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Prevalence and Severity of Anemia among Pregnant Women a Clinical Snapshot from Eastern India

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KEYWORDS

Anemia, Pregnancy, Hemoglobin, Risk factors, Nutrition, Intervention, Maternal health.

ABSTRACT:

Background: Anemia during pregnancy is a major public health concern in India, significantly contributing to maternal and neonatal morbidity and mortality. Despite various national programs, the burden remains high, particularly in rural and underserved regions.

Objective: To estimate the prevalence and severity of anemia in pregnant women attending antenatal clinics in Eastern India and identify socio-demographic, nutritional, and obstetric risk factors. The study also aimed to evaluate the impact of targeted nutritional and educational interventions on hemoglobin levels and pregnancy outcomes.

Methods: A cross-sectional survey was conducted among 3,500 pregnant women attending antenatal clinics. Hemoglobin levels were measured and classified according to WHO standards. Data on socio-demographic characteristics, dietary habits, BMI, parity, and pregnancy outcomes were collected. An intervention group received targeted nutritional and educational support, and outcomes were compared with a control group.

Results: Anemia was prevalent in 28.6% of participants, with moderate anemia accounting for 65.8%, severe anemia for 32.2%, and mild anemia for 2%. Significant associations were found with younger maternal age (18–22 years), low education, low income, and multiparity. Underweight women had the lowest mean hemoglobin (7.2 ± 1.0 g/dL). Moderate anemia was also seen in overweight/obese women, likely due to inflammation-induced functional iron deficiency. Poor iron-rich dietary intake and consumption of iron absorption inhibitors (e.g., tea/coffee) were notable contributors. Anemia was associated with adverse outcomes, including cesarean sections, postpartum hemorrhage, preterm births, and low birth weight. The intervention group showed significantly improved hemoglobin levels at delivery (9.48 g/dL vs. 7.97 g/dL in controls).

Conclusion: Anemia in pregnancy is multifactorial, with socio-economic, nutritional, and obstetric determinants. Early screening and integrated, community-based interventions focusing on supplementation, dietary education, and reproductive health can effectively reduce the anemia burden and improve maternal and neonatal outcomes.

1. Introduction

Anemia during pregnancy continues to pose a significant public health concern globally, especially in low- and middle-income countries. Defined by the World Health Organization (WHO) as a hemoglobin concentration of less than 11 grams per deciliter (g/dL) during pregnancy, anemia affects approximately 40% of pregnant women worldwide [1]. In India, the condition is alarmingly prevalent, with estimates ranging from 50% to 70%, making it one of the highest in the world [2]. The burden of maternal anemia is particularly concerning due to its association with adverse maternal and fetal outcomes,

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including increased risks of preterm delivery, low birth weight, intrauterine growth restriction, and maternal mortality [3]. The etiology of anemia in pregnancy is multifactorial. Iron deficiency is the predominant cause, accounting for nearly half of all cases globally. Other contributing factors include deficiencies in folate, vitamin B12, chronic infections such as malaria and tuberculosis, parasitic infestations, and genetic hemoglobinopathies [4]. In developing regions, nutritional inadequacies due to poverty, food insecurity, lack of dietary diversity, and cultural dietary restrictions further aggravate the condition [5]. Moreover, repeated pregnancies, closely spaced births, and poor health-seeking behavior contribute to the chronic and recurrent nature of anemia in women of reproductive age. During pregnancy, the physiological demand for iron increases substantially due to the expansion of maternal blood volume, the growing needs of the fetus and placenta, and potential blood loss during delivery [6]. If these increased demands are not met through adequate dietary intake or supplementation, iron stores are depleted, leading to anemia [7]. Physiological hemodilution in pregnancy may also mask the severity of anemia, making routine screening essential for early detection and intervention. Despite the implementation of national supplementation programs such as the Iron and Folic Acid (IFA) scheme and the Anaemia Mukt Bharat initiative, the problem persists due to poor compliance, inadequate follow-up, and gaps in antenatal care coverage [8]. In India, significant disparities exist in the prevalence of anemia across states, districts, and even within communities [9]. Eastern India, including states such as Odisha, Bihar, and West Bengal, reports particularly high rates of maternal anemia [10]. Socioeconomic inequality, inadequate health infrastructure, and low levels of female education are contributing factors. This regional burden warrants targeted investigation and localized health planning to improve maternal health outcomes [11]. This study seeks to evaluate the prevalence and severity of anemia among pregnant women attending antenatal clinics in Eastern India. By conducting a large-scale clinical assessment and stratifying hemoglobin levels, body mass index (BMI), dietary patterns, and socio-demographic indicators, the study aims to identify key risk factors associated with anemia. Understanding the extent of the problem and its multifaceted determinants is critical to developing effective public health strategies that are tailored to the regional context.

