

CORRECTION OF ANEMIA WITH INTRAVENOUS IRON VERSUS ORAL IRON IN ANTENATAL PATIENTS AT SIR GANGA RAM HOSPITAL LAHORE

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Abstract

Background: Anemia in pregnancy is common, with oral iron traditionally used for treatment. However, gastrointestinal side effects and poor absorption limit its effectiveness. Intravenous iron offers a promising alternative, though existing literature remains controversial. This study at Sir Ganga Ram Hospital Lahore compares the efficacy of intravenous versus oral iron in antenatal patients.

Objectives: To compare IV ferric carboxylates versus oral iron in correction of anemia in pregnant women at Sir Ganga Ram Hospital, Lahore.

Duration: Six months w.e.f 22-06-2024 to 21-12-2024

Methodology: This randomized controlled trial was conducted at Sir Ganga Ram Hospital, Lahore, over six months. A total of 92 pregnant women (46 in each group) were randomly assigned to receive either IV Ferric Carboxylates or oral iron. Participants were aged 18-45 years, with singleton pregnancies and mild to moderate anemia. Anemia correction was assessed at 3 months based on hemoglobin levels, analyzed using SPSS version 17.

Results: The study included 92 participants with a mean age of 28.41 ± 5.27 years. At enrollment, the mean Hb was 7.06 ± 0.86 g/dL, and 63% had moderate iron deficiency anemia (IDA). After 3 months, Group A showed significantly higher Hb and ferritin levels, with a higher correction rate (95.7%) compared to Group B (78.3%).

Conclusion: In conclusion, intravenous iron treatment demonstrated superior efficacy over oral iron in improving hemoglobin and ferritin levels, with higher correction rates observed in the intravenous iron group. Stratification showed trends favoring intravenous iron across subgroups, although statistical significance was not reached in all due to the small sample size.

INTRODUCTION

Iron is the most abundant element on Earth, making up 35% of the planet's physical mass. It plays a critical role in the function of all cells, facilitating oxygen delivery, electron transport, and enzymatic activity. Cells with higher metabolic demands require increased iron and are more vulnerable to

dysfunction when iron-deficient.^{1,2} During pregnancy, iron requirements rise significantly, increasing roughly tenfold from 0.8 mg/day in the first trimester to 7.5 mg/day in the third trimester. This is essential to support the expansion of maternal red blood cells, ensure placental and fetal

growth, and address blood loss during delivery. The placenta itself demands around 90 mg of iron and transfers approximately 270 mg to the fetus throughout the pregnancy.³

Globally, over 80% of countries report a prevalence of anemia in pregnancy greater than 20%, constituting a significant public health issue. It is estimated that the global prevalence of anemia in pregnant women is approximately 41.8%.⁴ In Pakistan, the prevalence of iron deficiency anemia (IDA) in women ranges from 30% to 60%. The country also experiences high maternal mortality rates (276 per 100,000 live births) and perinatal mortality rates (186 per 1,000 pregnancies), both of which are linked to chronic iron deficiency and acute blood loss.⁵

Oral iron supplementation is the standard model of drug administration during pregnancy. This method is generally safe as it does not require a hospital stay or carry immediate life-threatening risks like anaphylactic reactions, which can occur with injectable iron preparations. However, oral iron therapy is often poorly tolerated due to gastrointestinal side effects, such as bloating, diarrhea, heartburn, nausea, constipation, and dark stools, which can reduce patient compliance.^{6,7}

Ferric carboxymaltose (FCM) is a new intravenous iron formulation that allows up to 1000 mg to be safely administered in a single 15-minute infusion, with minimal risk of allergic reactions. FCM has shown better anemia correction rates compared to oral iron.⁸ Several studies report significantly higher correction rates in the IV group, such as Breymann et al. (84.0% vs. 70.0%, $p=0.031$),⁹ Lewkowitz et al. (60.0% vs. 15.0%, $p=0.039$),¹⁰ and Chauhan et al. (95.54% vs. 72.94%, $p<0.0001$).⁷ However, other studies show less significant differences, with Khan et al. reporting (96.3% vs. 88.8%, $p>0.05$)¹¹ and Pasricha et al. showing (52.0% vs. 57.0%, $p=0.27$)⁸ between the IV and oral groups.

