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EFFICACY OF IV VERSUS ORAL IRON IN THE TREATMENT OF IRON DEFICIENCY ANEMIA DURING PREGNANCY

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ABSTRACT

Background: During pregnancy, iron deficiency anemia (IDA) is a common illness that has a major influence on the health of both the mother and the fetus. Choosing between intravenous (IV) and oral iron supplementation is still a crucial therapeutic issue.
Objective: The purpose of this study is to evaluate the effectiveness of oral and intravenous iron therapy in treating iron deficiency anemia in pregnant women.
Methods: Over the course of six months, from May 30, 2025, to November 30, 2025, this randomized controlled experiment was carried out at the Department of Obstetrics and Gynecology, Doctor Hospital and Medical Center. The research comprised 112 women (56 in each group) with hemoglobin levels less than 11 g/dL who were in their second trimester (gestational age 14–21 weeks). Following admission, patients were divided into two groups at random: A and B. Participants were randomized to either continue daily therapy with oral polysaccharide iron complex (Ironone) or receive a single intravenous dose of ferric carboxymaltose (Feroxyma). For four weeks, women in the oral iron group were given 150 mg capsules of polysaccharide iron complex. Every randomized participant had follow-up appointments, and at the fourth week, the results were evaluated.
Results: Efficacy of IV iron and oral iron therapy showed significant difference between groups. i.e. (71.4% vs. 32.1%, p-value<0.001). The stratified analysis in this study shows IV iron superior across age groups and gestational ages, with particularly strong effects at 14–17 weeks and in nulliparous/multiparous women.
Conclusion: Results of this study clearly demonstrate that both oral and IV iron therapy resulted in improvement in hemoglobin level after 4 weeks of treatment but the improvement in hemoglobin level in IV iron therapy showed significantly higher superiority for treating iron deficiency anemia during pregnancy.

Key Words: Anemia, Iron therapy, Efficacy, Intravenous, Oral, Pregnancy.

INTRODUCTION

The requirement of iron tend to increase during pregnancy because of placental development, fetal growth and higher erythropoiesis. When dietary iron intake is insufficient, maternal iron stores become depleted, ultimately compromising erythropoiesis, and causing IDA[1]. As per the World Health Organization, more than 2 billion people globally suffer from nutritional iron deficiency; 38.2% of pregnant women worldwide are affected by anemia in pregnancy [2].

IDA is the main cause behind low birth weight babies and mothers who have reduced physical and intellectual capability. Furthermore, non-anemic ID has been found to be a potential long-term risk factor for low birth weight and fetal neurodevelopment deficits [3]. Hence, it is recommended to supplement iron during pregnancy to manage IDA. Nevertheless, the optimal route of iron administration is best remain unclear. In particular, there is little agreement on the use of IV iron in treatment algorithms [4].
The first-line treatment is oral iron which is available, affordable and safe. On the other hand, the side-effects of gastrointestinal tract such as metallic taste, gastric discomfort, nausea and constipation are some of the limitations, along with the need for patient compliance [5]. Previous meta-analyses have shown that both oral iron and IV iron equally effective in improving hematologic parameters, but that IV iron was associated with higher hemoglobin, less side effects, and fewer compliance issues [6].

There are two reasons why there isn't agreement. There are disadvantages to both existing therapy options: IV iron is more resource intensive and carries with it a risk of transfusion reaction, while oral iron has low rate of systemic absorption and high incidence of gastrointestinal side effects. In particular, 2nd- and 3rd-generation IV iron formulations currently introduced for transfusion are expected to have a lower rate of transfusion reaction [7].

This study objective was to evaluate oral/IV iron for IDA in pregnancy. Previous local studies conducted by Hafsa et al. [8] utilized various formulations of iron supplementation, highlighting the lack of research addressing this aspect within our population. Therefore, our study endeavors to fill this gap by investigating the efficacy of two new formulations of iron both in IV and oral form with fewer side effects. We aim to compare the IV ferric carboxymaltose effectiveness with oral polysaccharide iron complex. In the future, this issue will be treated with a better method that will undoubtedly enhance the outcomes for both the mother and the fetus.

