



Cost-effectiveness of using Intravenous Ferric Carboxymaltose vs Intravenous Iron Sucrose for Treatment of Iron Deficiency Anemia in Pregnancy

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Recommendations:

- The proposed intervention IV FCM is cost effective for introduction in public health programme at current price of Rs. 2400 for 1000mg to treat moderate to severe iron deficiency anemia among pregnant women.
- IV FCM significantly increases both hemoglobin and ferritin levels with negligible adverse events compared to IV ISC.
- IV FCM has an added advantage of administration of large dose (1000mg) in a day and thus reduces out-of-expenditure as well as health system cost compared to IV ISC which needs an average 4 to 5 visits to complete the total required dosage.

Background

- Anemia is a major public health concern which contributes to maternal and perinatal morbidity and mortality.
- Anemia during pregnancy increases the risk of premature birth, low birth weight, and fetus malformation.
- In India, more than 50% of pregnant women suffer from anemia (NFHS-5, 2019-21) (1).
- The most commonly used parenteral iron includes IV Iron Sucrose which requires multiple visits to complete the dose incurring additional costs with possible poor compliance.
- Despite evidence and guidelines supporting IV FCM, its adoption in India remains limited due to higher costs.
- The price of IV FCM drug per 1000mg is INR 2400 compared to IV ISC which is INR 66.9 per 1000mg dose administered (7).

PICO	Description of the components
Population	Pregnant women in second trimester having moderate to severe Iron deficiency anemia in India
Intervention	IV Ferric Carboxymaltose (IV FCM) 1000mg in single visit
Comparator	IV Iron Sucrose (IV ISC) 1000mg dose given in five visits (200mg each visit given on alternate days)
Outcome	- Incremental cost-effectiveness ratio (ICER) per QALY gained - Number of pregnant women who recovered from anemia - Drug related adverse events averted - Maternal deaths (including PPH) and Adverse neonatal outcomes averted (including still births, preterm and low birth weight)
Perspective	Abridged Societal Perspective (Health system Cost and OOPE)

Key Findings:

- Treating pregnant women with moderate to severe IDA using IV FCM costs INR 19,091.66 for each QALY gained compared with IV ISC.
- The incremental QALY gained per pregnant women 0.069.
- The incremental number of women who recovered from anemia and with improved iron stores (Ferritin levels > 30 mcg/L with no change in Hb) by IV FCM is high.
- The intervention IV FCM could additionally avert the number of drug related adverse events, adverse neonatal outcomes (preterm birth, stillbirth and low birth weight) and maternal deaths.



Methodology

- A decision tree model was developed with the analytical time horizon considered from the second trimester of pregnancy until delivery for pregnant anemic women with moderate to severe iron deficiency anemia to evaluate the costs and outcomes.
- The model considered QALYs gained, recovery from anemia, rise in Serum Ferritin levels (≥ 30 mcg) (with no change in Hb), adverse events due to drug averted, still births, preterm/LBW and normal/C-section delivery estimated from primary data. The estimates for NICU admissions, PPH, hysterectomy and neonatal/maternal mortality uses secondary data.
- Health system cost estimates were used from National Health System Cost Database and the price of the drugs were obtained from the Tamil Nadu Medical Service Corporation.

Parameters	Values	Model Parameters per pregnant anaemic woman	IV FCM (INR)	IV ISC (INR)
Incremental number of women who recovered from anemia	5,88,777 (471021.94, 706532.9)	Total Cost (health system + OOE) per pregnant anaemic woman	INR 15,058.02 (12046.4, 18069.6)	INR 13,742.38 (10993.9, 16490.8)
Incremental number of women with improved iron stores (Ferritin levels >30 microgm/l with no change in Hb)	7,23,355 (578684.09, 868026.14)	QALYs per pregnant anaemic women	50.303 (40.24, 60.36)	50.234 (40.19, 60.28)
Drug Related Adverse Events Averted	4,20,555 (336444.24, 504666.36)	Incremental Cost per pregnant anaemic woman	INR 1,315.63 (1052.5, 1578.7)	
Adverse Neonatal Outcomes Averted (Preterm birth, Still Birth and Low Birth Weight)	4,80,634 (384507.7, 576761.55)	Incremental QALY gained per pregnant anaemic woman	0.069 (0.055, 0.083)	
Maternal Deaths Averted	22 (17.7, 26.6)	ICER per QALY gained	INR 19,091.66 (15273.33, 22910.0)	

Sensitivity Analysis:

- Sensitivity analysis showed that the lower value for the probabilities of the parameters such as c-section delivery and preterm/LBW for IV FCM decreased the ICER and vice-versa. Across all plausible parameter ranges, the ICER remained well below India's per-capita GDP threshold.
- Probabilistic sensitivity analysis (PSA) indicated that more than 95% of the times the ICERS were within the cost-effectiveness threshold.
- The cost-effectiveness acceptability curve (CEAC) showed a 98% probability that the intervention is cost-effective at the chosen willingness-to-pay threshold.

Budget Impact Analysis:

- In a district with 18 lakhs population, as per the SRS 2021 Crude birth rate and NFHS 5, the estimated number of **pregnant women with moderate to severe iron deficiency anemia** is 10,712.
- The estimated incremental annual health system budget for providing moderate/severe anemic pregnant women with IV FCM compared to IV ISC in one district with 18 lakhs population is INR 2.25 crores.

Conclusion:

- Cost effectiveness: The incremental cost-effectiveness ratio (ICER) per QALY gained for treatment of pregnant anemic women with IV FCM is INR 19,091.6 (0.08 times GDP per capita) at price INR 2400 for 1000mg.
- IV Ferric Carboxymaltose is an effective parenteral iron therapy for the treatment of iron deficiency anemia in pregnant women leading to improved maternal and fetal health outcomes along with reduction in out-of-pocket expenses.

References

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