ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 07 | July - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

USE OF INJECTION FERRIC CARBOXY-MALTOSE AND INJECTION IRON SUCROSE IN TREATMENT OF MILD TO MODERATE IRON DEFICIENCY ANAEMIA IN PREGNANCY - A COMPARATIVE STUDY

Obstetrics & Gynaecology

Dr. Santosh Devpal* Resident Doctor, Department of Obstetrics and Gynaecology, Umaid Hospital, Dr.S.N.Medical College, Jodhpur *Corresponding Author

Dr Indra Bhati Senior Professor and Unit Head, Department of Obstetrics and Gynaecology, Umaid Hospital, Dr. S.N. Medical College, Jodhpur

Dr. Neha Rathore Resident Doctor, Department of Obstetrics and Gynaecology, Umaid Hospital, Dr. S.N. Medical College, Jodhpur

Dr. Gayatri Meena Resident Doctor, Department of Obstetrics and Gynaecology, Umaid Hospital, Dr. S.N. Medical College, Jodhpur

Dr. Sobhika Rana Medical Officer ,Department of Obstetrics and Gynaecology, Umaid Hospital, Dr. S.N. Medical College, Jodhpur

ABSTRACT

Introduction- Iron deficiency anaemia is a commonly encountered entity (14%) in pregnancy globally and more so in India (50.3%). Until recently Iron sucrose remained the gold standard parenteral iron preparation for anaemia correction in pregnancy but after FDA approval in 2013 for Ferric Carboxy Maltose, it is emerging as a novel and promising molecule. With not much evidence from India and from Rajasthan, we conducted this study to evaluate and compare the efficacy and safety of the two preparations for the treatment of mild to moderate iron deficiency anaemia during pregnancy between 16 to 37 weeks period of gestation. **Method-** This comparative hospital–based longitudinal study was conducted on 100 Pregnant women diagnosed with mild to moderate iron deficiency anaemia. They were randomly assigned50 in each groups to received either Injection FCM or Iron Sucrose.Changes in haemoglobin and serum ferritin level from baseline after 3 and12 weeks of treatment was the primary outcome and improvement inpatient's compliance; safety and side effects of medication were studied and compared in the both groups. **Result-** FCM was found to be better at treating anaemia in pregnancy, with respect to the mean rise in haemoglobin (P=0.02) and serum ferritin (P<0.01) at 3 and 12 weeks with greater improvement in fatigue scores and a few number of visits required in the FCM group. **Conclusion-** Both Ferric Carboxy Maltose and intravenous Iron Sucrose complex are safe, convenient and effective in treatment of iron deficiency anemia in pregnant women with negligible side effects. The mean total rise in hemoglobin level achieved with intravenous FCM was significantly higher than intravenous Iron Sucrose group. The single FCM dosing regime was associated with greater patient compliance compared with multiple doses of Iron sucrose

KEYWORDS

Irondeficiency anaemia, Ferric carboxymaltose,Ironsucrose

INTRODUCTION

Anaemia is defined as low haemoglobin concentration resulting in decrease of oxygen carrying capacity of blood.

According to WHO a haemoglobin concentration less than 11 mg/dl is anaemia in pregnancy. Haematological changes during pregnancy occurs by plasma volume increased by 40-45% and RBC mass increases by 15-20% tis disproportionate increase between plasma volume and RBC mass resulting in physiological anaemia of pregnancy [due to haemodilution] in this condition Hb remains approximately 10 mg/dl[1]

WHO has categorised anaemia during pregnancy as: [2]

Mild Anaemia- Hb concentration between 9 to 10.9 mg/dl

Moderate Anaemia- Hb between 7 to 8.9 mg/dl,

Severe Anaemia- Hb less than 7 mg/dl.

