

RESEARCH ARTICLE

Oral iron versus intravenous iron therapy in moderate iron deficiency anemia in pregnancy

Hussain Md Shohail, Milan Kumar Taye, Long Teron, Nikhil Ranjan Rajkhowa, Mohsina Ahmed, Muslima Firdaus Khan

Corresponding author: Dr Nikhil Ranjan Rajkhowa, Associate Prof, OBGY, Assam Medical College, Dibrugarh, Assam, India; Email – nikhilranjanrajkhowa@gmail.com

Distributed under Attribution-Non Commercial – Share Alike 4.0 International (CC BY-NC-SA 4.0)

ABSTRACT

Background: In India prevalence of anemia in pregnancy is 65-75 %. Dietary iron deficiency is responsible for 90-95% of these cases, which is a preventable condition. In India since 1970 oral IFA, through national programme is used to control anemia in pregnancy. But different studies show superiority of IV iron sucrose over oral IFA in improving Hb level in anemia cases. **Objectives:** This study has taken up to compare efficacy of oral IFA and IV iron sucrose in moderate anemia in pregnancy. **Methods:** This comparative prospective study was carried out from July 2021 to June 2022 in the department of obstetrics and gynaecology, Assam Medical College & Hospital, Dibrugarh. 140 pregnant women with moderate iron deficiency anemia were selected following thorough investigations between 14th weeks to 28th weeks of gestation. The cases were divided into two groups by randomized method with 70 patients in each group. Hb measured after 4 weeks of intravenous and oral iron therapy. **Results:** In this study the mean rise of haemoglobin after 4 weeks in IV iron group were 1.83 gm/dl (22.99% increase from baseline) ($p < 0.001$) and in oral iron group were 1.2 gm/dl (14.99 % increase from baseline) ($p < 0.001$). The mean rise of ferritin after 4 weeks were 14.58 mcg/l (87.72 % increase from baseline) ($p < 0.001$) in IV group and 9.69mcg/l in oral group (63.25 % increase from baseline) ($p < 0.001$). **Conclusion:** Intravenous iron sucrose is safe, highly effective, practical and has better compliance for the treatment of moderate anemia in pregnancy. It induces a quick increase in haemoglobin as well as quicker replenishment of iron stores. It eliminates the need for blood transfusions in moderate anemia in later part of pregnancy.

Keywords: Iron deficiency anemia, intravenous iron, oral iron.

Anemia in pregnancy is a major public health concern in developing countries like India. Its prevalence is very high in developing countries (51%) in comparison to developed countries (14%).¹ Not only this prevalence of moderate anemia and severe anemia is quite high in developing countries in contrast to the developed countries, where only mild to moderate anemia is prevalent. In India moderate to severe anemia is responsible for 20-40 % of maternal mortalities and proportionate number of severe morbidities.² In our institution severe anemia was responsible for 10.9% of maternal mortality.³

Out of all causes of anemia in pregnancy dietary iron

deficiency is responsible for 90 -95% of the causes which is a preventable condition. India is one of the earliest country to take up anemia control programme at national level in 1970 (through oral IFA supplementation). But till date we are still far lagging behind in achieving our goal for control of anemia in pregnancy. In different studies it is observed that injectable iron can improve Hb level better than oral IFA supplementation in moderate anemia cases. That is why we want to take up this study to see the efficacy of oral iron versus injectable iron therapy in moderate anemia during pregnancy in our centre.

Aim and objectives - To assess the impact of oral iron

Received: 18th April 2023, **Peer review completed:** 10st July 2023, **Accepted:** 13rd July 2023.

Shohail HM, Taye MK, Teron L, Rajkhowa NR, Ahmed M, Khan MF. Oral iron versus intravenous iron therapy in moderate iron deficiency anemia in pregnancy. The New Indian Journal of OBGYN. 2023; 10(1): 167-71.

versus intravenous (IV) iron therapy on moderate iron deficiency anemia in pregnancy.

