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Original Article

Intravenous Iron Sucrose Therapy for Iron Deficiency Anaemia in Pregnancy: Efficacy and Safety in Bangladeshi Women

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Abstract

Background: Iron deficiency anaemia (IDA) remains a major public health concern among pregnant women in Bangladesh. Given the high prevalence of iron deficiency anaemia in pregnancy among Bangladeshi women injectable iron sucrose therapy during antenatal period may be effective in its treatment. The aim of this study was to evaluate the efficacy and safety of intravenous iron sucrose therapy in antenatal patients with IDA. Methods: A cross-sectional study was conducted among 150 pregnant women with mild to moderate IDA (Hb 7–9.9 g/dL, serum ferritin <12 µg/L) at Shaheed Suhrawardy Medical College Hospital from November 2017 to April 2018. Patients received calculated doses of intravenous iron sucrose. All of them received intravenous injection of iron sucrose in a calculated dose according to haemoglobin level. Haemoglobin levels were reassessed after 21 days of injection. Side effects were monitored. Approval of the study was obtained from Department of Obstetrics and Gynaecology, Shaheed Suhrawardy Medical College and Hospital. Written informed consents were obtained. Privacy and confidentiality of data were strictly maintained and preserved anonymously. Results: Mean age was 26.09±5.39 years, 86% were housewife and about 9% were service holder; 58% were from lower socioeconomic condition; about 39% had secondary and higher level of education. Following three weeks of intravenous iron sucrose administration at the calculated therapeutic dose, mean haemoglobin levels rose by 2.35±0.53 g/dL, increasing from 7.52±0.43 g/dL at baseline to 10.88±0.43 g/dL post-treatment. The rise of the mean haemoglobin levels was statistically significant (p<0.001). Mild adverse effects were reported in approximately 13% of participants, including epigastric discomfort (4.7%), abdominal pain (3.3%), nausea and vomiting (2.7%), and allergic reactions (2%). No serious or major side effects were observed.

Conclusion: Intravenous iron sucrose is a safe and effective therapy for IDA during pregnancy, with minimal side effects and significant improvement in haemoglobin levels. The administered dose should be calculated based on the patient's body weight and the estimated iron deficit, as determined by haemoglobin concentration and serum ferritin levels.

Key words: *Iron deficiency anaemia, Intravenous iron Sucrose, Anaemia management, Antenatal care.*

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INTRODUCTION

Iron deficiency anaemia (IDA) affects over one-third of pregnant women globally and remains a leading cause of maternal morbidity and mortality in developing countries[1]. The World Health Organization defines anaemia in pregnancy as a haemoglobin level below 11 g/dL or a haematocrit value less than 0.332[2]. In Bangladesh, 46% of non-pregnant women and 39% of pregnant women are anaemic[3]. Anaemia contributes to nearly all maternal deaths in many regions, increasing the overall risk fivefold through complications such as postpartum haemorrhage, cardiac failure, puerperal sepsis, venous thrombosis, and pulmonary embolism[4]. The risk of mortality escalates significantly in cases of severe anaemia[5].

Contributing factors to the high prevalence of anaemia in Bangladesh include early marriage, teenage pregnancy, multiparity, short birth intervals, diets rich in phytates, inadequate iron and folic acid intake, and widespread worm infestation[6]. Globally, anaemia affects approximately two-fifths of non-pregnant women and over half of all pregnant women[7]. Maternal mortality due to anaemia remains a major public health challenge in low-resource settings. An estimated 600,000 women die annually from pregnancy and childbirth-related complications, many of which are preventable with basic interventions[8].

IDA is classified as mild (8–10 g/dL), moderate (7–8 g/dL), and severe (<7 g/dL)[9]. Oral iron therapy is the first-line treatment for mild anaemia; however, poor compliance and slow haematological response limit its effectiveness in moderate to severe cases[10]. Parenteral iron therapy, particularly intravenous iron sucrose, provides faster correction with fewer adverse reactions compared to older formulations[11]. While oral iron remains the preferred option for prophylaxis and mild anaemia, moderate to severe cases often require parenteral iron and/or blood transfusion depending on haemodynamic status, gestational age, and severity[12].

