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Comparison Of Intravenous Iron Sucrose Versus Oral Iron For The Treatment Of Iron Deficiency Anaemia In Pregnancy

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ABSTRACT

Background: Iron deficiency anemia (IDA) is common in pregnancy, especially in developing countries. Oral iron is the standard treatment, but gastrointestinal side effects limit its effectiveness. Intravenous iron sucrose provides an alternative with fewer side effects and better efficacy.
Objective: To compare the efficacy and safety of intravenous iron sucrose versus oral ferrous sulfate for treating IDA in pregnancy.
Methods: A prospective, randomized, open-label study was conducted at a tertiary care hospital. 100 pregnant women with IDA between 14-35 weeks gestation were randomized to receive either intravenous iron sucrose or oral ferrous sulfate. Hemoglobin, packed cell volume, mean corpuscular volume, and reticulocyte count were assessed at baseline, 2 weeks, 4 weeks, and at term.
Results: Intravenous iron sucrose resulted in a significantly greater increase in hemoglobin and packed cell volume at 2 weeks, 4 weeks, and at term. There were fewer gastrointestinal side effects in the intravenous group (0% vs 44% for oral iron). Both groups had similar iron requirements.
Conclusion: Intravenous iron sucrose is more effective and better tolerated than oral ferrous sulfate for treating moderate-to-severe IDA during pregnancy. It offers faster anemia correction, fewer side effects, and improved maternal outcomes.

Keywords: Iron deficiency anemia, intravenous iron sucrose, oral iron, pregnancy, anemia treatment.

INTRODUCTION

Iron deficiency anemia (IDA) remains the most common nutritional disorder during pregnancy, particularly in developing countries. Nearly half of pregnant women globally suffer from anemia, with iron deficiency being the leading cause [1,3].

Oral iron therapy has long been the standard approach due to its availability and affordability. However, gastrointestinal side effects such as nausea, constipation, and poor absorption often lead to poor compliance [3,5].

Intravenous iron sucrose has emerged as a safe, well-tolerated alternative, with lower risk of adverse reactions compared to older agents. It bypasses gastrointestinal absorption, ensuring faster correction of anemia [1,2].
Recent clinical studies demonstrate the superiority of intravenous iron sucrose over oral iron in terms of efficacy and tolerability. Khan et al. (2018) reported better pregnancy-related outcomes with intravenous iron [3], while Kumari et al. (2021) and Saxena & Rathore (2021) observed faster hemoglobin improvements with fewer side effects [4,5]. Sadaf et al. (2022) and Kotecha et al. (2023) further confirmed its favorable safety profile and improved compliance [1,6].

Moreover, intravenous iron reduces the need for blood transfusions, which carry risks such as infection and alloimmunization. Panda et al. (2019) highlighted its role in achieving target hemoglobin without transfusion [7].

This study aimed to compare the efficacy, safety, and tolerability of intravenous iron sucrose versus oral ferrous sulfate in pregnant women with moderate-to-severe IDA.

METHODOLOGY

1. Study Design
This was a prospective, randomized, open-label study comparing the efficacy and safety of intravenous iron sucrose versus oral iron in treating iron deficiency anemia during pregnancy. Participants were followed from enrollment to term, with hematological and clinical outcomes assessed at regular intervals.

2. Study Setting
The study was conducted in the Departments of Obstetrics and Gynaecology and Pathology at a tertiary care teaching hospital, equipped with antenatal clinics, infusion facilities, and laboratory support for blood investigations.

3. Study Duration
The study was carried out over 16 months, from March 2024 to August 2025, allowing sufficient time for recruitment, treatment, and follow-up of all participants through delivery.

4. Participants – Inclusion and Exclusion Criteria
Pregnant women between 14–35 weeks gestation with hemoglobin levels of 6–8 g/dL and iron deficiency anemia were included. Women with hypersensitivity to iron, recent transfusion, liver or kidney disease, or non-IDA causes of anemia were excluded.

5. Study Sampling
A purposive sampling method was used. Eligible patients were recruited from antenatal clinics after screening and informed consent. All participants were enrolled consecutively until the required sample size was met.

6. Study Sample Size
A total of 100 pregnant women were enrolled, with 50 participants in each treatment arm. The sample size was determined based on previous literature and powered to detect a significant difference in hemoglobin improvement.

