**Original Research Article**

**Comparison Between the Effectiveness of Intravenous Infusion and Oral Iron Treatment of Postpartum Iron Deficiency Anemia**

**Abstract**

**Background:** Postpartum iron deficiency anemia remains a significant public health concern globally, specifically concerning women in low-and middle-income countries. In South Asia, involving Bangladesh and India, the prevalence is frighteningly extreme due to factors such as poor nutritional status, frequent pregnancies, and inadequate access to quality postpartum care. **Aim:** To find out the association between the effectiveness of intravenous infusion and oral iron therapy in the treatment of postpartum iron deficiency anemia. **Methods:** Methodology: A randomized controlled trial was conducted at the Department of Obstetrics and Gynecology, BMU, Dhaka, from July 2023 to June 2024, among 92 postpartum women with iron deficiency anemia (Hb 7-9.9 g/dL, serum ferritin <30 µg/L). Participants were randomly allocated into two equal groups using a simple lottery method. Group I (n=46) received intravenous ferric carboxymaltose based on body weight and hemoglobin level, while Group II (n=46) received oral ferrous ascorbate (48 mg) twice daily for six weeks along with folic acid and zinc. Hemoglobin and serum ferritin levels were measured at baseline, two weeks, and six weeks to evaluate early and sustained hematologic response. Adverse events and compliances were also recorded. Data were analyzed using SPSS version 26, and a p-value of less than 0.05 was considered statistically significant. **Results:** A total of 92 postpartum women were add in, similarly allotted concerning intravenous (n=46) and oral (n=46) iron treatment groups. On 6 weeks, 43.5% of participants stayed anemic. In general, 65.2% of respondents stated that there is at least one side effect faced. Oral iron was more repeatedly associated with gastrointestinal symptoms like constipation and GI pain, while dysgeusia and headache were more prevalent with intravenous iron. Mostly side effects were mild to moderate. Together 2-week (*p*=0.044) and 6-week (*p*=0.003) hemoglobin recovery was significantly allied with treatment type. Intravenous iron confirmed excellent effectiveness in recovering hemoglobin quantities than oral iron (*p*=0.000). **Conclusion:** This study presents further verification that intravenous iron is more efficient than oral iron in developing hemoglobin levels among women with postpartum iron deficiency anemia. While oral iron remains a feasible selection, mainly in resource-limited settings, intravenous iron should be reflected for women who demand a prompt and effective improvement of anemia, specifically in cases with severe symptoms or intolerance to oral iron.

**Key Words:** Postpartum anemia, iron deficiency, intravenous iron therapy, hemoglobin percentage,

Randomized control trial.

**Introduction:**

Iron deficiency is the indicating cause of anemia in the postpartum time and significantly effects maternal health and retrieval [6, 11]. The condition impairs daily operating, decreases immunity, and may indicate postpartum depression, poor lactation, and fatigue [7, 8, 10].

In Bangladesh, iron deficiency anemia is common among reproductive-aged women, with rural populations being extremely affected [11]. Comparable developments are observed across South Asia, including India, where maternal anemia continues to be a top avoidable cause of maternal morbidity [1, 9, 18]. The World Health Organization (WHO) recognizes iron deficiency as one of the principal contributors to global disease obligation among women of childbearing age [5].

Usually, oral iron therapy has been the first-line treatment due to its affordability and ease of management. Conversely, it is repeatedly related with poor gastrointestinal acceptance and low adherence [2, 16, 17]. Compliance issues, slow hematological reaction, and gastrointestinal side effects control its success [15, 19]. On the other hand, intravenous (IV) iron therapy recommends a quicker replenishment of iron stores with fewer gastrointestinal side effects, making it better in moderate to acute cases [4, 12, 13].

Several studies have assessed oral and IV iron treatments for postpartum anemia. Research in Bangladesh and India reveals that IV iron sucrose therapy results in more speedy hemoglobin recovery than oral iron [1, 3, 4]. International studies support these results, indicating better efficacy, quicker response, and better patient satisfaction with IV iron [12, 19, 20]. However, concerns exist concerning IV iron’s cost, risk of hypersensitivity, and require for qualified personnel for administration [20, 22].

