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Original Research Article

Iron Sucrose vs Iron Ferric Carboxymaltose-Which is better in Anemia in Pregnancy

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Abstract: ***Background:*** Anemia during pregnancy is commonly caused by iron deficiency anemia. It can cause severe consequences for both the fetus and the mother. This study aims to compare the safety and efficacy of IV iron sucrose and IV iron ferric carboxy maltose in pregnant patients with anemia. ***Material and Methods*****:** This is a prospective observational study; all women treated with iron sucrose & FCM for anemia during pregnancy between January 2021 to June 2021 at Department of Obstetrics and Gynaecology, Ganesh Hospital, Ghaziabad. Total 36 women were selected. Each study group consisted of 18 women receiving FCM which was group A and 19 in group B receiving Injection Iron Sucrose between 30 and 36 weeks of pregnancy. Treatment effectiveness was assessed by repeat Hemoglobin and Serum Ferritin level measurement after 4 weeks of completion of therapy. Safety was assessed by analysis of adverse drug reactions during infusion and 2 hours after infusion. ***Results:*** Intravenous ferric carboxymaltose infusion significantly increased Hemoglobin values compared to Intravenous ferrous sucrose. None of the women developed serious adverse reaction in FCM group whereas 3 drug reactions were noted in patients treated with Iron sucrose. ***Conclusion:*** Ferric carboxymaltose can be used safely in Iron defciency anemia complicatinin pregnancy and has shown to have better results.

Keywords: Iron Ferric Carboxymaltose, Anemia in Pregnancy.

INTRODUCTION

Iron defciency anemia is most common medical condition during pregnancy in developing countries. The prevalence of anemia in pregnant women is high, affecting 41.8% of all pregnant women. The prevalence of anemia in pregnancy is much more in developing counties [1].

It is a global public health problem and is responsible for 40% of maternal deaths in developing countries out of which it is responsible for 25% of direct maternal deaths. The prevalence of Iron deficiency anemia (IDA) in pregnancy in India ranges from 23.6%- 61.4% [2]. Besides mortality it also causes increased perinatal mortality and morbidity but remains a major preventable cause of unfavorable perinatal and maternal outcome.

World Health Organization (WHO) defines Anemia as hemoglobin (Hb) less than 11g/dl during pregnancy. Progression from iron deficiency to IDA in pregnancy is common, due to the increased demand for iron during pregnancy (about 1000mg), required to support maternal hemoglobin mass expansion as well as the growing fetus and placenta [3]. Anaemia is also physiological due to hemodilution.

Iron deficiency (IDA) in pregnancy can cause various kinds of gestational complications, as we as increased maternal and infant morbidity and mortality [4, 5]. Maternal consequences include cardiovascular symptoms, reduced

physical, mental and immune function and peripartum iron reserves [6, 7]. Diet alone cannot supply such high amounts of iron, because of poor bioavailability [8]. All this makes iron supplementation, a necessity in all pregnant women.

The mainstay of treatment for iron deficiency anaemia is iron supplementation either oral or parenteral. The indications for parenteral iron treatment are intolerance to oral iron, non-compliance to oral iron and patients who need rapid restoration of iron stores. Current intravenous iron formulations include ferric gluconate, iron sucrose, iron polymaltose and recently ferric carboxymaltose [9]. They have similar structure, but differ by the size of the core and the surrounding carbohydrate. Iron sucrose and ferric carboxymaltose are dextran free intravenous alternatives. Iron sucrose has been widely used due to its higher bio-availability for erythropoiesis than iron dextran and offers a good safety profile [10]. But it cannot be given in higher doses and requires frequent doses for administration.

Ferric carboxy maltose is a novel iron complex which consists of an iron-hydroxide core chelated in a carbohydrate shell and this complex is taken up as a whole by macrophages, leading to very low levels of non-transferrin bound iron, avoiding iron toxicity and oxidative stress [11]. (FCM) has a near neutral pH (5-7), physiological osmolarity and increased bioavailability, which makes it possible to administer high single doses over shorter time periods (up to 1000mg in a single dose infused in 15 minutes) Because it is free of dextran and its derivatives, FCM does not cross react with dextran antibodies [12, 13] and does not need the administration of a test dose. It does not pre-dispose to anaphylactic reactions since it has a low immunogenic potential. Study aimed to compare the safety and efficacy of intravenous ferric carboxy maltose (FCM) vs iron sucrose in anaemia in pregnancy.

