Original Article

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Iron Sucrose versus Ferric Carboxymaltose: Effectiveness in Treatment of Postpartum Anaemia following Caesarian Section

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ABSTRACT

Background: *Postpartum anemia is a leading cause of maternal mortality and morbidity throughout the world, particularly in developing countries.The most common causes of postpartum anemia are antepartum iron deficiency anemia and blood loss during childbirth. Treatment of anemia with ferric carboxymaltose during labor can considerably reduce maternal and newborn morbidity. The aim of the study is to compare the effectiveness of iron sucrose and ferric carboxymaltose in the treatment of postpartum anaemia following caesarian section.*

Materials and methods: *A comparative cross-sectional study was carried out among the 234 outdoor patients of the Department of Obstetrics and Gynecology at Sheikh Hasina Medical College Hospital, Tangail during the period from July 2017 to June 2020.*

Results: *The pre-transfusion mean of hemoglobin level was 8.9±0.5 gm/dl and the post-transfusion mean of hemoglobin level was 10.4±0.4 gm/dl in group A. The pre-transfusion mean of hemoglobin level was 8.7±0.7 gm/dl and the post-transfusion mean of hemoglobin level was 11.0±0.4 gm/dl in group B. The mean of increased hemoglobin level was 1.5±0.4 gm/dl and 2.3±0.5 gm/dl respectively in both groups. The pre-transfusion mean of ferritin level was 46.3±16.1 ng/mL and the post-transfusion mean of ferritin level was 171.5±25.8 ng/mLin group A. The pre-transfusion level was 46.5±16.2 ng/mL and the post-transfusion mean ferritin level was 196.2±24.9 ng/mLin group B. The mean of increased ferritin level was 125.2±22.2 ng/mL and 149.0± 20.5 ng/mL respectively in both groups. These differences were statistically significant within the study groups (p<0.05).*

Conclusions: *The study revealed that serum ferritin levels increased significantly in the FCC group than ISC group.Ferric carboxymaltose are more effective and safe for the treatment of iron deficiency anemia in postpartum patients.*

Key words: Ferric carboxymaltose; Iron sucrose; Labor; Postpartum anemia.

Introduction

Anemia is a condition in which hemoglobin, hematocrit and erythrocyte levels are below normal.[1] World Health Organization (WHO) defines postpartum anemia as a hemoglobin level of less than 10gm/dl during the postpartum period.[2] Hemodilution, pregnancy-related iron deficiency anemia, antepartum and postpartum haemorrhage are the main causes of postpartum anemia.[3]

Postpartum anemia is most common in developing nations, where the prevalence ranges from 50 to 80%.[4] It is one of the commonest puerperal complications after delivery and role a significant factor in maternal morbidity and mortality.[5] According to WHO estimates, iron deficiency anemia is directly or indirectly responsible for 115,000 maternal deaths and 591,000 perinatal deaths worldwide.[6] Improved quality of life of women in childbearing periods will result from adequate and prompt treatment of anemia during the postpartum period.[7]

Patients who are in the puerperium and have iron deficiency anemia usually need substantial amounts of iron.[8] Additionally, after a surgical operation like a caesarean section, an inflammatory response can happen, which can cause iron sequestration in macrophages and the demand for iron increases.[9] While blood transfusions are a potential for more severe cases of anemia, several preparations of iron supplements have been utilized to treat iron deficiency anemia.

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Although the oral iron supplementation raises hemoglobin levels satisfactorily, sign symptoms such as nausea, diarrhea and gastritis tend to reduce compliance. With a positive outcome, intravenous iron preparation has been used to treat iron deficiency anemia, enabling patients to avoid blood transfusions and the side effects of the oral preparation.[9] Iron sucrose and ferric carboxymaltose are two intravenous iron formulations that are commonly used in the treatment of postpartum anaemia following caesarian section.[10] The aim of the study is to compare the effectiveness of iron sucrose and ferric carboxymaltose in the treatment of postpartum anaemia following caesarian section.