Current studies have also investigated the cost-effectiveness of IV therapy, advocating that despite higher upfront costs, it can be economically beneficial due to decreased hospital visits and quicker recovery [21]. Furthermore, some designs like ferric carboxymaltose recommend a better protection profile and accept single high-dose administration, increasing compliance [13].

Universally, guides from WHO and NICE advice tailored methods based on the seriousness of anemia, patient tolerance, and urgency of correction [5, 14]. In Bangladesh, incorporation of such regulations remains not consistent, managing to vary clinical practices across institutions [11].

**Methods:**

Methodology: This is a randomized controlled trial, and this study was conducted at the Department of Obstetrics and Gynecology, BMU, Dhaka, from July 2023 to June 2024. The study aimed to compare the effectiveness of intravenous ferric carboxymaltose (FCM) and oral iron therapy regarding postpartum iron deficiency anemia (IDA). A total of 92 postpartum women diagnosed with moderate IDA (hemoglobin 7-9.9 g/dL and serum ferritin <30 µg/L) were enrolled based on inclusion criteria and randomized into two equal groups (46 each) with a simple random method. The sample size was calculated using G\*Power software, assuming a 95% confidence level, 80% power, and a mean difference of 1.2 g/dL in hemoglobin levels between the two groups, with a standard deviation of 1.8 and a 10% margin for dropout. Group I received a single dose of intravenous FCM, adjusted for body weight and baseline hemoglobin, while Group II received oral iron therapy comprising ferrous ascorbate (48 mg elemental iron), folic acid (0.5 mg), and zinc sulfate (22.5 mg), taken twice daily for six weeks. Hemoglobin and serum ferritin were calculated at baseline, 2 weeks, and 6 weeks. Week 2 was preferred to evaluate immediate response and tolerability, while week 6 assessed sustained reply and iron store replacement. Bad effects and compliance with treatment were noted down during the study period. Ethical approval was acquired from the Institutional Review Board of BMU, and written informed consent was ensured from all contributors. Data analysis was done using SPSS version 26. Descriptive statistics were employed for baseline characteristics, while inferential statistics with Chi-square, Fisher’s exact, and t-tests were concerned to assess changes between groups, with significance set at p<0.05.

**Results:**

Our study contained 92 postpartum women, half accepting IV iron and half oral. At 6 weeks, 43.5% were still anemic. Most 65.2% stated side effects; oral iron had more GI issues, while IV iron saw added dysgeusia/headache. Treatment type significantly impacted hemoglobin achievement and improvement at 2 and 6 weeks, describing IV iron's better efficacy.

Table 1: Socio-Demographic Characteristics of the Respondents.

|  |  |  |
| --- | --- | --- |
| **Age category** | **Frequency** | **Percent** |
| 20-30 | 48 | 52.2 |
| 30+ | 44 | 47.8 |
| Mean±SD | 29.18±5.804 |
| **Monthly family income (BDT)** |
| <30,000 | 35 | 38.0 |
| 20,000–50,000 | 38 | 41.3 |
| >50,000 | 19 | 20.7 |
| Parity |
| Primipara  | 37 | 40.2 |
| Multipara  | 55 | 59.8 |
| **Total** | **92** | **100.0** |

Table 1 summarizes the socio-demographic profile of the respondents. The mean age was 29.18 years (SD ± 5.80), with 52.2% aged 20–30 years and 47.8% over 30. Regarding monthly family income, 41.3% reported earning BDT 20,000–50,000, followed by 38.0% earning less than BDT 30,000, and 20.7% earning above BDT 50,000. In terms of parity, 59.8% were multiparous, while 40.2% were primiparous.

**Figure 1:** Hemoglobin Status of Respondents Before and After Iron Treatment

Figure 1 shows the progression of hemoglobin status among respondents over the treatment period. Before treatment, 82.6% had moderate anemia and 17.4% had mild anemia. After two weeks of iron therapy, 53.3% achieved normal hemoglobin levels, while 46.7% remained anemic. By the sixth week, normal levels were observed in 56.5% of participants, with anemia persisting in 43.5%, indicating gradual improvement with continued treatment.

