection as well as immunological reactions.[14,15]

In current study, majority of the study population belonged to 19-25 years (53.3%) followed by 26-30 years (35.0%) and > 30 years (11.7%). Pandya et al.[16] found that the mean age of the study population was 27.8±5.21 years. Mishra et al.[17] found that the most common age group included women between 27-30 years of age (38.5%). Froessler et al.[3] observed that the mean age of the study population was 28.0±6.0 years.

When compared to western women, whose iron reserves are sufficient and who only require 30-40 mg of elemental iron per day for anemia prophylaxis in pregnancy,[18,19] the iron stores in Indian women are deficient, and as a result, they require 100 mg of elemental iron per day for prophylaxis. The recommended amount of elemental iron for the treatment of anemia is 200 milligrams (mg) per day 14. As compared to oral iron, intravenous iron is advantageous because it causes a quicker rise in hemoglobin and a faster replenishment of the body's iron stores.[20]In addition to this, there is a diminished

requirement for blood transfusions,[21]and the treatment may be administered in an outpatient setting.

In our study,mean Hb level increased significantly from before giving Injection Iron sucrose to after 2 weeks of Injection Iron sucrose to after 4 weeks of Injection Iron sucrose to at 7th month to after 2 weeks of 2nd Injection Iron sucrose and after 4 weeks of 2nd Injection Iron sucrose.

In a research that compared the clinical effectiveness and safety of intramuscular iron sorbitol citrate with intravenous iron sucrose, it was discovered that the rise of Hb was greater in the intravenous group.[22]This was one of the findings of the study. According to the findings of this study, intravenous iron therapy is preferable than intramuscular iron therapy in terms of the increase in hemoglobin level as well as the safety profile.

More than 500 pregnant women who were diagnosed with iron deficiency anemia were given treatment by Breymann.[23]In accordance with the dose that was estimated, intravenous iron sucrose was administered as either an iv push over 5-10 minutes or an iv infusion over 20-30 minutes. Every injection was administered on an outpatient basis, and there was not even a single test dosage. This study places a strong emphasis on the safety of injecting iron mixed with sucrose. In the current investigation, the initial dosage was administered in a ward that had facilities for providing emergency medical assistance. After then, every successive dosage was administered on an OPD basis. None of the patients required any kind of immediate medical attention. In other studies,[22,24] the target Hb for the computation of the needed dose was determined to be 11 g/dl, and 500 mg was added to the treatment in order to refill the stockpiles.

There was a higher frequency of responders (Hb>11g%) in the intravenous group in a study that assessed and compared the efficacy of two and three doses of intravenous iron sucrose with oral iron therapy. The frequency of responders in the intravenous group was 75%, while the frequency of responders in the oral iron therapy group was 80%. There was a significant difference in the amount of repleted iron reserves before delivery (ferritin >50 mg/l) between the group that received three intravenous iron doses and the group that received oral iron (49 vs. 14%) in the group that received three intravenous iron doses. There was not a discernible difference in the results for the mother or the baby. The research did not find any conclusive evidence that parenteral iron therapy offered any substantial advantages over oral iron therapy.[25]In actual clinical settings, however, noncompliance with oral iron treatment is quite prevalent.

In current investigation, the adverse effects reported were Muscle cramps (6.0%), Diarrhea (10.0%), Nausea & vomiting (13.0%), Metallic taste (11.0%), Constipation (8.0%), Headache (5.0%), Dizziness (7.0%) and Pain and swelling at the site (10.0%).

In the experiment that was conducted by Perewunsnyk et al.,[26]In 0.5 percent of patients, minor general side effects such as a metallic taste, flushing of the cheeks, and burning at the injection site occurred. Both the gradual release of iron from the complex and the low allergenicity of sucrose have been hypothesized as contributing factors to the great tolerance that the medication elicits in its users. There has been one recorded fatality associated with intravenous iron sucrose injection.[27]Because of exceedingly sluggish infusion, as was stated in the reason for this phenomenon (1-2 hours). It is possible that free radicals produced from the iron sucrose were the cause of death. The injection should be administered within 15 to 20 minutes, or a gentle intravenous push of up to 200 mg can be carried out over the course of two to three minutes.

Huilgol et al.[28] conducted a study to determine the safety and effectiveness of iron sucrose in 76 pregnant women. The researchers found that the iron sucrose had minimal side effects, with just two patients reporting pain at the injection site and one woman experiencing rigidity.In their study of 36 pregnant women, Uma et al.[29] found that some patients experienced minor side effects in a few cases (pain at the injection site in one case, a metallic taste in three cases, a headache in one case, and a warm tingling sensation in two cases), but the vast majority of patients (80.56%) did not experience any side effects.

The results of the current study add to the growing body of data that Iron Sucroseis both effective and safe in treating anaemia, particularly among pregnant women in India. The fact that not all data on haematological parameters were accessible and the absence of a control group are the two main shortcomings of the current investigation. Despite these limitations, the clinical efficacy and excellent safety of IRON SUCROSE in pregnant Indian women with anaemia is supported by this study.

Our research had certain limitations, including a non-randomized trial and the absence of a control group that received intramuscular iron treatment. For the purpose of evaluating the comparative effectiveness and safety of intravenous iron sucrose complex and intramuscular iron treatment, large-scale randomized controlled studies are necessary.

CONCLUSION

According to the findings of our study, the intravenous administration of iron sucrose treatment was a successful method of treating anemia in pregnant women. It is well knowledge that intramuscular preparations are linked to the development of local adverse effects. The adverse effects of the iron sucrose complex intravenous treatment were almost non-existent. It led to a quick rise in haemoglobin level, and the rate at which reserves were replaced was accelerated. In order to determine whether or not it can be employed at the

peripheral level, comparative studies over extended periods of time are necessary.

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