Materials and methods

This is a comparative prospective study was carried out from June 2021 to May 2022 covering a period of one year. Approval was taken from the Institutional Ethical Committee, Assam Medical College & Hospital, Dibrugarh. Anemic pregnant patients attending the antenatal outpatient department and emergency labour room of the department of obstetrics and gynecology, Assam Medical College & Hospital, Dibrugarh fulfilling the inclusion criteria were selected for the study. An informed written consent was obtained from each study subject, after the nature of study was explained in their own understandable language. Detailed history was recorded, complete systemic and obstetric examination were carried out. Period of gestation was calculated according to last menstruation period (LMP) or first trimester obstetric ultrasonography, if patient is not sure of dates. Each case was recorded in proforma.

Sample size of one hundred forty (140), considering 95% confidence interval with 90% power and the findings of the study Agarwal et al ⁴ as reference the sample size for the present study is calculated to be 70 in each group.

Inclusion criteria: Pregnant women with -

1. Appropriate consent.
2. Iron deficiency anemia with Hb values between 7.8-8.5 gm%
3. Gestational age 14-28 weeks.
4. Single viable fetus with no anomalies.

Exclusion criteria: Pregnant women with -

1. No consent.
2. Hb less than 7.8 gm% or more than 8.5 gm%.
3. Gestational age less than 14 weeks or more than 28 weeks.
4. Anemia due to causes other than iron deficiency.
5. History of blood transfusion and erythropoietin treatment in present pregnancy.
6. Other medical or surgical disorders like CKD, bleeding diathesis, hypothyroidism, diabetes, hemorrhoids, IBS complicating pregnancy or h/o haematological diseases.
7. Multiple pregnancy.
8. Specific allergy to iron preparations.

The pregnant women between 14th weeks to 28th weeks of gestation were selected and were divided into two groups by randomized method (lottery basis). They were followed up till term in all study cases. For the convenience of the

study baseline haemoglobin was taken in-between 7.8gm/dl to 8.5 gm/dl.

Group A: 70 anemic pregnant women were given inj iron Sucrose 200 mg intravenously twice weekly. They were advised to take 500 µgm folic acid orally twice daily, govt supply, NHM.

Group B: 70 anemic pregnant women were given tab oral iron folic acid (60 mg of elemental iron with 500 µgm of folic acid) twice daily, govt supply, NHM.

Investigations: Following investigation were done -

1. To diagnose iron deficiency anemia in pregnancy.
 - Haemoglobin,
 - Peripheral Blood Smear
 - PCV
 - MCV, MCH, MCHC, RDW
 - Serum iron, serum ferritin, TIBC
 - Reticulocyte count
 - Hb typing
2. To determine the cause of iron deficiency anemia in pregnancy if and when necessary
 - c-Reactive protein
 - BUN/ Serum creatinine – renal disease
 - LFT- hepatic disease.
 - Urine examination – RBC, casts
 - Stool examination – occult blood, ova
 - X-ray chest – pulmonary TB
 - USG whole abdomen – cirrhosis, splenomegaly.
 - Endoscopy - bleeding from a hiatus hernia, an ulcer or the stomach
 - Colonoscopy - lower intestinal sources of bleeding
 - Bone marrow examination – refractory anemia
3. Other investigations in pregnancy
 - Blood group and Rh typing
 - Bleeding time, clotting time
 - TSH, RBS
 - VDRL, PPTCT, HbS Ag, Anti HCV

Procedure of study: To enrol into the study, eligibility was checked and then patients who fulfilled the inclusion criteria were included. On entry into the study, eligibility was checked and then patients who fulfilled the inclusion criteria were included. Investigation included estimation of hemoglobin value, serum iron, ferritin, TIBC level, hematocrit, red cell indices, reticulocyte count and peripheral blood smear to note the type of anemia. The patients will be

divided into two groups on lottery basis. One group will be given IV iron sucrose; another group will be given oral iron.

