EDITORIAL

Iron supplementation and anaemia in India: necessary, but no longer sufficient

Manya Prasad, Umesh Kapil
Institute of Liver and Biliary Sciences, New Delh
All India institute of Medical Sciences, New Delhi

CORRESPONDING AUTHOR
Dr Umesh Kapil, Former Professor, Department of Gastroenterology and Human Nutrition Unit, All India Institute of Medical Sciences (AIIMS), New Delhi 110029
Email: umeshkapil@gmail.com

CITATION
Prasad M, Kapil U. Iron supplementation and anaemia in India: necessary, but no longer sufficient. Journal of the Epidemiology Foundation of India. 2025;3(3):229-230.
DOI: https://doi.org/10.56450/JEFI.2025.v3i03.001
ARTICLE CYCLE
Received: 20/09/2025; Accepted: 25/09/2025; Published: 30/09/2025

Anaemia in India remains one of the most persistent public health challenges despite decades of iron–folic acid (IFA) supplementation programmes. National policy has appropriately emphasised iron supplementation as the cornerstone of prevention and treatment of iron-deficiency anaemia. However, contemporary national data and biomarker evidence make one conclusion unavoidable: while iron supplementation remains necessary, it is no longer sufficient to achieve meaningful population-level reductions in anaemia. The next phase of India's strategy must move beyond tablet distribution toward diagnostic precision, targeted therapeutic intensity, and systematic action on non-iron causes.

National data on burden: Anaemia continues to affect Indians across the life course. According to NFHS-5, 67.1% of children aged 6–59 months, 59.1% of adolescent girls, 52.2% of pregnant women, and 57.0% of women of reproductive age are anaemic. In several groups, prevalence has stagnated or worsened compared with NFHS-4, despite programme expansion.(1) These trends suggest that improvements in service coverage have not translated into the expected biological impact.

Crucially, anaemia in India is not synonymous with iron deficiency. The Comprehensive National Nutrition Survey (CNNS) reported that among children aged 1–4 years, anaemia prevalence was 40.5% while iron deficiency was 31.9%; among adolescents, anaemia was 28.4% versus iron deficiency 21.5%.(2) CNNS also documented measurable inflammation and substantial vitamin B12 and folate deficiencies, particularly among adolescents.(3) These findings highlight the multifactorial nature of anaemia and the limitations of iron-only approaches.

Global synthesis reinforces this interpretation. Cross-country analyses show that the proportion of anaemia attributable to iron deficiency is often well below the commonly assumed 50% and varies widely across settings.(3) Therefore, even perfectly implemented iron programmes will achieve only partial reductions where iron deficiency is not the dominant driver.

Efficacy versus Effectiveness of oral iron: Oral iron remains the cornerstone of treatment for iron-deficiency anaemia because it is inexpensive, scalable, and biologically effective. Indian national guidelines provide age- and severity-specific treatment protocols.(4) High-quality evidence supports clinical efficacy. A recent Cochrane review found that daily oral iron during pregnancy reduces maternal anaemia and iron deficiency at term.(5) Another Cochrane review in menstruating women reported substantial reductions in anaemia (risk ratio ≈0.39).(6)

However, programme effectiveness depends heavily on adherence and implementation fidelity. NFHS-5 shows that only 44.1% of pregnant women consumed IFA for ≥100 days and just 26.0% for ≥180 days.[1] These gaps are large enough to blunt population-level impact even when tablets are widely distributed. Recognising this, Anaemia Mukt Bharat (AMB) emphasises behaviour change communication, life-course supplementation, and strengthened service delivery.(7)

India's recent operational guidance appropriately positions IV iron (ferric carboxymaltose or iron sucrose) as second-line therapy when oral treatment fails or rapid correction is needed, while reiterating oral iron as first line.(8.9)

Why anaemia declines have been limited: Modest national progress in reducing anaemia in India reflects a convergence of biological and programmatic constraints. First, the attributable fraction is inherently limited—when a substantial proportion of anaemia is not caused by iron deficiency, iron supplementation alone cannot eliminate the burden.[3] Second, inflammatory states impair oral iron response through hepcidin-mediated mechanisms that reduce intestinal absorption and sequester iron in storage sites, leading to anaemia of inflammation and underscoring the need for biomarker-guided approaches.(10) Third, infection ecosystems remain important; although Anaemia Mukt Bharat (AMB) includes deworming and malaria control, implementation is variable, and sanitation trials in India suggest that WASH improvements alone may not rapidly reduce anaemia because of complex transmission pathways.(11) Fourth, haemoglobinopathies impose a biological ceiling on responsiveness—India's beta-thalassaemia carrier prevalence (≈2.8–4.0%) means that iron therapy will not correct a significant subset of genetic anaemias.(12) Fifth, multiple micronutrient deficiencies coexist, with CNNS documenting substantial vitamin B12 and folate deficiencies that further limit the effectiveness of iron-only strategies.(2) Finally, measurement considerations complicate trend interpretation, as NFHS relies on capillary haemoglobin, which is not directly comparable with venous measurements, highlighting the need for harmonised biomarker surveillance.(1)

