

A Study On Effectiveness Of Iron Supplementation In Improving Haemoglobin Levels Among Pregnant And Non-Pregnant Women

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ABSTRACT

Iron deficiency anaemia is a major concern among women of reproductive age and may be intensified during pregnancy because of increased maternal and foetal iron requirements. This prospective observational study evaluated iron supplementation among pregnant and non-pregnant women attending KIMS Hospital, Secunderabad. A total of 121 women aged 18–49 years were included, comprising 58 pregnant (47.9%) and 63 non-pregnant (52.1%) participants receiving prescribed oral iron therapy. Clinical characteristics, haemoglobin response, medication use, adherence, pregnancy trimester, symptoms, red-cell indices, and anaemia severity were recorded over a six-month study period. The thesis reported mean haemoglobin improvement from 9.4 to 11.8 g/dL in pregnant women and from 8.9 to 11.5 g/dL in non-pregnant women. Across the full cohort, 39.7% had a haemoglobin rise greater than 1.5 g/dL and 43.0% had a rise of 1.0–1.5 g/dL. High medication adherence was reported in 73.6% of participants. Livo-gen was the most frequently recorded formulation (25.6%), followed by Dex-orange (20.7%). Pregnancy status was not associated with anaemia severity in the reported chi-square analysis ($\chi^2=1.15$, $p=0.563$), whereas MCV-based morphology was reported as associated with severity ($\chi^2=43.2$, $p<0.001$). The findings support continued haemoglobin monitoring, adherence counselling, and appropriate iron supplementation in women with iron deficiency anaemia.

Keywords: Iron supplementation; Haemoglobin; Iron deficiency anaemia; Pregnancy; Women of reproductive age; Medication adherence

I. INTRODUCTION

Iron deficiency anaemia (IDA) is a common nutritional disorder in women of reproductive age and is characterized by inadequate iron availability for normal haemoglobin synthesis. Women are particularly susceptible because of menstrual blood loss, dietary insufficiency, and the increased physiological demands of pregnancy. During pregnancy, expansion of maternal blood volume and transfer of iron to the developing foetus increase the requirement for iron, making routine monitoring and timely treatment clinically important [1]–[5].

Oral iron therapy remains a central approach to prevention and treatment of IDA. Ferrous and ferric preparations, often combined with folic acid or vitamin C, are used to replenish iron stores and support erythropoiesis. Treatment response is influenced by baseline iron status, formulation, dose, gastrointestinal tolerability, adherence, dietary factors, and pregnancy-related changes in iron metabolism [6], [7].

The study was undertaken because comparative real-world evidence on supplementation response in pregnant and non-pregnant women was considered limited. The thesis therefore examined haemoglobin response alongside pregnancy status, trimester, prescribed iron formulations, medication adherence, symptoms, and red-cell indices in women receiving routine clinical care.

II. OBJECTIVES

- To assess the prevalence and severity of iron deficiency anaemia among pregnant and non-pregnant women.
- To evaluate improvement in haemoglobin levels following iron supplementation in both study groups.
- To examine commonly used iron formulations, including ferrous sulphate and ferrous ascorbate preparations.
- To analyse trimester-wise anaemia findings in pregnant women receiving iron therapy.
- To assess treatment adherence and the clinical/tolerability profile documented during supplementation.
- To evaluate the overall role of iron therapy in anaemia management among women of reproductive age.

III. LITERATURE SURVEY

Published evidence identifies iron deficiency as a leading nutritional cause of anaemia in women and emphasizes the need for screening and correction during reproductive years [1], [2]. Maternal anaemia is associated with clinically important pregnancy risks, while adequate iron status is necessary for maternal erythropoiesis, placental function, and foetal development [3], [5], [8].

Studies of antenatal supplementation have shown that iron-containing regimens can reduce maternal iron deficiency and anaemia, although residual iron deficiency may persist in some women [8]. Systematic evidence also links maternal anaemia with adverse maternal and neonatal outcomes, supporting early diagnosis and structured treatment [9], [10].