Oral group: Women in this group were given daily oral dose of 60mg of elemental iron with 500 microgram folic acid, 1 tablet twice daily for the entire pregnancy. The patients were advised regarding diet and were asked to take the iron tablets 1 hour after meal⁵ with locally available citrus fruits and not to take coffee or tea before and after taking iron tablets. They were asked to bring back empty packs and were asked about the colour of their stool to ensure that whether they had consumed the tablets regularly.

Parenteral group: Patients in this group was advised to stop oral iron 24 hours prior to recruitment to the study for intravenous iron sucrose.

Total dose of iron was calculated by Ganzoni's formula: Dose of iron (mg) = 2.4 × (target Hb-actual Hb) × W (kgs) + 500 mg. Where, 2.4 is a correction factor, 500 mg is the quantity of stored iron in adults, target Hb was taken as 11 gm%, W is weight in kg.

IV iron sucrose of govt supply NHM is available in 5 ml ampule of 100 mg of iron. A maximum dose of 200 mg (2 ampule) of iron sucrose in 100 ml NS was administered through IV infusion set (needle 21G × 1.5”).

Before starting treatment the patient's pulse, blood pressure, temperature, FHR were recorded. Ask in test done and patient was monitored for duration of 15 minutes for any sign of reaction. If no reaction occurred, the injection with 100 ml NS was given slowly over 15-20 mins and patient was monitored for 30 mins for any sign of anaphylactic reaction. No premedication in the form of antihistamine were given. Inj adrenaline, inj hydrocortisone, oxygen were kept ready for serious reactions. This was given on OPD basis twice weekly. Pulse rate, BP, FHR were checked after giving iron sucrose. They were advised to take 500 µgm folic acid orally twice daily.

No direct leading questions were asked to elicit side effects. Only those side effects volunteered by the pregnant women, were recorded. They were asked to inform immediately if there were any unpleasant symptoms following iv iron therapy or as soon as following oral iron. This report included a detailed description of the symptoms, time of onset, duration, whether treatment was discontinued and whether any corrective measures were taken. On subsequent visits signs of improvement of general conditions and disappearance of symptoms of anemia were noted. Hematological improvement was noted after 4 weeks of treatment.

Statistical analysis: The data were entered into Microsoft Excel spreadsheets. The description of the data is in the form of mean ± SD for quantitative data while in the form of % proportion for qualitative (categorical) data. Chi-square and Fisher's exact test were used to evaluate the association between categorical variables. Within the same group, the dependent t-test was used to compare the mean difference. The unpaired t-test was used to compare the mean difference between the two independent groups depending on the fulfilment of the normality assumption for continuous variables. The statistical analyses were done using PSW software version 21.0. A p-value < 0.05 is considered significant.

Results

Table 1 shows comparison of haemoglobin during different visits in both the groups. It was observed that mean baseline haemoglobin were 7.96±0.16gm/dl and 8.01±0.18 gm/dl in IV and oral group respectively. Post treatment Hb after 4 weeks showed mean value 9.79 ± 0.72 gm/dl in IV group and 9.21 ± 0.49 gm/dl in oral group (p< 0.001) which was statistically significant.

Table 1: Comparison of rise of mean haemoglobin level in both groups

Visits	IV Group (gm/dl)	Oral Group (gm/dl)	*p value
Baseline	7.96 ±0.16	8.01 ±0.18	0.084
After 4 weeks	9.79 ±0.72	9.21 ±0.49	<0.001*
% Increase	22.99	14.99	-
p value	<0.001	<0.001**	-

*Unpaired t-test; the p-value is significant at 5% level of significance

**Paired t-test; the p-value is significant at 5% level of significance

Table 2 shows serum ferritin level at first visit that is baseline value and the rise in serum ferritin level in subsequent visits. The mean baseline serum ferritin level was 16.62 ± 3.99 µgm/l and 15.32± 4.07 µgm/l in IV and oral groups respectively. Post treatment ferritin after 4 weeks in IV and oral groups showed a mean value of 31.20± 3.05 µgm/l and 25.01 ± 3.77 µgm/l respectively (p<0.001) which was statistically significant.

