European Journal of Molecular & Clinical Medicine (EJMCM)
ISSN: 2515-8260 Volume 07, Issue 11, 2020

Original research article

To determine the role of injection Iron Sucrose for the treatment of iron deficiency anemia in pregnancy: A prospective observational study

Dr. Anupam Kumari[1], Dr. Jayanti Sinha[2], Dr.Sweety Sinha[3]

[1]Senior Resident,Department of Obstetrics & Gynaecology, NSMCH, Bihta, Patna, Bihar, India.

[2]Department of Obstetrics & Gynaecology,AIIMS, Patna, Bihar, India.

[3]Assistant. Professor, Department of Obstetrics & Gynaecology, PMCH, Patna, Bihar, India

Corresponding Author: Dr. Anupam Kumari

Abstract

Aim: The aim of the present study was to determine the efficacy of injection Iron Sucrose for the treatment of iron deficiency anemia in pregnancies that were given iron sucrose for non-compliance or intolerance to oral iron.

Material and methods: A prospective, observational study was conducted in the Department of Obstetrics & Gynaecology, NSMCH, Bihta, Patna, Bihar, India, for 10 months. Total 100 patients were included in the study. They were chosen to be given injection Iron Sucrose on the basis of intolerance or non-compliance to oral iron therapy or were deemed suitable by the clinician to be given iron sucrose and after confirmation of iron deficiency. All the patients were in their third trimester. Doses were calculated as per Ganzoni's formula mentioned below and various maternal outcomes were studied. Hemoglobin was checked after 6 weeks and before delivery. Serum ferritin was also checked before initiating the treatment and also at term. All women attending antenatal clinic with hemoglobin >7.5 gm% and <11 gm% in third trimester were included in this study.

Results: Most of our patients were aged between 20 and 30 years (74%). Primigravidae and multigravidae were almost equal in number (47% and 53% respectively) enrolled in the study. The study population had co morbidities like gestational diabetes mellitus, gestational hypertension, history of previous cesarean and thyroid disorders and all of them were stable on medication. Haemoglobin from before treatment (mean 9.74±0.854 gm%) to after treatment (mean 10.89±0.764 gm%) was statistically significant (p-value <0.001) with mean increase in haemoglobin of 11.07% 6 weeks after treatment. Haemoglobin rise at term (mean 10.99±0.641 gm%) was also significant (p-value <0.001) with mean increase in haemoglobin of 11.82% at term. Rise in ferritin levels from before treatment (mean 27.21 ng/mL±13.12) to ferritin levels at term (mean 66.21 ng/mL±14.89) was also significant (p-value <0.001) with mean increase in serum ferritin level of 60.11% at term.

Conclusion: The iron sucrose is an excellent option to treat iron deficiency anemia in patients where oral iron therapy has either failed or not suitable. It significantly increases hemoglobin levels in the study population. It is readily available in the market and can be infused on an outpatient basis.

Keywords: Ganzoni's formula, Iron deficiency anemia, Iron sucrose, Postpartum hemorrhage

Introduction

Iron deficiency anemia is the most common form of anemia the world over and also the most common nutritional disorder in the world. Anemia in pregnancy, defined by the World Health Organization (WHO) as hemoglobin level of less than 11 g/dL, is a global health problem affecting 41.8% of women worldwide.[1] WHO (World Health Organisation) has estimated that prevalence of anemia in developed and developing countries in pregnant women is 14% in developed and 51% in developing countries.[2] It is projected that India has the utmost prevalence of anemia ie., 57 -96.2%, among the South Asian countries.[3] It is a direct cause of 20% of maternal mortality in India[4] and indirect cause in 20% to 40% of maternal deaths.[5] Iron deficiency anemia during pregnancy increases the risk of low birth weight (LBW), preterm birth, maternal and perinatal mortality, and poor apgar score.[3] Over the past years, various oral, intramuscular and intravenous preparations of iron have been used for correction of IDA (Iron Deficiency Anemia) in pregnant patients. The first choice in the treatment of iron deficiency anemia for almost all patients is oral iron replacement because of its effectiveness, safety, and lower cost. Though oral iron has its place in the management of IDA, it has a major drawback of reduced compliance owing to poor tolerability and side effects. The gastrointestinal (GI) adverse effects of oral iron may further exacerbate the pregnancy associated GI disturbance which includes indigestion, constipation, nausea, vomiting, and reflux esophagitis.[3] Severe systemic adverse effects associated with iron dextran and iron gluconate limited the use of intravenous iron. Iron sucrose complex (ISC) is a relatively new drug, which is used intravenously for the correction of IDA. Iron sucrose is a widely used safe molecule with few adverse events.[3] The aim of the present study was to determine the efficacy of injection Iron Sucrose for the treatment of iron deficiency anemia in pregnancy who were given iron sucrose for non-compliance or intolerance to oral iron.