Among nutritional deficiency anaemias, Iron deficiency anaemia is most common type, affecting pregnant woman globally as per WHO estimation. Iron deficiency anaemia contributes approximately 115000 maternal deaths and 591000 perinatal deaths as direct or indirect cause[3]

According to WHO prevalence of anaemia in pregnant women is 14% in developed and 51% in developing countries. [4.1,4.2]In INDIA according to NFHS-5 the prevalence of anaemia is estimated to be 50.3% in pregnant females. It is very unfortunate to mention that Iron deficiency anaemia stands second most common cause of maternal death in India and India contribute to about 80% of maternal deaths in South East Asia[5]

There are multiple factor responsible for high incidence of Iron deficiency anaemia in India including low dietary intake of iron, Phytate rich Indian diet, faulty food habits, poor bioavailability of iron, chronic blood loss during menses, high prevalence of malaria and hookworm infestations, multiple births and short interpregnancy interval[6]

In most of the Indian families' women eat in the last and leftover food so she does not get proper nutrition and since during pregnancy there is increase demand of Iron because of growing foetus it aggravates Iron deficiency anaemia.

Oral iron therapy is gold standard for treatment of mild to moderate Iron deficiency anaemia in pregnancy. For treatment of IDA WHO recommend 120 mg /dl elemental oral iron tablets until cure[7]

The main problem with oral iron therapy is compliance due to many GI symptoms like epigastric pain, heart burn, nausea, vomiting, bloating, stanning of teeth, metallic test etc. [8]

Furthermore, oral therapy is not adequate for treating moderate to severe anaemia specially in the late second and third trimesters of pregnancy. Therefore, Parenteral therapy promises better response in these patients and can avoid the need for prenatal and postnatal blood transfusions. [9]

The most commonly used parenteral iron supplement is iron sucrose complex [ISC] which was FDA approved in 2000 and is considered the gold standard for treatment of IDA in pregnancy . it forming iron hydroxide sucrose complex in water with 34000-60000 Dalton molecular weight. [10]

There are few safety issues and no test doses required. The only downside to iron sucrose is the limited dosage per session. The maximum tolerated dosage is 200 mg per session or 600 mg per week this increase the overall cost of treatment by requiring multiple visits[11]

The latest addition in parentera liron preparations is Ferriccarboxy-maltose (FCM), which is adextran free type Iiron complex, has faster

controlled delivery, raising Hb and replenishing iron stores at shorter duration with minimal toxicity and anaphylaxis. It has wider therapeutic index, better compliance and tolerance[12]

AIM AND OBJECTIVE : To Find Out-

1. Primary outcome: - Change in Haemoglobin level and serum ferritin level from baseline after 3 weeks and 12 weeks.
2. Secondary outcome: - improvement in levels of fatigue, tolerance, compliance, efficacy, safety and side effects of medication, and perinatal outcomes.

METHODOLOGY

Type of study:Observationalprospective comparative study

Study Place present studywas conducted on 100 pregnant women with IDA in department of OBGY at Ummaid hospital of DR.S.N. Medical College Jodhpur, Rajasthanstudy population: present study was conducted on pregnant women visiting hospital [OPD and ANC clinic]during study period between16 and 37 weeks period of gestation with singlet pregnancy and diagnosed with mild to moderate IDA (haemoglobin level >7mg/dl and <10.9mg/dl). Before enrolling in the study, informed written consent will be obtained from each pregnant woman.

Study Duration –from ethical approval to until target sample size achieved

Sample Size - 100 pregnant women

These pregnant women were randomly divided into two groups in 1:1 ratio using a computer-generated block randomization table and given either FCM or ISC.

Exclusioncriteria

Following pregnant women were excluded from study:

1. Pregnant women in preterm labour or PROM
2. Prior history of blood transfusion or anticipated need for blood transfusion during the study
3. History of any diseaseas sociated with iron overload e.g. Tha lassemia, Haemochromatosis, oranyo the rironstoragedisorder.
4. Multiplepregnancies
5. Knownhistoryofhypersensitivitytoanyironpreparations
6. Knownhistory of serious medical condition or anyuncontrolled systemic disease e.g. chronic renal disease, sever ecardiovascular disease, chronicoracutehepaticdisorder, tuberculosis etc.

A thorough clinical history (menstrual and obstetric), a history of prior treatments, including iron therapy, compliance with oral iron, and a list of chronic medical conditions was obtained at enrolment. A thorough examination was conducted, including anthropometry, a general physical examination, and an obstetric examination. Standard departmental protocol was followed for routine prenatal examinations. At admission time Iron deficiency anaemia was diagnosed by Hb level [SYSMEX automatic cell counter] andRedcell indices such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red cell distribution width (RDW) MI After admission in ward CBC with PBF, Hb electrophoresis, serum ferritin levels, serum iron, total iron binding capacity (TIBC), was performed as part of anaemia-specific investigations and after conforming diagnosis ofIDA assigned them one of the two groups either IS or FCM.