MATERIALAND METHODS

The study was conducted in the Department of Obstetrics and Gynaecology, Ganesh Hospital, Ghaziabad during January 2021 to June 2021. Total 36 women were selected. Each study group consisted of 18 women receiving FCM which was group A and 19 in group B receiving Injection Iron Sucrose between 30 and 36 weeks of pregnancy. Treatment effectiveness was assessed by repeat Hemoglobin and Serum Ferritin level measurement after 4 weeks of completion of therapy. Safety was assessed by analysis of adverse drug reactions during infusion and 2 hours after infusion.

Inclusion Criteria

38 antenatal patients with gestational age more than 30 weeks and moderate anemia with Hb 7-9.9gm and S.ferritin levels <30mcg were included in the study.

Exclusion Criteria

- Hypersensitivity reaction to any iron preparation
- History of blood transfusion
- History of bleeding tendencies
- History of iron overload disorders
- Thalassaemia's or haemochromatosis or medical disorders like chronic renal failure, cardiovascular disorder, tuberclosis, and hepatitis B/C or HIV infection were excluded from study.

These patients were evaluated for CBC, PBF and S.ferritin levels. The dose of intravenous iron was calculated by the following formulas; Total iron Requirement: 2.4 x body weight (in kg) x hb deficit+500mg (iron stores). Hemoglobin deficit was calculated by subtracting from 11gm%.

All women were given albendazole for deworming. Women who had dimorphic anemia were given 500ug folic acid and B12 -methylcobalamine 1500mcg tablets daily.

Group A, subjects were given IV iron FCM 1000mg in single dose diluted in 100ml of 0.9% noraml saline and given over 15 mins.

Group B, subjects were given IV iron sucrose in multiple doses, 200mg/day on day 0, 2,4,6,8 totals of 1000mg (iron sucrose 200mg diluted in 100ml of 0.9% noraml saline and given over 20 to 30min).

In both groups Hb% and serum ferritin were done on day 0 and 30 of last dose of parentral iron. Side effects like headache, nausea, myalgia, arthalgia, nausea, vomiting, epigastric discomfort and anaphylactic reactions were looked for during the procedure. The patients were observed for one hour after infusion, they were called after one month for follow up and then clinical examination was done and investigations were repeated for comparison.

RESULTS

A total of 38 antenatal women were included in study. Most of which were aged between 20-29 years. Majority of them were multigravida in both groups (table-1, 2).

Table-1: Distribution of Patients According To Age

Age (in years)	Group A	Group B
15-19	02	01
20-24	6	7
25-29	9	8
30-34	1	2
35-39	1	0
Total	18	18
Mean±SD (years)	23.54±2.53	24.56±3.50

Table-2: Gravidity of Patients

Gravidity	Group A	Group B
Primigravida	9	10
Multigravida	9	8
Total	18	18

Most patients in Group A and in Group B had their pre- treatment Hb in range of 8-8.9 g/dl (table-3).

Table-3: Pre-treatment Haemoglobin (gm/dl) of the Patients

Pre-treatment Hb (gm/dl)	Group A	Group B
7.0-7.9	5	2
8.0-8.9	10	11
9.0-9.9	3	5
Total	18	18

Patients with serum ferritin less than 30 mcg/dl were selected; majority of patients in both groups had their pre treatment serum ferritin in range of 10-19.9 mcg/l (table-4).

Table-4: Pre-treatment Serum Ferritin (mcg/l) of the Patients

Pre-treatment Hb (gm/dl)	No of patients Group A	No. of patients Group B
0-9.9	3	4
10.0-19.9	10	11
20.0-29.9	5	3
Total	18	18

At 4 weeks post treatment, the rise in mean Hb level was more in Group A (FCM) as compared to Group B (iron sucrose). Statistically the rise was highly significant (table-5).

