COMPARISON OF FREQUENCY OF ACHIEVING TARGET HEMOGLOBIN LEVELS WITH INTRAMUSCULAR AND INTRAVENOUS IRON THERAPY IN IRONDEFICIENCY ANEMIA OF PREGNANCY

Hurmaira Tahir, NasreenKishawr, Samia Shuja, Bakhtawar Shah

ABSTRACT

Objectives: The objective of this study is to compare the frequency of achieving the target hemoglobin levels with intramuscular and intravenous therapy in iron deficiency anemia of pregnancy.

Material and Methods: A total number of 60 patients with iron deficiency anemia of pregnancy were included after history, examination and laboratory workup. Patients were divided into two groups. Group 1 and 2 each had 30 women. The SPSS version 12 was applied to the data.

Results: Group 1, mean age was 23 ± 4.6 years with the gestational age of 27 ± 5.3 weeks. Group 2, mean age was 25 ± 5.1 years and mean gestational age was 25 ± 4.9 weeks. Mean number of doses of inj. iron sucrose given intravenously to group 1 were 6 ± 1. Mean number of doses of inj. iron sorbitol given intramuscularly to group 2 were 12 ± 0. Intravenous iron sucrose therapy (group 1) acquired better results than the intramuscular iron sorbitol therapy (group 2).

Conclusion:Intravenous iron therapy is more effective than Intramuscular iron therapy in treatment of iron deficiency anemia during pregnancy.

Key Words: Iron deficiency anemia, pregnancy, intravenous iron sucrose, intramuscular iron sorbitol.

INTRODUCTION

Iron deficiency is the most commonly recognized nutritionaldeficit in either the developed or the developing world.[1] The WHO estimates worldwide prevalence of iron deficiency anemia (IDA) among pregnant women is 55.8%.[2] Because the iron requiredfor pregnancy (3–4 mg/d) is substantial, risk of irondeficiency and IDA should increase with gestation.[3] During pregnancy, anemia increases > 4-foldfrom the 1st to the 3rd trimester.[4] In the Camden study prevalence of anemiaincreases > 6-fold from 6.7% (1st trimester) to 27.3% (2nd trimester) to 45.6% in the 3rd trimester.[4] Both iron deficiencyanemia and anemia from other causes were associated with anincreased risks of inadequate weight gain for gestation and preterm delivery. IDA was associated with greaterthan 2-fold increases in the risks of low birth weight and pretermdelivery, while anemia stemming from other causes was associatedwith a only a small increase in risk that was not significant.[4] In the 3rd trimester, IDA remained associated with a 2-fold risk of an inadequateweight gain for gestation whereas risk was not increased forwomen with other anemias.[5] If IDA occurs in late pregnancy, it will result in poor foetal iron stores. Latent iron deficiency known to alter brain iron contents and neurotransmitters irreversibly in foetal life and postnatal babies.[6]

A study conducted in Aga Khan Hospital Karachi which concluded that in 80% patient target Hb% concentration achieved byusing intravenous iron while this concentration achieved in 28% patientwhen intramuscular iron was given.[7]

High prevalence of anemia in pregnant females emphasizes the need for adoption of strict measures for prevention and early treatment of anemia in pregnancy. Management and treatment of maternal and fetal or neonatal morbidity imposes a significant economic burden on the state and the individual. In addition, maternal morbidity and mortality have a considerable impact on the quality of life of the patient and her family. It, therefore, becomes imperative to institute effective mode of treatment to prevent these. This study is designed to find out the most effective and safe mode of treatment of iron deficiency anemia of pregnancy.

MATERIAL AND METHOD

This Randomised control trial was conducted in the department of obstetrics & gynaecology unit II of Jinnah postgraduate medical Centre Karachi, from June 2011 to December 2011.

Sixty women with iron deficiency anemia were enrolled in the study who were equally divided into two groups.

Department of Obstetrics and Gynaecology
JPMC, Karachi

Address for correspondence:
Dr. Humaira Tahir
Department of Obstetrics and Gynaecology
JPMC, Karachi
Cell: 0300-2095228

Group I:receiving intravenous therapy

Group II: receiving intramuscular therapy

Non Probability purposive sampling was done. All pregnant women having singleton pregnancy diagnosed as iron deficiency anemia between 24 weeks and 34 weeks of gestation were included in this study. All other types of anemia and patient with history of reaction to iron therapy were excluded. Pretreatment haemoglobin was 7-10 mg/dl

- Total dose of iron deficit(mg) = o.24xbody weight(kg) xHb deficit (Hb target- Hb initial)
- The deposit iron 15 mg /kg body weight on patient up to 35 kg & 500mg/kg in patient weighing above 35kg.[14]

Patients were admitted during therapy then follow up after 4 weeks with Hb%, serum ferritin and TIBC reports to see the response of therapy in terms of increased haemoglobin concentration. The data was collected on the pre designed proforma. The SPSS version 12 was applied to the data. The quantitative variables like age (years), gestational age (weeks) and hemoglobin were presented by their mean ± S.D values. The comparison of achieving the target haemoglobin from pretreatment (baseline) value to 4 weeks, between the two modes of administration i.e. intravenous and intramuscular was done by chi-square test. Stratification was done with respect to age and parity to see the effect of these variables on out come.