METHODOLOGY

After obtaining ethical approval from ethical committee, pregnant women accomplishing the inclusion criteria will be taken. This randomized controlled trial was conducted at Department of Obstetrics and Gynecology, Doctor Hospital and Medical Center over a six-month time duration from 30 May 2025 to 30 November, 2025. The trial was registered with ClinicalTrials.gov PRS having ID # NCT07384663. A total of 112(56 in each group) women are estimated using % of non-anemic women as 91% in the IV iron group and 73% in the oral iron group.[9] We used 80% power of study and 5% level of significance. A non-probability consecutive sampling method was used to find participants. Pregnant women between the ages of 18 and 45 who were in the 2nd trimester (gestational age between 14 and 21 weeks) and had a level of less than 11 g/dL were the study's inclusion criteria. Exclusion criteria was pregnant women with multiple pregnancies (based on USG), a history of multiple allergies (based on clinical history), active infections, recent red blood cell (RBC) transfusions, known hypersensitivity to any of the investigational drugs' excipients, and women with Thalassemia minor. Every participant gave their informed consent. All respondents' names, ages, addresses, and phone numbers were recorded in the data collecting form. Following admission, patients were divided in 2 groups randomly: A and B. Participants were randomly allocated to either continue daily therapy with oral polysaccharide iron complex (Ironone) or receive a single IV dose of ferric carboxymaltose (Feroxyma). At the baseline appointment, treatment was started. Following the collection of baseline data, women were assigned to the IV iron group and given a single dose of 500 mg of ferric carboxymaltose diluted in 100 mL of 0.9% sodium chloride (or 10 mg/kg if pre-pregnancy body weight was less than 50 kg). Participants were monitored for adverse events both during and half an hour after the infusion completed. The infusions were given over a period of around 20 minutes. For four weeks, women in the oral iron group were given a 150 mg polysaccharide iron complex capsule every day. Every randomized participant was scheduled for follow-ups, and at the fourth week, the outcome (efficacy of therapy defined in terms of prevention of anemia by identifying the proportion of women with Hb≥11.0 g/dL after four weeks of treatment) was evaluated. All collected data was entered and analyzed using SPSS version 26. Mean ± S.D was calculated for age, gestational age (at baseline), Hb level at baseline. Categorical data like non-anemia (Hb ≥ 11.0 g/dL) at 4th week, parity was presented as frequency (%). Non-anemia at 4th week was compared using chi-square test in both groups. Data was stratified for age, gestational age (at baseline) and parity to rule out the effect modifiers. Post stratified Chi-square test was utilized taking p-value ≤ 0.05 as significant.

