Parenteral iron sucrose treatment in pregnancy: A Study on Hemoglobin response in Khyber Pakhtunkhwa Pakistan

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ABSTRACT

Objective: To evaluate the response of iron therapy in gestational anemia at Khyber Pakhtunkhwa (KPK) province.
Study Design: Prospective single arm interventional study.
Place and Duration: From 1st August 2021 to 1st February 2022 at the Obstetrics and Gynecology Department of Combined Military Hospital Peshawar.
Methodology: This study included 102 participants. The sample size was calculated to achieve a 95% confidence level. Participants were selected using a random sampling technique to ensure representativeness of the target population. Collected variables included maternal age (years), gestational age (weeks), baseline hemoglobin (Hb) level prior to initiation of therapy (g/dL), Hb level after 04 weeks of therapy (g/dL), and the change in Hb level (post-therapy minus baseline). Categorical variables included financial status (low, middle, high income) and place of residence (urban or rural). Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 22. Mean and standard deviation were calculated for continuous variables, while frequencies and percentages were calculated for categorical variables. Post-stratification Chi-square tests were applied to assess associations between categorical variables, including financial status, residential status, and treatment efficacy. A p-value of ≤ 0.05 was considered statistically significant.
Results: Age range in this study was from 18 to 45 years with mean age of 28.666±3.31 years, mean gestational age 20.284±2.21 weeks, mean baseline Hb 7.705±0.93%, Hb after 12 weeks 9.637±1.76% and mean change in Hb level was 1.931±1.10%.
Conclusion: Intravenous iron sucrose is an effective treatment for iron deficiency anemia in pregnancy, producing a significant rise in hemoglobin. Its use results in meaningful correction of anemia, indicating that it is a safe and reliable option for iron replacement.
Keywords: Anemia, Hemoglobin, Iron deficiency anemia, Iron sucrose, KPK, Pregnancy.

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INTRODUCTION

Anemia is the commonest medical disorder and still a devastating condition in the Asian region especially in the developing countries as Pakistan.[1] Iron deficiency is the most common cause of anemia followed by folate deficiency.[2, 3] The WHO definition for diagnosis of anemia in pregnancy is a Hb concentration of less than 11g/dl and a hematocrit of less than 0.33.[4] Keeping in view the physiological changes of pregnancy it is further elaborated to be hemoglobin of <11.0 g/dL in first and third trimester and <10.5 g/dL in second trimester.[5]
Gestational anemia can have devastating effects both on mother and fetus resulting in preterm labor, increased risk of operative deliveries due to low birth weight, postpartum hemorrhage and failure of establishment of lactation and impaired cognitive development in infants.[6]Being one of the major contributing factor of maternal mortality it is now a worldwide health concern for the women in reproductive age group.[7]
According to the World Health Organization, approximately 32.4 million pregnant women worldwide are affected by anemia, of which nearly 50% of cases are attributable to iron deficiency.[8, 9] Therefore iron deficiency anemia (IDA) accounts for the major type. It is mostly a problem of underdeveloped countries where

women belonging to low income group have poor intake of high bioavailability diet in child bearing age and during pregnancy.[10, 11] Various preparations of iron including oral ferrous sulphate, ferrous fumarate and intravenous iron sucrose are used to treat iron deficiency anemia.[12] Each modality of iron therapy has certain advantages and limitations in terms of compliance, side effects, safety margin and effectiveness.[13] For quick and desirable response of increase in hemoglobin level Intravenous iron sucrose is mostly preferred especially where there is poor compliance due to less tolerance and increased severity of anemia as this ensures replenishment of iron stores and eliminates gastrointestinal absorption issues.[14, 15]

The KPK province is a densely populated area of our country where women have limited access to health care facilities mostly because of their social and cultural constraints. There are not enough studies which evaluate the bioavailability, absorption rates and biochemical response of iron supplementation during pregnancy.[6, 16] This study focuses on the role of intravenous iron sucrose therapy for the correction of anemia in women reporting to Combined Military Hospital Peshawar.

METHODOLOGY

This prospective single arm interventional study was conducted from 1st August 2021 to 1st February 2022 at the Obstetrics and Gynecology department of CMH hospital Peshawar. The ethical approval was taken before conducting the study via letter Ser. no. 378, dated 04 February, 2021. The sample size of 102 was calculated with a level of confidence as 95% by using WHO sample size calculating formula.

The inclusion criteria include pregnant women in age group of 18-45 years, singleton pregnancy, and gestational age from 12 weeks to 25weeks and diagnosed with iron deficiency anemia as per our operational definition. Exclusion criteria includes pregnant women with history of blood transfusion within the prior 3 months, or history of medications interfering with the blood indices or iron metabolism, known hypersensitivity to the iron sucrose, history of chronic infection/diseases like HIV, hepatitis B, hepatitis C, and chronic renal failure. Written consent was taken by the patients fulfilling the inclusion criteria and they were informed regarding their scheduled visits in lines with the protocol of the study. To assess allergic reaction to iron sucrose, initially test dose was given. Total dose was calculated by using Ganzoni's Formula (Total iron dose = Body weight in kg × (Target Hb - Actual Hb g/dL) × 2.4 + Iron stores (1000mg), where 2.4 was a correction factor.

After calculation the iron dose required, patient received intravenous iron sucrose (200mg on alternate day) in 100 ml normal saline over 15-20 min twice weekly till dosage was completed, not to exceed 600 mg per week. The outcome was measured in terms of improvement in hemoglobin levels on CBC report of patient at visit after 4 weeks. The Gathered data was analyzed using SPSS version 22. For quantitative variables like mother age, gestational age, baseline Hb level, Hb level after 4-week therapy and change in Hb level was presented as mean and standard deviation. Frequency and percentages were calculated for qualitative variables like financial status, residential status and efficacy. Post stratification chi square test was applied. A p-value ≤0.05 was considered statistically significant.