Materials and methods

This comparative cross-sectional study was carried out during the period July 2017 to June 2020 in the Department of Obstetrics & Gynecology at Sheikh Hasina Medical College Hospital, Tangail.

Data were collected from the conveniently selected 234 postpartum anemic patients through face-to-face interviews with a pretested semi-structured questionnaire. Postpartum anemic patients following caesarean section who had hemoglobin levels 7-10 gm/dl were included in this study. Patients with other than iron deficiency anemia having thalassemia or sickle cell disease who received a blood transfusion, having postpartum hemorrhage and history of parenteral Iron therapy were excluded from this study.

The study population was categorized equally into two groups- Group A and Group B. In Group A, 117 cases received intravenous Iron Sucrose Complex (ISC) as 200 mg elemental iron in 100 ml of 0.9% normal saline and infused over 30 minutes at every alternate day up to 5 doses. A maximum of 600 mg of iron sucrose was given per week. In Group B, 117 cases received intravenous injections of Ferric Carboxymaltose Complex (FCC) as a fixed dose of 1000mg in 250 ml normal saline over 15 minutes. Patients were observed for any side effects like headache, nausea, vomiting, pain and burning at the injection site, rigor, fever, tingling sensation, itching or any other side effect for 1 hour after iron therapy. On enrollment, a detailed clinical history, previous history of iron therapy, compliance with oral iron and chronic medical illness were taken. A complete examination was done. Hemoglobin, serum ferritin and peripheral blood smear for cell morphology were done before administering the iron injection. Repeated hemoglobin and ferritin levels were done after 2 weeks from the last dose of iron injection. Informed consent was taken from all patients before recruitment into the study.

The collected data were sorted, cleaned, kept up with precision and protected for factual examination by using SPSS v23. The quantitative data were analyzed descriptively such as mean, standard deviation and percent and comparison was done between groups by unpaired t-test. A p-value of <0.05 at a 95% confidence interval was taken as significant. The results were presented in tables and charts.

Participation was voluntary and confidentiality was maintained and informed written consent was taken from each woman. The study was validated by the ethical committee of the Sheikh Hasina Medical College, Tangail, Bangladesh. (Reference: SHMCT/EB/2021/02).

Results

A total of 234 postpartum women with iron deficiency anemia were included in this study where 117 patients were treated with iron sucrose categorized as group A and 117 patients were treated with ferric carboxymaltose categorized as group B equally.

Table I depicts the age and parity of both groups of women. The mean age of the participant was 25.1±4.9 years and 24.8±4.6 years respectively in both groups A and B. The mean of the woman's parity was 1.6±0.7 and 1.6±0.6 respectively in both groups A and B. There was no statistically significant difference found within the age and parity of the study groups ($p>0.05$).

Figure 1 portrays that, the majority of the women (87.2% and 86.3%) age was 30 years respectively in both groups A and B.

Figure 2 illuminates that, the majority of the women (92.3% and 94.0%) had a history of 2 parity respectively in both groups A and B.

Table II denotes the association of the patient's hemoglobin level in pre- and post-transfusion. In group A, the pre-transfusion mean of hemoglobin level was 8.9±0.5 gm/dl and the post-transfusion mean of hemoglobin level was 10.4±0.4 gm/dl. The difference was statistically significant within the study groups ($p<0.000$). In group B, the pre-transfusion meal of hemoglobin level was 8.7±0.7 gm/dl and the post-transfusion mean of hemoglobin level was 11.0±0.4 gm/dl. The difference was statistically significant within the study groups ($p<0.000$).

Table III denotes the association of the patient's ferritin level in pre- and post-transfusion. In group A, the pre-transfusion mean of ferritin level was 46.3±16.1 ng/mL and the post-transfusion mean of ferritin level was 171.5±25.8 ng/mL. The difference was statistically significant within the study groups ($p<0.000$). In group B,

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the pre-transfusion level was 46.5±16.2 ng/m and the post-transfusion mean ferritin level was 196.2±24.9 ng/mL. The difference was statistically significant within the study groups (p<0.001).

