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Study of Efficacy and Compliance of Iron Sucrose in Iron Deficiency Anaemia in Pregnancy

Sarada Bandaru[1], Murahari Suguna Shobha Rani[2]

[1]Associate Professor, Department of Obstetrics and Gynaecology, Apollo Institute of Medical Sciences and Research, Chittoor, Andhra Pradesh, India.
[2]Associate Professor, Department of Obstetrics and Gynaecology, Government Maternity Hospital, Sultan Bazar, Koti affiliated to Osmania Medical College, Koti, Hyderabad, Telangana, India
Corresponding Author: Dr. Sarada Bandaru,E-mail Id: dr.Sarada73@gmail.com

Abstract

Introduction

Iron deficiency anemia in pregnancy is one of the commonest problem in developing world. About 70% of the pregnant women in south east asian region suffer from nutritional anemia which is mainly caused by iron deficiency. According to WHO 500,000 maternal deaths per year and 20,000,000 morbidity cases are attributed to anaemia.

Objective

To study efficacy of intravenous iron sucrose in moderate iron deficiency anemia (7-10 gm/dl) in pregnancy between 14-34 weeks of gestational age.

Material and Methods

The present study was carried out in Department of Obstetrics and Gynaecology, Apollo Institute of Medical Sciences and Research, Chittoor.

Results

In the present study the frequency is high in (42%) in 22 -24yrs age group.The mean age of the patients is 22.9000.About 26%patients are primi ,46% are second gravida,24% are third gravida ,4% are fourth gravida.

In the present study vegetarians are 60 % and Non vegetarians are 40 %.

Discussion

Measurements of serum hemoglobin concentration or hematocrit are the primary screening lists for indentifying anaemia. Measurements of serum ferritin levels has the highest sensitivity and specificity for diagnosing iron deficiency anaemia levels of less than 10-15ug/l confirms iron deficiency anaemia.Oral Iron is the first line therapy in pregnancy with anemia. However, the compliance of pregnant women is much less because of untoward effects. The stores in Indian women are deficient and they need 100 mg elemental iron per day for prophylaxis. For treatment, the dose recommended is 200mg of elemental iron per day.

Conclusion

Iron deficiency anemia is most common problem in pregnancy.As anemia is associated with increased maternal mortality & morbidity, the modern alternate is to treat with intravenous iron because it is well tolerated & restores iron stores rapidly which is safe and effective in the treatment of iron deficiency anemia during pregnancy

Keywords:IDA- Iron Deficiency Anemia, APH- Antepartum Hemorrhage, HB – Hemoglobin, MEH - Mean Corpuscular hemoglobin, MCHC - Mean Corpuscular hemoglobin concentration, MCV - Mean Corpuscular Volume, PCV - Packed Cell Volume, TIBC - Total Iron Binding capacity, ISC - Iron Sucrose Complex, IPC - Iron Polymaltose Complex.

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Introduction

Iron deficiency anemia in pregnancy is one of the commonest problem in developing world. About 70% of the pregnant women in south east asian region suffer from nutritional anemia which is mainly caused by iron deficiency. Anemia continues to toll on material lives in India from direct as well as indirect causes of death like cardiac failure, hemorrhage, infections, pre-eclampsia and puerperal sepsis. "Pregnancy causes a state of plethora", which leads to tremendous changes in haemotological system and physiological anemia of pregnancy. According to WHO 500,000 maternal deaths per year and 20,000,000 morbidity cases are attributed to anaemia. The prevalence of iron deficiency anemia in pregnancy in developing world is 56% (range 35-75%)and in developing countries it is 18% whereas prevalence of anemia is low socio-economic group in first, second and third trimester is 9%,14% and 37% respectively.

Iron deficiency anemia impairs oxygen delivery through the placenta to the fetus and interferes with the normal intra uterine growth leading to fetal loss and perinatal deaths. It is associated with increased preterm labor (28.2%), preeclampsia (31.2%) and maternal sepsis. Traditional therapy which is based on oral administration of Iron has drawbacks.