RESULTS

A total of 102 pregnant women with gestational anemia were included in the study. The mean maternal age was 28.67 ± 3.31 years, and the mean gestational age at the time of therapy was 20.28 ± 2.21 weeks. The mean baseline hemoglobin (Hb) level was 7.71 ± 0.93 g/dL, which increased to 9.64 ± 1.76 g/dL after 4 weeks of parenteral iron sucrose therapy, representing a mean rise of 1.93 ± 1.10 g/dL (Table I).

Regarding socio-demographic characteristics, 60 (58.8%) participants resided in rural areas, while 42 (41.2%) were from urban areas. Financially, 41 (40.2%) participants belonged to the lower-income group, 56 (54.9%) to the middle-income group, and 5 (4.9%) to the upper-income group (Table II).

These findings indicate that parenteral iron sucrose therapy produced a significant increase in hemoglobin levels across a diverse population of pregnant women in Khyber Pakhtunkhwa.

Table I: Mean ± SD of demographic characteristics and hemoglobin levels of study participants (N = 102)

Demographics	Mean ± SD
Maternal Age (years)	28.666±3.31
Gestational age (weeks)	20.284±2.21
Baseline Hb (g/dL)	7.705±0.93
Hb after 4 weeks (g/dL)	9.637±1.76
Change in Hb level (g/dL)	1.931±1.10

Table II: Frequency and percentage distribution of study participants according to residential and financial status (N = 102)

Variables	Category	Frequency, n (%)
Residential status	Rural	60 (58.8)
	Urban	42 (41.2)
Financial status	Lower	41 (40.2)
	Middle	56 (54.9)
	Upper	5 (4.9)

DISCUSSION

A study in 2023 by Ali S is done to identify the efficiency of intravenous iron in pregnant women who are anemic in Quetta.[16]This is in comparison to our study which also catered an important region i.e. Peshawar (KPK) as both regions have near similar cultural and social constraints for women leading to limited access to health care facilities.

A study done by Raja in 2022, the population studied were pregnant women in 2nd trimester with hemoglobin level 10.5 with ages ranging from 18 to 40 years.[17] This is in equivalence to our study population.[2]

In the study done by Sadaf R in 2022, it was concluded that intravenous iron sucrose therapy is a secure and effective methodology for the treatment of iron deficiency anemia in women who were non-compliant and showed poor response to oral iron as they can deliver a larger iron supply more rapidly

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than oral iron and, because of the route of administration, bypass the risk of gastrointestinal side effects. This is in consistent with our study which showed improvement in hemoglobin after intravenous iron therapy.[18, 19]

In 2023, randomized controlled trial was done on 100 pregnant women at PIMS hospital, in which 2 groups were made, group A including treatment with IV iron sucrose, while group B included treatment with oral iron fumarate. It was concluded that maternal iron reserves are raised by intravenous iron preparation more as compared to oral iron in terms of serum ferritin. Similarly in our study hemoglobin levels were raised by IV iron formulation more effectively as compared to oral therapy.[20]

Vidhate P well elaborated in his study that a treatment regimen for iron deficiency anemia on alternate day of iron sucrose infusions was well tolerated and also had more efficacy in patients with iron deficiency anemia.[21]

A case was reported in 2023 at medical center Maryland, in which a pregnant patient was given IV iron sucrose at 32 weeks of gestation. The patient developed rhabdomyolysis for which IV fluids and electrolytes repletion was done and symptoms improved.it was concluded that although IV iron infusions are generally well tolerated but they do have adverse reactions in some cases.[22]

In a recent study of 2023 in India by Papaniya T it was advocated that IV iron sucrose reduced the need of blood transfusion in women with severe anemia.IV iron sucrose was found to be more costly but more effective as compared to oral iron preparation.[23] Our study also concluded that improvement in hemoglobin levels in 4 weeks is reassuring and this will lessen the requirement of other treatment modalities.

Keeping in view the anemia as a major health concern, a question always arises, if the iron superior in IV preparation or oral formulation. A total of 268 pregnant women were registered in a study at India. These patients were diagnosed with moderate IDA and were divided in to 2 groups. Group 1 received IV iron sucrose, while the 2nd group received oral ferrous sulphate tablets. It was concluded that IV iron sucrose was better in terms of tolerability, fewer side effects and rapid correction of anemia as compared to oral hematinics.[20]

Another study in 2017, safety and efficacy of IV iron sucrose was compared with oral ferrous fumarate on 2 groups of 112 patients. In group a, IV iron sucrose 200mg was given in 100 ml normal saline per day, while group b patients were given tablet ferrous fumarate 200 mg daily. Serum ferritin levels and CBC was measured after 4 weeks and the results were compared.[24] 50 % of group a patients not only showed raised hemoglobin but also serum ferritin increased while the 2nd group had only increased Hb in 15% patients and these results are in accordance with our study showing significant rise in hemoglobin levels after 4 weeks of giving iron sucrose therapy. Although multiple doses of IV iron sucrose are required but it is cost effective as well as safe and well tolerated.

CONCLUSION

Intravenous iron sucrose is an effective treatment for iron deficiency anemia in pregnancy, producing a significant rise in hemoglobin. Its use results in meaningful correction of anemia, indicating that it is a safe and reliable option for iron replacement.

AUTHOR'S CONTRIBUTION

Farooqi K: Conception and Design of Study, Data Analysis, Manuscript Drafting
Alam K: Manuscript Final Critical Review, Literature Review
Nisa Z: Manuscript Final Critical Review, Literature Review
Malik R: Data compilation and Analysis, Designed Research Methodology
Naz N: Manuscript Final Reading

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