7. Study Groups
Participants were randomized into two groups. Group A received intravenous iron sucrose in calculated doses on alternate days, while Group B received 200 mg oral ferrous sulfate tablets thrice daily until target hemoglobin was achieved.

8. Study Parameters
Primary parameters included hemoglobin, packed cell volume (PCV), mean corpuscular volume (MCV), and reticulocyte count. Secondary parameters included symptom improvement, side effects, and obstetric outcomes.

9. Study Procedure
Following enrollment and randomization, treatments were initiated based on group allocation. Patients were monitored at 2 weeks, 4 weeks, and at term. Clinical and lab data were recorded at each follow-up visit.

10. Study Data Collection
Data were collected using standardized forms, including baseline characteristics, treatment details, laboratory results, and adverse events. All data were anonymized and securely stored for analysis.

11. Data Analysis
Statistical analysis was done using SPSS version 16.0. Mean differences were compared using t-tests; categorical variables were analyzed using Chi-square tests. A p-value of <0.05 was considered statistically significant.

12. Ethical Considerations

The study was approved by the institutional ethics committee. Written informed consent was obtained from all participants. Confidentiality and patient rights were maintained throughout the study.

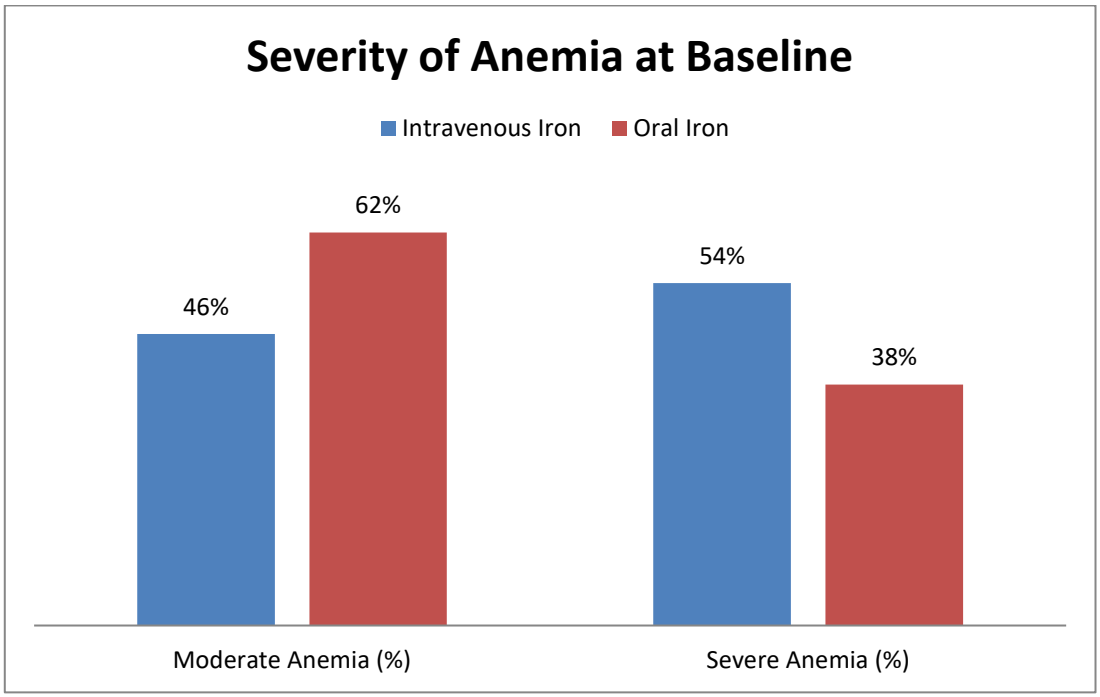
RESULTS

1. Severity of Anemia at Baseline

A higher percentage of women in the intravenous group had severe anemia at baseline, indicating slightly worse initial status (Table 1).