Table 2: Comparison of rise of serum ferritin level in both the groups

Visits	IV Group (µgm/l)	Oral Group (µgm/l)	*p value
Baseline	16.62 ±3.99	15.32 ±4.07	0.058
After 4 weeks	31.20 ±3.05	25.01 ±3.77	<0.001*
% Increase	87.72	63.25	-
p value	<0.001	<0.001**	-

*Unpaired t-test; the p-value is significant at 5% level of significance

**Paired t-test; the p-value is significant at 5% level of significance

Table 3 shows distribution of patients according to adverse reactions. There were no major adverse effects. In oral group 5 patients had nausea and vomiting, 3 patients had epigastric pain, 4 patients had constipation and 1 patient had myalgia. In IV group 2 patients had nausea vomiting, 1

patient had epigastric pain, 1 patient had constipation, 3 patients had staining and 1 patient had myalgia.

Table 3: Adverse reaction

Side Effect	IV Group	Oral Group	*P value
Nausea vomiting	2	5	0.441
Epigastric pain	1	3	0.619
Constipation	1	4	0.365
Staining	3	0	0.244
Thrombophlebitis	0	0	-
Rashes	0	0	-
Myalgia	1	1	1.0
Fever	0	0	-
Hypotension	0	0	-

*P value calculated using Fisher's exact test

Discussion

In the present study mean rise of hemoglobin after 4 weeks were 1.83 gm/dl in IV group (22.99% increase from baseline) and 1.2gm/dl in oral group (14.99% increase from baseline). Suganya G et al⁶ found mean rise of hemoglobin after 4 weeks as 2.43±0.20gm/dl in IV group and 0.91±0.20 gm/dl in oral group. Neelima Agarwal et al⁴ found mean rise of hemoglobin after 4 weeks as 1.26±0.58 gm/dl in IV group and 0.78 ±0.37 gm/dl in oral group. Manisha Parmar et al⁷ found mean rise of hemoglobin after 4 weeks as 2.17±0.45 gm/dl having moderate anaemia (Hb 7-9 gm%) and 2.73 ± 0.51 gm/dl with severe anaemia (Hb < 7 gm%) with IV iron sucrose. Alka Kriplani et al⁸ found mean rise of haemoglobin as 2.27 gm/dl after 4 weeks with IV iron sucrose. Alka Kriplani et al used 1000 mg for replenishment of iron instead of 500mg as used in previous studies.

In the present study mean rise of ferritin after 4 weeks were 14.58 µgm/l in IV group (87.72% increase from baseline) and 9.69 µgm/l in oral group (63.25% increase from baseline). Neelima Agarwal et al⁴ found mean rise of ferritin after 4 weeks as 12.00 ± 11.77 µgm/l in IV group and 6.50 ± 9.53 µgm/l in oral group. Aasif Abdullah et al⁹ found mean rise of ferritin after 4 weeks as 14.4 µgm/l in IV group and 5.5 µgm/l in oral group. P K Kochhar et al¹⁰ also found that IV iron increases mean ferritin level as 85.9 µgm/l and 61.1 µgm/l in oral group after day 30.

In the present study no major adverse effects were observed in both groups, no dropout cases were seen from both the groups and compliance were good. Suganya G et al⁶, Neelima Agarwal et al⁴, G D Abhilashini et al¹¹, Alka Kriplani et al⁸ found no major adverse effect in their respective studies.

