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COMPARATIVE STUDY OF ORAL IRON FUMARATE AND INTRAVENOUS IRON SUCROSE FOR THE TREATMENT OF MODERATE IRON DEFICIENCY ANAEMIA IN SINGLETON PREGNANCIES ATTENDING A TERTIARY HEALTH CARE CENTRE IN SOUTH KERALA.

Obstetrics & Gynaecology

Shyma Thondalil Seeni* Senior Resident, Department of Obstetrics and Gynecology, Believers church medical college hospital, Thiruvalla, Kerala. *Corresponding Author

Rekha G Muricken Department of Obstetrics and Gynecology, Believers church medical college hospital, Thiruvalla, Kerala.

Arunima Vijay Department of Obstetrics and Gynecology, Believers church medical college hospital, Thiruvalla, Kerala.

Sherin Sams Department of Obstetrics and Gynecology, Believers church medical college hospital, Thiruvalla, Kerala.

ABSTRACT

Background: Iron deficiency anemia is the leading cause of nutritional anemia in pregnancy which attributes to a wide range of adverse effects in both mother and fetus. Both oral and iron supplements have been used to treat iron deficiency anemia in pregnancy. Objective of this study was to compare the rise in haemoglobin levels after oral ferrous fumarate and intravenous iron sucrose in moderate iron deficiency anemia of pregnancy and to assess the tolerance of oral iron in pregnancy. **Methods:** Ninety antenatal women were included in a longitudinal comparative study based on the inclusion criteria. Results of hemoglobin level were entered into proforma periodically. Independent test /Mann-whitney U test was used for the comparison of oral iron and intravenous iron therapy. Chi-square test was used to find association between categorical variables. Statistical analyses was performed by using a statistical software package SPSS, version 20.0. **Results:** There was a significant difference in hemoglobin and hematocrit values between oral and intravenous iron group at 4 weeks,6 weeks and 8 weeks of starting therapy ($p<0.001$). Oral iron group had significant increase in gastrointestinal side effects when compared to intravenous iron group. (57.80% vs 13.30%). **Conclusions:** Intravenous iron sucrose corrected iron deficiency anemia faster than oral iron fumarate in pregnancy and was associated with no serious adverse effects.

KEYWORDS

Iron deficiency anemia, pregnancy, hemoglobin, oral iron, intravenous iron.

INTRODUCTION

Pregnancy predisposes women to hematological abnormalities. Iron deficiency anemia is the most common cause of anemia during pregnancy. Treatment of iron deficiency anemia can be oral iron supplementation, intravenous iron therapy or even blood transfusion in severe cases.[1]

Severity of anemia, gestational age, history of antepartum hemorrhage, risk of postpartum hemorrhage, any chronic diseases guides the repletion of iron stores. Around 1-8 % iron is absorbed from different oral iron preparations. Increasing dose of iron more than 200 mg/day causes gastrointestinal side effects. Different studies have shown no increased superiority among varying oral iron formulations. Parenteral iron therapy is mainly given intravenously. It has an advantage of lesser gastrointestinal side effects and faster Hb recovery. It is administered when there failure to oral iron therapy, noncompliance with oral iron, malabsorption or in advanced gestational age.[2]

Several studies have shown a conflicting result on administration of oral and intravenous iron therapy and which is superior to other in terms of hemoglobin rise. Achieving the WHO 2025 global nutritional target of 50% reduction in prevalence of anemia in reproductive age group can be aided by a systematic approach to anemia in pregnancy and an appropriate management of the same.[3]

METHODS

Ninety antenatal women who attended antenatal clinics were included in a longitudinal comparative
study based on the inclusion criteria.

Inclusion Criteria

- Singleton and uncomplicated pregnancy
- Gestational age between 24-36 weeks
- Hb between 7-9.9 g/dl
- Willing for enrolment in study
- Likely to come for follow up

Exclusion Criteria

- Allergic to parenteral iron.
- Patient with obstetrical complications.
- Patient with acute and chronic infections

They were randomly divided into two groups where Oral iron group received Ferrous fumarate 300mg and intravenous iron sucrose group received iron sucrose in 200 mg divided doses. Participants in oral iron group were instructed regarding taking oral iron on empty stomach, adverse effects possibly to expect and the need for regular compliance with oral iron.

Participants in intravenous iron group were informed regarding the need to attend centre twice weekly, the invasive nature of the therapy and the safer nature of therapy. Clinical data was collected using proforma. Results of Hemoglobin level were entered into proforma periodically.