Iron response is not determined by supplementation alone. Absorption, iron stores, treatment adherence, and the balance between inadequate and excessive haemoglobin concentrations must be considered during therapy [7], [11]. These findings support evaluation of treatment response in both pregnant and non-pregnant populations rather than assuming identical clinical behaviour.

IV. MATERIALS AND METHODS

Study design and setting

A prospective observational study was conducted at KIMS Hospital, 1-8-31/1 Minister Road, Krishna Nagar Colony, Secunderabad, Telangana. The thesis describes a six-month study period. Women receiving iron supplementation as part of routine therapy were observed without experimental allocation of treatment.

Table 1. Study design and eligibility criteria

Item	Study specification
Design	Prospective observational study
Study setting	KIMS Hospital, Secunderabad, Telangana
Study duration	Six months
Sample size	121 women
Age range	18–49 years
Included	Pregnant or non-pregnant women with IDA receiving prescribed oral iron supplementation and adequate clinical/Hb data
Excluded	Incomplete records; non-iron anaemia/haemoglobin disorders; no iron supplementation; severe comorbidity independently affecting Hb

Data collection and outcomes

Demographic and clinical data included age, pregnancy status, trimester where applicable, haemoglobin measurements, clinical symptoms, prescribed iron formulation, dosage/frequency information, treatment adherence, RBC count, and mean corpuscular volume (MCV). The primary treatment-response outcome was improvement in haemoglobin concentration. Additional descriptive outcomes included anaemia severity, medication patterns, adherence, symptoms, and red-cell morphology.

Statistical analysis and ethics

IBM SPSS version 24 was reported for analysis. Categorical variables were summarized using frequencies and percentages, while continuous variables were described using means and standard deviations where available. The thesis reports chi-square testing at a 5% significance level. Ethical approval was reported as obtained from KIMS Hospital Hyderabad; participant privacy and confidentiality were maintained. No ethics approval number was provided in the thesis.

V. RESULTS

Study population and anaemia profile

Table 2. Study population and selected anaemia characteristics

Characteristic	Frequency	Reported percentage
Pregnant women	58	47.9%
Non-pregnant women	63	52.1%
Mild anaemia	28	10.8%
Moderate anaemia	64	65.0%
Severe anaemia	29	24.2%
Microcytic MCV (<80 fL)	86	71.1%
Normocytic MCV (80–100 fL)	33	27.3%
Macrocytic MCV (>100 fL)	2	1.6%

Note: The anaemia-severity frequencies total 121, but the percentages printed in the thesis do not mathematically reconcile with those frequencies. Both are reproduced as reported rather than silently recalculated.

Haemoglobin response to supplementation

Table 3. Reported mean haemoglobin response by pregnancy status

Group	Before supplementation (g/dL)	After supplementation (g/dL)	Absolute change (g/dL)
Pregnant women	9.4	11.8	+2.4
Non-pregnant women	8.9	11.5	+2.6

Note: These group means are reported in the thesis Discussion. No paired-test p-value or confidence interval for the pre/post change was provided.