Table IV denotes the association of the patient's hemoglobin and ferritin levels after the post-transfusion state. The mean of increased hemoglobin level was 1.5±0.4 gm/dl and 2.3±0.5 gm/dl respectively in the group A and B. There was a statistically significant difference found within the study groups (p<0.00). The mean of increased ferritin level was 125.2±22.2 ng/mL and 149.0± 20.5 ng/mL respectively in both groups A and B. There was a statistically significant difference found within the study groups (p<0.00).

Table V demonstrates the adverse effects of infusion within both groups. The most common adverse reactions were pain in the injection site (6.8% and 5.1%) in both groups. Other reactions were itching with rash, headache, nausea and vomiting, burning at the injection site and tingling sensation occur very less in both groups. None of the women had developed rigor, diarrhea tingling sensation, hypotension and hypertension.

Table I Association of the patient's age and parity within the study groups (n=234)

Traits	Study groups		p-value
	Group A	Group B	
	Mean±SD	Mean±SD	
Age (Years)	25.1±4.9	24.8±4.6	0.547
Parity	1.6±0.7	1.6±0.6	0.547

Unpaired 't' test was done.

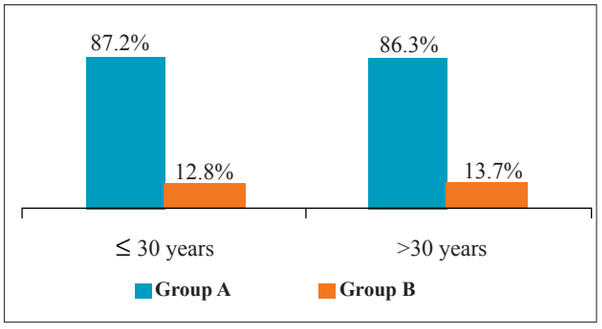

Figure 1 Patient's age of the study groups (n=234)

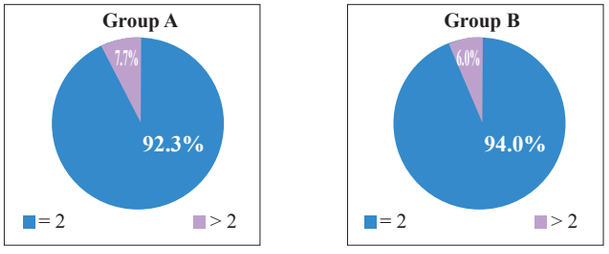

Figure 2 Patient's parity of the study groups (n=234)

Table II Pre and post transfusion variation of the patient's hemoglobin level within the study groups (n=234)

Study group	Hemoglobin level(gm/dl)		p-value
	Group A	Group B	
	Mean±SD	Mean±SD	
Group A	8.9±0.5	10.4±0.4	*0.00
Group B	8.7±0.7	11.0±0.4	*0.00

Unpaired 't' test was done, *Statistically significant value.

Table III Pre and Post transfusion variation of the patient'sferritin levelwithin the study groups (n=234)

Study group	Ferritin level (ng/mL)		p-value
	Group A	Group B	
	Mean±SD	Mean±SD	
Group A	46.3±16.1	171.5±25.8	*0.00
Group B	46.5±16.2	196.2±24.9	*0.00

Unpaired 't' test was done, *Statistically significant value.

Table IV Comparison of changes of the patient's hemoglobin and ferritin level after transfusion within the study groups (n=234)

Post-transfusion state	Study groups		p-value
	Group A	Group B	
	Mean±SD	Mean±SD	
Hemoglobin level (gm/dl)	1.5±0.4	2.3±0.5	*0.00
Ferritin level (ng/mL)	125.2±22.2	149.0± 20.5	*0.00

Unpaired 't' test was done, *Statistically significant value.

