Original Article

Comparison of Outcome of Two Injectable Iron Therapies In Postpartum Iron Deficiency Anemia

Khaula Khatoon and Irum Inam

Objective: The objective of the study is to compare the efficacy and evaluate safety of two injectable iron therapies given during postpartum period (intravenous versus intramuscular) in improving postpartum anemia. The objective of the study is to compare the efficacy and evaluate safety of two injectable iron therapies given during postpartum period (intravenous versus intramuscular) in improving postpartum anemia.

Material and Methods: Post-operative and postnatal wards of Gynae Department Jinnah Hospital, Lahore. It was randomized controlled trial with non-probability purposive sampling. The duration of study was for Six months.

Results: The comparison of investigations (Hb, MCV, Hematocrit, & ferritin) in both groups was carried out on admission, day 15, day 40 after treatment. The study revealed that intravenous iron sucrose complex was more effective in increasing Hb, MCV, Hematocrit, & Ferritin levels with significantly less complications as compared intramuscular iron sorbitol citrate.

Conclusions: Intravenous iron sucrose is more effective in improving post-partum anemia and having less complications as compare to intramuscular iron sorbitol citrate.

Keywords: Post partum anemia, Iron deficiency anemia, treatment.

Introduction

Occurrence of post partum anemia is not unusual[1,2]. Iron deficiency anemia, defined by the World Health Organization as a hemoglobin(Hb) less than 12 g/dL, is the most common cause of anemia in the postpartum period, with rates as high as 37% reportedin the first postpartum week.[2,3] One in 8 American women are iron deficient up to 12 months postpartum, and 1in 12 women remain iron deficient 13-24 months after delivery.[2] Postpartum anemiais caused primarily by inadequate iron intake prior to and during pregnancy and by peripartum blood loss[4,5] Postpartum anemia has been associated with postpartum depression, stress, anxiety, cognitive impairment,[2,6]poor mother-infant interactions, and delayed infant development.[7]Infants of mothers with iron deficiency anemia have lower developmental test scores at 10 weeks, and these developmental deficits in infants of iron deficient mothers have been shown to persist at 9 months of age, even after correction of maternal iron status.[7]

Material and Methods

This is hospital based study of six months duration on 100 patients 50 cases in each group(A&B). Post-operative and postnatal wards of gynae department Jinnah Hospital, Lahore.

Inclusion Criteria: Child bearing age women (15 to 45 years) who delivered singleton baby of any parity. Post partum anemia identified on Complete Blood examination with haemoglobin level less than 8gm/dl at 24-48 hours of delivery.

Exclusion Criteria: History of transfusion during labor or regular intake of iron supplements during pregnancy. Having history, examination or concerned laboratory investigations of any co-morbidity like infections, sepsis, renal or hepatic disease to rule out hemo-concentration, anemia secondary to renal and hepatic failure which have a different etiology and treatment as compared to postpartum anemia being studied.

Data Collection Procedure: All the patients of iron deficiency anemia fulfilling the inclusion criteria was selected from postnatal and post operative gynae ward department of Jinnah Hospital, after 24 hours of delivery. Patients were divided in two groups, group A and group B randomly by using random table number. Group-A was treated by intravenous and group B patients were treated with intramuscular iron. An informed consent was obtained for treating them for either method and using their data in the study. They were also informed that there was no health hazard involved. Both groups-A&B patients were counseled about the disadvantages of intramuscular iron like: nausea, vomiting, pain, skin discoloration, abscess formation and anaphylaxis. They were treated by intravenous iron sucrose

administered were calculated by the following formula. Weightx (target haemoglobin-actual haemoglobin x0.24+500mg). Iron sucrose was administered as an infusion in 100ml 0.9% sodium chloride solution for 30 minutes after test dose and no further supplementation was given. In Group-B patients was treated with iron sorbitol citrate iron deficient was calculated as: Elemental iron needed (mg)=(normal Hb-patients Hb)x weight (Kg)x2.21 X1000. Initially a test dose of 50mg of iron sorbitol citrate was given followed by 1000mg daily or alternate days by deep intramuscular injection. It was to be given on the outer quadrant of the buttocks using a, Z, technique to prevent dark staining of the skin. Inj. epinephrine, hydrocortisone and oxygen was available in the event of anaphylactic reaction. The investigation like Hb% and serum ferritin (mcg/L) was carried out on follow up on day 15 & day 40 after treatment of both groups. On follow-up any side effect if observed was also recorded. The response of patients in each group in terms of time taken by these injectable modalities to achieve target Hemoglobin of 11g/dl and ferritin level of 15 microgram/l and their maximum level achieved.