The efficacy of orally administered high-dose Iron was limited by the high incidence of gastrointestinal side effects and noncompliance whereas blood transfusion remains a last resort because of patient choice and the risks of injection, immunologic impact and transfusion reactions. The alternative strategies call for parenteral administration intra venous iron sucrose which is well tolerated, safe and restores iron stores and hemoglobin

Objective:

To study efficacy of intravenous iron sucrose in moderate iron deficiency anemia (7-10 gm/dl) in pregnancy between 14-34 weeks of gestational age.

Material and Methods

The present study was carried out in Department of Obstetrics and Gynaecology, Apollo Institute of Medical Sciences and Research, Chittoor.

Study population: 100 pregnant women with moderate anemia between 14-34 weeks of gestational age, attending OPD in Apollo Institute of Medical Sciences and Research, Chittoor during period of January 2020 to January 2021.

Inclusion Criteria

All cases of moderate iron deficiency anaemia in pregnancy who met the following diagnostic criteria: Hemoglobin between 7-10gm/dl, Serum ferritin less than 15ug/lt, peripheral blood picture showing microcytic hypochromic anemia.

Exclusion Criteria

Anemia not attributable to iron deficiency. Pregnancy with history of asthma, eczema or other atopic allergy. Women in first trimester of pregnancy with known hypersensitivity to Iron sucrose.

Study Method

Pregnant women in the age group of 18-30 years attending antenatal clinic were screened for anemia. Detailed history was taken about the geographical place and diet pattern. These women were subjected to following tests: Complete hemogram, peripheral blood smear, complete urine examination, stool for occult blood and ova cyst, Serum ferritin, Serum Iron, TIBC. These women were treated with 400mg intravenous Iron sucrose in two divided doses

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on all outpatientbasis. Oral Iron was stopped 3days prior to infusion. Iron sucrose was administered over 20mins after dilution with isotonic saline solution and patients were monitored for an hour for any adverse reactions. As the aim of the study is to response of uniform dose over a range of pre-treatment Hb, optimal dose of Iron sucrose was not calculated and patient was called after 1 month and repeat hemoglobin and ferritin level was assessed for improvement i.e. efficacy of the drug.

Results

Table 1: Age Distribution

Age	Frequency	Percent
18-21	30	30
22-24	42	42
25-30	28	28
Total	100	100

In the present study the frequency is high in (42%) in 22 -24yrs age group.

Table 2: Maximum, Minimum and Mean age in Cases

	Frequency	Minimum	Maximum	Mean	Standard deviation
Age of years	100	18.00	28.00	22.9000	2.63609

The mean age of the patients who were involved in the study is 22.9000.

Table 3: Distribution of parity

Parity	Frequency	Percent
G1	26	26
G2	46	46
G3	24	24
G4	4	4
Total	100	100

About 26%patients are primi ,46% are second gravida,24% are third gravida ,4% are fourth gravida.

Chi Square=17.68

P value =0.001 which is significant

Table 4: Dietary History

Diet	Frequency	Percent
Vegetarian	60	60
Non vegetarian	40	40

In the present study vegetarians are 60 % and Non vegetarians are 40 %

chi square =2.00

P value =0.157 which is not significant

Table 5: comparision of rise in mean Hb of different studies

Study	Rise in mean Hb
Divakar H et al	1.31gm /dl
T .Mays and Mays	1.9gm /dl
Shafi et al	2.1gm /dl
Ragip et al	1.2gm /dl
Kriplani et al	1.27gm /dl

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Dewan bhupesh et al	2.2gm /dl
Lakshmi et al	2 gm /dl
Hallak M et al	2.3gm /dl
Gupta et al	2gm /dl
Breymann C et al	1.7gm /dl
Present Study	1.6460gm/.dl

Mean rise in Hb levels in the present study was 1.6460gm/dl which is compared with studies by Breymann C et al who observed a rise of 1.7 gm/dl. Ragip et al observed a rise of 1.2 gm/dl, Kriplani et al observed a rise of 2.27 gm/dl and Gupta et al observed a rise of 2gm/dl. The observed finding almost correlated with findings of the studies of Dewen Bhupesh et al(2.2gm/dl), Lakshmi et al (2 gm/dl), Hallak M et al(2.3gm/dl).