Table 1: Severity of Anemia at Baseline

Group	Moderate Anemia (%)	Severe Anemia (%)
Intravenous Iron	46%	54%
Oral Iron	62%	38%



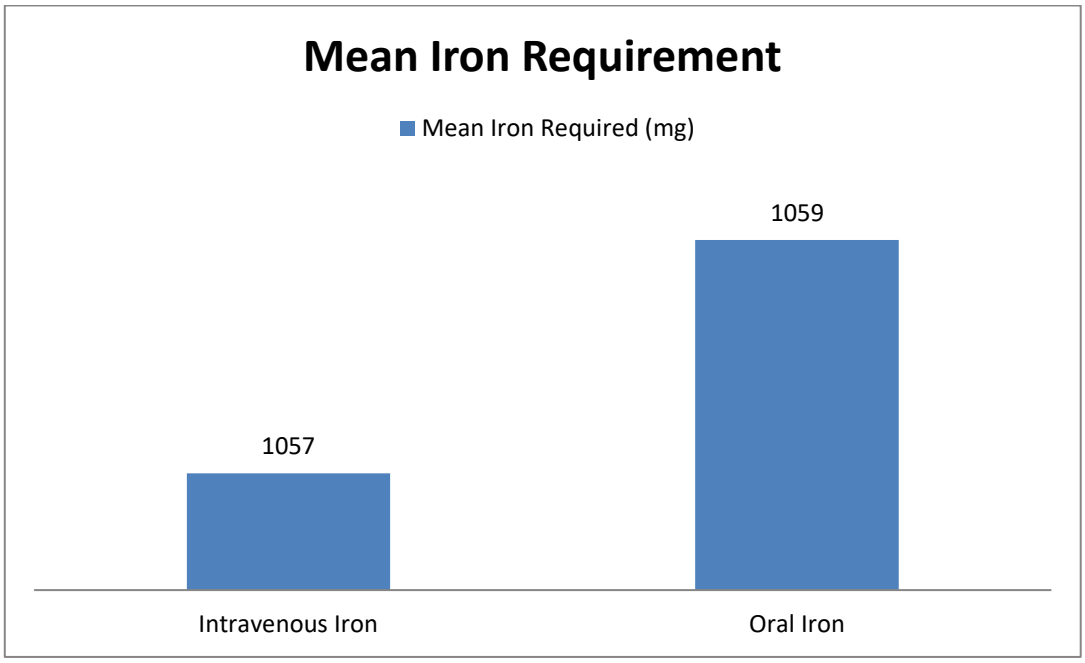
Graph 1: Severity of Anemia at Baseline

2. Mean Iron Requirement

The mean iron requirement was nearly identical in both groups, suggesting similar dosing needs (Table 2).