Material and Methods

A prospective, observational study was conducted in Department of Obstetrics & Gynaecology, NSMCH, Bihta, Patna, Bihar, India, for 10 months. Total 100 patients were included in the study. They were chosen to be given injection Iron Sucrose on the basis of intolerance or non-compliance to oral iron therapy or were deemed suitable by the clinician to be given iron sucrose and after confirmation of iron deficiency. All the patients were in their third trimester. Doses were calculated as per Ganzoni's formula mentioned below and various maternal outcomes were studied. Hemoglobin was checked after 6 weeks and before delivery. Serum ferritin was also checked before initiating the treatment and also at term. All women attending antenatal clinic with hemoglobin >7.5 gm% and <11 gm% in third trimester were included in this study. patients with hypersensitivity to parenteral iron therapy, Anemia other than due to iron deficiency, Chronic kidney disease, Other chronic disorders (SLE etc.), Gastrointestinal disorders like Crohns' disease were excluded from this study.

Outcomes

Rise in haemoglobin after 6 weeks and at term and rise inserum ferritin level at term.

Dose calculation

Dose was calculated as per Ganzoni's formula.

Total iron deficit

Dose in milligram= 2.4 x body weight (kilogram) X (target haemoglobin-actual haemoglobin) + replenishment of iron stores, which was taken as 500 mg.

Method of infusion

- 200 mg of iron sucrose was infused after diluting in100 ml of 0.9% normal saline,

- Infusion completed in 30 minutes,
- Total permissible dose in one day was 200 mg,
- Multiple doses were given on alternate days onoutpatient basis,
- Minimum of 7 and maximum of 10 doses were givenin one month,
- Sensitivity test was not done,
- Patients were kept under observation for one-hourpost infusion for any reactions.

Results

Total 100 anaemic pregnant mothers were given injection iron sucrose as per the discretion of the treating physician. The patients included were having haemoglobin between>7.5gm% to <11gm%. All the patients were given iron sucrose after confirming iron deficiency as the cause of anaemia. These patients were followed up for their entire antenatal period and haemoglobin was checked pre-treatment and 6 weeks post-treatment and at term. Serum ferritin was also checked pre-treatment and at term. Following results were obtained.

Table 1 shows distribution of patients in terms of age and parity, who were enrolled for this study. Most of our patients were aged between 20 and 30 years (74%). Primigravidae and multigravidae were almost equal in number (47% and 53% respectively) enrolled in the study. The study population had co morbidities like gestational diabetes mellitus, gestational hypertension, history of previous cesarean and thyroid disorders and all of them were stable on medication.

Table 2 that rise in haemoglobin from before treatment (mean 9.74±0.854 gm%) to after treatment (mean 10.89±0.764 gm%) was statistically significant (p-value <0.001) with mean increase in haemoglobin of 11.07% 6 weeks after treatment. Table 2 show that haemoglobin rise at term (mean 10.99±0.641 gm%) was also significant (p-value <0.001) with mean increase in haemoglobin of 11.82% at term.

Table 3 show that rise in ferritin levels from before treatment (mean 27.21 ng/mL±13.12) to ferritin levels at term (mean 66.21 ng/mL±14.89) was also significant (p-value <0.001) with mean increase in serumferritin level of 60.11% at term.

Table 1: Demographic features and clinicalcharacteristics of the study population

Patient variables		**No. of patients**	**%**
Age group	Below 20	20	20
	20 – 25	53	53
	25 – 30	21	21
	Above 30	4	4
Parity	Primi	47	47
	Multi	53	53
Side effects due to iron sucrose	Breathlessness	3	3
	Headache	1	1
	Local reaction	6	6
	Nausea	3	3
	Nil	87	87
	Elderly	3	3
	GDM	2	2
	Hyperthyroidism	1	1
Co-morbidities	Hypothyroidism	1	1
	PIH	2	2
	Previous 1LSCS	11	11
	Previous 2 LSCS	1	1
Medication	Eltroxin 50 mcgOD	1	1

	Medical nutritionTherapy	3	3
	Neomercazole 5OD	1	1
	Nil	95	95

Table 2: Rise in haemoglobin from before treatmentto after treatment

Hb at	No. of patients	Hemoglobin(gm %)		p-value
		Mean	SD	
Before treatment	100	9.74	0.854	
After treatment	100	10.89	0.764	<0.001
At term	100	10.99	0.641	<0.001

Table 3: Rise in ferritin levels from before treatmentto ferritin levels at term

Ferritin	No. of patients	Ferritin (ng/mL)		p- value
		Mean	SD	
Before treatment	100	27.21	13.12	<0.001
At term	100	66.21	14.89	

Therefore, results of this study clearly demonstrate that Iron Sucrose is able to bring haemoglobin to optimum level at the time of delivery to cater for the anticipated blood loss of delivery and also for the postpartum needsof the mother.