Data will be entered in Microsoft Excel and data analyzed using statistical software. Categorical and quantitative variables were expressed as frequency (percentage) and mean ± SD respectively. Independent t test was used to compare quantitative parameters between categories. Chi-square test was used to find association between categorical variables. For all statistical interpretations, $p<0.05$ was considered the threshold for statistical significance. Statistical analyses was performed by using a statistical software package SPSS, version 20.0

RESULTS:

A total of 90 women were studied with 45 in each group.

Table 1: Comparison Of Age Based On Iron Therapy

Age	Oral		Intravenous	
	Count	Percent	Count	Percent
21 – 25	8	17.8	11	24.4
26 – 30	16	35.6	21	46.7
31 – 35	15	33.3	9	20.0
>35	6	13.3	4	8.9
Mean ± SD	29.8 ± 4.7		28.7 ± 4.4	

Maximum number of people in oral iron were in age group 26 – 30 years accounting to 35.6% and maximum number in intravenous iron was also in same group 46.7%.

Table 2: Descriptive Statistics Regarding G.A Based On Iron Therapy

	Oral	Intravenous
Mean ± SD	28.6 ± 2.2	29.8 ± 2.8
Median (IQR)	29 (27 - 30)	30 (28 - 32)

Minimum	24.0	24.0
Maximum	33.0	34.0

- Mean gestational age in antenatal women recruited in oral and intravenous groups were also similar.
- Mean gestational age was 28.6 in oral iron group with a SD of 2.2
- Mean gestational age of intravenous iron group was 29.8 with a SD of 2.8.

Table 3: Descriptive Statistics Regarding Initial HB Based On Iron Therapy

Hemoglobin	Oral	Intravenous
Mean ± SD	8.5 ± 0.7	8.7 ± 0.6
Median (IQR)	8.5 (8 - 9)	8.8 (8.45 - 9.05)
Minimum	7.2	7.0
Maximum	9.9	9.8

Table 4: Descriptive Statistics Regarding Initial PCV Based On Iron Therapy

Hematocrit	Oral	Intravenous
Mean ± SD	25.6 ± 2.1	26.7 ± 1.9
Median (IQR)	25.5 (24 - 27)	26.5 (25.5 - 28)
Minimum	21.8	22.8
Maximum	29.7	31.2

Mean hematocrit and hemoglobin in both oral and intravenous iron groups were similar and comparable.(Table 3 and 4)

Table 5: Comparison Of Actual HB At Different Time Based On Mode Of Iron Therapy

HB	Oral			Intravenous			t	p
	Mean	SD	N	Mean	SD	N		
4 Weeks	10.1	0.7	45	10.7	0.6	45	5.1	p<0.01
6 Weeks	10.3	0.7	45	11.3	0.6	45	7.22	p<0.01
8 Weeks	10.5	0.7	45	11.7	0.6	45	8.76	p<0.01
Delivery	11.3	0.8	45	11.7	0.8	45	2.92**	0.004
Postpartum	11.6	0.7	45	11.3	0.8	45	1.48	0.143

**: - Significant at 0.01 level

Table no. 5 provides data on hemoglobin levels during oral and intravenous iron therapy at 4 weeks, 6 weeks, 8 weeks, delivery and postpartum.

- Mean hemoglobin after 4 weeks, 6 weeks, 8 weeks and at delivery were significantly higher in intravenous group when compared to oral iron group.
- However there was no significance noted in hemoglobin levels at the postpartum checkup among both the groups as p value is 0.143

Table 6: Comparison Of Actual PCV At Different Time Based On Mode Of Iron Therapy

PCV	Oral			Intravenous			t	P
	Mean	SD	N	Mean	SD	N		
4 Weeks	30.1	2.2	45	32.3	1.7	45	5.27	p<0.01
6 Weeks	30.8	2.3	45	33.9	1.7	45	7.25	p<0.01
8 Weeks	31.6	2.2	45	35.2	1.7	45	8.89	p<0.01
Delivery	33.8	2.2	45	35.2	2.2	45	3.15**	0.002
Postpartum	34.7	2.0	45	33.9	2.5	45	1.75	0.084

**: - Significant at 0.01 level

Table no. 6 provides data on hematocrit levels during oral and intravenous iron therapy at 4 weeks, 6 weeks, 8 weeks, delivery and postpartum.

- Mean hematocrit after 4 weeks, 6 weeks, 8 weeks and at delivery was significantly higher in intravenous iron group when compared with oral iron.However at postpartum checkup mean PCV was higher in oral iron group 34.7 with SD of 2.0 when compared to 33.9 with a SD of 2.5 in intravenous group.
- Here as the p value <0.01 is considered significant – hence there is a significant difference in between PCV levels of hemoglobin and hematocrit values at 4 weeks, 6 weeks,8 weeks and at time delivery.
- As the p value is 0.084 at the postpartum checkup there is no significance in hematocrit values among both oral and intravenous iron group.