METHODOLOGY

This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology, Sir Ganga Ram Hospital, Lahore, with a duration of six months after the approval of the study synopsis. A total sample size of 92 pregnant women (46 in each group) was calculated using 80% power of the test

and 5% significance level, based on the expected correction rates of anemia of 95.54% vs. 72.94% between the IV and oral iron therapy groups, respectively.⁷ The women were randomly divided into two groups using the lottery method: Group A (IV Ferric Carboxymaltose) and Group B (Oral Iron). Inclusion criteria were women aged 18-45 years with singleton pregnancies and gestational age between 24-28 weeks, diagnosed with mild to moderate anemia. Exclusion criteria included women with anemia other than iron deficiency anemia (IDA), those with a history of allergy to injectable iron, multiple pregnancies, pre-existing chronic conditions, and those already on iron therapy. Iron Deficiency Anemia (IDA) was defined as a hemoglobin (Hb) level of less than 11 g/dL during pregnancy, with anemia severity classified as mild, moderate, or severe based on Hb levels. After informed consent, participants were assigned to receive either a single dose of IV ferric carboxymaltose (20 mg/kg up to 1000 mg) or 60 mg elemental iron as ferrous sulphate twice daily for 3 months. All participants underwent necessary lab tests, including CBC, urine C/E, BSL, Hepatitis serology, and ultrasound. Correction of anemia was assessed by Hb levels at 3 months, with a target Hb ≥ 11 g/dL indicating successful correction. All the collected data was entered and analyzed using SPSS version 17. Numerical variables, such as age, gestational age, and hemoglobin levels at enrollment and after 3 months, were presented as mean $\pm$ SD. Categorical variables, including IDA status (mild, moderate) and correction of anemia achieved, were shown as frequencies and percentages. The chi-square test was applied to compare the correction rates between the groups, with a significance level set at $p \leq 0.05$. Additionally, the frequency of correction was stratified by age, parity, gestational age, and IDA status, with post-stratification chi-square tests applied for significance.

RESULTS

The study included a total of 92 participants, with a mean age of 28.41 ± 5.27 years. The majority of participants were aged between 18 and 30 years (59.8%), while 40.2% were between 31 and 45 years. The mean gestational age was 26.14 ± 1.52 weeks, with 55.4% of participants at 24-26 weeks of

gestation and 44.6% at 27-28 weeks. The mean parity was 2.20 ± 0.89 , with 64.1% of participants having a parity of 1-2, and 35.9% having a parity greater than 2. At the time of enrollment, the mean hemoglobin (Hb) level was 7.06 ± 0.86 g/dL. Regarding the status of iron deficiency anemia (IDA), 37.0% of participants had mild IDA, while 63.0% had moderate IDA. Data is given in Table 1.0. Both the groups were statistically comparable at baseline for all the variables (p -value >0.05), as shown in Table 2.0.

After 3 months of treatment, the mean hemoglobin (Hb) level in Group A was 11.96 ± 0.69 g/dL, significantly higher than in Group B, which had a mean Hb level of 11.51 ± 0.61 g/dL ($p = 0.001$). Serum ferritin levels were also significantly higher in Group A (78.33 ± 10.72 ng/ml) compared to Group

B (73.46 ± 8.71 ng/ml, $p = 0.019$). Correction was achieved in 95.7% of participants in Group A, compared to 78.3% in Group B ($p = 0.013$). Statistical significance was determined using the Chi-Square test and independent sample t-test ($p \leq 0.05$). Data is given in Table 3.0.

Stratification revealed a clear superiority of Group A over Group B across all subgroups. However, due to the small sample size, statistical significance was not achieved in all subgroups. Significant differences were observed in age ($p = 0.007$), with a higher proportion of participants aged 18-30 years in Group A. Other comparisons, including gestational age, parity, and IDA status, showed trends favoring Group A, but failed to reach statistical significance in most cases due to the limited sample size. Data is given in Table 4.0.