Various parenteral iron preparations are available, including intravenous and intramuscular formulations. Historically, iron dextran and iron sorbitol citrate were used, but their administration required a test dose due to the risk of severe anaphylactic reactions[13]. In contrast, iron sucrose has demonstrated a favourable safety profile in pregnancy and can be administered without a test dose[14]. Intravenous iron therapy may reduce the need for blood transfusion, which carries risks such as mismatched transfusion, infection, and anaphylaxis[15].

This study evaluates the efficacy and safety of intravenous iron sucrose in pregnant women with IDA during the antenatal period. It was conducted among patients attending the selected hospital to assess the therapeutic response and tolerability of injectable iron sucrose in the management of antenatal iron deficiency anaemia.

A cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Shaheed Suhrawardy Medical College & Hospital, Dhaka, from November 2017 to April 2018. Pregnant women presenting with mild to moderate iron deficiency anaemia (haemoglobin 7–9.9 g/dL) were screened for eligibility. Although the calculated sample size was 384, based on standard formulae, the study was limited to 150 consecutive patients due to time and resource constraints. Pregnant women with age between 18 and 40 years, singleton pregnancy between 20 and 32 weeks of gestation, mild to moderate anaemia and willingness to provide informed consent were included for this study; whereas coexisting medical conditions (e.g. hypertension, diabetes mellitus, cardiac disease, peptic ulcer, asthma, bleeding disorders, thalassemia), history of blood transfusion within the preceding 120 days and parasitic infestation confirmed by stool examination were excluded from the study. Data were collected using a structured questionnaire. All participants were admitted and underwent baseline investigations including complete blood count, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), peripheral blood smear, serum iron, serum ferritin, total iron-binding capacity (TIBC), urine analysis to exclude urinary tract infection, and stool examination for ova or cysts.

Iron sucrose infusion protocol:

The total iron requirement was calculated using the formula:

Total Iron Deficit = [Body weight (kg) × (Target Hb – Actual Hb) × 2.4] + 500 mg (iron stores).

Each patient received intravenous iron sucrose (100 mg diluted in 100 mL of normal saline) on alternate days. The average total dose administered was approximately 1500 mg. Patients were continuously monitored during infusion, with emergency resuscitation drugs kept ready.

Statistical analysis:

Data were coded, cleaned, and entered into SPSS version 22. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as means, standard deviations, and ranges. Student's t-test and Chi-square test were applied as appropriate. A p-value <0.05 was considered statistically significant. Informed written consent was obtained from all participants. Data were anonymized, and confidentiality was strictly maintained throughout the study.

RESULTS

In this study population comprised 150 pregnant women diagnosed with mild to moderate iron deficiency anaemia (IDA). The socio-demographic profile includes age, occupation, monthly income/ economic condition and educational status.

Table I Distribution of socio-demographic condition of the study population; study revealed a predominance of

women in the 21–30 year age group, accounting for 64% of participants (31.3% aged 21–25 years and 32.7% aged 26–30 years). Women aged ≤20 years represented 16%, while those aged 31–35 and 36–40 years constituted 14% and 6%, respectively. This distribution reflects the reproductive age concentration typical of antenatal clinic attendees in urban tertiary settings.

Table I : Distribution of socio-demographic Condition of the study population (n=150)

Age in years	Number	Percentage (%)	Mean±SD
≤20	24	16.0	26.09±5.39
21-25	47	31.3	
26-30	49	32.7	
31-35	21	14.0	
36-40	9	6.0	
Total	150	100.0	
Occupational status	**Number**	**Percentage**	
House wife	129	86.0	
Service holder	13	8.7	
Others	8	5.3	
Total	150	100.0	
Monthly income/ Socio Economic Condition			
Lower	87	58.0	
Lower middle	34	22.7	
Middle	29	19.3	
Total	150	100.0	
Educational status			
Illiterate	11	7.3	
Sign only	4	2.7	
Primary	77	51.3	
Secondary	53	35.3	
Higher secondary	5	3.3	
Total	150	100.0	

In terms of occupation, the majority were housewives (86%), followed by service holders (8.7%) and a small proportion engaged in other forms of employment (5.3%). This occupational pattern underscores the socio-cultural norm of domestic roles among pregnant women in the study region.