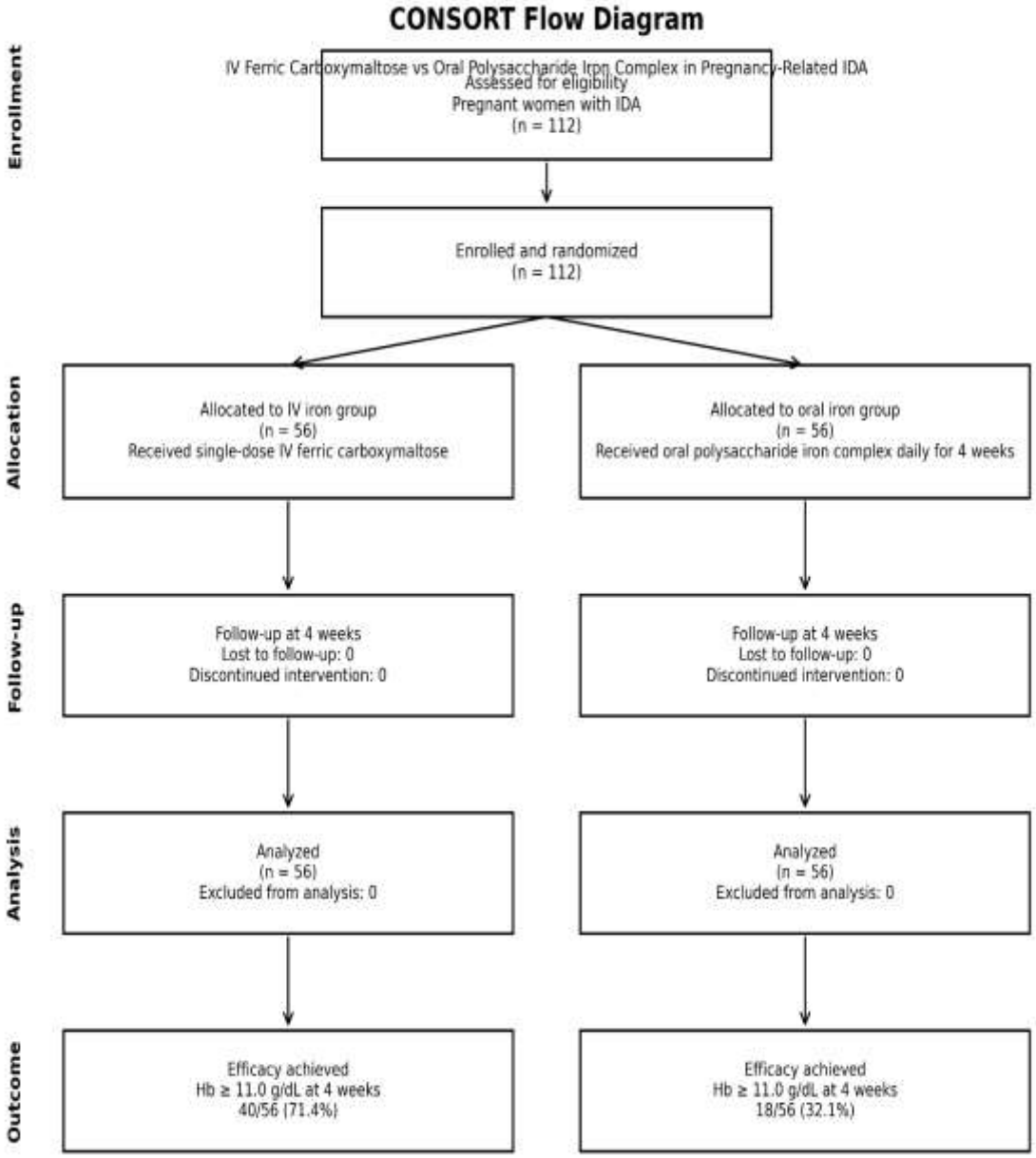

Fig-1: CONSORT DIAGRAM

RESULTS

Mean age of women in IV and oral group was 31.39±7.91 and 31.11±7.79 years. Mean gestational age of women in IV and oral group was 17.59±2.18 and 17.80±2.25 weeks. Parity status of women showed that 17.9% females in IV group and 19.6% females in oral group were nulli-parous, 12.5% women in IV and 1.4% in oral group were primi-parous and 69.6% females in IV group and 58.9% females in oral group were multi-parous. In table-1 comparison of ferritin and hemoglobin level was presented between IV and oral group. Ferritin level and hemoglobin level before treatment showed no significant difference between groups. However, hemoglobin level after 4 weeks post treatment shows significant difference between groups. Efficacy between groups showed significant difference. Efficacy of IV group was significantly higher as compared to oral group. i.e. p-value<0.001 (Table-1) Table-2 presents comparison of efficacy between treatment in relation patients age, gestational age and parity status. For the stratified variables (age, gestational age and parity) efficacy of IV group was significantly higher as compared to oral group. However, among primi-parous women no significant difference was seen between groups. (Table-2)

Table-1: Efficacy of Treatment groups

			IV-Group n = 56	Oral-Group n = 56	p-value
Age (years)		**Mean ± SD**	31.39 ±7.91	31.11±7.79	**0.848(I)**
Gestational age (weeks)		**Median (IQR)**	31.5(13.5)	31.00(13.5)	**0.601(M)**
Ferritin Level		**Mean ± SD**	17.25±5.78	15.40±5.58	**0.069(M)**
		Median (IQR)	18.50(10)	15.35(9.95)	
Hb	**Baseline**	**Mean ± SD**	9.16±0.98	9.03±0.98	**0.520(M)**
		Median (IQR)	9.30(1.55)	9.10(.85)	
	After 4 weeks	**Mean ± SD**	11.55±1.06	10.30±0.98	**<0.001* (M)**
		Median (IQR)	11.60(.38)	10.45(1.80)	
Efficacy			40(71.4%)	18(32.1%)	**<0.001*(C)**

Note: (I): independent sample t-test, **(M)** Mann Whitney U Test**, (C):** Chi Square test, **(*)** p-value<0.05

