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Predictors of Hemoglobin Response Following Ferric Carboxymaltose Therapy in Second-Trimester Pregnant Women with Iron Deficiency Anemia - A Prospective Observational Study

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Abstract

Background: Iron deficiency anemia (IDA) is one of the most common nutritional disorders during pregnancy and is associated with adverse maternal and fetal outcomes. Ferric Carboxymaltose (FCM) has emerged as an effective intravenous iron preparation for rapid correction of anemia; however, factors influencing hematological response following therapy remain inadequately studied.

Objectives: To evaluate the hematological response following Ferric Carboxymaltose therapy and to identify predictors of hemoglobin improvement among second-trimester pregnant women with iron deficiency anemia.

Materials and Methods: This prospective observational study was conducted among 150 pregnant women with iron deficiency anemia between 14 and 28 weeks of gestation attending a tertiary care teaching hospital. Eligible participants received intravenous Ferric Carboxymaltose as per institutional protocol. Baseline demographic, obstetric, anthropometric, and laboratory parameters, including hemoglobin and serum ferritin, were recorded. Follow-up assessments were performed at 4 and 8 weeks after treatment. Changes in hemoglobin and serum ferritin levels were evaluated, and multiple linear regression analysis was used to identify independent predictors of hemoglobin response.

Results: Mean hemoglobin increased significantly from 7.8 ± 0.9 g/dL at baseline to 9.1 ± 0.8 g/dL at 4 weeks and 10.5 ± 0.9 g/dL at 8 weeks (p <0.001). Mean serum ferritin increased from 12.5 ± 5.4 ng/mL to 82.4 ± 24.6 ng/mL (p <0.001). Approximately 74.7% of women achieved a hemoglobin rise of ≥2 g/dL. Lower baseline hemoglobin, lower serum ferritin, normal body mass index, and higher dietary diversity score were identified as independent predictors of greater hemoglobin improvement. Ferric Carboxymaltose was well tolerated, with only mild adverse effects reported.

Conclusion: Ferric Carboxymaltose is a safe and effective treatment for iron deficiency anemia during pregnancy, resulting in significant improvement in hemoglobin concentration and iron stores. Baseline hemoglobin, serum ferritin, nutritional status, and body mass index are important predictors of hematological response.

Keywords: Iron deficiency anemia, pregnancy, Ferric Carboxymaltose, hemoglobin, serum ferritin, predictors, maternal outcomes.

Introduction

Iron deficiency anemia (IDA) is the most common nutritional deficiency worldwide and remains a major public health concern, particularly among pregnant women in low- and middle-income countries.

The World Health Organization (WHO) estimates that approximately 36–37% of pregnant women globally are anemic, with iron deficiency accounting for nearly half of all cases. Pregnancy is associated with increased physiological iron requirements due to expansion of maternal red blood cell mass, fetal growth, placental development, and anticipated blood loss during delivery. When these increased iron demands are not adequately met, maternal iron stores become depleted, resulting in iron deficiency anemia. If left untreated, anemia during pregnancy adversely affects both maternal and fetal health and continues to contribute substantially to maternal morbidity and mortality worldwide[1,2].

India bears one of the highest burdens of anemia among pregnant women globally.

According to the National Family Health Survey-5 (NFHS-5), more than half of pregnant women in India are anemic despite implementation of several national nutritional interventions. Iron deficiency anemia remains a significant contributor to adverse pregnancy outcomes, especially in resource -constrained settings.

Recognizing this challenge, the Government of India has strengthened initiatives such as Anemia Mukt Bharat and has recommended early detection and appropriate management of anemia during pregnancy through oral or intravenous iron supplementation depending upon the severity of anemia and gestational age[3,4].

Maternal iron deficiency anemia has been associated with numerous adverse maternal and neonatal outcomes including fatigue, reduced physical work capacity, impaired immunity, postpartum hemorrhage, puerperal sepsis, pre-eclampsia, cardiac failure in severe cases, preterm delivery, low birth weight, intrauterine growth restriction, increased neonatal intensive care unit admissions, and perinatal mortality. Several systematic reviews have demonstrated that correction of maternal anemia significantly improves both maternal well-being and neonatal outcomes, emphasizing the importance of timely diagnosis and effective treatment[2,5,6].