Iron requirement was calculated according to Ganzoni's formula Iron requirement (mg)=Total iron deficit [mg]=BW [kg] x (target Hb(14g/dL) −actual Hb) [g/dL] ×0.24+storage iron (1000) [mg]

The doses was rounded to the nearest 100 mg in both groups. Patients in the FCM group was given IV. ferric carboxy maltose after determining their total iron shortage available in our hospital supply (INJECTION REVOFOR). The maximum dose per sitting was 1000 mg, which was diluted in 200 ml of 0.9% normal saline and supplied as an IV infusion over 15 to 20 min. subsequent doses (if necessary) was planned on days 7 and 14, respectively.

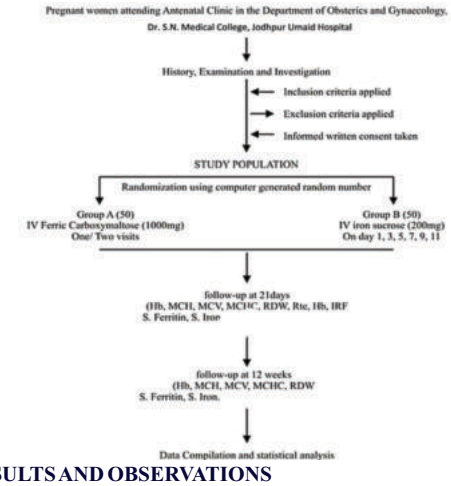
Patients in the ISC group were given 200 mg of ISC in 200 ml of NS over 15-20 min thrice a week, with a weekly maximum of 600 mg. Before and after the infusion, the patient's vital parameters including blood pressure, temperature, pulse rate, respiratory rate and oxygen saturation ,were monitored. Foetal heart rate was also monitored before and after the infusion.

Albendazole tablets 400 mg single dosage and 5 mg of folic acid once daily, was given to all the women. Any negative effects—small or significant—was highlighted& noted.

After the start of the treatment, 4 and 12 weeks later, all patients were checked with Hb level, RBC indices, and serum iron investigations. At follow-up visits minor or serious adverse effects were reported.

Women were also be enquired about their feeling of well being any adverse events observed. They were followed until delivery.

FLOW CHART



RESULTS AND OBSERVATIONS

Table :rise Inmeanhaemoglobinatday-21posttreatment

`	No	FCM group		No	Iron Sucrose group		P- value, LS
7-7.9	15	Meantotal Hb±SD	9.79± 0.55	14	Meantotal Hb±SD	9.16± 0.43	p=0.04
		Risemean Hb±SD	2.19± 0.57		Risemean Hb±SD	1.84± 0.44	p=0.0008
8-8.9	18	Meantotal Hb±SD	10.43± 0.24	17	Meantotal Hb±SD	10.28± 0.43	p=0.03
		Risemean Hb±SD	1.91± 0.33		Risemean Hb±SD	1.69± 0.40	p=0.003
9-10	17	Meantotal Hb±SD	11.38± 0.54	19	Meantotal Hb±SD	11.03± 0.25	p=0.0002
		Risemean Hb±SD	2.0± 0.36		Risemean Hb±SD	1.36± 0.48	p=0.04
Meantotal Hb±SD			10.53± 0.69		10.15±0.95		p=0.02
Risemean Hb±SD			2.03±0.47		1.51± 0.39		p=0.003

Table above shows that,all women in both groups had rise in mean Hb 21-days after treatment. The overall mean haemoglobin rise was higher (from 8.53 ± 0.75to10.53±0.69g/dl)in FCM group as compared toironsucrose group (8.63±0.98to10.15±0.95g/dl), which was statistically significant (p value=0.02). Mean rise in haemoglobin was more in FCM group as compared to iron sucrosegroup (2.03g/dl vs.1.51 g/dl)(p value=0.003).