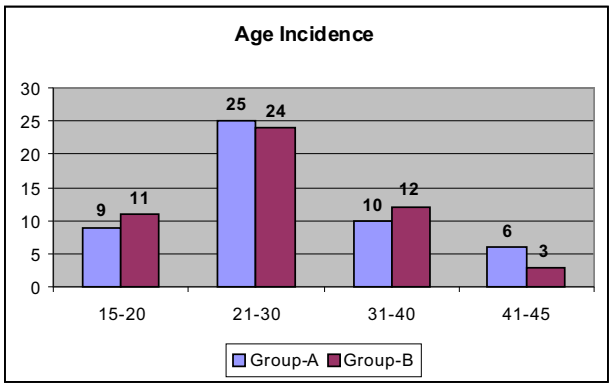
Similarly any side effect like nausea, vomiting, pain, skin discoloration, abscess formation and anaphylactic reaction if happens in both groups was taken care of and recorded. On history findings like socio-economic status (low or middle), parity/duration of marriage, last menstrual period, on examination findings like pallor, dyspnea, palpitation, fatigue/lethargy & mode of delivery and on investigation red cell indices (MCV, MCH, MCHC) & peripheral blood smear was also recorded for both groups on initially and follow-ups. All this information was recorded through a specifically designed proforma .

Data Analysis Procedure: Among the study variables, outcome variables were variables of interest. They were hemoglobin and serum ferritin. Both were quantitative variables. Other quantitative variable include red cells indices (MCV, MCH and MCHC). These were described by finding their means and standard deviation on admission and post therapy day 15 & day 40 of post-partum for both groups. Qualitative variables like age range, parity/duration of marriage, socio-economic status (low or middle) and intake of iron before or during pregnancy, findings like pallor, dyspnoea, palpitation, fatigue/lethargy, mode of delivery and side effects were described in frequencies and proportions. Outcome variables like increase in haemoglobin and ferritin level was recorded and compared between two treatment regimens, any difference found in two regimens was tested for statistically significance by applying student t test.

A P value of ≤0.05 was taken as significant. While background variables like socio-economic status (low or middle), parity/duration of marriage, findings like pallor, dyspnea, palpitation, fatigue/lethargy & mode of delivery was also be cross-tabulated for both groups.

Results

In this study, a total of 100 patients were recruited after fulfilling the inclusion/exclusion criteria to compare the outcome of two injectable modalities of



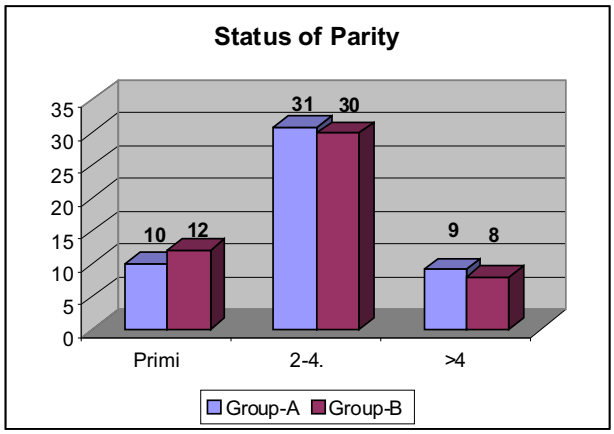


Table-3: Comparison of investigations in both gro-ups (on admission).

Investigations	Group-A Values in Mean	Group-B Values in Mean
Hb	7.2±0.1	7.2±0.1
MCVf	70	71
Hematocrit	26	27.5
Ferritin	11	12.5

Table-1: Age distribution of the subjects.

Age in years	Group-A (n=50) Number of case	Percentage	Group-B (n=50) Number of case	Percentage
15-20	09	18	11	22
21-30	09	18	24	48
31-40	09	18	12	24
41-50	06	12	03	06
Mean and S.D.	27.22±0.38		26.34±0.47	
Total	50	100	50	100

Table-2: Status of parity .

Age in years	Group-A (n=50) Number of case	Percentage	Group-B (n=50) Number of case	Percentage
Primi	10	20	12	24
2-4	31	62	30	60
>4	09	18	08	18
Total	50	100	50	100

Table-4: Comparison of investigations in both groups (day 15)

Investigations	Group-A Values in mean	Group-B Values in mean	P-value
Hb	9.2±0.11	709±0.42	<0.05
MCVf	80	72	<0.05
Hematocrit	33	29	<0.05
Ferritin	46	12	<0.05

Table-5: Comparison of investigations in both groups (day 40)

Investigations	Group-A (n=50) Values in mean	Group-B (n=50) Values in mean	P-value
Hb	11.49±0.08	11.17±0.040.42	<0.05
MCVf	86	75.5	<0.05
Hematocrit	35	31.8	<0.05
Ferritin	42.2	15	<0.05

Table-6: Comparison of side effects in both groups .

