National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Comparative study of oral iron and intravenous iron sucrose for the treatment of iron-deficiency anemia in pregnancy

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Received: April 12, 2024; **Accepted:** May 01, 2024

ABSTRACT

Background: The most prevalent nutritional disorder during pregnancy is iron-deficiency anemia (IDA). Management of anemia can be done by either oral, parenteral, or blood transfusion, depending on the severity. Oral iron (OI) replacements can be taken as they are safe, effective, and lower cost. However, one disadvantage is poor tolerability, as they cause gastrointestinal complications. Iron sucrose complex is a relatively new drug used intravenously (IV) for the correction of IDA. **Aims and Objectives:** This research compared the safety and effectiveness of OI versus iron sucrose in the treatment of IDA during pregnancy. **Materials and Methods:** A prospective observational study was performed involving 60 patients who attended the antenatal clinic from June 2019 to November 2019 at Bidar Institute of Medical Science between 24 and 36 weeks of gestation and hemoglobin levels between 7 and 10 g/dL. In the IV group, 200 mg of iron sucrose was administered in 100 mL of 0.9% normal saline over 15–20 min on alternate days. In the oral group, 200 mg of ferrous ascorbate per day for 4 weeks was prescribed. All patients were monitored for laboratory responses and adverse effects. An unpaired "*t*" test was used for statistical analysis. $P < 0.05$ was considered significance. **Results:** There was an increase in hemoglobin in both groups, but there was a significant increase in hemoglobin in the IV group. The other laboratory parameters also showed a significant increase in the IV group than in the oral group. The IV group had no major side effects. **Conclusion:** The IV iron sucrose formulation was more effective than the oral formulation for anemia correction in pregnancy.

KEY WORDS: Iron-Deficiency Anemia of Pregnancy; Iron Sucrose; Ferrous Ascorbate

INTRODUCTION

The most prevalent nutritional disorder during pregnancy is iron-deficiency anemia (IDA). It is one of the major health problems in the world. The World Health Organization defines anemia as hemoglobin (Hb) <11 g%, and it has reported 35–75% anemia prevalence in developing countries,[1] of which 65–75% is in India.[2] The etiology of anemia could be poor nutrition, iron deficiency, malaria, worm infestations, HIV infection, and hemoglobinopathies[3] An adverse obstetric outcome is typically one of the consequences of anemia.[4] In addition, it causes 20% of maternal deaths. It was noted that anemia was an indirect reason for maternal death in about 20–40% of the patients.[5]

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2024.14.04177202401052024	

Management of anemia can be done by either oral, parenteral, or blood transfusion, depending on the severity.[6] Blood transfusions have their own disadvantages, such as transfusion reactions, anaphylaxis, and infection transmission (such as HIV, hepatitis B surface antigen, and cytomegalovirus).

Thus, oral iron (OI) replacements can be taken as they are safe, effective, and lower cost. However, one disadvantage is poor tolerability, as they cause gastrointestinal (GI) complications.[7] Iron sucrose complex is a relatively new drug used for IDA correction intravenously (IV).[8]

This study was conducted to compare IV iron with OI in the management of IDA during 24–36 weeks of gestation in pregnancy.

MATERIALS AND METHODS

A prospective observational study was carried out at the Obstetrics and Gynecology Department, Bidar Institute of Medical Sciences Teaching Hospital, from June 2019 to November 2019. All pregnant women between 24 and 36 weeks attending the antenatal clinic were enrolled. The inclusion criteria included singleton uncomplicated pregnancy, gestational age between 24 and 36 weeks, Hb between 7 and 10 g/dL, and age between 18 and 40 years.

Exclusion criteria included being allergic to parenteral iron, patient with Hb <7 and >10 g/dL, having a history of bleeding disorders, hemoglobinopathies, any acute or chronic infection, any obstetric complications, and any history of recent blood transfusion.

After taking consent, an examination and investigation were done. Ethical clearance was taken.

A total of 60 patients who satisfied the inclusion and exclusion criteria were enrolled, and based on the treatment given by the obstetrician, they were divided into 2 groups: A and B. Group "A" OI group and Group "B" IV iron (IVI) group. In group A, patients received 2 tablets of ferrous ascorbate each containing 100 mg of elemental iron daily for 4 weeks. It was advised that women should take the tablets with an empty stomach and not take milk, tea, or coffee after taking the tablets. Hb was repeated at 2, 4, and 6 weeks after the beginning of oral treatment. In group "B", the parenteral iron sucrose dose was calculated by:

Total dose = weight in kilograms (target Hb in g/dl–actual Hb) × 0.24 + 500 mg.

Iron sucrose was administered as 200 mg (elemental iron) in 100 mL of 0.9% normal saline IV over 15–20 min on alternate days. Along with this, folic acid supplements were given to prevent its deficiency. During this period, the use of OI was withheld.