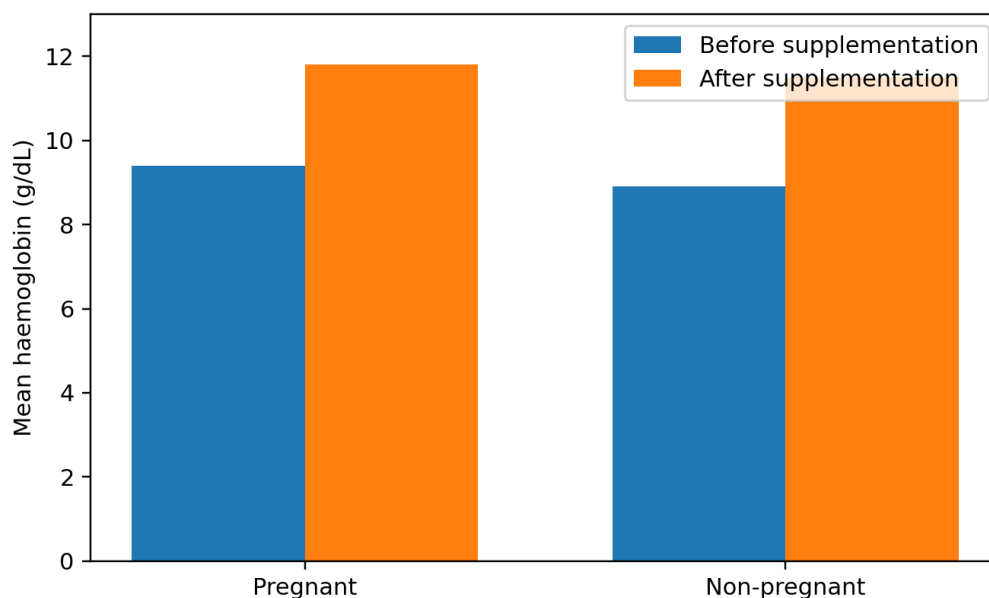


Fig. 1. Mean haemoglobin levels before and after iron supplementation by pregnancy status.

Table 4. Magnitude of haemoglobin rise after supplementation

Hb rise category	Frequency	Percentage
Significant (>1.5 g/dL)	48	39.7%
Moderate (1.0–1.5 g/dL)	52	43.0%
Minimal (<1.0 g/dL)	21	17.3%

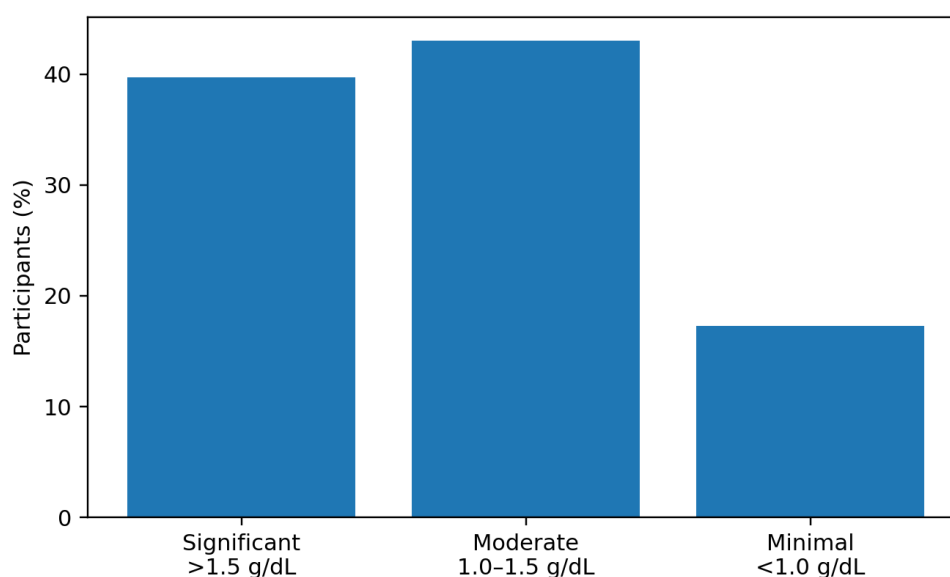


Fig. 2. Distribution of haemoglobin-rise categories after iron supplementation.

Pregnancy-related findings

Table 5. Trimester-wise status reported among pregnant women

Trimester	Frequency	Reported percentage
First trimester (0–12 weeks)	12	35%
Second trimester (13–26 weeks)	22	42%
Third trimester (27–40 weeks)	24	48%

Note: The trimester frequencies total the 58 pregnant participants. The reported percentages sum to more than 100% and therefore appear to represent trimester-specific anaemia prevalence rather than the distribution of the 58 pregnant participants. The thesis does not fully clarify the denominator.