Table-5: Rise in Mean Haemoglobin (gm/dl) Level at 2 Weeks Post Treatment

Variable	Haemoglobin (gm/dl)		Statistical inference (unpaired t Test)
	Group A Mean±SD	Group B Mean±SD	
Rise in haemoglobin (gm/dl) at 4 weeks post treatment	1.88±0.46	1.09±0.44	t=11.21 p<0.001 Highly significant

At 4 weeks post treatment, the rise in mean serum ferritin was higher in FCM group than Iron Sucrose group, which is statically highly signficant (table-6).

Table-6: Rise In Mean Serum Ferritin (mcg/L) Level at 2 Weeks Post Treatment

Variable	Haemoglobin (gm/dl)		Statistical inference (unpaired t Test)
	Group A Mean±SD	Group B Mean±SD	
Rise in serum ferritin (mcg/L) at 4 weeks post treatment	124.68±11.53	81.40±13.01	t=15.08 p<0.001 Highly significant

No serious side effects were reported in any group. Mild adverse effects like nausea, vomiting, diarrhea, constipation etc were observed in 52% patients in Group A, and 34% patients in Group B (table-7, 8).

Table-7: Adverse Drug Reactions

Adverse drug reactions	Group A No. (%)	Group B No. (%)
Diarrhoea	2	1
Nausea	1	2
Constipation	0	1
Abdominal pain	1	1
Injection site reactions	1	2
Headache	1	1
Dysguesia	0	2
Skin discoloration	0	0
Vomiting	0	0
Hypersensitivity reaction	0	0
Hypertension	0	0
Hot flushing	0	0
Hypotension	0	0
Total	6(34%)	10(32%)

DISCUSSION

The aim of the study was to compare the safety and efFIcacy of ferric carboxymaltose with iron sucrose in antenatal women with iron deficiency anaemia. Iron deficiency anaemia is one of the most important causes of maternal and neonatal morbidity in both developed and developing countries. So, diagnosis for IDA is important and all pregnant women should be corrected of anaemia before delivery. IDA is also an important indirect cause of maternal death.

Our results are in line with a no of randomized control studies, which have shown the safety and ef□cacy of ferric carboxy maltose. The demographic data like age were comparable among both groups. Baseline Hb and ferritin levels in both groups were clinically insignficant. The prevalence IDA in primi was 40-42% while in multi was 55%. The reason for the high prevalence in multi could be frequent pregnancies.

Lack of spacing between two births, leading to depletion of iron stores. There was a statistically significant rise in Hb in FCM group as compared to that of Iron Sucrose (1.88 vs 1.09 g/dl). Serum ferritin also was significantly higher in the FCM group (124.68 vs 81.40 mcg/L) with comparatively lesser side effects (52% vs 34%), all of them being mild in nature. The results of the present study with regard to efficacy and safety of FCM in comparison with Iron Sucrose have been consistent with the other studies conducted by Garg R *et al*. [14], Joshi SD *et al*. [15] and Maheshwari B *et al*. [16] In a study by Van Wyck *et al*. [17] the Hb rise >3 g/dl in patients treated with FCM over 4 weeks, whereas in our study the mean rise was 1.79 g/ dl. In a study by Giannoulis *et al*. [18] the increase in hb was 4-6 g/dl in 4 weeks in patients treated with iron sucrose, whereas in our study the Hb levels showed increase by 1.09 g/d over 4 weeks. Breymann *et al*. [19] reported the increase in ferritin levels from 39.9 to 150 mcg/l in 4 weeks, in our study we observed in FCM group, mean ferritin level increased from 14.09 to 123.80 mcg/l in 4 weeks. Adverse reactions do occur with iron sucrose, GI side effects being most common. None of the patients in our study required prolonged hospitalization, they had an uneventful recovery. David *et al*. [20], Evstatiev *et al*. [21] and Iftikar *et al*. [22] proved that FCM was well tolerated and had better compliance than other preparations. The result of our study was consistent with the above trials.

CONCLUSION

From our study we concluded that FCM appears to be safe and ef□cient for correction of IDA in third trimester of pregnancy with lesser adverse effects and better patient compliance. In this study we also found, correction of IDA by single large dose of FCM is significant.

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