Discussion

Anemia in pregnancy is defined as hemoglobin levels of less than 11 gm% in venous blood irrespective of trimester (World health organization).(12)ICMR classifies anemia as mild (10-10.9 gm %), moderate (7-9.9 gm%), severe (4-6.9 gm %) and very severe (<4 gm%). The above mentioned definition and classification are widely accepted in India.[6]

IDA has been the most common nutritional deficiency across the globe, with about 32 million pregnant women categorized as being anemic and about 0.75 million pregnant women categorized as being severely anaemic.[7] India is one of those countries that have the highest prevalence of anemia in the world. According to the Indian national family health survey, the prevalence of IDA in pregnancy ranges from 23.6-61.4%.[8] The incidence of IDA in India was estimated at 60.0% in urban population and 69.0% in rural population, and IDA resulted in approximately 326,000 maternal deaths with an associated disability adjusted life years of 12,497,000.[9] Diversity in cultures, religions, food habits, lifestyles, and traditions puts a challenge to the implementation of various government health programmed in India. It is assumed that low socio-economic status, high parity, nutritional deficiencies, phytate rich Indian diets, malaria, helminthic infections, and inflammatory or infectious diseases further increase the risks of IDA during pregnancy.[10]

Oral iron must be the preferred first-line treatment for iron deficiency. Women should receive information on improvement of dietary iron intake and factors affecting the absorption of dietary iron. Rich sources of dietary iron include red meat, fish and poultry. These provide haem iron that is more easily absorbed than nonhaem iron, but the latter forms the vast majority of iron taken through the diet.[11] Vitamin C enhances the absorption of non-haem iron; on the other hand, tea and coffee inhibit iron absorption from food.

Parenteral iron is indicated when oral iron is not tolerated or absorbed or patient compliance is in doubt or if the woman is approaching term and there is insufficient time for oral supplementation to be effective.[10] Hence, parenteral iron could be an alternative to oral iron in patients who are unable to tolerate oral iron, and are non- compliant or need rapid restoration of iron stores. Parenteral iron can be used from the second trimester and during the postpartum period.[12] Diagnosis of IDA has to be confirmed before starting parenteral

therapy. Calculation of dose of parenteral Iron should be done before administration. The infusion has to be carried out only in a health facility with adequate supervision and availability for the management of anaphylaxis.[13] Sensitivity test prior to infusion is highly recommended. Iron sucrose is most commonly used preparation for IV infusion and is safe with only a few adverse events.[11] It is rapidly taken up by bone marrow for erythropoiesis and the reticuloendothelial system for storage. The advantage of iron sucrose is that it doesn't require to administer a test dose and adverse reactions are virtually unknown.[14] Intravenous iron sucrose was way more efficacious with few adverse effects than oral formulation in pregnant women with poor tolerability of oral iron and who required immediate replenishment of iron stores.

Neeru S et al, in a randomized control trial in 2012, used iron sucrose in comparison with oral iron for treatment of IDA and found that iron sucrose was effective in increasing hemoglobin significantly (23.62 % vs 14.11 % in oral iron) with p-value <0.05.[15] Bhavi SB et al, also reported a similar effect of iron sucrose in raising hemoglobin significantly (p-value <0.0001).[16] Qassim A et al, published a systematic review of 21 randomized controlled trials and 26 observational studies comparing injectable iron preparations irrespective of the comparator arms and proved that however parenteral preparations improve hematological parameters, but fail to alter maternal or perinatal outcomes. It also showed that none of the preparations are superior to each other; hence iron sucrose has a clear advantage of being cheaper and readily available.[17]

Dubey S et al, in a randomized trial used iron sucrose or oral iron in 200 pregnant patients and followed them up at 2,4 and then 4 weeklies till delivery. At all levels, it was shown that iron sucrose increased hemoglobin and iron stores faster than oral iron significantly (p-values of 0.000).[18] Haldar P et al, retrospectively studied 990 pregnant patients who were given 400 mg of intravenous iron sucrose at 2 primary health centers in rural India and found that mean increase of hemoglobin was 1.76 gm% and way higher (1.5times) in severely anemic patients. They recommended that dose of iron sucrose should be calculated as per Ganzoni's formula and dose be given accordingly as was done in this study.[19] Present study supports the studies mentioned above and shows that iron sucrose is well tolerated as a parenteral iron preparation and has good outcomes in terms of increase in hemoglobin levels 6 weeks after treatment and term with a significant rise in serum ferritin levels which is more important to cater for the anticipated blood loss during delivery and lactational requirement.