Table 2: Mean Iron Requirement

Group	Mean Iron Required (mg)
Intravenous Iron	1057
Oral Iron	1059



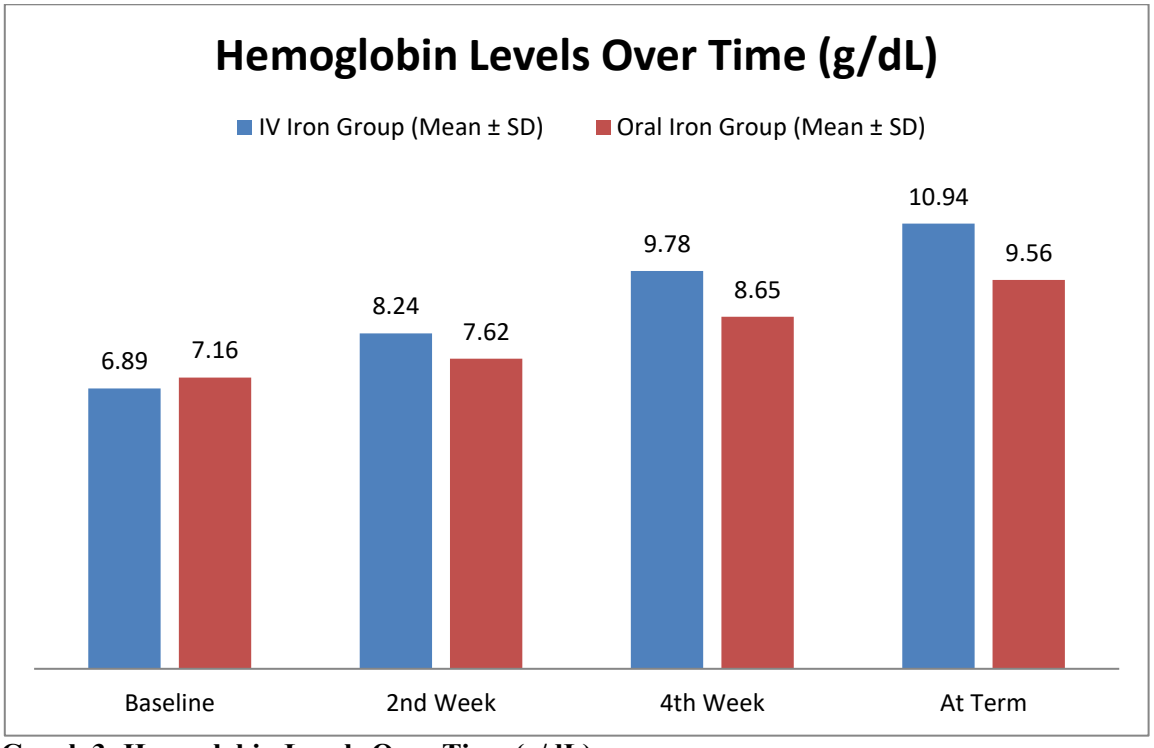
Graph 2: Mean Iron Requirement

3. Hemoglobin Levels Over Time (g/dL)

Intravenous iron resulted in a significantly greater and faster rise in hemoglobin compared to oral iron throughout pregnancy (Table 3).

Table 3: Hemoglobin Levels Over Time (g/dL)

Time Point	IV Iron Group (Mean ± SD)	Oral Iron Group (Mean ± SD)	p-value
Baseline	6.89 ± 0.50	7.16 ± 0.42	0.039
2nd Week	8.24 ± 0.58	7.62 ± 0.47	<0.05
4th Week	9.78 ± 0.61	8.65 ± 0.54	<0.05
At Term	10.94 ± 0.70	9.56 ± 0.62	<0.01



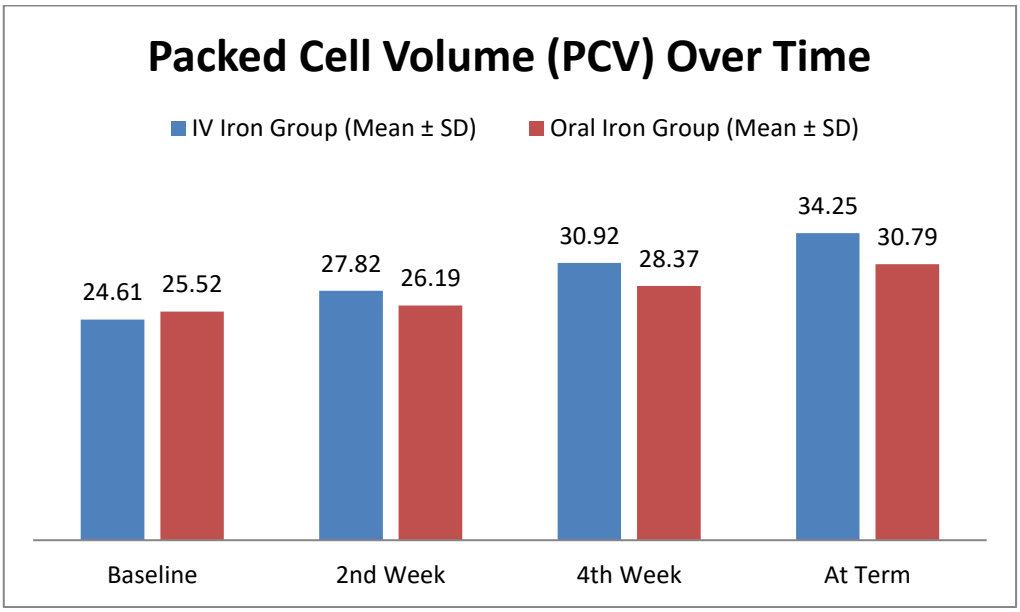
Graph 3: Hemoglobin Levels Over Time (g/dL)

4. Packed Cell Volume (PCV) Over Time

PCV increased more rapidly and significantly in the intravenous group from the fourth week onwards (Table 4).