Table 1.0: Demographic Characteristics of Women Diagnosed with IDA in Pregnancy

Characteristics	Total (n=92)
Age (years)	28.41 $\pm$ 5.27
• 18-30 years	55 (59.8%)
• 31-45 years	37 (40.2%)
Gestational Age	26.14 $\pm$ 1.52
• 24-26 weeks	51 (55.4%)
• 27-28 weeks	41 (44.6%)
Parity	2.20 $\pm$ 0.89
• 1-2	59 (64.1%)
• >2	33 (35.9%)
Hb at Enrollment	7.06 $\pm$ 0.86
IDA Status	
• Mild	34 (37.0%)
• Moderate	58 (63.0%)

Table 2.0: Comparison of Baseline Characteristics between the Study Groups

Characteristics	Group A (n=46)	Group B (n=46)	p-value
Age (years)	28.65 $\pm$ 4.85	28.17 $\pm$ 5.71	0.666
• 18-30 years	26 (56.5%)	29 (63.0%)	0.524
• 31-45 years	20 (43.5%)	17 (37.0%)	
Gestational Age	26.04 $\pm$ 1.53	26.24 $\pm$ 1.52	0.541
• 24-26 weeks	28 (69.9%)	23 (50.0%)	0.294
• 27-28 weeks	18 (39.1%)	23 (50.0%)	
Parity	2.17 $\pm$ 0.80	2.22 $\pm$ 0.99	0.817
• 1-2	31 (67.4%)	28 (60.9%)	0.514

• >2	15 (32.6%)	18 (39.1%)	
Hb at Enrollment	7.02±0.88	7.11±0.85	0.598
IDA Status			
• Mild	18 (39.1%)	16 (34.8%)	0.666
• Moderate	28 (60.9%)	30 (65.2%)	

Chi Square test/ Independent sample t test, taking p-lvaue≤0.05 as significant.

Table 3.0: Comparison of Study Outcomes after 3 Months Treatment

Characteristics	Group A (n=46)	Group B (n=46)	p-value
Hb (g/dl)	11.96±0.69	11.51±0.61	0.001
Serum Ferritin (ng/ml)	78.33±10.72	73.46±8.71	0.019
Correction Achieved			
• Yes	44 (95.7%)	36 (78.3%)	0.013
• No	2 (4.3%)	10 (21.7%)	

Chi Square test/ Independent sample t test, taking p-lvaue≤0.05 as significant.

Table 4 .0: Stratification of Frequency of Correction of Anemia

Characteristics	Group A (46)	Group B (n=46)	p-value
Age			
• 18-30 years	26 (100.0%)	22 (75.9%)	0.007
• 31-45 years	18 (90.0%)	14 (82.4%)	0.498
Gestational Age			
• 24-26 weeks	26 (92.9%)	17 (73.9%)	0.064
• 27-28 weeks	18 (100.0%)	19 (82.6%)	0.063
Parity			
• 1-2	30 (96.8%)	24 (85.7%)	0.128
• >2	14 (93.3%)	12 (66.7%)	0.062
IDA Status			
• Mild	18 (100.0%)	13 (81.3%)	0.054
• Moderate	26 (92.9%)	23 (76.7%)	0.089

Chi Square test, taking p-lvaue≤0.05 as significant.

DISCUSSION

Anemia during pregnancy is a significant health issue, especially in developing countries, leading to adverse outcomes for both mothers and infants. Traditionally, oral iron supplements have been used to manage anemia in antenatal patients, but they often cause gastrointestinal side effects and have lower absorption rates.^{12,13} Intravenous iron, a newer approach, offers faster and more effective correction, particularly in cases of severe anemia.^{7,8} However, existing literature remains controversial regarding the superiority of intravenous iron over oral iron.⁷⁻¹¹ This study was conducted at Sir Ganga Ram Hospital

Lahore to compare the effectiveness of intravenous versus oral iron in correcting anemia in antenatal patients.