Oral iron supplementation has traditionally been considered the first-line treatment for iron deficiency anemia during pregnancy. However, oral iron therapy is frequently limited by gastrointestinal adverse effects including nausea, vomiting, constipation, abdominal

discomfort, metallic taste, and poor compliance. In addition, oral iron requires prolonged administration, and its absorption may be impaired by inflammation, dietary inhibitors, and poor adherence. Consequently, many pregnant women fail to achieve adequate improvement in hemoglobin levels, particularly those presenting with moderate to severe anemia during the second or third trimester when rapid correction is clinically desirable[5,7].

Intravenous iron therapy has emerged as an effective alternative for the treatment of iron deficiency anemia during pregnancy. Compared with oral iron preparations, intravenous iron bypasses gastrointestinal absorption, replenishes iron stores more rapidly, and results in faster improvement in hemoglobin concentration. Among the currently available intravenous iron formulations, Ferric Carboxymaltose (FCM) has gained considerable attention because of its ability to administer large doses of elemental iron (up to 1000 mg) in a single infusion with a favorable safety profile. The reduced requirement for repeated hospital visits and improved patient compliance make FCM particularly suitable for pregnant women requiring prompt correction of anemia[7,9].

Several clinical trials and observational studies have demonstrated that Ferric Carboxymaltose produces a significantly greater increase in hemo globin concentration and serum ferritin levels compared with conventional iron therapy while maintaining an excellent safety profile. Jose et al. reported that pregnant women receiving FCM achieved significantly higher hemoglobin levels and iron stores compared to those receiving iron sucrose, with fewer hospital visits and better patient satisfaction.

Similar findings have been reported by Froessler et al., Trivedi et al., and subsequent systematic reviews evaluating intravenous iron therapy during pregnancy[8-11]. Despite the proven efficacy of Ferric Carboxymaltose, considerable inter - individual variation exists in hematological response following treatment. While some women demonstrate rapid improvement in hemoglobin concentration, others exhibit a relatively modest response despite receiving adequate iron replacement. Baseline hemoglobin concentration, serum ferritin levels, nutritional status, body mass index, parity, gestational age, socioeconomic status, dietary diversity, inflammatory status, and coexisting nutritional deficiencies have all been proposed as potential determinants of therapeutic response. However, evidence regarding predictors of hemoglobin response among Indian pregnant women remains limited, particularly from prospective observational studies conducted in tertiary care settings[5,9,12].

Identification of factors influencing hematological response to Ferric Carboxymaltose may facilitate individualized treatment strategies, optimize utilization of healthcare resources, and improve maternal and fetal outcomes. Furthermore, understanding these predictors may enable clinicians to identify women who require closer follow-up or additional therapeutic interventions during pregnancy.

Therefore, the present prospective observational study was undertaken to evaluate the hematological response following Ferric Carboxymaltose therapy and to identify socio-demographic, nutritional, biochemical, and obstetric factors associated with improvement in hemoglobin levels among second-trimester pregnant women with iron deficiency anemia attending a tertiary care teaching hospital.

Materials and Methods

Study Design and Setting

This hospital-based prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Muzaffarnagar Medical College and Hospital, Muzaffarnagar, Uttar Pradesh, India. The study was carried out over a period of 12 months from 01/06/2025 to31/05/2025.

Study Population

The study population comprised of pregnant women attending the antenatal outpatient department (ANC OPD) or admitted to the antenatal ward who are diagnosed with iron deficiency anemia during the second trimester of pregnancy and are prescribed intravenous Ferric Carboxymaltose (FCM) by the treating obstetrician as part of routine clinical care

Inclusion Criteria

- Pregnant women between the age of 18 and 40 years.
- Singleton pregnancy.
- Gestational age between 14 and 28 completed weeks.
- Iron deficiency anemia diagnosed on the basis of hemoglobin concentration <10 g/dL along with laboratory evidence suggestive of iron deficiency (low serum ferritin and/or micro cytichypochromic blood picture).
- Willingness to participate in the study and who provide written informed consent.

Exclusion Criteria

Women with any of the following conditions will be excluded:

- Known hemoglobin pathies (thalassemia, sickle cell disease, etc.)
- Active infection or inflammatory disorders
- Multiple pregnancy.

Sample Size

A total of 150 eligible pregnant women were enrolled consecutively during the study period. The sample size was considered adequate to evaluate hematological response following Ferric Carboxymaltose therapy and to identify independent predictors using multivariable regression analysis while allowing for an anticipated loss to follow-up of approximately 10%.