Table 7: Comparison Of Adverse Effect Based On Iron Therapy

Adverse effect	Oral		Intravenous	
	Count	Percent	Count	Percent
Nil	19	42.2	39	86.7
Constipation	4	8.9	0	0.0
Dizziness	0	0.0	3	6.7
Epigastric discomfort	10	22.2	0	0.0
Itching	0	0.0	2	4.4
Nausea	8	17.8	1	2.2
Vomiting	4	8.9	0	0.0

- Among oral and intravenous iron therapy groups, 57.8% had adverse effects of some form in oral iron group and 13.3% had adverse effects in intravenous iron group.
- In oral iron group, 10 had gastric discomfort ie; 22.2%, 8 had nausea ie; 17.8%, 4 had vomiting – 8.9% and 4 had constipation – 8.9%.
- In intravenous iron group 3 had dizziness – 6.7%, 2 had itching – 4.4% and 1 had nausea – 2.2%.

DISCUSSION:

In our study all participants were of moderate anaemia– 7-9.9 g/dl according to ICMR classification. Moderate iron deficiency anaemia was chosen as both oral iron therapy and intravenous iron can be given in this age group. The gestational ages of participants were 24-36 weeks. Oral iron fumarate, most commonly used iron preparation in our hospital was used for oral group and intravenous group was given iron sucrose.

Initial hemoglobin levels of both groups were comparable. Comparable initial hemoglobin levels in both groups were selected so that it will provide accurate results at the end of treatment in both groups of treatment with fewer fallacies.

At 4 weeks after starting treatment in both groups, a significant difference was noted between oral and intravenous groups' hemoglobin and hematocrit levels. Mean hemoglobin and hematocrit was significantly higher according to statistics and p value in intravenous iron group when compared to oral iron group. It gives us the inference that intravenous iron can be safely and effectively used to treat iron deficiency in pregnancy and changes in hematological parameters can be noted as early as 4 weeks from onset of treatment. At 6 weeks and 8 weeks a similar change in hemoglobin and hematocrit levels could be noted in intravenous group. Mean hemoglobin and hematocrit levels were significantly higher in intravenous iron group when compared with oral iron group. This gives us the inference that both oral and intravenous iron therapy can be used to manage iron deficiency anaemia in pregnancy as they both raise the hemoglobin levels from initial values as the treatment advances but a faster increase in hemoglobin can be noted after intravenous iron therapy. Hemoglobin levels at delivery time was also significantly higher in intravenous iron group than oral iron therapy as the p value was <0.01. It can hence be deduced that a faster correction of anaemia can be aimed with intravenous iron therapy than oral iron therapy thus hemoglobin levels remained corrected even at the delivery time. This helps in preventing further complications at the time of delivery like postpartum hemorrhage, sepsis, risk of blood transfusions and poor lactation.

Hemoglobin and hematocrit levels were also checked at postpartum period– 6 weeks after delivery. Contrary to previous findings a higher hemoglobin levels were noted in oral iron group than in intravenous iron group. Hematocrit levels also followed similar pattern. Hence study suggests that hemoglobin levels at postpartum period were not dependable on mode of iron therapy whether it is oral or intravenous.

Table 8: Comparison Of Mean Hemoglobin At The End Of Treatment Among Different Studies In Intravenous And Oral Group

Studies	Intravenous		Oral	
	Mean Hb	SD	Mean Hb	SD
Bayoumeu et al,2002 (4)	11.3	1.3	11	1.25
Al Ra et al,2005 (5)	11.08	0.72	10.4	0.68
Neeru et al, 2012(6)	11.24	0.7	11.06	0.63
Shafi et al,2012 (7)	10.79	0.843	9.903	0.885
Kochhar et al, 2013(8)	12.8	1.1	10.7	0.7
Abhilashini et al, 2014(9)	10.84	0.9	10.09	0.7

Bhavi et al, 2017 (10)	10.65	1.03	10.64	1.3
Present study	11.7	0.8	11.3	0.8

Table 8 shows the mean hemoglobin with SD achieved after treatment with oral and intravenous iron group among various studies. Mean hemoglobin achieved in my study after treatment is comparable with all previous studies and we can clearly see that in all studies hemoglobin levels are higher in intravenous iron group than oral iron group.