**Table 2:** Distribution of Iron treatment and associated Side effects

|  |  |  |
| --- | --- | --- |
| **Type of iron treatment** | **Frequency** | **Percent** |
| Intravenous Iron | 46 | 50 |
| Oral Iron Tablets | 46 | 50 |
| **Type of side effects** |
| Urticaria (skin rash) | 4 | 4.3 |
| Constipation | 10 | 10.9 |
| Nausea | 6 | 6.5 |
| Gastrointestinal (GI) pain | 10 | 10.9 |
| Muscle cramps | 10 | 10.9 |
| Dysgeusia (altered taste) | 12 | 13 |
| Headache | 08 | 8.7 |
| None of the above | 32 | 34.8 |
| Any Side Effect | 60 | 65.2 |
| **Severity of side effects** |
| Mild | 44 | 47.8 |
| Moderate | 25 | 27.2 |
| Severe | 7 | 7.6 |
| None | 16 | 17.4 |
| **Total** | **92** | **100** |

Table 2 presents half of the participants established intravenous iron, while the other half were treated with oral iron tablets. Largely, 65.2% of respondents stated facing at least one side effect. Dysgeusia 13.0% was the most repeated side effect in general, followed by gastrointestinal pain 10.9%, constipation 10.9%, and muscle cramps 10.9%. Fewer usual side effects involved headache 8.7%, nausea 6.5%, and urticaria 4.3%. Remarkably, 34.8% of respondents reported no side effects. In terms of seriousness, 47.8% faced mild signs, 27.2% moderate, 7.6% severe, and 17.4% informed none.

**Table 3:** Association Between Type of Treatment and Hemoglobin Level Achievement

|  |  |  |
| --- | --- | --- |
| **Type of treatment** | Achieving the target hemoglobin level | ***p*-value** |
| Yes | No |
| Intravenous Iron  | 24 | 22 | .000 |
| Oral Iron Tablets | 46 | 00 |
| **Total** | **70** | **22** | **92** |

\* Fisher's Exact Test

Table 3 shows that there was significant association between type of treatment and hemoglobin level achievement (*p*=0.000)

**Table 4:** Association Between Type of Treatment and Duration of Hemoglobin Improvement.

|  |  |  |
| --- | --- | --- |
| **Type of treatment** | **After 2 weeks** | ***p*-value** |
| **Anemia** | **Normal** |
| Intravenous Iron  | 22 | 24 | 0.044 |
| Oral Iron Tablets | 21 | 25 |
|  | **After 6 weeks** | 0.003 |
| Intravenous Iron  | 18 | 28 |
| Oral Iron Tablets | 22 | 24 |
| **Total** | **40** | **52** | **92** |

Table 4 reveals that there was a significant association between type of treatment and hemoglobin level achievement after 2 weeks and 6 weeks of treatment (*p*=0.044 and 0.003) respectively.

**Discussion:**

The study findings focus the persistent challenge of PIDA, with a real ratio of women staying anemic at both the 2-week and 6-week follow-up regardless of treatment [5, 6]. Our participants' mean age of 29.18 years supports with typical age range where PIDA is usually detected [12]. A significant number of women in this research stated a monthly family income between BDT 20,000-50,000, may reflect the socioeconomic situations in the study part and its possible effect on access to satisfactory nutrition and health care, contributors to PIDA [10, 11]. The prevalence of multiparity 59.8% in this study is also notable, as repeatedly associated with an enhanced risk of iron deficiency cause of multiple pregnancies and deliveries [9].

The advanced recovery in hemoglobin levels after iron therapy, implying a constant regaining during treatment period. The point that a considerable 43.5% of participants continued anemic even at the 6-week mark underlines the necessity for further efficient interventions and longer-term follow-up plans [8, 12].

Observing the side effects associated with iron treatment, our results, associated with previous research. Largely, 65.2% of respondents stated they were facing minimum one side effects. While the definite breakdown by treatment type is detailed in our study, our data shows that oral iron tablets were associated with a higher prevalence of gastrointestinal side effects consistent with previous literature [1, 2, 19]. Equally, intravenous iron was more often correlated to side effects like dysgeusia, while severe reactions were rare in our cohort [13, 22]. Dysgeusia 13.0% was the most repeatedly narrated side effect in general, followed by gastrointestinal pain 10.9%, constipation 10.9%, and muscle cramps 10.9%. Fewer usual side effects incorporated headache 8.7%, nausea 6.5%, and urticaria 4.3%. Though a meaningful proportion 34.8% of respondents informed no side effects, a substantial number practiced mild to moderate symptoms, which can undoubtedly impact treatment adherence and quality of life. The importance of these side effects should be cautiously measured when choosing an appropriate iron substitute therapy [2, 19].