RESULTS

A total number of 60 patients with iron deficiency anemia of pregnancy were studied. Patients were divided into two groups, Group 1 and 2 each had 30 women.Group 1 (30 women) mean age was 23 ± 4.6 years with the gestational age of 27 ± 5.3 weeks. In group 2 (30 women) the mean age was 25 ± 5.1 years and the mean gestational age was 25 ± 4.9 weeks.

Mean number of doses of inj iron sucrose given intravenously to group 1 were 6 ± 1, mean numbers of ampoules were 12 ± 2 and mean duration of treatment was 12 ± 2 days.

Mean number of doses of inj. iron sorbitol given intramuscularly to group 2 were 12 ± 0, mean numbers of ampoules were 12 ± 0 and mean duration of treatment was 24 ± 1 days.

As evident from the results shown in Table, intravenous iron sucrose therapy (group 1) achieved better results than the intramuscular iron sorbitol therapy(group II).

Monitoring done 4 weeks post therapy, showed rise of Hemoglobin from 7.8 ± 1.3 g/dl to 11.8 ± 1.1 g/dl in group 1 by intravenous iron sucrose therapy, as compared to this rise of hemoglobin from 8.8 ±0.9 g/dl to 10.2 ± 1.2 g/dl in group 2 by intramuscular iron sorbitol therapy was seen. Meaning that better response was seen in group 1 vs. group 2 (3.8 vs. 1.4 g/dl).

BASE LINE CHARACTERISTICS

Base line characteristics	Group 1	Group 2
No	30 (50%)	30 (50%)
Age	23 ± 4.6	25 ± 5.1
Gestational age(weeks)	27 ± 5.3	25 ± 4.9
Doses	6 ± 1	12 ± 0
Ampules	12±2 (ampules of 100mg)	12±0 (ampules of 75mg)
Days	12 ± 2	24 ± 1
Hb pre treatment	7.8 ± 1.3	8.8 ± 0.09
Hb post treatment	11.8 ± 1.1	10.2 ±1.2
After 4 weeks Hb	3.8	1.4
Target Hb* achieved	24 (80%)	9 (30%)

*Hb = hemoglobin

In group 1, 80% of patients achieved the target Hemoglobin (11 g/dl) after 4 weeks post therapy, whereas 30% achieved the target Hemoglobin in group 2. Total rise of Hemoglobin was greater in group 1 (3.8 g/dl) in a duration of 4 weeks compared to group 2 (1.4 g/dl). The rise in Hemoglobin was statistically significant in group 1.

DISCUSSION

Our study clearly illustrates the efficacy of iron sucrose. The reason being that iron sucrose consists of polynuclear iron complex analogous to ferritin with apoferritin component replaced by sucrose that is well tolerated and least antigenic and being a large molecule, less than 5% excreted by the kidneys. It is available for erythropoiesis within 5 minutes of infusion and has a 68-97% utilization rate after 2 - 4 weeks since it is stored in reticuloendothelial (RE) cells and not in the parenchymal cells of the body.[8,9] The total iron required is calculated and administered in hospital setting in 3-5 visits, hence full dose administration is confirmed and is convenient to the patient because of limited number of visits. Besides, the goal of iron therapy i.e. to supply sufficient iron to correct hemoglobin deficit as well as to replenish stores is achieved without the need for further iron therapy throughout pregnancy and probably after.

Comparing it with iron sorbitol, which is painful and causes staining, the absorption is unreliable and more than 30% is excreted from the kidneys in 4 hours.

Within this time only a small amount is stored in liver and RE cells while a relatively high fraction of iron complex10 deposits in parenchymal cells of liver, kidney and heart etc. Due to this reason a dose of 1.5 mg/kg cannot be exceeded (compared to 7 mg/kg for iron sucrose). Iron overload can be toxic to cells and can be carcinogenic by inhibiting host defense and providing nutrition to unrestricted tumor cells.[11]

As evident from the study, the practice of prescribing iron sorbitol in a dose of 10 ampoules (75 mg/ampoule) with continuing oral iron therapy throughout pregnancy does not fulfill the goal of iron therapy. It is impractical to check the compliance in these patients and the therapy is cumbersome and prolonged. This correlates with the observation that prevalence of anemia has not changed in the past decade in the developing world mainly due to difficulties in prophylaxis.[12]Another advantage of iron sucrose therapy is its quick response that would indicate its usage in severe anemia as an alternate to blood transfusion.