Conclusion

We concluded that the iron sucrose is an excellent option to treat iron deficiency anaemia in patients where oral iron therapy has either failed or not suitable. It significantly increases haemoglobin levels in the study population. It is readily available in the market and can be infused on an outpatient basis.

Reference

1. Hayley Messenger, Boon Lim. The Prevalence of Anemia In Pregnancy In A Developed Country – How Well Understood Is It?. J Preg Child Health. 2016; 3:231.
2. Kalaivani K. Prevalence and consequences of anemia in pregnancy. Indian J Med Res. 2009; 130:627-633.
3. Fogsi. General Clinical Practice Recommendations Management of Iron Deficiency Anemia in Pregnancy, 2016.
4. Malagi U, Reddy M, Naik R. Evaluation of national nutritional control programme in Dharward (Karnataka). J Hum Ecol. 2006; 20(4):279-81.

5. Kumar A, Jain S, Singh NP, Singh T. Oral versus high dose parenteral iron supplementation in pregnancy. International Journal of Gynecology and Obstetrics. 2005; 89:7-13.
6. Good clinical practice recommendations for IDA in pregnancy in India J Obstet Gynaecol India. 2011;61(5):569-71.
7. Stevens GA, Finucane MM, Regil LM, Paciorek CJ, Flaxman SR, Branca F, et al. Nutrition impact model study group (anaemia). Global, regional, and national trends in hemoglobin concentration and prevalence of total and severe anemia in children and pregnant and non-pregnant women for 1995-2011: a systematic analysis of population-representative data.Lancet Glob Heal. 2013;1(1):e16-25.
8. Lokare PO. A study of prevalence of anemia and sociodemographic factors associated with anemia among pregnant women in Aurangabad city, India. Annals Nigerian Med. 2012;6(1):30-4.
9. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, et al. Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. Food Nutri Bullet. 2006;27(4):311-5.
10. RCOG green-top guideline No.47. Available at: https://www.rcog.org.uk / globalassets / documents / guidelines / gtg-47.pdf.
11. Lynch SR. Interaction of iron with other nutrients. Nutr Rev. 1997;55:102.
12. Pavord S, Myers B, Robinson S, Allard S, Strong J, Oppenheime C. UK guidelines on the management of iron deficiency in pregnancy. British committee for standards in haematology. Brit Soc Haematol.2012;156:588-600.
13. Rampton D, Folkersen J, Fishbane S, Hedenus M, Howaldt S, Locatelli F, et al. Hypersensitivity reactions to intravenous iron: guidance for risk minimization and management. Haematol. 2014;99(11):1671-6.
14. Shi Q, Leng W, Wazir R, Li J, Yao Q, Mi C, et al. Intravenous iron sucrose versus oral iron in the treatment of pregnancy with iron deficiency anaemia: a systematic review. Gynecol Obstetr Invest. 2015;80(3):170-8.
15. Neeru S, Nair NS, Rai L. Iron sucrose versus oral iron therapy in pregnancy anemia. Indian J Comm Med. 2012;37(4):214-8.
16. Bhavi SB, Jaju PB. Intravenous iron sucrose v/s oral ferrous fumarate for treatment of anemia in pregnancy. A randomized controlled trial. BMC Preg Childbirth. 2017;17(1):137.
17. Qassim A, Mol BW, Grivell RM, Grzeskowiak LE. Safety and efficacy of intravenous iron polymaltose, iron sucrose and ferriccarboxymaltose in pregnancy: a systematic review. NZJ Obstet Gynaecol. 2018;58:22-39.
18. Dubey S, Suri V, Aggarawal N, Das R. Is it safe to use intravenous iron sucrose during pregnancy? a randomized controlled trial. Int J Reprod Contracept Obstet Gynecol. 2013;2:544-9.
19. Haldar P, Kant S, Yadav V, Majhi J, Malhotra S, Kaur R, et al. Effect of intravenous iron sucrose on hemoglobin level, when administered in a standard- dose, to anemic pregnant women in rural Northern India. J Family Med Prim Care. 2018;7:762-8.

Received: 07-10-2020 || Revised: 26-10-2020 || Accepted: 24-11-2020