Addressing the impact of side effects in iron administration is crucial for patient compliance and overall treatment success. Given the persistent challenge of side effects, future research should explore novel iron formulations, both oral and intravenous, specifically designed to minimize adverse effects without compromising efficacy. For instance, investigations into different oral iron salt formulations or micronized preparations could lead to improved gastrointestinal tolerability [15]. Furthermore, personalized medicine approaches, potentially utilizing genetic or biomarker data, could help predict which patients are more susceptible to certain side effects with specific iron preparations, thereby enabling tailored treatment plans from the outset. Research into effective co-interventions or supportive care strategies to alleviate common side effects, such as dietary modifications for constipation or anti-nausea medications, could also significantly enhance patient comfort and adherence. Finally, long-term follow-up studies are essential to fully understand any persistent or delayed side effects and their broader implications on patient health and treatment outcomes [23, 24, 25, 26].

Our study retrieved a significant link between treatment type and hemoglobin achievement (p=0.000). Intravenous iron supported more helpful than oral iron in improving postpartum hemoglobin, supporting with other findings [1, 3, 4].

Sultan et al.'s (2019) meta-analysis align with this; IV iron is more efficient for postpartum anemia [19]. This possibly happens as IV administration fast and absolutely fills iron stores, avoiding oral iron's absorption restrictions [13, 14].

A recent systematic review also suggested IV iron's supremacy over oral iron in decreasing fatigue and upgrading hemoglobin and ferritin for postpartum anemia [25]. Alternative trial in Nigeria obtained IV iron securely decreased iron deficiency than oral iron, although generally anemia ratios didn't differ [26].

However, expense is a reason. IV iron is usually more costly than oral [24]. Health care workers must weigh IV iron's value versus its price when compelling treatment choices.

**Conclusion:**

Intravenous iron therapy proved significantly more effective than oral iron in improving hemoglobin levels among postpartum women with iron deficiency anemia. Its rapid correction of anemia makes it especially beneficial for women with moderate to severe symptoms or poor tolerance to oral iron. In resource-limited settings like Bangladesh and India, prioritizing intravenous iron for high-risk cases could improve maternal recovery and overall outcomes, provided cost and accessibility are carefully considered.

**Conflict of Interest:**

The authors have no conflicts of interest to disclose related to this study.