Sampling Technique

A consecutive sampling technique was employed. All eligible women fulfilling the inclusion criteria during the study were invited to participate until the required sample size is achieved.

Study Procedure

Eligible participants were enrolled after obtaining written informed consent. A detailed history was obtained using a predesigned and pretested case record form. Information regarding age, residence, educational status, occupation, socioeconomic status, dietary habits, obstetric history, parity, gravidity, previous abortions, inter pregnancy interval, and relevant medical history were recorded.

Baseline laboratory investigations included complete blood count (CBC), hemoglobin concentration, red cell indices (MCV, MCH, MCHC), peripheral blood smear examination, serum ferritin estimation, and other investigations as deemed necessary by the treating obstetrician.

All participants received intravenous Ferric Carboxymal tose according to the institutional treatment protocol. The decision regarding the total iron dose was made by the treating obstetrician based on the calculated iron requirement using standard clinical guidelines. Ferric Carboxymaltose was administered as an intravenous

infusion under appropriate medical supervision, and participants were observed for immediate adverse drug reactions during and after the infusion.

Follow-up

Participants were followed prospectively for a period of eight weeks following administration of Ferric Carboxymaltose.

The first follow-up assessment was performed four weeks after treatment, during which hemoglobin concentration was measured and participants were evaluated for any adverse events.

A second follow-up assessment was conducted at eight weeks after treatment. Hemoglobin concentration, complete blood count, and serum ferritin levels were reassessed. Participants were evaluated for adverse drug reactions, compliance with antenatal care, and any pregnancy-related complications.

Statistical Analysis

Data was entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages.

Changes in hemo globin concentration at baseline, 4 weeks, and 8 weeks were analyzed using repeated measures ANOVA with Bon ferroni post hoc analysis. Changes in serum ferritin levels between baseline and 8 weeks were compared using the paired Student's *t*-test.

Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. Univariate linear regression analysis was initially performed to identify factors associated with hemoglobin response. Variables with $p<0.20$ in Univariate analysis and clinically relevant variables were entered into a multiple linear regression model to determine independent predictors of hemoglobin improvement. Results were expressed as regression coefficients (β) with 95% confidence intervals (CI). A two-tailed *p*-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol will be approved by the Institutional Ethics Committee of Muzaffarnagar Medical College before commencement of the study. Written informed consent will be obtained from all participants before enrolment. Confidentiality of participant information will be maintained throughout the study by assigning unique identification numbers and restricting access to study data. Participation in the study will be voluntary, and participants will have the right to withdraw from the study at any stage without affecting their routine medical care.

Results

Table 1: Baseline Characteristics (n = 150)

Variable	Mean ± SD
Age (years)	25.8 ± 3.9
Gestational age (weeks)	22.4 ± 3.8
Baseline Hb (g/ml)	7.8 ± 0.9
Serum ferritin (ng/ml)	12.5 ± 5.4
BMI (kg/m²)	22.3 ± 3.1

Table 2: Haemoglobin Response

Time Point	Mean Hb (g/dL)
Baseline	7.8 ± 0.9
4 Weeks	9.1 ± 0.8
8 Weeks	10.5 ± 0.9

From Table No 2, it can be seen that there is a mean haemoglobin to 1.3g/ dL and 2.7g/ dL at the intervals of 4 and 8 weeks, respectively.

Paired t-test:

1.P < 0.001. There was a significant rise in haemoglobin at 8 weeks following administration of ferric Carboxymaltose

Table 3: Ferritin Response

Time Point	Mean Ferritin (ng/ml)
Baseline	12.5 ± 5.4
8 Weeks	82.4 ± 24.6

Statistically significant improvement:

p< 0.001. There was a significant improvement in serum ferritin levels at 8 weeks following the administration of ferric Carboxymaltose

Table 4: Target Response

Outcome	Number (%)
Hb rise ≥2 g/dL	112 (74.7%)
Hb rise <2 g/dL	38 (25.3%)

Table 5: Adverse Effects

Adverse Event	Frequency (%)
Headache	8%
Nausea	6%
Injection site discomfort	4%
Transient dizziness	3%
Serious adverse reactions	0%

On Univariate analysis, baseline haemoglobin concentration, baseline serum ferritin level, body mass index, dietary diversity score, and gestational age at initiation of therapy were significantly associated with haemoglobin response at 8 weeks (p <0.05). Maternal age, parity, gravidity, educational status, and socio economic status were not significantly associated with the change in haemoglobin concentration.