Side Effects	Group-A (n=50) Number of case	Percentage	Group-B (n=50) Number of case	Percentage
Yes	05	10	13	26
No	45	90	37	74
Total	50	100	50	100

iron the therapy given during postpartum period (intravenous versus intramuscular) in improving postpartum anemia and to compare which one is having less side effects between these two injectable modalities of iron therapy. In this research, majority of the patients were found between 21-30 years of age in both A & B groups, **table-I & fig-I** are showing the age distribution of patients. **Fig-2** & **table-2** shows status of parity, most of the patients in both groups were having parity between 2-4.The comparison of investigations in both groups (on admission) is computed, in **table-3** and value are recorded in mean. The comparison of investigations in both groups at day 15 after treatment with value in mean and their P value is shown in **table-4. Table-5** is indicating the comparison of investigations in both groups (A&B) at day 40 the values are in mean & with their P value. **Table-6** is regarding comparison of adverse effects of both drugs. It is in percentage. It revealed that 90% of group A and 74% of group B patients have no complications. Hence complications is statistically in significant (P Value=<0.05)

Discussion

Iron deficiency during pregnancy and postpartum could be due to insufficient absorption and to increased needs resulting to chronic iron deficiency and anemia.[8] It is the most common nutritional deficiency worldwide. It can cause reduced work capacity in adults[8] and impact motor and mental development in adolescents.[9]The human body does not have a mechanism of getting rid of extra iron amount and the mechanism of iron absorption plays a crucial role in iron homeostasis.[2] During pregnancy the needs for iron are increased due to the fetus, the placenta and the increased volume of maternal erythrocytes. Women in the reproductive age frequently have anemia and iron deficiency due to menstrual loss. Frequently these women are already anemic by the time they get pregnant.[10,11]

Treatment of IDA has included oral iron, intramuscular iron, iron dextran, ISC, recombinant erythropoietin and blood transfusion.[12] However, most of these have their disadvantages. Even patients who respond well to oral iron therapy require a long time(months) to reach target Hb compared with weeks required in case of treatment with ISC. The compliance is always a problem and to improve this, even iron-rich natural mineral water has been tried to treat IDA in pregnant women.[13] The use of intramuscular iron preparations in IDA is also discouraged because of pain, irregular absorption and staining. In cases of iron deficiency anemia the combination of iron supplementation and erythropoietin is not preventing iron loss and is not increasing the endogenous erythropoiesis. On the contrary high iron levels in plasma circulation after simultaneous intravenous administration of iron and erythropoietin, is essential for stimulation of erythropoiesis.[14] Intravenous iron treatment is indicated for patients with poor compliance in oral supplementation, in cases with poor iron absorption (bowel operations, or diseases),in patients with severe renal impairment, and in postpartum hemorrhage.[15,16] Recent evidence suggest that iron sucrose can be detected in high levels in the liver circulation and marrow within 5 minutes after intravenous administration. The time interval is 5 to 6 hours and the renal metabolism is minimal, less than 5% of the total dose. These data lead to the conclusion that iron sucrose is metabolically available in only a few hours after administration. This way iron is engaged exclusively from the reticulate liver cells, transferrin and apoferritin in the marrow and spleen. Then it is quickly metabolized and itis available for erythropoies is and inversion of anemia.[17] In our study after five weeks iron sucrose there was complete reversal of anemic status in all women of group A. In group B there was improvement of anemia which was not as significant as in group A, though. It is already known that intravenous administration of excessive dose of iron might cause liver necrosis, renal, suprarenal and pulmonary damage. The presence of iron sucrose in the plasma circulation is associated with absence of any undesirable effect to the patients. This absence of side effects is partly due to the lower allergenic effect of the sucrose complex because of the very slow release of elementary iron from the complex.[17,18]Also the accumulation of iron-sucrose in organic parenchymais much lower compared to iron-dextransand iron-gluconate.[18,19] In addition, incorporation into the bone marrow for erythropoiesis is faster than othercomplexes,[17,19] Rare anaphylactic reactions because of the use of iron sucrose have been reported in about0.002% of cases.[18] Our study showed that iron sucrose complex can be used in the post partum anemia patients and effective in increasing Hb, MCVf, Hematocrit and ferritin level with significantly less complications as compare to intramuscular iron sorbitol citrate. Our study is also confirmed by a local study conducted by Ahmed K, Sadiq I, Yousuf AW[20] who were intended to evaluate the efficacy, side effects and cost-

The already in use intramuscular iron therapy, iron sorbitol and concluded that iron sucrose therapy is expensive but has better compliance, on the other hand, intramuscular therapy is economical and effective but not more than intravenous therapy.