The two groups were monitored clinically for any adverse reactions. Laboratory investigations such as hemoglobin%, complete blood picture, peripheral smear for types of anemia, and urine analysis were carried out on day 1 and on stipulated follow-up.

Statistical analysis was done by calculating the mean ± standard deviation. To determine the statistical significance between the two groups, the student T unpaired test was utilized.

RESULTS

Among the 60 enrolled pregnant patients, there were 9 dropouts in the OI group and 6 dropouts in the IVI group. Both groups baseline clinical and demographic characteristics were comparable [Tables 1 and 2]. In the OI group, 46.66% showed adverse reactions, while in the IV group, 13.3% showed adverse reactions. No major anaphylactic reactions were noted with iron sucrose [Table 3].

DISCUSSION

IDA is one of the most widespread of all nutritional deficiencies in pregnancy. In this study, the safety, efficacy, and tolerability of OI were compared to IV iron sucrose in treating IDA in pregnancy. Moreover, it was found that IV iron sucrose elevates Hb and restores iron better than ferrous ascorbate [OI] in a short time. This was also observed in other studies conducted by Bayoumeu *et al*.[6-9] and others.

As the rate of increase of Hb is faster with IV iron sucrose, it is suitable to use even in the third trimester.

OI is inexpensive, safe, and efficient; however, non-compliance has been seen because of GI side effects. About 10–40% of patients suffer diarrhea, constipation, discomfort, nausea, and severe abdominal pain.[10] Our study showed 60% of side effects in the OI group. Among the parenteral iron iron-dextran compounds given intramuscularly, they cause pain, injection site staining, and arthralgia.[11] It is not recommended for those with rheumatoid arthritis since it is linked to arthritis flare-ups. Another IM iron, the iron sorbitol citric acid complex produces nausea, vomiting, pain at the injection site, and a metallic taste.[2] Ferric citrate and ferric gluconate are other iron preparations that were discovered to cause severe extended liver necrosis.[12]

Table 1: Comparison of demographic characteristics in the two groups

Characteristics	Oral iron group (*n*=30)	Intravenous iron group (*n*=30)
Age (years)	26	26
Body mass index (kg/sqm)	21.5±3.81	22.6±3.59
Primigravida	20	10
Multigravida	10	20
Single gestation	30	30
Second trimester	24	23
Third trimester	6	7

Table 2: Comparison of laboratory investigations pre- and post-treatment in two groups

Baseline	Pre-treatment			Post-treatment		
	Oral	IV	*P*-value	Oral	IV	*P*-value
Hemoglobin (g/dL)	8.347±0.355	8.257±0.342	0.3251	9.2833±0.5173	10.0037±0.5128	<0.0001
packed cell volume (%)	28.18±1.932	27.21±1.902	0.0548	32.07±0.992	33.87±0.959	<0.0001
Mean corpuscular volume (fl)	80.26±1.459	79.52±1.583	0.0652	80.98±1.982	82.08±1.899	0.0322
Mean corpuscular hemoglobin (picogram)	25.21±0.965	24.79±0.871	0.082	27.9±0.569	29.76±0.675	<0.0001
Mean corpuscular hemoglobin concentration (g/dL)	31.00±1.231	30.40±1.345	0.0767	33.41±1.223	33.36±1.047	8.8655

Table 3: Adverse reaction with oral and intravenous iron

Adverse reactions	Oral	Intravenous
NV	8	0
Constipation	6	0
Fever/chills	0	1
Rashes	0	0
Dizziness	0	2
Thrombophlebitis	0	1
Total	14	4

NV: Nausea and vomiting

Iron sucrose is a medium iron complex with a molecular weight of 30,000–1,00,000 Daltons. It is found to be very effective in regulating marrow proliferation. The half-life is 5–6 h and rapidly distributed.[13]

The rise in Hb was faster with iron sucrose use than with OI or IM iron-dextran.[14] In our study, iron sucrose was well accepted and was found to have 13.3% of adverse effects.

CONCLUSION

There was an increase in Hb in the two groups, but there was a significant increase in the Hb in IV iron sucrose groups. The other laboratory parameters also showed a significant increase in Hb in the IV iron sucrose group than in the OI group. The IV group had no major adverse effects. It was concluded from this study that IV iron sucrose was superior to OI in terms of effectiveness than OI for correction of anemia in pregnancy.

ACKNOWLEDGMENT

We would like to thank Dr. Ankita Bist for her help and support in statistical analysis.

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How to cite this article: Savitha A, Saritha H, Deshmukh U, Swetha K. Comparative study of oral iron and intravenous iron sucrose for the treatment of iron-deficiency anemia in pregnancy. Natl J Physiol Pharm Pharmacol 2024;14 (Online First). DOI: 10.5455/njppp.2024.14.04177202401052024

Source of Support: Nil, **Conflicts of Interest:** None declared.