Table V Adverse effects within the study groups (n=234)

Adverse effects	Study groups	
	Group A	Group B
	n(%)	n(%)
Pain at injection site	8(6.8)	6(5.1)
Itching with rash	5(4.3)	3(2.6)
Headache	3(2.3)	2(1.7)
Nausea and vomiting	2(1.7)	1(1.7)
Burning sensation at injection site	3(2.6)	1(0.9)
Tingling sensation	2(1.7)	2(1.7)

*Multiple responses.

Discussion

The mean age of the participant was 25.1±4.9 years and 24.8±4.6 years respectively in both groups A and B.A study by Lunagriya M et. al. reported that their study population mean age was 24.4 years and another clinical trial by Breymann C et. al. found that study sample mean age was 27.7years.[11,12] These findings were similar to this study.

In this study, the pre-transfusion mean of hemoglobin level was 8.9±0.5 gm/dl and the post-transfusion mean

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of hemoglobin level was 10.4±0.4 gm/dlin group A. The pre-transfusion meal of hemoglobin level was 8.7±0.7 gm/dl and the post-transfusion mean of hemoglobin level was 11.0±0.4 gm/dl in group B. These differences were statistically significant within the study groups ($p<0.05$). The mean of increased hemoglobin level was 1.5±0.4 gm/dl and 2.3±0.5 gm/dl respectively in both groups. It was revealed that hemoglobin concentration was effectively increased in both groups ($p<0.05$), but in the FCC group increased more effectively. Singh et. al.in their study on 200 postpartum patients with anemia observed that a significantly higher number of women achieved Hb>11gm/dl in FCC group, 88 women FCC group achieve Hb rise of 2gm as compared to only 24 in the ISC group on the 21st day after therapy, which was highly significant ($p<0.001$) and the mean rise of Hb was 2.086 gm for the FCC group and 1.8 gm for the ISC group, which was significant.[13] The mean of increased hemoglobin level was found more in the FCC than ISC groups which were almost similar to the studies.[12,14,15]

In the present study,the pre-transfusion mean of ferritin level was 46.3±16.1 ng/ml and the post-transfusion mean of ferritin level was 171.5±25.8 ng/ml in group A. The pre-transfusion level was 46.5±16.2 ng/ml and the post-transfusion mean ferritin level was 196.2±24.9 ng/ml in group B. The mean of increased ferritin level was 125.2±22.2 ng/ml and 149.0± 20.5 ng/ml respectively in both groups. These differences were statistically significant within the study groups ($p<0.05$). These studies revealed that serum ferritin levels increased significantly in the FCC group than ISC group, which was similar to present study findings.[12,16,17]

Regarding the adverse effects of infusion in both groups were mild. The most common adverse reactions were pain in the injection site. Other reactions were itching with rash, headache, nausea and vomiting, burning at the injection site and tingling sensation occur very less in both groups. In this study, FCC is better and more rapid in improving Hb concentration and replenishing iron stored in postpartum anemia. This can be given in large doses in a short period and in the outpatient department. Overall incidences of side effects were found lower in the FCC group than iron sucrose group.[18-21]

Conclusion

From the study, it can conclude that FCC was more effective in improving hemoglobin concentration and rapid replenishment of iron stores in postpartum anemia and lesser side effect than iron sucrose. FCC is better than ISC. FCC can be used to treat postpartum iron deficiency anemia, which saves time, reduces hospital stays and can be given in high doses within short times.

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Disclosure

All the authors declared no competing interest.

References

1. Eisenstaedt R, Penninx BW, Woodman RC. Anemia in the elderly: current understanding and emerging concepts. Blood reviews. 2006;20(4):213-226.

2. Kousher S, Kouser S, Malik M, Malik A. Safety of intravenous iron therapy in postnatal patient iron deficiency anaemia. Journal of South Asian Federation of Obstetrics and Gynaecology. 2011;3:25-27.

3. Pavord S, Myers B, Robinson S, Allard S, Strong J, Oppenheimer C, British Committee for Standards in Haematology. UK guidelines on the management of iron deficiency in pregnancy. British Journal of Haematology. 2012;156(5):588-600.

4. Milman N. Postpartum anemia I: Definition, prevalence, causes and consequences. Annals of Hematology. 2011;90:1247-1253.