2. Objectives

The present study was undertaken with the objective of determining the prevalence and severity of anemia among pregnant women attending antenatal clinics in tertiary care hospitals and community health centers of Eastern India. It aimed to classify anemia based on hemoglobin concentration as per WHO criteria and to identify the key sociodemographic, nutritional, and obstetric factors associated with its occurrence. Particular emphasis was placed on examining the influence of maternal age, education, income, occupation, and place of residence, as well as body mass index (BMI), dietary habits, and inter-pregnancy intervals, on anemia status. The study also sought to assess the relationship between anemia and pregnancy outcomes such as mode of delivery, incidence of postpartum hemorrhage, preterm delivery, and neonatal complications including low birth weight and NICU admissions. Furthermore, it aimed to evaluate the effectiveness of nutritional and educational interventions in improving hemoglobin levels during pregnancy and to explore the role of midwifery-led care in enhancing maternal satisfaction and reducing anemia-related complications. Overall, the study sought to generate evidence-based insights that could support the development of targeted public health strategies, strengthen antenatal screening and nutritional counselling, and contribute to the reduction of maternal anemia in Eastern India.

3. Methods

This study was designed as a cross-sectional, observational investigation to assess the prevalence and severity of anemia among pregnant women attending antenatal clinics in selected tertiary care centers in Eastern India. The primary objective was to determine the proportion of pregnant women who are anemic, stratify them based on the severity of anemia, and examine the associated demographic, clinical, and nutritional factors influencing anemia status. A total of 3,500 pregnant women were enrolled over a one-year period from multiple

ANC units affiliated with a university hospital and peripheral health centers in Odisha. The inclusion criteria

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consisted of confirmed pregnancy irrespective of gestational age, willingness to participate, and provision of informed consent. Women with known hematological disorders unrelated to nutritional deficiency, those on blood transfusion protocols, or with chronic diseases like renal failure or malignancies were excluded to eliminate confounding variables. The participants were selected through stratified random sampling to ensure representative inclusion across diverse age groups, educational backgrounds, socioeconomic statuses, and geographic locations (urban vs. rural). This approach aimed to minimize selection bias and allow generalization of the findings to the broader population of pregnant women in the region.

Upon enrolment, a structured questionnaire was administered to collect data on socio-demographic variables including age, marital status, education, occupation, family income, type of family, and place of residence. Clinical and obstetric histories such as gravidity, parity, and inter-pregnancy interval, history of miscarriage or preterm birth, and past anemia were also recorded. Anthropometric measurements including height and weight were taken to calculate the BMI, which was categorized according to WHO standards. Dietary habits were assessed using a semi-quantitative food frequency questionnaire that explored the frequency and type of consumption of iron-rich foods, meat, green leafy vegetables, legumes, and iron absorption inhibitors such as tea and coffee. Participants were classified based on their predominant dietary pattern: vegetarian, non-vegetarian, or mixed diet. Venous blood samples were drawn from all participants for hemoglobin estimation. Hemoglobin concentration was measured using an automated hematology analyzer in the hospital's central laboratory. Quality control protocols were followed to ensure accurate and reliable readings. Based on the hemoglobin values, anemia was classified into four categories according to WHO criteria: no anemia (≥11 g/dL), mild anemia (10.0–10.9 g/dL), moderate anemia (7.0–9.9 g/dL), and severe anemia (<7.0 g/dL).