Table-2: Efficacy of Treatment stratified for age, gestational age and parity

		Efficacy	IV-Group	Oral-Group	p-value
Age (Years)	**18-30 Years**	**Yes**	17(68%)	6(22.2%)	**0.001(c)**
		No	8(32%)	21(77.8%)	
	31-40 Years	**Yes**	16(76.2%)	7(35%)	**0.008(c)**
		No	5(3.8%)	13(65%)	
	>40 Years	**Yes**	7(70%)	5(55.6%)	**0.650(f)**
		No	3(30%)	4(44.4%)	
Gestational Age (Weeks)	**14-17 Weeks**	**Yes**	22(78.6%)	7(29.2%)	**<0.001(c)**
		No	6(21.4%)	17(70.8%)	
	18-21 Weeks	**Yes**	18(64.3%)	11(34.4%)	**0.021(c)**
		No	10(35.7%)	21(65.6%)	
Parity	**Nulliparous**	**Yes**	9(90%)	4(36.4%)	**0.024(f)**
		No	1(10%)	7(63.6%)	
	Primiparous	**Yes**	4(57.1%)	5(41.7%)	**0.650(f)**
		No	3(42.9%)	7(58.3%)	
	Multiparous	**Yes**	27(69.2%)	9(27.3%)	**<0.001(c)**
		No	12(30.8%)	24(72.7%)	

DISCUSSION

Results of this study demonstrate higher efficacy for IV iron in comparison with oral therapy in order to treat iron deficiency anemia during pregnancy. Hemoglobin gain is greater in the IV group (mean 11.55 vs 10.30 g/dL; efficacy 71.4% vs 32.1%, p-value<0.001). This finding is in agreement with recently published randomized controlled trials and systematic reviews and meta-analysis. [10, 11] Network meta-analysis (FRIDA) also ranks IV sucrose and IV ferric carboxymaltose above oral ferrous sulfate for 4-week Hb gain.[12] In one randomized controlled trial (IVIDA trial) rate of maternal anemia was significantly reduced with IV iron as compared to oral iron on admission for delivery. (40% vs. 85%, p-value=0.039).[13]

This trial differ in methodology from this study as the hemoglobin assessment was assessed after delivery in their case. IVON trial from Nigeria reported no considerable difference in oral and IV iron treatment on prevalence of anemia during term. However, for treating IDA, a single larger IV dosage of ferric carboxymaltose administered during pregnancy is safer and more effective than oral ferrous sulphate.[14] IV iron sucrose and other IV formulations consistently achieve higher hemoglobin increases within 3–6 weeks than oral iron.[15, 16] Results of this study regarding superiority of IV iron is consistent with prior randomized controlled trials from India. However, some of the trials have reported improvement in ferritin levels as well better perinatal outcome.[14, 17-19]

The subgroup analysis in this study shows IV iron superior across age groups and gestational ages, with particularly strong effects at 14–17 weeks and in nulliparous/multiparous women. Few published trials present such detailed stratification, but large RCTs and cohort data suggest IV iron retains its advantage across second and third trimester and different parity groups.[20, 21] The repeated occurrence of higher efficacy in the IV groups across the studies illustrates the clinical value of parenteral iron, especially in groups with limitations in oral iron absorption, or experience nausea and vomiting, or have other hurdles to taking oral iron.[22, 23] Although IV iron therapy is considered safe and effective for both maternal as well as for neonates the cost is the main issue as it is more expensive as well as its administration need specialized supervision in hospital settings which makes it a bit challenging in under developing clinical setups.[24]

Clinical trials of IV iron in pregnancy vary in their approach: some do not describe fetal monitoring procedures at all, while others report pre- and post-infusion fetal heart monitoring without demonstrating a clear need for such practice.[25] To further lessen the strain on patients and resources, recent recommendations support combining therapy into a single infusion visit and do not require fetal heart monitoring.[26] Due to variations in prenatal screening, supplementing practices, and perinatal care facilities, the lack of robust regional data makes it difficult to extrapolate findings from worldwide research to local populations.

The study holds few limitations which includes, assessment of ferritin level due to cost issue and patient affordability, small sample size, single center study and we did not assess neonatal outcome (preterm delivery, birth weight and fewer complications) which can be assessed in future large-scale studies to see the effect of iron supplementation for neonatal outcome.

CONCLUSION

Results of this study clearly demonstrate that both oral and IV iron therapy resulted in improvement in hemoglobin level after 4 weeks of treatment but the improvement in hemoglobin level in IV iron therapy showed significantly higher superiority for treating iron deficiency anemia during pregnancy.

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