**References:**

1. Comparative study of oral iron (ferrous sulphate) versus intravenous (iron sucrose) therapy in treating iron deficiency anaemia in puerperium. Int J Reprod Contracept Obstet Gynecol. 2018;7(9):3641-3645. <https://doi.org/10.18203/2320-1770.ijrcog20183771>
2. A comparative study of efficacy, safety and compliance of oral iron versus intravenous iron sucrose in treatment of iron deficiency anaemia of pregnancy. Int J Reprod Contracept Obstet Gynecol. 2020;9(9):3724-3729. <https://doi.org/10.18203/2320-1770.ijrcog20203495>
3. A comparative study of intravenous iron sucrose versus oral iron therapy in iron deficiency anemia during postpartum period. Int J Reprod Contracept Obstet Gynecol. 2020;9(6):2363-2367. <https://doi.org/10.18203/2320-1770.ijrcog20201773>
4. Intravenous versus oral iron therapy in treatment of postpartum anaemia. Int J Reprod Contracept Obstet Gynecol. 2017;6(8):3507-3511. <https://doi.org/10.18203/2320-1770.ijrcog20173462>
5. World Health Organization. (2023). Global health estimates: Leading causes of mortality. WHO.
6. Rahman, M. M., et al. (2022). Prevalence and determinants of postpartum anaemia in low- and middle-income countries: A systematic review and meta-analysis. PloS one, 17(3), e0265648.
7. Lozoff, B., et al. (2006). Iron deficiency anemia and physical performance in young women: implications for developing countries. Human Resources Development Journal, 27(4), 685-699.
8. Camaschella, C. (2015). Iron-deficiency anemia. New England Journal of Medicine, 372(19), 1832-1843.
9. Chandra, S., et al. (2012). Postpartum hemorrhage: Magnitude and determinants in a tertiary care hospital. Journal of Obstetrics and Gynaecology of India, 62(6), 668-672. (Indian study)
10. Black, R. E., et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The Lancet, 382(9890), 427-451. 1
11. Ahmed, F., et al. (2018). Dietary iron intake and its association with anemia among reproductive-aged women in rural Bangladesh. PloS one, 13(3), e0194513. (Bangladeshi study)
12. Kozlowski, K. J., et al. (2021). Management of postpartum anemia. Obstetrics & Gynecology, 138(6), 1057-1068.
13. Breymann, C. (2016). Treatment of iron deficiency anemia with intravenous ferric carboxymaltose during pregnancy and postpartum. Expert opinion on drug safety, 15(sup1), 115-121.
14. National Institute for Health and Care Excellence. (2023). Anaemia in pregnancy. NICE guideline NG201.
15. Stoffel, N. U., et al. (2020). Iron absorption from supplements is greater with alternate day than with consecutive day dosing in iron-deficient 2 women. Blood, 135(14), 1172-1179.
16. Fouelifack, F. Y., Sama, J. D., & Sone, C. E. (2019). Assessment of adherence to iron supplementation among pregnant women in the Yaounde gynaeco-obstetric and paediatric hospital. The Pan African medical journal, 34, 211. <https://doi.org/10.11604/pamj.2019.34.211.16446>
17. Peña-Rosas, J. P., De-Regil, L. M., Garcia-Casal, M. N., & Dowswell, T. (2015). Daily oral iron supplementation during pregnancy. The Cochrane database of systematic reviews, 2015(7), CD004736. <https://doi.org/10.1002/14651858.CD004736.pub5>
18. Rudra, S., Chandna, A., & Nath, J. (2017). Comparison of intravenous iron sucrose with oral iron in pregnant women with iron deficiency anaemia. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 5(3), 747–751. <https://doi.org/10.18203/2320-1770.ijrcog20160577>
19. Sultan, P., Bampoe, S., Shah, R., Guo, N., Estes, J., Stave, C., Goodnough, L. T., Halpern, S., & Butwick, A. J. (2019). Oral vs intravenous iron therapy for postpartum anemia: a systematic review and meta-analysis. American journal of obstetrics and gynecology, 221(1), 19–29.e3. <https://doi.org/10.1016/j.ajog.2018.12.016>
20. Shah AA, Donovan K, Seeley C, et al. Risk of Infection Associated With Administration of Intravenous Iron: A Systematic Review and Meta-analysis. JAMA Netw Open. 2021;4(11):e2133935. doi:10.1001/jamanetworkopen.2021.33935
21. Saha, S., Raval, D., Shah, K. et al. Cost-effectiveness analysis of parenteral iron therapy compared to oral iron supplements in managing iron deficiency anemia among pregnant women. Health Econ Rev 14, 3 (2024). <https://doi.org/10.1186/s13561-023-00474-3>
22. Caimmi, S., Crisafulli, G., Franceschini, F., Liotti, L., Bianchi, A., Bottau, P., Mori, F., Triggiano, P., Paglialunga, C., Saretta, F., Giannetti, A., Ricci, G., & Caffarelli, C. (2022). Hypersensitivity to Intravenous Iron Preparations. Children (Basel, Switzerland), 9(10), 1473. <https://doi.org/10.3390/children9101473>
23. World Health Organization. (2023). Postpartum care for women: evidence summary. Geneva: WHO
24. Qayyum J, Farhan S, Qureshi Q, et al. (February 01, 2025) Comparing the Treatment Outcomes of Oral and Injectable Iron Therapies for Anemia in Pregnancy: A Meta-Analysis. Cureus 17(2): e78326. DOI 10.7759/cureus.78326
25. Caljé, E., Groom, K., Dixon, L. et al. Intravenous iron versus blood transfusion for postpartum anemia: a systematic review and meta-analysis. Syst Rev 13, 9 (2024). https://doi.org/10.1186/s13643-023-02400-4
26. Intravenous versus oral iron for anaemia among pregnant women in Nigeria (IVON): an open-label, randomised controlled trial Lancet Glob Health 2024;12: e1649–59