5. Potts M, Campbell M. Three meetings and fewer funerals- misoprostol in postpartum haemorrhage. The Lancet. 2004;364(9440):1110-1111.

6. Ezzati M, Lopez AD, Rodgers A, Murray CJ. Comparative quantification of health risks. Global and regional burden of disease attributable to selected major risk factors. Geneva: World Health Organization. 2004:1987-1997.

7. Beard J, Hendricks M, Perez E, Murray-Kolb L, Berg A, Vernon-Fegans L. Maternal iron deficiency affects postpartum emotion and cognition. The Journal of Nutrition. 2005;135:267-272.

8. Somdatta P, Reddaiah VP, Singh B. Prevalence of anaemia in the postpartum period: A study of a North Indian village. Tropical Doctor. 2009;39(4):211-215.

9. Silverstein SB, Rodgers GM. Parenteral iron therapy options. American Journal of Hematology. 2004;76(1):74-78.

10. Covic A, Mircescu G. The safety and efficacy of intravenous ferric carboxymaltose in anaemic patients undergoing haemodialysis: A multi-centre, open-label, clinical study. Nephrology Dialysis Transplantation. 2010;25(8):2722-2730.

11. Lunagariya M,Kanaklatta D,Nakum, Vithal A, Patel J, Petal M. Iron Sucrose Vs Ferric Carboxymaltose: In Search of Better Treatment Option in case of Post-Partum Iron Deficiency Anaemia. International Journal of Contemporary Medical Research. 2018;5(1):2454-2479.

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12. Breymann C, Krafft A. Treatment of iron deficiency anemia in pregnancy and postpartum. Transfusion Alternatives in Transfusion Medicine. 2012;12(34):135-142.

13. Singh S, Dhama V, Chaudhary R, Singh P. Comparing the safety and efficacy of intravenous iron sucrose and intravenous ferric carboxymaltose in treating postpartum anemia. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2016;5(5):1451-1457.

14. Verma U, Singh S, Chandra M, Chandra M, Garg R, Singh S, Rajvansh R. To evaluate the efficacy and safety of single dose intravenous iron carboxymaltose verses multidose iron sucrose in postpartum cases of severe iron deficiency anemia. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2015;4(2):442-446.

15. Patel J, Petal K, Patel J, Sharma A, Date SK. Comparison of Intravenous Iron Sucrose and Ferric Carboxymaltose Therapy in Iron Deficiency Anemia during Pregnancy and Postpartum Period. Journal of Pharmaceutical Science and Bioscientific Research.2015;5:239-243.

16. Christoph P, Schuller C, Studer H, Irion O, De Tejada BM, Surbek D. Intravenous iron treatment in pregnancy: Comparison of high-dose ferric carboxymaltose vs. iron sucrose. Journal of Perinatal Medicine. 2012;40(5):469-474.

17. Froessler B, Collingwood J, Hodyl NA, Dekker G. Intravenous ferric carboxymaltose for anaemia in pregnancy. BMC Pregnancy and Childbirth. 2014;14(1):1-5.

18. Sharma N, Thiek JL, Natung T, Ahanthem SS. Comparative study of efficacy and safety of ferric carboxymaltose versus iron sucrose in post-partum anaemia. The Journal of Obstetrics and Gynecology of India. 2017;67:253-257.

19. Hussain I, Bhoyroo J, Butcher A, Koch TA, He A, Bregman DB. Direct comparison of the safety and efficacy of ferric carboxymaltose versus iron dextran in patients with iron deficiency anemia. Anemia. 2013;2013.

20. Friedrisch JR, Cancado RD. Intravenous ferric Carboxymaltose for the treatment of iron deficiency. Revista Brasileira de Hematologia e Hemoterapia. 2015;37(6):400-405.

21. Rathod S, Samal SK, Mahapatra PC, Samal S. Ferric carboxymaltose: A revolution in the treatment of postpartum anemia in Indian women. International Journal of Applied and Basic Medical Research. 2015;5(1):25.