Monthly household income was stratified into three categories: lower income (<10,000 BDT) was reported by 58% of participants, lower-middle income (10,000–20,000 BDT) by 22.7%, and middle income (>20,000 BDT) by 19.3%. This indicates that a significant proportion of the study population belonged to economically disadvantaged groups, which may influence nutritional status and access to healthcare.

Regarding educational attainment, primary education was the most common level completed (51.3%), followed by secondary education (35.3%). A small fraction had attained higher secondary education (3.3%), while 7.3% were illiterate. The relatively low levels of formal education among participants may contribute to limited awareness of nutritional requirements during pregnancy and poor compliance with oral iron therapy.

Overall, the socio-demographic profile highlights a vulnerable population segment predominantly young, economically constrained, and with limited formal education which may predispose them to higher rates of iron deficiency anaemia and reduced access to preventive care.

Figure 2. Mode of Delivery among Study Participants

Description:
Figure 2 depicts the mode of delivery among the treated women. Most delivered vaginally, whereas a smaller proportion required caesarean section. The distribution suggests no adverse influence of intravenous iron therapy on delivery outcomes.

Legend:
Figure 2 – Frequency of vaginal and caesarean deliveries among women receiving intravenous iron sucrose. No significant difference in mode of delivery was observed in relation to iron therapy.

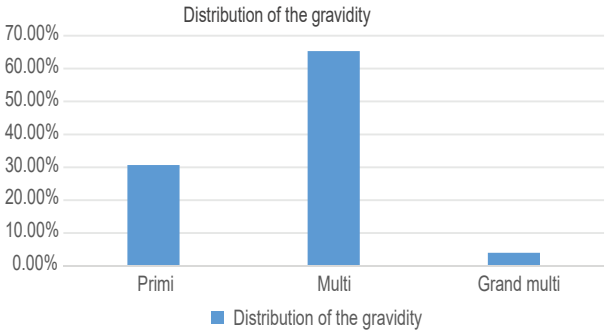

Figure- 1: Distribution of gravidity among study subjects (n=150)

Figure 1 appears the distribution of gravidity among pregnant women who received intravenous iron sucrose therapy. Multigravida women constituted the largest group (65.3%), followed by primigravida (30.7%) and grand multi (4%).

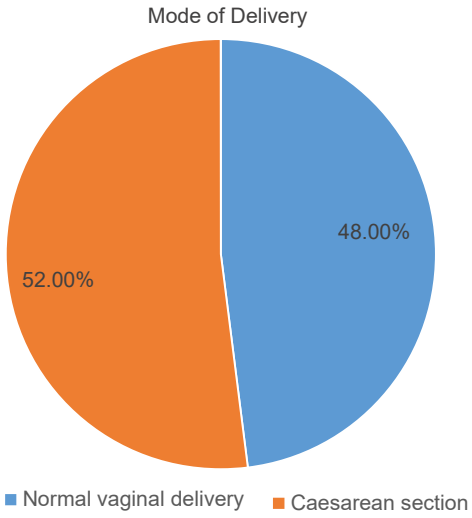

Figure- 2: Distribution of mode of delivery of the study subjects (n=150)

Figure 2 depicts the distribution of mode of delivery among the treated women. Among them, 48% were delivered vaginally and 52% needed caesarean section.