Mean age of participants in this study was 28.41 ± 5.27 years that is comparable with the findings of some other studies. Khan et al. in India reported a mean age of 22.2 ± 6.0 years,¹¹ while Chauhan et al. found a mean age of 26.61 ± 4.79 years.⁷ Arzoo et al. in Pakistan observed a mean age of 28.5 ± 4.8 years, and Tondge et al. in India reported a mean age of 23.2 ± 3.9 years.¹⁴

The mean gestational age in this study was 26.14 ± 1.52 weeks. This is closely aligned with the findings



of Arzoo et al., who reported a mean gestational age of 26.2 ± 3.6 weeks in their study.¹⁵ The mean parity in this study was 2.20 ± 0.89 . This is similar to the findings of Arzoo et al., who reported a median parity of 2 (IQR 1-3).¹⁵

Mean Hb at enrollment was 7.06 ± 0.86 g/dL in this study. This is lower compared to several previous studies, such as Breyman et al. (2017), who reported a mean Hb of 9.8 ± 0.8 g/dL,⁹ and Sarhan et al., who found a mean of 8.53 ± 0.48 g/dL.¹⁷ Tondge et al. reported 8.21 ± 1.12 g/dL,¹⁴ while Saxena et al. recorded a mean Hb of 6.89 g/dL.¹⁷ Chauhan et al. found a mean Hb of 8.39 ± 0.5 g/dL.¹⁷ These variations emphasize differences in anemia severity across different populations and regions.

In this study, after 3 months of treatment, Group A had a mean hemoglobin (Hb) level of 11.96 ± 0.69 g/dL, significantly higher than Group B, which had a mean Hb of 11.51 ± 0.61 g/dL ($p = 0.001$). Serum ferritin levels were also significantly higher in Group A (78.33 ± 10.72 ng/ml) compared to Group B (73.46 ± 8.71 ng/ml, $p = 0.019$). These findings are consistent with Chauhan et al., who reported Hb levels of 12.0 ± 1.1 g/dL for Group A and 11.76 ± 1.29 g/dL for Group B ($p < 0.05$),¹⁷ and Sarhan et al., who found Hb levels of 9.86 ± 0.60 g/dL for Group A and 9.5 ± 0.46 g/dL for Group B ($p = 0.03$).¹⁶ In terms of serum ferritin, Arzoo et al. reported higher levels after treatment, with Group A showing 80.0 ± 8.3 ng/ml versus 70.0 ± 7.2 ng/ml for Group B at 4 weeks ($p < 0.01$),¹⁵ and 85.0 ± 8.0 ng/ml for Group A versus 75.0 ± 7.5 ng/ml for Group B at 8 weeks ($p < 0.001$), further supporting the greater effectiveness of intravenous iron in improving ferritin levels.

In this study, correction of anemia was achieved in 44 (95.7%) participants in the intravenous iron group and 36 (78.3%) in the oral iron group, with a statistically significant difference ($p = 0.013$). Previously, correction of anemia was reported significantly high in FCM group than oral ferrous sulphate group (84.0% vs. 70.0%; p -value=0.031) by Breyman et al. (2017) in Switzerland.⁹ Later on similar results were reported by Lewkowicz et al. (2022) in the US wherein pregnant women in the IV group had significantly high correction of anemia than oral group as (60.0% vs. 15%; p -value=0.039).¹⁰ More recently, another study by Chauhan et al.

(2023) in India reported significantly higher anemia correction rate in IV group than oral group (95.54% vs. 72.94%; p -value<0.0001).⁷ Khan et al. (2018)¹¹ in India reported higher frequency of correction in anemia in IV group than oral group (96.3% vs. 88.8%; p -value>0.05) and the difference was not significant.¹¹ Furthermore, an inverse relation was shown by Pasricha et al. (2023)⁸ in Australia where less frequency of correction in anemia was reported in IV group than oral group (52.0% vs. 57.0%; p -value=0.27) and the difference was also insignificant.

CONCLUSION

In conclusion, intravenous iron treatment demonstrated superior efficacy over oral iron in improving hemoglobin and ferritin levels, with higher correction rates observed in the intravenous iron group. Stratification showed trends favoring intravenous iron across subgroups, although statistical significance was not reached in all due to the small sample size.

LIMITATIONS & RECOMMENDATIONS

This study's strengths include a well-defined comparison between intravenous and oral iron in antenatal patients, with clear statistical significance in anemia correction. However, limitations include the small sample size and the absence of long-term follow-up, which may affect the generalizability of results. Future studies with larger sample sizes and extended follow-up periods are necessary to confirm these findings and assess the long-term benefits and safety of intravenous versus oral iron in pregnancy-related anemia.