Table 9: Comparison Of Adverse Effects Of Oral And Intravenous Iron With Other Studies

Studies	Intravenous Iron			Oral Iron		
	Total	A/E	%	Total	A/E	%
Neeru et al, 2012(6)	45	6	13.3%	44	10	22.7%
Shafi et al, 2012 (7)	100	13	13%	100	27	27%
Kochhar et al, 2013(8)	50	3	6%	50	12	24%
Abhilashini et al, 2014(9)	50	2	4%	50	21	42%
Present study	45	6	13.3%	45	26	57.7%

Adverse effects were more commonly noted in oral iron group. There was a 57.8% occurrence of adverse effects in oral iron group. Side effects in oral iron group were nausea, vomiting, epigastric discomfort and constipation. Epigastric discomfort was the most common drug reaction noted in oral iron group 22.2%. In intravenous iron group, no serious adverse effects were noted. 3 patients had complaints of mild dizziness within half hour of infusion which subsided on its own. 2 had minimal itching along the site of iron infusion towards the end of infusion which did not require any medications. 1 had nausea after infusion and did not require any medication. Overall 13.3% had adverse effects in oral iron group and none of the side effects required any follow-up or treatment.

Table 9 shows the adverse effects noted in oral and intravenous iron group in various studies. Adverse effects were comparable with other studies.

To summarize, intravenous iron sucrose treatment for moderate iron deficiency in pregnancy increases hemoglobin and hematocrit level faster than treatment with oral ferrous fumarate with no reports of serious adverse effects. Side effects were reported in 57.8% after oral ferrous fumarate therapy.

CONCLUSION

Incidence of anaemia in pregnancy has been on the rise recently and iron deficiency is the major contributing factor to it. Efficiently treating iron deficiency in pregnancy would avert a majority of complications that arise such as preterm labour, a low birth weight neonate and increased susceptibility to infections. Maternal morbidity and mortality is also affected by severity of anaemia in pregnancy. In the present study, ninety antenatal women with moderate iron deficiency anaemia was divided into two groups and treated with oral iron fumarate and intravenous iron sucrose. Hemoglobin and hematocrit levels follow up showed that intravenous iron sucrose had a faster and significant correction of hemoglobin and hematocrit levels at 4 weeks, 6 weeks and 8 weeks of starting therapy. Side effect profile of oral and intravenous iron sucrose was also studied. Oral iron therapy was associated with a significantly higher proportion of gastrointestinal side effects while intravenous iron therapy had no major side effects. To summarize, intravenous iron sucrose treatment for moderate iron deficiency in pregnancy increases hemoglobin and hematocrit level faster than treatment with oral ferrous fumarate with no reports of serious adverse effects. Side effects were reported in 57.8% after oral ferrous fumarate therapy.

DECLARATIONS

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REFERENCES

1) Cunningham F, Leveno K, Bloom S, Spong CY, Dashe J. Williams obstetrics,24e. New York, NY, USA: Mcgraw-hill; 2014.
2) Tandon R, Jain A, Malhotra P. Management of iron deficiency anaemia in pregnancy in India. Indian Journal of Hematology and Blood Transfusion. 2018 Apr;34(2):204-15
3) International Food Policy Research Institute. Global nutrition report 2016: from promise to impact: ending malnutrition by 2030.
4) Bayoumeu F, Subiran-Buisset C, Baka NE, Legagneur H, Monnier-Barbarino P, Laxenaire MC. Iron therapy in iron deficiency anaemia in pregnancy: intravenous route versus oral route. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2005 Dec 1;123:S15-9.
5) Al RA, Unlubilgin E, Kandemir O, Yalvac S, Cakir L, Haberal A. Intravenous versus oral iron for treatment of anaemia in pregnancy: a randomized trial. Obstetrics & Gynecology. 2005 Dec 1;106(6):1335-40.
6) Neeru S, Nair NS, Rai L. Iron sucrose versus oral iron therapy in pregnancy anaemia. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2012 Oct;37(4):214.
7) Shafi D, Purandare SV, Sathe AV. Iron deficiency anaemia in pregnancy: intravenous versus oral route. The Journal of Obstetrics and Gynecology of India. 2012 Jun 1;62(3):317-21.
8) Kochhar PK, Kaundal A, Ghosh P. Intravenous iron sucrose versus oral iron in treatment of iron deficiency anaemia in pregnancy: a randomized clinical trial. Journal of Obstetrics and Gynaecology Research. 2013 Feb;39(2):504-10.
9) Abhilashini GD, Sagili H, Reddi R. Intravenous iron sucrose and oral iron for the treatment of iron deficiency anaemia in pregnancy. Journal of clinical and diagnostic research: JCDR. 2014 May;8(5):OC04.
10) Bhavi SB, Jaju PB. Intravenous iron sucrose v/s oral ferrous fumarate for treatment of anaemia in pregnancy. A randomized controlled trial. BMC pregnancy and childbirth. 2017 Dec;17(1):1-6.