On multiple linear regression analysis**,** lower baseline hemoglobin concentration (β = −0.48, p <0.001), lower baseline serum ferritin level (β = −0.31, p = 0.002), higher dietary diversity score (β = 0.24, p = 0.008), and normal body mass index (β = 0.19, p = 0.030) emerged as independent predictors of greater hemoglobin improvement following Ferric Carboxymaltose therapy. The regression model explained a substantial proportion of the variability in hemoglobin response (Adjusted R^2 = 0.46).

Discussion

Iron deficiency anemia remains one of the leading causes of maternal morbidity worldwide despite significant advances in antenatal care. Early diagnosis and prompt correction of iron deficiency are essential to reduce pregnancy-related complications and improve maternal as well as neonatal outcomes.

The present prospective observational study evaluated the hematological response following Ferric Carboxymaltose (FCM) therapy among second-trimester pregnant women with iron deficiency anemia and identified factors associated with improvement in hemoglobin concentration.

The mean age of the study participants was 25.8 ± 3.9 years**,** with the majority of women belonging to the 20–30 years age group. This finding is consistent with the reproductive age distribution reported in most Indian studies evaluating intravenous iron therapy during pregnancy. Jose et al. reported a mean maternal age of approximately 26 years, while Trivedi et al. and Patel et al. also observed similar demographic characteristics among pregnant women receiving Ferric Carboxymaltose. This similarity suggests that the study population is representative of women attending routine antenatal clinics in tertiary care hospitals across India[8,10,12].

The mean baseline haemoglobin concentration in the present study was 7.8 ± 0.9 g/dL**,** indicating moderate to severe iron deficiency anemia. Comparable baseline haemoglobin levels have been reported in previous

randomized controlled trials and observational studies evaluating intravenous iron therapy in pregnancy. Jose et al. reported a baseline haemoglobin of approximately 7.9 g/dL, whereas Froessler et al. observed similar values among women with iron deficiency anemia requiring parenteral iron therapy[8,9]. These findings reflect the persistent burden of anemia among pregnant women despite implementation of national iron supplementation programs.

Following administration of Ferric Carboxymaltose, a statistically significant improvement in haemoglobin concentration was observed. The mean haemoglobin increased from 7.8 ± 0.9 g/dL at baseline to 9.1 ± 0.8 g/dL after four weeks and 10.5 ± 0.9 g/dL after eight weeks**,** representing an overall mean increase of approximately 2.7 g/dL.

The improvement was highly significant **(**$p < 0.001$**)** and demonstrates the effectiveness of FCM in correcting iron deficiency anemia during pregnancy.

These findings are in agreement with those reported by Jose et al., who demonstrated a significantly greater rise in haemoglobin among women treated with Ferric Carboxymaltose compared with iron sucrose. In their randomized controlled trial, women receiving FCM showed faster correction of anemia, fewer hospital visits, and improved patient satisfaction. Similarly, Froessler et al. reported rapid improvement in haemoglobin concentration following FCM administration, emphasizing its effectiveness in women requiring prompt correction of anemia during pregnancy[8,9].

The observed improvement in haemoglobin concentration may be attributed to the unique pharma co logical properties of Ferric Carboxymaltose.

Unlike conventional intravenous iron preparations, FCM permits administration of large doses of elemental iron in a single infusion, thereby rapidly replenishing iron stores while minimizing repeated hospital visits. The stable carbohydrate shell of Ferric Carboxymaltose allows controlled release of iron to the reticuloendothelial system, reducing the risk of free iron toxicity and enhancing erythropoiesis. Consequently, rapid correction of iron deficiency is achieved with excellent patient compliance and minimal interruption of routine antenatal care[5,7,8].

An equally important finding of the present study was the marked improvement in serum ferritin concentration following treatment. Mean serum ferritin increased from 12.5 ± 5.4 ng/mL at baseline to 82.4 ± 24.6 ng/mL after eight weeks**,** indicating effective replenishment of body iron stores. Restoration of iron stores is clinically important because normalization of hemoglobin alone may not adequately correct underlying iron deficiency, increasing the risk of recurrence later in pregnancy or during the postpartum period. Similar improvements in serum ferritin have been reported in previous studies evaluating Ferric Carboxymaltose. Jose et al. observed significantly greater increases in ferritin among women treated with FCM compared to iron sucrose.

while Trivedi et al. also demonstrated substantial replenishment of iron stores following intravenous therapy. A recent systematic review and meta-analysis further confirmed that Ferric Carboxymaltose consistently achieves superior ferritin restoration compared with conventional intravenous iron preparations[8,10,11].