Table: Pre- Treatment Serum Ferrit In Level In Women

Pre-treatmentHb(gm/dl)	FCMgroup(n=50)						Iron Sucrose group (n=50)					
	No	0.0-5.0	5.1-10.0	10.1-15.0	Mean S.ferritin	SD	No.	0.0-5.0	5.1-10.0	10.1-15.0	Mean S.ferritin	SD
7-7.9	15	10	4	1	5.350	3.125	14	6	7	1	6.002	3.113
8-8.9	18	3	13	2	7.205	2.098	17	4	10	3	6.519	2.846
9-10.9	17	5	7	5	7.611	4.133	19	2	7	10	9.47	4.309
MeanS.ferritin	6.84 ± 3.29						7.53 ± 3.81					

Above table shows the mean level of serum ferritin level before treatment in FCM group in hemoglobin level between (7.7.9) is 5.350 with SD 3.125, between (8-8.9) is 7.205 with SD 2.098, between (9-10.9) is 7.611 with SD 4.133 and in iron sucrose group mean serum ferritin level in hemoglobin between (7-7.9) is 6.002 with SD 3.113, hemoglobin level between (8-8.9) is 2.846 with SD 2.846,hemoglobin level between (9.10.9) is 9.47 with SD 4.309 . The total Mean Serum Ferritin level in FCM group is 6.84 ± 3.29µg/L in FCM group and 7.53 ± 3.81µg/L in iron sucrose group.

DISCUSSION

In our study, At 12 weeks post-treatment, overall mean haemoglobin was higher (12.38 ± 0.90 g/dl) in FCM group as compared to that in iron sucrose group(11.86 ± 0.91g/dl) . Mean rise in haemoglobin was more in FCM group as compare to iron sucrose group(3.86 g/dl vs. 3.22 g/dl) . At 12 weeks after treatment, rise was more in 7.0-7.9 gm/dl as compared to higher 3.89 ± 0.63 gm/dl in FCM group whereas 3.22`± 0.54 gm/dl in Iron sucrose group.

In a comparative study done by Jose et al48, it was observed that at 12 weeks post- treatment, mean total Hb level was significantly higher in FCM group as compared to that of iron sucrose group (11.53±0.46 vs. 10.8±0.44 g/dl). Total rise in mean haemoglobin level was also more in FCM group as compared to iron sucrose group (2.96 vs. 2.21g/dl), the rise being highly significant statistically ($p<0.001$).

In our study, At 21 days post-treatment, overall mean serum ferritin was higher (from 6.84 ± 3.29 µg/L to 136.03±13.73 µg/L) in FCM group as compared to that in iron sucrose group (from7.53 ± 3.80 µg/L to126.68±13.70) ,which was statistically significant($p<0.01$). Mean rise in serum ferritin is more in FCM group as compare to iron sucrose group (129.18 µg/L vs. 119.19 µg/L), this rise being statistically significant ($p<0.01$).

In the study by Mahajan A et al46, mean serum ferritin levels were changed significantly across after 2weeks treatment in both the FCM 144.25 mcg/L ($p<0.0001$) and iron sucrose group 95.84 mcg/L ($p<0.0001$). Serum ferritin levels were higher in the FCM group, than in the iron sucrose group at each point of measurement. This study was also similar to our study because there was a significant rise in ferritin levels in FCM group compared to iron sucrose group.

In a study of Jose et al48 also mean serum ferritin levels were changed significantly across after 3weeks treatment in both the FCM 343 µg/L and iron sucrose group 298µg/dL ($p = 0.02$). Serum ferritin levels were higher in the FCM group, than in the iron sucrose group. This study was similar to the present study. This may be due to the rapid replenishment of iron store by FCM given in single dose as compared to iron sucrose which was given in divided doses

CONCLUSION

The study showed that both ferric carboxymaltose and intravenous iron sucrose complex are safe, convenient and effective intreatmentofirondeficiency anaemia in pregnant women within eligible side effects.

The mean haemoglob in level achieved with in travenousferric car boxy maltose was significantly higher than intravenousir on sucrose group.

Thesingle FCM dosingregime was associated with greater patient compliance compared with iron sucrose.

FCM canbeadministered 1000 mginasingle sitting and has fewerad versereactionsthushavingabettercompliance.

This make sit the first- linedrug in the management of antepartumirondeficiency anaemia causing a faster and higher replenishment of iron stores and correction of Haemoglobin levels.