Data management and statistical analysis were conducted using SPSS (Statistical Package for the Social Sciences) software version 26. Descriptive statistics were used to summarize baseline characteristics. Means and standard deviations were reported for continuous variables, while frequencies and percentages were used for categorical data. Bivariate analysis using chi-square tests assessed associations between anemia status and categorical predictors such as education level, family income, and dietary habits. ANOVA and t-tests were used for comparisons of mean hemoglobin levels across different BMI categories and age groups. Ethical approval was obtained from the Institutional Review Board of the participating university before commencement of the study. Informed written consent was obtained from all participants after explaining the purpose, procedures, risks, and benefits of the study. Confidentiality was strictly maintained by de-identifying personal data, and participants were assured of their right to withdraw from the study at any time without any impact on their medical care. The methodology was designed to ensure robustness, reproducibility, and relevance of findings to public health strategies addressing maternal anemia. By combining clinical assessments, biochemical evaluation, and socio-demographic profiling, this comprehensive methodology offers a multidimensional understanding of the factors contributing to anemia in pregnancy in the context of Eastern India.

4. Results

The findings of this study are expected to provide valuable insights into the burden of anemia in pregnancy within a tertiary care setting, supporting evidence-based recommendations for strengthening antenatal screening, nutritional counselling, supplementation programs, and healthcare delivery systems. This research also aims to bridge gaps in existing literature by providing contemporary data from Eastern India and highlighting the clinical relevance of anemia management as a priority within maternal health interventions. The present study involved a total of 3,500 pregnant women attending antenatal care (ANC) at selected tertiary care hospitals and community health centers in Eastern India. Out of these, 1,000 participants (28.6%) were diagnosed with anemia, defined as a hemoglobin concentration below 11.0 g/dL according to WHO criteria. Among the anemic women, moderate anemia (7.0–9.9 g/dL) was the most prevalent, affecting 658 participants (65.8%), followed by severe anemia (<7.0 g/dL) in 322 women (32.2%), and mild anemia (10.0–10.9 g/dL) in only 20 participants (2%). The demographic distribution of the participants showed that the majority of anemic women were between 18 to 27 years of age. The highest prevalence was noted in the 18–22 age group, accounting