The thesis also reports trimester haemoglobin values in two slightly different series: 10.4, 9.2, and 8.6 in one methodology passage and 10.5, 9.4, and 8.8 in another. Because these values are internally inconsistent and some passages label haemoglobin as mg/dL rather than the clinically used g/dL, they are not merged into a single fabricated series in the article.

Iron formulations and adherence

Table 6. Iron formulations prescribed in the study population

Medication	Frequency	Percentage
Livo-gen	31	25.6%
Dex-orange	25	20.7%
Au-trin	24	19.8%
Oro-fer XT	21	17.4%
Ferro-soft	20	16.5%

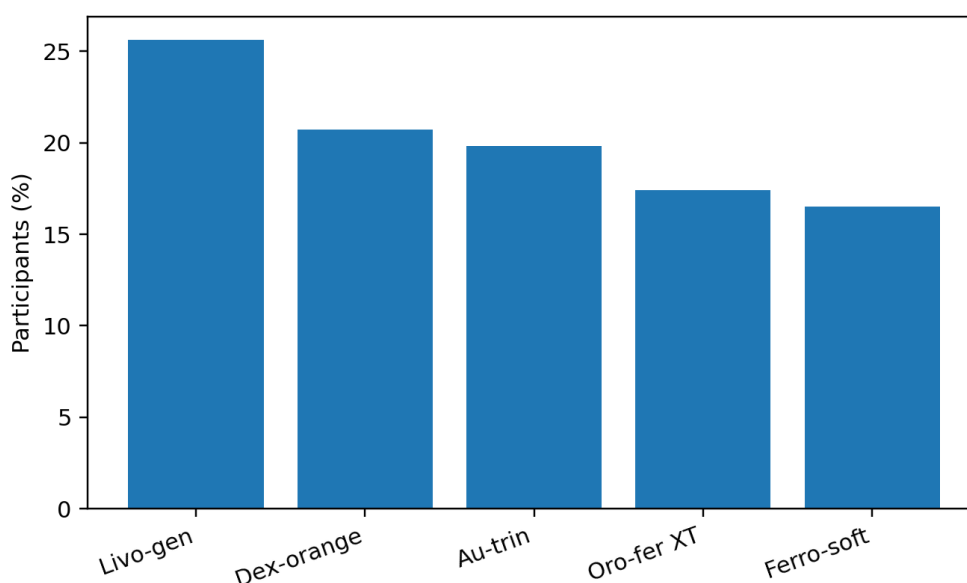


Fig. 3. Distribution of recorded iron formulations.

Table 7. Medication adherence

Adherence level	Frequency	Percentage
High (>80% doses)	89	73.6%
Medium (50–79% doses)	22	18.2%
Low (<50% doses)	10	8.2%

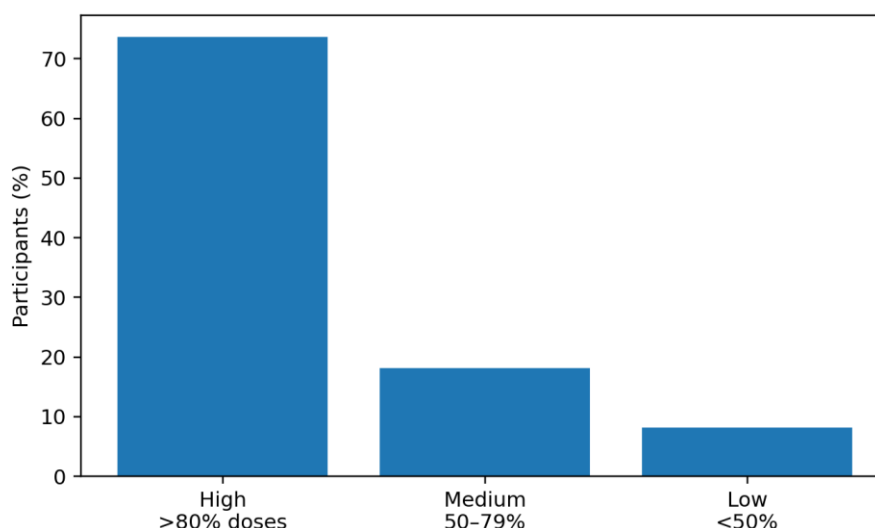


Fig. 4. Medication adherence among study participants.