Policy directions for the next phase: India does not need to abandon iron supplementation; it needs to deploy it with greater precision within a systems framework. Five pragmatic shifts could accelerate progress. Hb alone cannot distinguish iron deficiency from inflammation-related anaemia. WHO recommends ferritin measurement with adjustment for inflammation. Deworming, malaria management in endemic pockets, and treatment of chronic infections should be operational priorities, not adjuncts. Evidence from high-malaria settings cautions against untargeted iron delivery without infection control.(13) AMB's inclusion of fortified foods is appropriate, but evidence for staple fortification is heterogeneous, and quality assurance is critical. Vehicles such as double-fortified salt show promise in Indian contexts but require rigorous monitoring.

Measure biological impact. Programmes should routinely track receipt, adherence, and haemoglobin response. NFHS adherence gaps and HMIS–survey discrepancies underline the importance of independent verification.

CONCLUSION

India's anaemia strategy is at an inflection point. Iron supplementation remains foundational and evidence based, but the persistence of high anaemia prevalence despite programme expansion signals the limits of an iron-centric paradigm. The next gains will come from precision—diagnostic, therapeutic, and programmatic. A strategy that combines sustained IFA delivery with biomarker-guided care, targeted IV iron, infection control, haemoglobinopathy awareness, dietary diversification, and robust monitoring is far more likely to bend the anaemia curve than further expansion of tablets alone.

REFERENCES

1. Ministry of Health and Family Welfare (Government of India). National Family Health Survey (NFHS-5) 2019–21: India fact sheet. New Delhi: MoHFW; 2021.
2. Ministry of Health and Family Welfare (Government of India), UNICEF, Population Council. Comprehensive National Nutrition Survey (CNNS) 2016–2018: National report. New Delhi: MoHFW; 2019.
3. Petry N, Olofin I, Hurrell RF, et al. The proportion of anemia associated with iron deficiency in low, medium, and high human development index countries. Nutrients. 2016;8(11):693.
4. Ministry of Health and Family Welfare (Government of India). Guidelines for Control of Iron Deficiency Anaemia. New Delhi: MoHFW; 2013.
5. Finkelstein JL, Cuthbert A, Weeks J, Venkatramanan S, Larvie DY, De-Regil LM, Garcia-Casal MN. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2024;8(8):CD004736.
6. Low MS, Speedy J, Styles CE, De-Regil LM, Pasricha SR. Daily iron supplementation for improving anaemia, iron status and health in menstruating women. Cochrane Database Syst Rev. 2016;4(4):CD009747.
7. National Health Mission. Anaemia Mukt Bharat strategy. New Delhi: MoHFW; updated 2026.
8. Nicholson L, Axon E, Daru J, Rogozińska E. Effect and safety of intravenous iron compared to oral iron for treatment of iron deficiency anaemia in pregnancy. Cochrane Database Syst Rev. 2024;12(12):CD016136.
9. Ministry of Health and Family Welfare (Government of India). Operational Guidelines on Intravenous Iron Treatment in Pregnant Women and Lactating Mothers. New Delhi: MoHFW; 2025.
10. Wang CY, Babitt JL. Hepcidin regulation in the anemia of inflammation. Curr Opin Hematol. 2016;23(3):189-97.
11. Patil SR, Arnold BF, Salvatore AL, Briceno B, Ganguly S, Colford JM Jr, et al. The effect of India's total sanitation campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial. PLoS Med. 2014 Aug 26;11(8):e1001709.
12. Sumedha D, Anita K. Prevalence of beta thalassemia carriers in India: a systematic review and meta-analysis. J Community Genet. 2023 Dec;14(6):527-541.
13. Joe W; Rinju; Patel N, Alambusha R, Kulkarni B, Yadav K, Sethi V. Coverage of iron and folic acid supplementation in India: progress under the Anemia Mukt Bharat strategy 2017-20. Health Policy Plan. 2022 May 12;37(5):597-606.