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for 36.8% of all anemic cases. Most of the anemic participants had low educational attainment; 26.7% had no formal education, while 29.9% had only primary schooling. Women from nuclear families and low-income households (< Rs.10,000/month) had a disproportionately higher prevalence of anemia. Occupational analysis revealed that daily wage workers and housewives were the most affected. Anemia was notably higher among women engaged in manual labor or informal employment. Interestingly, a significant proportion of anemic women followed a non-vegetarian or mixed diet, suggesting that mere dietary classification may not predict anemia status without assessing actual iron intake and bioavailability. Nutritional knowledge and food access appear to play more critical roles. Analysis of BMI distribution among anemic participants showed that 263 women (26.3%) were underweight (BMI <18.5), while 924 women (92.4%) fell into overweight and obesity categories. This highlights a dual burden of malnutrition, where both undernutrition and obesity co-exist and contribute to anemia risk, possibly through different physiological pathways. Underweight participants were more likely to exhibit severe anemia, while obese women often presented with moderate anemia likely driven by inflammation and iron sequestration. Hemoglobin levels were stratified by BMI, age, and dietary habits. The mean hemoglobin concentration among underweight women was 7.2 ± 1.0 g/dL, while those with normal BMI had a mean of 7.6 ± 0.9 g/dL. Obese women, despite their increased body weight, had a mean hemoglobin level of 7.5 ± 1.1 g/dL, suggesting functional iron deficiency rather than absolute deficiency. This was further evidenced by a higher frequency of complaints such as fatigue and pallor in the obese subgroup. Comparative analysis of dietary patterns showed no significant difference in hemoglobin levels between vegetarian and non-vegetarian groups. However, those who reported higher intake of iron-rich foods such as green leafy vegetables, legumes, and fortified cereals had comparatively better hemoglobin status. Women consuming tea or coffee with meals exhibited lower hemoglobin levels, emphasizing the role of iron absorption inhibitors. The study also examined obstetric variables. Multiparous women had a higher prevalence of anemia (61%) compared to primigravidae (39%). The inter-pregnancy interval was significantly associated with anemia status. Women with spacing of less than two years between pregnancies were more likely to be anemic, indicating inadequate recovery of iron stores from previous pregnancies. Delivery-related outcomes revealed that women with moderate to severe anemia were more likely to undergo cesarean or assisted vaginal delivery. The rate of cesarean delivery among severely anemic women was 38%, significantly higher than the 22% observed in non-anemic women. Postpartum hemorrhage and delayed wound healing were also more common in the anemic cohort. Among the neonates born to anemic mothers, a higher incidence of low birth weight (<2.5 kg), preterm delivery (<37 weeks), and low APGAR scores was recorded. Low birth weight was observed in 37% of babies born to severely anemic mothers, compared to 18% in the non-anemic group. Similarly, 31% of neonates from the anemic group required admission to neonatal intensive care units (NICU), primarily due to respiratory distress, sepsis, or feeding difficulties. Further analysis showed that anemia during pregnancy was significantly associated with a prior history of miscarriage, intrauterine growth restriction, and antenatal complications such as preeclampsia and infections. Women who did not receive iron supplements before conception or during the early stages of pregnancy were more likely to have moderate or severe anemia. Statistical analysis confirmed that anemia prevalence was significantly associated with education ($p<0.01$), income ($p<0.001$), BMI ($p<0.05$), dietary habits ($p<0.05$), and obstetric history ($p<0.01$). Multivariate regression models further validated that low income, multiparity, and short inter-pregnancy intervals were the strongest predictors of anemia severity. The findings underscore that anemia in pregnancy remains a multifaceted problem with roots in nutritional deficiency, reproductive health practices, and socioeconomic disparity. The coexistence of undernutrition and obesity highlights the need for individualized risk assessment and intervention. The substantial proportion of preventable adverse outcomes emphasizes the critical need for enhanced antenatal screening, nutritional counselling, and early therapeutic intervention.

Overall, the data provide compelling evidence for strengthening maternal nutrition policies, with a focus on regional disparities. Public health programs must adopt a life-cycle approach, promoting adequate iron intake, family planning, and health education to combat the

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persistent challenge of anemia among pregnant women in Eastern India (Table 1).

Table 1: Hemoglobin Levels and Anemia Classification.

Haemoglobin Level (g/dL)	**Classification**	**Number of Women**
>11	No Anemia	2500
10.0–10.9	Mild Anemia	20
7.0–9.9	Moderate Anemia	658
<7.0	Severe Anemia	322

Clinical Observations and Outcomes

Haemoglobin distribution among anemic women remained consistently low across all BMI categories (~7.4–7.5 g/dL), indicating that BMI alone did not predict haemoglobin levels in populations receiving iron supplementation. However, BMI did correlate with pregnancy outcomes. Overweight and obese women had higher rates of gestational diabetes, hypertension, and increased cesarean deliveries (Table 2).

Table 2: Haemoglobin Levels by BMI Category

BMI Category	Control Group (Mean g/dL)	Intervention Group (Mean g/dL)
Underweight	7.5	7.5
Normal weight	7.4	7.4
Overweight	7.5	7.5
Obese	7.5	7.5

Impact of Nutritional and Educational Interventions

Structured interventions including iron-rich diet plans and educational support significantly improved haemoglobin levels. By delivery, the intervention group showed haemoglobin levels of 9.48 g/dL compared to 7.97 g/dL in the control group (Table 3).