Table 6: showing the percentage of adverse effects of Iron Sucrose in different studies

Studies	**Adverse effects in percentage(%)**
Dipti A et al	1.4%
Sunitha D et al	6%
Bhupesh et al	4.19%
Kriplani et al	5%
Present Study	8%

In the present study the percentage of adverse effects of iron sucrose are 8%, With in that Sunitha D et al 6%,Kriplani et al 5%,Bhupesh et al 4.19% and Dipti A et al with minimum adverse effect as 1.4%.

Discussion

Measurements of serum hemoglobin concentration or hematocrit are the primary screening lists for indentifying anaemia. Measurements of serum ferritin levels has the highest sensitivity and specificity for diagnosing iron deficiency anaemia levels of less than 10-15ug/l confirms iron deficiency anaemia.

Oral Iron is the first line therapy in pregnancy with anemia. However, the compliance of pregnant women is much less because of untoward effects. The stores in Indian women are deficient and they need 100 mg elemental iron per day for prophylaxis. For treatment, the dose recommended is 200mg of elemental iron per day.

The safety and efficacy of Iron sucrose has been demonstrated in several clinical trials of patients with chronic kidney disease with refectory anemia. Intravenous Iron therapy can be a good substitute to oral iron therapy. Treatment of anemia in pregnancy and postpartum period using iron sucrose is safe and feasible with high patient compliance (Tan and site ,2008). The reason being that Iron sucrose consists of polynuclear complex analogous to ferritin with apoferritin component replaced by sucrose that is well tolerated and least anti genic and being a large molecule less than 5% is excreted from kidneys. It is available for erythropoiesis within 5 minutes of infusion and has a 68-95% utilization rate after 2-4 weeks. Since it is stored in reticuloendothelial cells and not in parenchymal cells like liver, kidney, adrenal gland (or) other organs, organ toxicity is less likely even with iron sucrose overload (Bayocemeurt.,2002)

In the present study intravenous iron sucrose injections given to 100 pregnant women with Hb<9gm/dl are reported. Those women on average required 1800mg of Iron Sucrose which translates into 18 IV injections(each containing 100mg of elemental Iron). Their response in terms of improvement in serum Iron, ferritin and Hb levels was satisfactory. There were minor side effects and in one case thrombophlebitis.

The change in Hb baseline was significantly higher in IV group than oral. At each measurement the changes with respect to subsequent haemoglobin were significantly higher

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on 14 and 28 days. Ferritin values were higher in patients receiving intravenous iron throughout pregnancy. No serious adverse reactions were observed.

A random prospective open study with individual benefit was performed involving 50 patients with haemoglobin levels between and 10/dl and a ferritin value of<50ug/l conducted by francoise bayoumeu, md, a carolesubiran- buisset,MD,anour-eddinebaka,MD, a et al. an increase in haemoglobin was observed, rising from 9.6-+ 0.79g/dL to 11.11+_1.3 g/dl on day 30. Their study concluded that iron sucrose appears to be a treatment without serious side effects indicated in correction of pregnancy anemia or iron stores depletion similar to the results of this study. (amjobstetgynecol 2002;186;518-22). The cochrane review for iron deficiency anemia in pregnancy shows that iron sucrose minor general adverse effects including a metallic taste flushing of the face and at injection site occurred in 0.5 percent of cases. The high tolerance of drug has been partly attributed to slow release of iron complex and also due to low allergenicity of sucrose.