Conclusion

Intravenous iron sucrose is effective in improving Hb, MCV, Hematocrit and ferritin during post-partum anemia and having less complications as compare to intramuscular iron sorbitol citrate.

Department of Gyae and Obst.
Jinnah Hospital, Lahore
www.esculapio.pk

References

1. Pavord S, Myers B, Robinson S, Allard S, Strong J, Oppenheimer C, et al. UK guidline on the management iron deficiency in pregnancy. Br J Haematol 2012; 156:588-600.
2. Bodnar LM, Cogswell ME, McDonald T. Have we forgotten the significance of postpartum iron deficiency? Am J Obstet Gynecol 2005;193:36-44.
3. Bodnar LM, ScanlonKS, Freedman DS, Siega-Riz AM, Cogswell ME. High prevalence of postpartum anemia among low-income women in the United States. Am J Obstet Gynecol 2001;185:438-43.
4. Ahmed K, Saqid I, Yousuf AW. Injectable iron therapy: intramuscular vs. intravenous therapy. Biomedics 2000;16:44-7.
5. Pernoll ML. Iron deficiency anemia. In: Pernoll ML (ed). Benson and Pernoll's handbook of obstetrics and gynecology 10th ed. Columbus (OH): The McGraw-Hill Companies, Inc; 2001 p. 435-7.
6. James A, Patel S, Dinh Q. Impact of anemia on medical resource utilization and hospital cost in women with obstetrical bleeding. Blood 2007;110:5168
7. Beard JL, Hendricks MK, Perez EM. Maternal iron deficiency anemia affects postpartum emotions and cognition. J Nutr 2005; 135:267-72.
8. Perez EM, Hendricks MK, Beard JL. Mother-infant interactions and infant development are altered by maternal iron deficiency anemia. J Nutr 2005;135:850-5.
9. MomenAK, Meshari A, Nuaim L. Intravenous iron sucrose complex in the treatment of iron deficiency anemia during pregnancy. Reprod Biol 1996; 69: 121-4.
10. Ragip A, Unlubilgin E, Kanderim O, Yalvac S, Cakir L, Haberal A. Intranenous versus oral iron treatment of anemia in pregnancy:a randomized trial Obst Gynecol 2005; 106: 1335-40.
11. Breymann C. Modern therapy concepts of severe anemia in pregnancy and postpartum. Prevention and management of anemia in pregnancy and postpartum hemorrhage. Schellenberg Druck AC, Zurich, Switzerland 1998; pp.107-21.
12. Danielson B, Geisser P, Schneider W. Iron therapy with special emphasis on intravenous administration. 1SBN3 1996; 85819: 223-6.
13. Breymann C; Anemia working group. Current aspects of diagnosis and therapy of iron deficiency anemia in pregnancy. Schweiz Rundsch Med Prax 2001; 90: 1283-91.
14. McKenna D, Spence D, Haggan SE, McCrum E, Dornan JC, Lappin TR. A randomized trial investigating an iron-rich natural mineral water as a prophylaxis against iron deficiency in pregnancy. Clin Lab Hematol 2003; 25: 99-103.
15. Messer J, Escande B, Matis J. Erythropoietin and iron in the anemia of prematurity. TATM 1: 15-17
16. 11. Breymann C. Treatment of iron deficiency anaemia in pregnancy and postpartum with special focus on intravenous iron sucrose complex. J Med Assoc Thai 2005; 88: 108-109
17. 12. Gravier A, Descargues G, Marpeau L. Comment eviter les transfusions dans le post-partum interet d' une supplementation martiale par voie intraveineuse. J Gynecol Obstet Biol Reprod 1999; 28: 77-78.
18. Petewusnyk G, Huch R, Huch A, Breymann C. Parenteral iron therapy in obstetrics: 8 years experience with iron-sucrose complex. Br J Nutr 2002; 88: 3-10.
19. 14. Bailie G, Clark J, Lane CE, Lane PL. Hypersensitivity reactions and deaths associated with intravenous iron preparations. Nephrol Dial Transplant 2005; 20: 1443-1449.
20. Krafft A, Perewusnyk G, Hanseler E, et al. Effect of post partum iron supplementation on red cell and iron parameters in nonanaemic irondeficient women: a randomized placebo-controlled study. BJOG 2005; 112: 445-450.
21. Ahmed K, Sadiq I, Yousuf AW. Injectable Iron Therapy: Intramuscular vs Intravenous Therapy. Biomedica 2000;16:44-7.