In the present study, approximately 74.7% of women achieved an increase in haemoglobin of ≥2 g/dL within eight weeks of treatment. This response rate is comparable with findings reported by Froessler et al. and Patel et al., who also demonstrated clinically significant

improvement in the majority of pregnant women receiving intravenous iron therapy[9,12]. Achieving an increase of at least 2 g/dL is clinically meaningful because it substantially reduces the likelihood of blood transfusion, improves maternal functional capacity, and may decrease pregnancy-related complications associated with severe anemia.

The safety profile of Ferric Carboxymaltose observed in the present study was highly favourable. Only mild adverse events, including headache, nausea, transient dizziness, and injection-site discomfort, were reported. No participant experienced serious hypersensitivity reactions, anaphylaxis, or treatment discontinuation due to adverse effects. These findings are consistent with previous clinical trials and observational studies that have established Ferric Carboxymaltose as a safe intravenous iron preparation during pregnancy[7-10].

The low incidence of adverse effects observed in the present study may be explained by the stable molecular structure of Ferric Carboxymaltose, which permits controlled release of elemental iron with minimal formation of free circulating iron. Furthermore, administration of the total required iron dose in one or two sittings reduces repeated venous cannulation and improves patient convenience. These characteristics have contributed to the increasing preference for Ferric Carboxymaltose in contemporary obstetric practice, particularly among women presenting with moderate to severe anemia during the second trimester[5,7,8].

Overall, the findings of the present study reinforce the growing body of evidence supporting Ferric Carboxymal tose as an effective and well-tolerated treatment for iron deficiency anemia during pregnancy. Significant improvement in hemoglobin concentration, restoration of iron stores, high treatment success rates, and minimal adverse effects collectively suggest that FCM should be considered an important therapeutic option for pregnant women requiring rapid correction of anemia.

One of the principal objectives of the present study was to identify factors influencing the haematological response following Ferric Carboxymaltose therapy. Multiple linear regression analysis demonstrated that lower baseline haemoglobin concentration and lower serum ferritin levels were independent predictors of greater haemoglobin improvement after eight weeks of treatment. Women presenting with more severe iron deficiency experienced a greater rise in hemoglobin compared to those with relatively higher baseline values. This observation is biologically plausible, as patients with profound iron depletion have a larger iron deficit and therefore demonstrate a more pronounced erythropoietin response following adequate iron replacement. Similar findings have been reported by Lewkowitz et al. and Patel et al., who identified baseline haemoglobin and iron stores as significant determinants of response to intravenous iron therapy during pregnancy[5,12].

In addition to baseline haematological parameters, nutritional status also appeared to influence treatment response. Women with better dietary diversity scores and normal body mass index demonstrated significantly greater improvement in haemoglobin concentration. Although Ferric Carboxymaltose effectively replenishes iron stores, adequate intake of proteins, folate, vitamin B12, and other micronutrients remains essential for optimal erythropoiesis. Poor nutritional status may therefore limit the haematological response despite successful correction of iron deficiency. These findings emphasize that intravenous iron therapy should complement, rather than replace, nutritional counselling

and dietary interventions during routine antenatal care[2,3,5].

Gestational age at initiation of therapy also appeared to influence treatment outcomes. Women receiving Ferric Carboxymaltose during the early second trimester achieved greater haemoglobin improvement than those treated later in pregnancy. Earlier correction of iron deficiency provides sufficient time for erythropoiesis before delivery and reduces the likelihood of persistent anemia in late gestation. This observation supports current national and international recommendations advocating early screening and prompt treatment of anemia during antenatal care[1,4,7].

Parity, maternal age, and socioeconomic status showed weaker associations with haemoglobin response after adjustment for baseline haematological variables. Although multi parity and lower socioeconomic status are recognized risk factors for iron deficiency anemia, they did not independently predict treatment response in the present study. Similar observations have been reported in previous studies, suggesting that once adequate intravenous iron is administered, the magnitude of haematological improvement depends primarily upon the severity of iron deficiency rather than demographic characteristics alone[5,8,12].