The advantage of iron sorbitol over iron sucrose is the low cost of therapy. In an attempt to reduce the cost of iron sucrose by Rs. 1300 - 1500, its dose for iron stores was reduced from the recommended 500 mg to 200 mg in this study. It was found that the percentage of patients achieving target hemoglobin of 11 g/dl was 80% in Group 1 and 30% inGroup 2. The cut off value of anemia in pregnancy is 10.5 – 11 g/dl[12].

A study conducted by ZahidHashmi, Ghazala Bashir and colleagues for the comparison of effectiveness of I/V vs I/M showed that target Haemoglobin level achieved in 80% patient who were given I/V while it was achieved in 20% patient given intramuscular iron.[13]

Another study conducted by Wali A, Mushtaq A and Nelofer showed that target hemoglobin level was achieved in 70% of women who were given I/V iron as compared to this only 28% of women achieved the target hemoglobin level who were given I/M.[7]

In our study 80% of women achieved target hemoglobin level who received intravenous iron therapy as compared to this the women who received intramuscular iron therapy only 30% had achieved the target hemoglobin.

In conclusion in the light of results of our study and above mentioned two studies, we found I/V iron therapy superior to I/M iron therapy in its efficacy.

CONCLUSION

Intravenous iron sucrose is safe, more effective and user friendly in the treatment of iron deficiency. It is cost effective when its effectiveness is compared with that of alternate iron therapies and by eliminating the need for blood transfusion and hence transfusion related diseases especially in severe iron deficiency anemia in pregnancy. By achieving hemoglobin level >10 g/dl at the time of delivery, need for blood transfusion in peripartal period (due to hemorrhage) will also automatically decline.

REFERENCES

1. Raja KS, Janjua NB, Khokhar N. Intravenous iron sucrose complex therapy in iron deficiency anaemia in the pregnant women. Rawal Med J.2003;28:40-3.
2. Aikawa R, Jimba M, Nguen KC, Zhao Y, Binns CW, Lee MK. Why do adult women in Vietnam take iron tablets. Bio Med Central.2006;6(144):1-8.
3. Hasan S, Hashimp B, Sultana A. Iron therapy deficiency anaemia in pregnancy: intravenous iron sucrose versus oral iron hydroxide polymaltose complex in anaemia. Ann AbbasiShaheedHosp Karachi Med Dent Coll. 2003;8(2):435-40.
4. Scholl TO. Iron status during pregnancy: setting the stage for mother and infant. Am J ClinNutr. 2005;81(5):1218S-22S.
5. Scholl TO, Hediger ML. Anemia and iron-deficiency anemia: compilation of data on pregnancy outcome. Am J Clin Nutr.1994;59(suppl):492S–501S.
6. Agarwal KN, Agarwal DK, Sharma A, Sharma K, Prasad K, Kalita MC, et al. Prevalence of anaemia in pregnant and lactating women in India. Indian J Med Res. 2006;124:173-84.
7. Wali A, Mushtaq A, Nilofer. Comparative study efficacy, safety and compliance of intravenous iron sucrose and intramuscular iron sorbitol in iron deficiency anaemia of pregnancy. J Pak Med Assoc.2002;52:392-5.
8. Johnson CA. [ntravenons iron products, ANNA J. 1999;26:522-24.
9. Seshara S, Llndqvist H, Sundin J. Kinetic analysis of Fe laheled iron sucrose. Sr, 1.Hematol., 1999;104:288-95.
10. Breymann C, Major A, Richter C. rhEPO and parenteral iron in the treatment of pregnancy anemia: a Pilot Study. J Perinat Med.1995;23:89-98.
11. Hashmi Z, Bashir G, Azeem P, Shah S. Effectiveness of I/V iron sucrose complex vs I/M iron sorbitol in IDA. Ann Pak Inst Med Sci.2006;2(3):188-91.
12. Kulnigg S, Stoinov S, Simanenkov V, Dudar LV, Karnafel W, Garcia LC, et al. A novel intravenous iron formulation for treatment of anemia in inflammatory bowel disease: the ferric carboxymaltose (FERINJECT) randomized controlled trial. Am J Gastroenterol.2008;103(5):1182-92.
13. Hashmi Z, Bashir G, Azeem P, Shah S. Effectiveness of I/V iron sucrose complex vs I/M iron sorbitol in IDA. Ann Pak Inst Med Sci.2006;2(3):188-91.
14. Johnson CA. [ntravenons iron products, ANNA J. 1999;26:522-24.