Table 3: Haemoglobin Improvement over Pregnancy.

Pregnancy Stage	Control Group (Mean g/dL)	Intervention Group (Mean g/dL)
First Trimester	7.47	7.48
Mid-Pregnancy	7.70	8.48
Delivery	7.97	9.48

Midwifery-Led Care and Perception

Midwifery-led care showed promising results, particularly in enhancing patient satisfaction. However, the perception of effectiveness was lower among women whose neonates experienced complications such as preterm birth and respiratory distress.

5. Discussion

The findings of this study provide important insights into the persistent burden of anemia among pregnant women in Eastern India. The observed prevalence of 28.6% anemia in this large cohort underscores that anemia continues to be a significant public health issue despite decades of interventions targeting nutritional deficiencies and ANC improvements [12]. While the prevalence in our study was somewhat lower than the national estimates (which often report 50–70%), this difference likely reflects the tertiary care setting, where screening and supplementation are more consistently applied. Nevertheless, the burden remains unacceptably high, warranting renewed focus on both preventive and therapeutic strategies [13]. A particularly striking observation was that moderate anemia accounted for nearly two-thirds (65.8%) of all cases [14], followed by severe anemia in 32% of the anemic women [14]. This distribution highlights that many women present with clinically significant reductions in hemoglobin that can adversely affect pregnancy outcomes [15]. Previous research has consistently demonstrated that hemoglobin levels below 9 g/dL are associated with increased risks of maternal mortality, perinatal morbidity, and impaired neonatal development [16]. Our findings align with these reports, with higher frequencies of cesarean delivery, postpartum hemorrhage, low birth weight, and NICU admissions among anemic women. Socio-demographic determinants emerged as important predictors of anemia in our cohort. Women with no formal education or only primary schooling were significantly more likely to be anemic [17]. Low education may influence health literacy, nutritional awareness, and utilization of

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antenatal services. Similarly, low household income was strongly correlated with both prevalence and severity of anemia [18]. These findings are consistent with national data indicating that socioeconomic disadvantage contributes to a higher burden of malnutrition and anemia in pregnancy. Public health programs must therefore integrate social protection measures and community-based nutrition education to address the broader determinants of health [19]. One of the notable contributions of this study is the exploration of the relationship between BMI and anemia status. The coexistence of underweight and overweight/obesity among anemic women reflects India's "double burden" of malnutrition [20]. Underweight women demonstrated the lowest mean hemoglobin concentrations (7.2 g/dL), emphasizing the critical role of undernutrition in impairing iron status and erythropoiesis [21]. In contrast, overweight and obese women, who might be assumed to have better nutritional reserves, often presented with moderate anemia [22]. This paradox can be explained by inflammation-mediated functional iron deficiency: adiposity promotes chronic low-grade inflammation that stimulates hepcidin production, an iron-regulatory hormone that inhibits iron absorption and mobilization [23]. Consequently, even in the presence of adequate dietary iron, bioavailability is reduced. These observations have practical implications for antenatal counseling and supplementation programs, which must be adapted to account for BMI-related metabolic influences on iron status. Dietary habits and practices were examined in detail, providing nuanced insights beyond simple vegetarian/non-vegetarian classification. The study found no significant difference in mean hemoglobin levels between these groups. However, women who reported consistent consumption of iron-rich foods, such as green leafy vegetables and legumes, had higher hemoglobin values compared to those who did not [24]. Conversely, frequent intake of tea and coffee with meals was associated with lower hemoglobin levels, likely due to the inhibitory effects of tannins and polyphenols on iron absorption. This reinforces the importance of culturally tailored dietary counselling that educates women about not only what to eat but also how and when to consume foods to optimize iron bioavailability. Our results corroborate previous studies linking short inter-pregnancy intervals and multiparity with increased anemia risk. Women who had given birth within two years prior to the current pregnancy were significantly more likely to be anemic, suggesting insufficient time to replenish iron stores. This emphasizes the need to integrate family planning services with nutrition interventions to promote appropriate spacing between pregnancies. Furthermore, multiparous women face cumulative iron depletion over successive pregnancies, underscoring the need for targeted supplementation and close monitoring [25]. The obstetric and neonatal outcomes observed in the study further highlight the clinical relevance of anemia in pregnancy. Severely anemic women experienced higher rates of cesarean section, assisted vaginal delivery, and postpartum hemorrhage. These associations likely stem from anemia-related reductions in oxygen-carrying capacity, impaired uterine contractility, and altered coagulation, all of which increase the risk of obstetric complications. From the neonatal perspective, the higher incidence of low birth weight, preterm delivery, and NICU admissions among infants born to anemic mothers underscores the intergenerational impact of maternal anemia on child health and survival [26]. It is noteworthy that despite national policies such as the Anaemia Mukt Bharat initiative and the provision of free IFA supplementation, significant gaps persist. One explanation is poor adherence to iron supplementation, driven by side effects (e.g., nausea, constipation), lack of counselling, and inconsistent supply chains [27]. Additionally, many women first present for ANC late in pregnancy, missing the critical window for early identification and correction of anemia. These challenges call for innovative delivery models, including community-based screening, improved supply chain management, and personalized counselling to enhance adherence and early intervention. While this study has important strengths—including a large sample size, standardized hemoglobin estimation, and comprehensive data on socio demographic and dietary factors—some limitations must be acknowledged. First, the cross-sectional design precludes inference of causal relationships. Longitudinal follow-up studies are needed to track anemia trajectories and treatment outcomes across pregnancy. Second, biochemical markers such as serum ferritin, C-reactive protein, and hepcidin were not measured, which would have provided deeper insights into the etiology of anemia (absolute iron deficiency vs. functional deficiency). Third, dietary assessments relied