Clinical symptoms and statistical findings

Table 8. Clinical symptoms reported among women with IDA

Clinical symptom	Frequency	Percentage
Fatigue/weakness	30	24.8%
Hair fall/brittle nails	26	21.5%
Pale skin	24	19.8%
Shortness of breath	21	17.4%
Chest discomfort	20	16.5%

Table 9. Chi-square results reported in the thesis

Analysis	χ^2	df	p-value	Thesis conclusion
Pregnancy status vs anaemia severity	1.15	2	0.563	No meaningful association
MCV-based morphology vs anaemia severity	43.2	4	<0.001	Significant association; microcytosis more common in moderate/severe anaemia

Note: For the MCV analysis, the thesis table also contains the contradictory phrase 'Fail to reject the null hypothesis' despite $p < 0.001$ and its stated significant-association conclusion. The numerical p-value and stated association are reproduced without silently resolving that source inconsistency.

VI. DISCUSSION

The study describes improvement in haemoglobin after iron supplementation in both groups. The reported mean increase was 2.4 g/dL in pregnant women and 2.6 g/dL in non-pregnant women. In the full cohort, 82.7% of participants were classified as having either a moderate or greater-than-1.5 g/dL haemoglobin rise, indicating that most participants demonstrated a measurable treatment response.

High adherence was documented in nearly three quarters of the cohort, which is clinically relevant because oral iron effectiveness depends strongly on continued use. Livo-gen, Dex-orange, Au-trin, Oro-fer XT, and Ferro-soft accounted for the recorded formulations. The study did not randomize participants to formulations, so these prescription frequencies should not be interpreted as comparative efficacy rankings among products.

Pregnancy-specific findings suggest a greater burden of anaemia later in gestation, consistent with the increasing physiological requirement for iron during pregnancy [3], [5], [8]. The predominance of microcytic morphology also supports an iron-deficiency pattern, and the thesis reports a strong association between MCV morphology and anaemia severity ($p < 0.001$). In contrast, pregnancy status itself was not associated with anaemia severity in the reported chi-square analysis ($p = 0.563$).

Study limitations

Several limitations should be considered when interpreting the findings. The thesis does not report a paired inferential test or confidence interval for the pre/post haemoglobin change, so the treatment improvement is descriptive rather than a formally tested within-subject effect in the supplied analysis. Some percentages and

frequencies are internally inconsistent, and haemoglobin units/trimester values vary between sections. The thesis also discusses gastrointestinal adverse effects generally but does not provide a separate patient-level adverse-event frequency table, limiting quantitative assessment of tolerability. The study was conducted at a single hospital and therefore may not represent all women with IDA.

VII. CONCLUSION

- Iron supplementation was associated with improved haemoglobin levels in both pregnant and non-pregnant women in this prospective observational cohort.
- The thesis reported mean haemoglobin increases from 9.4 to 11.8 g/dL in pregnant women and from 8.9 to 11.5 g/dL in non-pregnant women.
- A moderate or significant haemoglobin rise was reported in 82.7% of the cohort, while high treatment adherence was observed in 73.6%.
- Ferrous-salt and combination products were commonly prescribed, with Livo-gen the most frequently recorded formulation.
- Microcytic morphology predominated and was reported to be associated with anaemia severity, whereas pregnancy status was not associated with severity in the reported chi-square analysis.
- Routine haemoglobin monitoring, adherence counselling, early identification of IDA, and appropriate iron therapy remain central to anaemia management in women of reproductive age.

VIII. DECLARATIONS

Ethics approval: The thesis reports ethical approval from KIMS Hospital Hyderabad. No approval/reference number was provided.