Conflict of Interest: None

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Substantial contributions to study design, acquisition of data Analysis & Interpretation of Data, Manuscript writing Has given final approval of the version to be published Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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REFERENCES

- Georgieff MK. Iron deficiency in pregnancy. *Am J Obstet Gynecol.* 2020;223(4):516-24.
- Benson CS, Shah A, Frise MC, Frise CJ. Iron deficiency anaemia in pregnancy: a contemporary review. *Obst Med* 2021;14(2):67-76.
- Garzon S, Cacciato PM, Certelli C, Salvaggio C, Magliarditi M, Rizzo G. Iron deficiency anemia in pregnancy: Novel approaches for an old problem. *Oman Med J.* 2020;35(5):e166.
- Georgieff MK, Krebs NF, Cusick SE. The benefits and risks of iron supplementation in pregnancy and childhood. *Ann Rev Nutr.* 2019;39(3):121-46.
- Habib MA, Raynes-Greenow C, Soofi SB, Ali N, Nausheen S, Ahmed I, et al. Prevalence and determinants of iron deficiency anemia among non-pregnant women of reproductive age in Pakistan. *Asia Pac J Clin Nutr.* 2018;27(1):195-203.
- Yadav K, Arjun MC, Jacob OM, Kant S, Ahamed F, Ramaswamy G. Comparison of different doses of daily iron supplementation for anemia prophylaxis in pregnancy: a systematic review. *J Fam Med Prim Care.* 2020;9(3):1308-16.
- Chauhan N, Dogra P, Sharma R, Kant S, Soni M. Randomized controlled trial comparing ferrous sulfate and iron sucrose in iron deficiency anemia in pregnancy. *Cureus.* 2023;15(2):e34858.
- Pasticha SR, Mwangi MN, Moya E, Ataide R, Mzembe G, Harding R, et al. Second-trimester anaemia in Malawian pregnant women: a randomised controlled trial. *Lancet.* 2023;401(10388):1595-609.
- Breymann C, Milman N, Mezzacasa A, Bernard R, Dudenhausen J. Ferric carboxymaltose vs. oral iron in the treatment of pregnant women with iron deficiency anemia: an international, open-label, randomized controlled trial (FER-ASAP). *J Perinat Med.* 2017;45(4):443-53.
- Lewkowitz AK, Stout MJ, Cooke E, Deoni SC, D'Sa V, Rouse DJ, et al. Intravenous versus oral iron for iron-deficiency anemia in pregnancy (IVIDA): a randomized controlled trial. *Am J Perinatol.* 2021;39(08):808-15.
- Khan NZ, Dwivedi AD, Shukla M. Effect of oral iron and intravenous iron sucrose on pregnancy related outcome among pregnant females with iron deficiency anemia. *India J Obstet Gynecol Res.* 2018;5(4):535-8.
- Raut AK, Hiwale K. Iron deficiency anemia in pregnancy. *Cureus* 2022;14(9):e28918.
- Tabrizi FM, Barjasteh S. Maternal hemoglobin levels during pregnancy and their association with birth weight of neonates. *Iran J Pediatr Hematol Oncol* 2015;5(4):211-7.
- Tondge G, Dasila PS, Pote T. Oral versus intravenous iron therapy among pregnant women with iron deficiency anaemia: a comparative study. *Int J Reprod Contracept Obstet Gynecol.* 2023;12(5):1384-9.
- Arzoo K, Jan S, Anwar R, Ali R, Masood A, Rehman MA. Efficacy of intravenous ferric carboxymaltose versus iron sucrose in the treatment of iron deficiency anemia of pregnancy: intravenous ferric carboxymaltose versus iron sucrose for iron deficiency anemia. *Pak J Health Sci.* 2025;6(2):131-5.
- Sarhan AM, Madkour NM, Salih SM, Zaitoun MM. Intravenous iron versus oral iron in correction of iron deficiency anemia during third trimester of pregnancy. *Egypt J Hosp Med.,* 2023;90(2):3273-7.
- Saxena D, Rathore D. Comparison of intravenous iron sucrose versus oral iron for the treatment of iron deficiency anaemia in pregnancy. *Int J Clin Obstet Gynaecol.* 2021;5(4):221-4