Conclusions

For the treatment of moderate anaemia in pregnancy, it has been found that intravenous iron sucrose is safe, highly effective, practical, and also has improved compliance. It

induces a quick increase in haemoglobin and hematocrit level, as well as a quicker replenishment of iron stores. It is found to be highly effective than oral iron in this study and may be the only way to eliminate the need for blood transfusions in moderately anaemic women in later part of pregnancy. Patients who do not respond to oral iron therapy needs to be investigated properly and iv iron therapy can be offered for treatment.

Conflict of interest: None. **Disclaimer:** Nil.

References

1. Prasanth R. Prevalence of anemia in both developing and developed countries around the world. *World J Anemia*. 2017 Jun; 1(2): 40-3.
2. Journal E, Kaur K, Arya BD. Scholars Research Library Anaemia "a silent killer" among women in India: Present scenario. *Zool Res*. 2014; 3(1): 32-6.
3. Taye MK, Teron L, Doley R, Abinaya MC, Das S. Maternal Death And Its Causes: A Retrospective Evaluation At Assam Medical College And Hospital, Dibrugarh, Assam: India. *International Journal Of Scientific Research*. 2022; 2277: 9-13.
4. Agarwal N, Sharma A, Gupta M, Agrawal A. Efficacy and safety of intravenous iron sucrose versus oral iron in pregnant women with mild to moderate iron deficiency anaemia. *Academia Edu*. 2016; 2(2): 109-11.
5. Dubik SD, Amegah KE, Alhassan A, Mornah LN, Fiagbe L. Compliance with weekly iron and folic acid supplementation and its associated factors among adolescent girls in Tamale Metropolis of Ghana. *Journal of nutrition and metabolism*. 2019 Dec 11; 2019.
6. Suganya G, Vimala D. A comparative study of oral iron and intravenous iron in iron deficient antenatal mothers. *Int J Reprod Contracept Obstet Gynecol*. 2018; 7(5): 1848 - 51.
7. Parmar M, Hemali V, Shah P, Thakar R, Deliwala K. Evaluation of effectiveness of intravenous iron sucrose in antenatal patients of iron deficiency anemia. *Int J Med Sci Public Heal*. 2014; 3(2):173.
8. Kriplani A, Mahey R, Dash BB, Kulshreshta V, Agarwal N, Bhatla N. Intravenous iron sucrose therapy for moderate to severe anaemia in pregnancy. *Indian J Med Res*. 2013; 138: 78-82.
9. Abdullah A, Qadir S, Haq A, Wagay MI, Masarat S. Intravenous Iron Sucrose Vs Oral Iron Therapy in Treatment of Pregnancy With Moderate Anaemia: a

- Prospective Study in a Tertiary Care Centre. International Journal of Basic and Applied Medical Sciences. 2014; 4(2): 78-83.
10. Kochhar PK, Kaundal A, Ghosh P. Intravenous iron sucrose versus oral iron in treatment of iron deficiency anemia in pregnancy: a randomized clinical trial. Journal of Obstetrics and Gynaecology Research. 2013 Feb; 39(2): 504-10.
 11. Abhilashini GD, Sagili H, Rani R. Intravenous iron sucrose and oral iron for the treatment of iron deficiency Anaemia in pregnancy. J Clin Diagnostic Res. 2014; 8(5): 4-7.

**Hussain Md Shohail¹, Milan Kumar Teye², Long Teron³,
Nikhil Ranjan Rajkhowa⁴, Mohsina Ahmed⁵, Muslima
Firdaus Khan⁶**

¹ PGT, OBGY; Assam Medical College, Dibrugarh, Assam, India; ² Associate Prof, OBGY Lakhimpur Medical College, Lakhimpur, Assam, India; ³ Assistant Prof, OBGY, Diphu Medical College, Diphu, Assam, India; ⁴ Associate Prof, OBGY, Assam Medical College, Dibrugarh, Assam, India; ⁵ Assistant Prof, OBGY, Nalbari Medical College, Nalbari, Assam, India; ⁶ PGT, OBGY; Assam Medical College, Dibrugarh, Assam, India.