Confidentiality: Participant privacy and confidentiality were reported as maintained, with access to patient data restricted to the principal investigator.

Funding: Not reported in the thesis.

Conflict of interest: Not reported in the thesis.

REFERENCES

- [1] World Health Organization. Anaemia. Accessed 20 September 2024. Available from the WHO anaemia fact sheet.
- [2] Barroso F, Allard S, Kahan BC, Connolly C, Smethurst H, Choo L, et al. Prevalence of maternal anaemia and its predictors: a multi-centre study. *Eur J Obstet Gynecol Reprod Biol.* 2011;159:99–105. doi:10.1016/j.ejogrb.2011.07.041.
- [3] Churchill D, Ali H, Mousa M, Donohue C, Pavord S, Robinson SE, et al. Maternal iron deficiency anaemia in pregnancy: lessons from a national audit. *Br J Haematol.* 2022;199:277–284. [DOI as supplied in thesis].
- [4] World Health Organization. Global Nutrition Targets 2025: Anaemia Policy Brief. Accessed 20 September 2024.
- [5] Cao C, O'Brien KO. Pregnancy and iron homeostasis: an update. *Nutr Rev.* 2013;71:35–51. doi:10.1111/j.1753-4887.2012.00550.x.
- [6] Andrews NC. Disorders of iron metabolism. *N Engl J Med.* 1999;341:1986–1995. doi:10.1056/NEJM199912233412607.
- [7] Lynch S, Pfeiffer CM, Georgieff MK, Brittenham G, Fairweather-Tait S, Hurrell RF, et al. Biomarkers of Nutrition for Development (BOND)—Iron Review. *J Nutr.* 2018;148:1001S–1067S. doi:10.1093/jn/nxx036.
- [8] Zhao G, Xu G, Zhou M, Jiang Y, Richards B, Clark KM, et al. Prenatal iron supplementation reduces maternal anaemia, iron deficiency, and iron deficiency anaemia in a randomized clinical trial in rural China. *J Nutr.* 2015;145:1916–1923. doi:10.3945/jn.114.208678.
- [9] Rahman MM, Abe SK, Rahman MS, Kanda M, Narita S, Bilano V, et al. Maternal anaemia and risk of adverse birth and health outcomes in low- and middle-income countries: systematic review and meta-analysis. *Am J Clin Nutr.* 2016;103:495–504. doi:10.3945/ajcn.115.107896.
- [10] Shi H, Chen L, Wang Y, Sun M, Guo Y, Ma S, et al. Severity of anaemia during pregnancy and adverse maternal and foetal outcomes. *JAMA Netw Open.* 2022;5:e2147046. doi:10.1001/jamanetworkopen.2021.47046.
- [11] Dewey KG, Oaks BM. U-shaped curve for risk associated with maternal haemoglobin, iron status, or iron supplementation. *Am J Clin Nutr.* 2017;106:1694S–1702S. doi:10.3945/ajcn.117.156075.
- [12] Scanlon KS, Yip R, Schieve LA, Cogswell ME. High and low haemoglobin levels during pregnancy: differential risks for preterm birth and small for gestational age. *Obstet Gynecol.* 2000;96:741–748. doi:10.1097/00006250-200011000-00018.
- [13] Alwan NA, Hamamy H. Maternal iron status in pregnancy and long-term health outcomes in the offspring. *J Pediatr Genet.* 2015;4:111–123. doi:10.1055/s-0035-1556742.
- [14] Quezada-Pinedo HG, Cassel F, Duijts L, Muckenthaler MU, Gassmann M, Jaddoe VWV, et al. Maternal iron status in pregnancy and child health outcomes after birth: a systematic review and meta-analysis. *Nutrients.* 2021;13:2221. doi:10.3390/nu13072221.
- [15] Hytten FE, Paintin DB. Increase in plasma volume during normal pregnancy. *J Obstet Gynaecol Br Emp.* 1963;70:402–407. doi:10.1111/j.1471-0528.1963.tb04922.x.