Table 4: Packed Cell Volume (PCV) Over Time (%)

Time Point	IV Iron Group (Mean ± SD)	Oral Iron Group (Mean ± SD)	p-value
Baseline	24.61 ± 1.30	25.52 ± 1.25	0.038
2nd Week	27.82 ± 1.45	26.19 ± 1.33	>0.05
4th Week	30.92 ± 1.51	28.37 ± 1.40	<0.05
At Term	34.25 ± 1.60	30.79 ± 1.49	<0.01



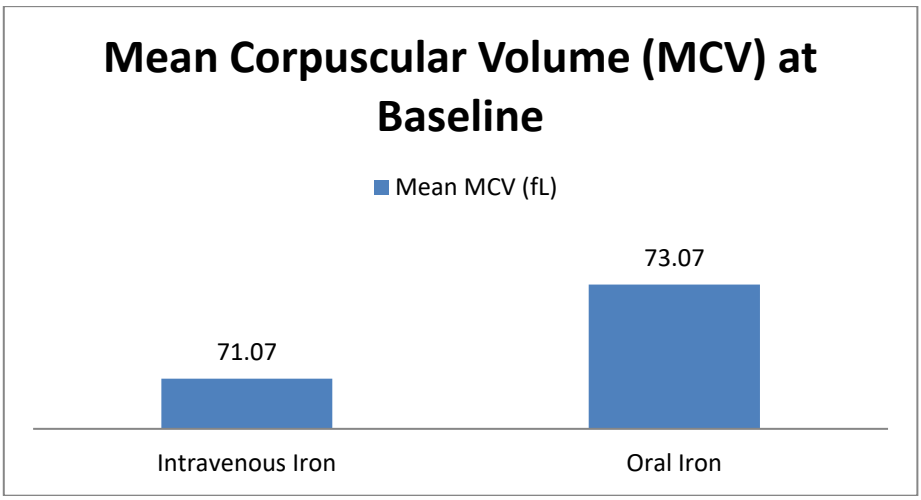
Graph 4: Packed Cell Volume (PCV) Over Time

5. Mean Corpuscular Volume (MCV) at Baseline

MCV values were comparable between groups at baseline with no significant difference (Table 5).

Table 5: Mean Corpuscular Volume (MCV) at Baseline

Group	Mean MCV (fL)	% with MCV 61–70 fL
Intravenous Iron	71.07	52%
Oral Iron	73.07	42%
p-value	0.163	-



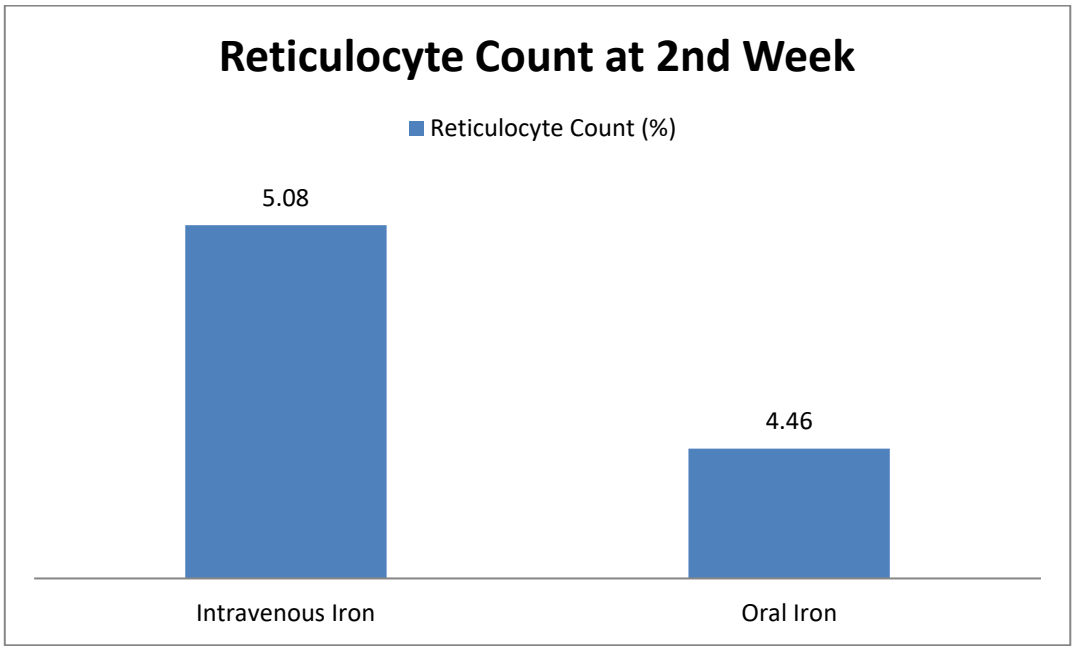
Graph 5: Mean Corpuscular Volume (MCV) at Baseline

6. Reticulocyte Count at 2nd Week

Although higher in the IV group, reticulocyte count difference was not statistically significant (Table 6).