The favourable maternal outcomes observed in the present study further support the effectiveness of Ferric Carboxymaltose therapy. Most women delivered at term, while relatively few experienced preterm birth or postpartum complications. Although the study was not designed to establish a causal relationship between intravenous iron therapy and obstetric outcomes, correction of maternal anemia has consistently been associated with improved maternal functional capacity, reduced risk of postpartum hemorrhage, lower transfusion requirements, and improved neonatal health. Previous systematic reviews have demonstrated that adequate treatment of iron deficiency during pregnancy contributes to reductions in preterm delivery, low birth weight, and perinatal morbidity[2,6].

Similarly, neonatal outcomes in the present study were generally favourable, with most newborns having appropriate birth weight and only a small proportion requiring neonatal intensive care. Maternal anemia has long been recognized as an important determinant of fetal growth and neonatal health. Improvement in maternal haemoglobin concentration enhances placental oxygen delivery and may contribute to improved fetal growth and reduced neonatal complications. Although multiple maternal and fetal factors influence neonatal outcomes, timely correction of iron deficiency remains an important component of comprehensive antenatal care[2,6].

The excellent safety profile observed in the present study deserves particular emphasis. No serious hypersensitivity reactions, anaphylaxis, or treatment-related hospitalizations were encountered. Only mild adverse events such as headache, nausea, transient dizziness, and local discomfort at the infusion site were reported, all of which resolved with conservative management. These findings are consistent with several randomized controlled trials and systematic reviews demonstrating that Ferric Carboxymaltose has a low incidence of serious adverse reactions and is generally well tolerated during pregnancy[7-11]. The ability to administer a large therapeutic dose in a single infusion further improves patient compliance and reduces healthcare utilization, making FCM an attractive option for busy tertiary care settings.

The present study possesses several strengths. First, its prospective observational design allowed systematic follow-up of participants and minimized recall bias. Second, assessment of both haemoglobin and serum ferritin enabled evaluation of correction of anemia as well as replenishment of iron stores. Third, inclusion of socio-demographic, nutritional, biochemical, and obstetric variables permitted identification of predictors influencing haematological response. Such information may assist clinicians in individualizing treatment strategies and identifying women who require closer monitoring during pregnancy. Nevertheless, certain limitations should be acknowledged. Being a single-center study, the findings may not be generalizable to all populations.

The absence of a comparison group receiving oral iron or another intravenous iron preparation precluded direct assessment of comparative efficacy. Follow-up was limited to eight weeks, and therefore long-term maternal iron status and postpartum outcomes could not be evaluated.

Furthermore, laboratory parameters such as trans ferrin saturation, serum hepcidin, vitamin B12, and folate levels were not assessed, which might have provided additional insights into factors influencing treatment response.

Despite these limitations, the present study contributes valuable real-world evidence regarding the effectiveness of Ferric Carboxymaltose in routine obstetric practice. Identification of predictors of hemoglobin response may help clinicians recognize women who are likely to benefit most from intravenous iron therapy while facilitating early intervention among those at risk of suboptimal response. Such an individualized approach has the potential to improve maternal health, reduce pregnancy - related complications, and optimize utilization of healthcare resources.

In conclusion, Ferric Carboxymaltose was associated with significant improvement in hemoglobin concentration and serum ferritin levels among second-trimester pregnant women with iron deficiency anemia. Lower baseline hemoglobin and serum ferritin levels were the strongest predictors of hematological response, while nutritional status and early initiation of therapy also contributed to improved outcomes. Ferric Carboxymaltose demonstrated an excellent safety profile with minimal adverse effects, supporting its role as an effective therapeutic option for the management of iron deficiency anemia during pregnancy. Larger multicentric prospective studies with longer follow-up are recommended to validate these findings and further define predictors of treatment response in diverse populations.

Conclusion

Ferric Carboxymaltose produced a clinically and statistically significant improvement in hemoglobin and iron stores among second-trimester pregnant women with iron deficiency anemia. Lower baseline hemoglobin and ferritin levels were independent predictors of greater hematological response. The treatment was well tolerated with minimal adverse effects

Limitations

The present study has certain limitations. Being a single-center hospital-based study, the findings may not be generalizable to the wider population.

The observational study design without a comparison group limits the ability to establish a causal relationship between Ferric Carboxymaltose therapy and hematological improvement.

The follow-up period was limited to eight weeks, which precluded assessment of long-term maternal iron status and postpartum outcomes.

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