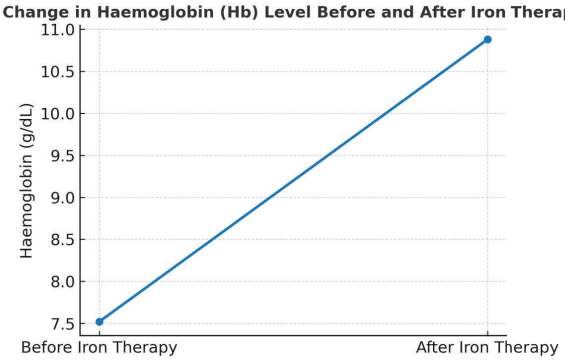

Figure- 3: Change in mean Hb levels before and after iron sucrose therapy (n=150)

Figure 3 Line Graph showing change in haemoglobin level before and after iron therapy. The line graph shows a significant improvement in haemoglobin (Hb) concentration among pregnant women receiving intravenous iron sucrose therapy. Hb increased from 7.52±0.43 g/dL before therapy to 10.88±0.43 g/dL after therapy. Mean Hb increased significantly by 2.35±0.43 g/dL after therapy ($p<0.001$), indicating marked therapeutic efficacy.

Table II summarizes the side-effects observed following intravenous iron sucrose administration. Recorded all the slide-effects were mild and transient adverse reactions, and no serious or life-threatening events occurred. Among the pregnant women 2% had allergic reaction, 2.7% had nausea/vomiting, 3.3% had abdominal pain and 4.7% had epigastric pain. No side effect was observed in most of the cases (87.3%).

Table II : Distribution of side-effects among study subjects following iron sucrose therapy

Side effect	Number	Percentage (%)	P value
Allergic reaction	3	2.0	0.001
Nausea vomiting	4	2.7	
Abdominal pain	5	3.3	
Epigastric pain	7	4.7	
No side effects	131	87.3	
Total	150	100.0	

DISCUSSION

This study evaluated the efficacy and safety of intravenous iron sucrose for management of iron deficiency anaemia (IDA) in pregnancy in a cohort of 150 antenatal women. Overall, intravenous iron sucrose produced a clinically and statistically significant rise in mean haemoglobin (Hb) from 7.52 ± 0.43 g/dL at baseline to 10.88 ± 0.43 g/dL 21 days after therapy (mean increase 2.35 ± 0.53 g/dL, $p < 0.001$). Adverse events were infrequent and mild (approximately 13% overall), with no major or life-threatening reactions recorded. Below we elaborate on each principal finding, compare with previously published data (references retained as in the submitted manuscript), and discuss clinical and public-health implications.

The observed mean Hb increase of 2.35 g/dL over three weeks indicates a rapid haematological response to parenteral iron sucrose in pregnant women with moderate IDA. This magnitude of increase is clinically meaningful: it moves many patients from the moderate into the mild/near-normal range and is likely to reduce immediate risks associated with anaemia in pregnancy (e.g., PPH, cardiac strain). This result is consistent with other institutional series reporting rises in mean Hb in the range of ~2.3–2.6 g/dL after parenteral iron sucrose therapy[3, 7, 17–20, 22]. The speed of correction observed here supports the practical advantage of IV iron when oral therapy is impractical or too slow.

Minor adverse events (epigastric pain 4.7%, abdominal pain 3.3%, nausea/vomiting 2.7%, allergic reaction 2%) occurred in ~13% of participants; no serious hypersensitivity, anaphylaxis, or infusion-related life-threatening events were documented. This favourable safety profile aligns with reports by Patel et al.[17], Van Wyck et al.10 and Al-Momen et al.[22] who found low rates of significant adverse reactions with iron sucrose. The absence of major reactions in our sample supports the established perception that iron sucrose is safer than older IV preparations (e.g., iron dextran) that required a test dose[13].

The majority of participants were young (mean 26.1 years), housewives (86%), with low or lower-middle income (58% lower, 22.7% lower-middle) and low formal education (primary level predominance). These characteristics indicate a socioeconomically vulnerable cohort in which dietary insufficiency, poor access to supplementation, early marriage and short birth spacing likely contribute to IDA, a pattern echoed by national and regional surveys and by previous work cited in this manuscript[4, 11, 15]. Socioeconomic and educational context should therefore be considered when designing antenatal iron-delivery strategies.