Table 6: Reticulocyte Count at 2nd Week

Group	Reticulocyte Count (%)	p-value
Intravenous Iron	5.08	0.066
Oral Iron	4.46	



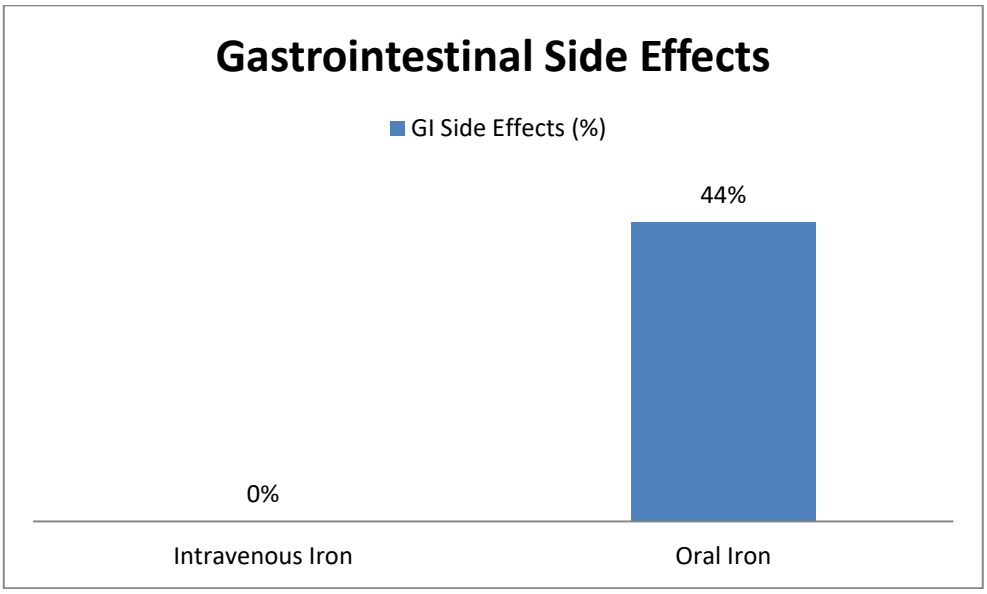
Graph 6: Reticulocyte Count at 2nd Week

7. Gastrointestinal Side Effects

Oral iron was associated with a higher rate of GI side effects, though compliance remained unaffected (Table 7).

Table 7: Gastrointestinal Side Effects

Group	GI Side Effects (%)	Compliance
Intravenous Iron	0%	100%
Oral Iron	44%	100%



Graph 7: Gastrointestinal Side Effects

DISCUSSION

This study demonstrated that intravenous iron sucrose is more effective and better tolerated than oral ferrous sulfate in treating moderate to severe iron deficiency anemia (IDA) during pregnancy. The results align with several previous studies supporting the superiority of intravenous iron in both hematologic improvement and tolerability.

The IV group showed a faster and more sustained rise in hemoglobin compared to oral therapy, consistent with findings by Khan et al. (2018), Kumari et al. (2021), and Saxena & Rathore (2021) [3–5]. Packed cell volume improvements also favored IV therapy.

Importantly, tolerability was better with intravenous iron, as none experienced gastrointestinal side effects, in agreement with Sadaf et al. (2022) and Kotecha et al. (2023) [1,6]. Despite similar iron requirements, IV therapy achieved superior outcomes, supporting findings by Panda et al. (2019) [7].

Limitations included lack of ferritin assessment, which could have better reflected iron stores. However, hematological improvements strongly support the efficacy of IV iron.

A limitation of our study was the lack of ferritin measurement, which would have better quantified iron stores. Nevertheless, the consistent improvement in hemoglobin and PCV confirms the efficacy of intravenous iron. Thus, in cases of moderate to severe anemia or intolerance to oral therapy, intravenous iron sucrose should be preferred as a safe and effective option.

CONCLUSION

This study demonstrates that intravenous iron sucrose is more effective and better tolerated than oral ferrous sulfate for treating moderate to severe iron deficiency anemia during pregnancy. The intravenous formulation led to a faster and more significant increase in hemoglobin levels, packed cell volume, and reduced gastrointestinal side effects. Given these advantages, intravenous iron sucrose is a superior alternative for pregnant women with moderate-to-severe anemia or those intolerant to oral iron therapy.

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