In a prospective cohort study on the effectiveness, safety and feasibility of intravenous iron sucrose in antenatal anemic women shriavaastava inciuded all women with haemoglobin of 6-8 gm% from 20 weeks to 48 hours postpartum. They studied haemoglobin PCV, MCV, MCHC on days 1,7,14 and 21. This study concluded iron sucrose elevates hemoglobin and iron stores faster. lron sucrose also decreased the need for blood transfusion in the peripartum period.

In the present study Hb and ferritin levels are used to monitor the response of hemopoietic system to iron sucrose complex because of their relative importance in the hemodynamics of the pregnant lady. Due to dilutional effect of pregnancy on plasma volume, there is a decrease in Hb, hematocrit and red blood cell count but MCV remains unaffected. Thus, serial evaluation is useful in differentiating dilutional anemia from progressive iron deficiency anemia during pregnancy. Except for bone marrow biopsy, serum ferritin is best indicator for assessment of iron stores in the non-pregnant women. In pregnancy, it falls dramatically in second and third trimester presumably because of hemodilution effect.

In the present study, the efficacy of iron sucrose was observed after giving fixed dose of 400 mg of iron sucrose infusion, so the mean increase in Hb was 1.6460 gm/dl, compared to study by Vandana S et al, infused 600 mg of iron sucrose in their study and observed an increase of Hb 2.446 gm/dl.

In the present study the increase in the mean Hb is 1.6460 which is compared to the studies by David B et al, observed a rise of 2g/dl Deepthi Shrivastava et al study (2.3g/dl), Avantika Gupta et al study (1.4 g/dl).

A single IV iron sucrose dose has been reported to be associated with an increased incidence of thrombosis (9/41,22%).In contrast ,6 small doses of intravenous iron sucrose administered over a three-week period were without infusion –associated thrombosis, with intravenous iron sucrose administered in 5 daily doses to 45 pregnant women, also well tolerated

Raheela Farhat, Mahnaaz Roohi et Al reported that intravenous group achieved a higher Hb level in a shorter period and showed no major side effects while (80%) of patients in oral iron therapy developed gastrointestinal symptoms. So, intravenous iron sucrose in safe and effective in treatment of iron deficiency anemia during pregnancy.

In the study done by Bhndal N (2006), there were no serious adverse effects reported, but 23% of them complained of metallic taste during infusion .18% of them had facial flushing and pain at the injection site.

In the present study about 26% of cases are Gravida 1, 46% of cases are Gravida 2, 24% of cases are Gravida3, 4% of cases are Gravida 4.

Majority of the patients were multipara (77%). In the study by Khurshid R et al, shows comparable results as the present study. This shows that multiparity is an important

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etiological factor in iron deficiency anemia. Repeated short interval pregnancies predisposes the pregnant woman to suffer from iron deficiency anemia as increased demand in pregnancy is not met with the supply due to faulty dietary habits.

A total dose of therapy with the iron sucrose complex (inclusive of storage) costs between Rupees 2500 to 6000. In country like India the majority of the pregnant women suffering from iron deficiency anemia belong to middle to lower socioeconomic status and to purchase a complete dose of parenteral iron therapy is an economic burden for them. However, the present study showed that the increase in all laboratory parameters are significant after the fixed dose of 400 mg of iron sucrose therapy.

The limitations of this study were that although IV Iron sucrose increased serum ferritin significantly, patients were not followed up in the post-natal period to determine whether hemoglobin levels were maintained during lactation because of higherstores. Serum ferritin has not been repeated at the end of pregnancy nor during the post-natal check-up to see how long the stores last.

Conclusion

Iron deficiency anemia is most common problem in pregnancy. Traditional therapy which is based on either oral administration of oral iron or blood transfusion, orboth, has many drawbacks like non -compliance and gastrointestinal side effects with oral Iron, whereas blood transfusions has transfusion reaction, immunologic impact and risk of infection. As anemia is associated with increased maternal mortality & morbidity, the modern alternate is to treat with intravenous iron because it is well tolerated & restores iron stores rapidly which is safe and effective in the treatment of iron deficiency anemia during pregnancy

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