In our cohort caesarean section rate was 52% and normal vaginal delivery 48%; gravidity distribution showed predominance of multigravida (65.3%). We found no signal suggesting that IV iron therapy adversely affected mode of delivery. Comparisons with regional obstetric series are complex because delivery mode depends on many obstetric indications; nevertheless, our findings do not indicate increased obstetric risk related to iron sucrose therapy and are similar to results reported by others where no increase in adverse obstetric outcomes was observed following IV iron[17, 22].

Magnitude of Hb rise. The mean Hb increment in our study (2.35 g/dL) closely matches the increase reported by Thakor et al.[3] (approx. 2.3 g/dL) and Nimbalkar et al.[7]. Patel et al.[17] also documented a significant Hb rise with iron sucrose, achieving target Hb in a high proportion of patients. Al-Momen et al.[22] and Kiran et al.[20] reported comparable increases (2.3–2.5 g/dL), supporting the reproducibility of this therapeutic effect across populations and settings.

Safety profile. Earlier trials and observational studies (e.g., Van Wyck et al.[10], Patel et al.[17], Al-Momen et al.[22]) reported low rates of serious adverse events with iron sucrose and mainly mild, self-limited reactions, consistent with our data. The low frequency of allergic reactions in our sample also mirrors findings of multicentre safety studies[10,18].

Context of oral versus IV iron. Systematic reviews and comparative studies (e.g., Bhandal & Russell^6, Rohina et al.[11], Halimi et al.[22]) note that IV iron provides faster correction and higher haemoglobin increments than oral therapy, especially when oral absorption or adherence is a problem. Our rapid correction and good tolerability are therefore in line with the literature advocating IV iron in moderate-to-severe antenatal anaemia or when timely correction is required.

Population risk factors. The socio-demographic determinants (low income, limited education, multiparity) found here are concordant with national surveys and previous local studies (Rizwan et al.[11], Mahamuda et al.[15], Haniff et al.[13]), reinforcing that socioeconomic disadvantage remains a major driver of antenatal IDA in Bangladesh and similar contexts.

Intravenous iron sucrose offers a rapid and reliable means of correcting moderate iron-deficiency anaemia in pregnancy, particularly during the late second and third trimesters when swift restoration of haemoglobin and iron stores is critical. Its proven safety and efficacy suggest that antenatal units, especially in resource-limited settings, should adopt structured protocols for its use with appropriate monitoring. Early detection of anaemia, timely selection of candidates unsuitable for oral therapy, and inclusion of IV iron in local treatment formularies can reduce transfusion requirements and improve maternal outcomes.

The study provides real-world data from an antenatal population in an urban tertiary centre and evaluates both efficacy (quantitative Hb change) and safety (systematic side-effect monitoring). The treatment protocol was standardized (dose calculation, monitoring), and follow-up timing (21 days) aligns with other clinical reports, facilitating comparisons.

CONCLUSIONS

This study corroborates existing evidence that intravenous iron sucrose is an effective and safe intervention for rapid correction of antenatal iron deficiency anaemia. It produced a significant rise in haemoglobin and ferritin levels with minimal adverse effects and without compromising maternal or delivery outcomes. Routine consideration of parenteral iron may thus be justified in

antenatal women who fail to achieve adequate response to oral supplementation. However, broader multicentre data and economic evaluations would strengthen policy recommendations.

LIMITATIONS

This study was limited by its single-centre, non-randomized design and modest sample size, which may restrict generalizability. The absence of a control group and short follow-up period precluded assessment of long-term iron repletion, neonatal outcomes, or recurrence. Biochemical monitoring was incomplete in some participants, and no cost-effectiveness analysis was performed, limiting policy applicability in resource-constrained settings.

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