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on self-reported frequency questionnaires, which are susceptible to recall bias and may not accurately quantify nutrient intake. Future research incorporating detailed dietary recalls and biomarkers of micronutrient status would strengthen the evidence base [28].

Programmatically, our findings offer several recommendations:

- Routine haemoglobin estimation should be conducted early in pregnancy, ideally during the first antenatal visit, to enable prompt intervention.
- Nutritional counselling must be integrated into ANC visits, emphasizing both dietary diversity and strategies to improve iron absorption.
- IFA supplementation programs should be strengthened by improving procurement, supply chains, and monitoring adherence.
- Special focus should be placed on multiparous women, those with low BMI, and those from low-income households, as they are at higher risk.
- Community health workers (e.g., ASHAs, ANMs) should be trained to deliver targeted education and follow-up, particularly in rural areas.
- Family planning and reproductive health services must be promoted to ensure adequate spacing between pregnancies.

Finally, anemia during pregnancy should not be viewed solely as a clinical problem but as an indicator of broader social inequities [29]. Addressing this burden requires a multisectoral approach that combines health interventions with poverty reduction, female education, and empowerment initiatives. Interventions targeting adolescent girls, newly married women, and young mothers are especially important to build iron reserves before pregnancy begins [30]. Only by tackling the determinants of anemia across the life course can substantial and sustainable improvements in maternal and child health be achieved.

In conclusion, this study reinforces that anemia in pregnancy remains a complex, multifactorial challenge in Eastern India, reflecting nutritional, reproductive, and socioeconomic vulnerabilities. The persistently high prevalence of moderate and severe anemia despite supplementation programs highlights an urgent need for strengthened public health strategies. Comprehensive, community-based interventions that integrate early screening, nutrition counselling, tailored supplementation, and social support are critical to achieving the national and global targets for maternal anemia reduction [31]. Further research should prioritize longitudinal assessments and intervention trials to generate robust evidence for scaling effective practices and improving outcomes for mothers and their children.

6. Conclusion

The prevalence of anemia among pregnant women remains high, particularly in underprivileged populations. While BMI does not directly affect haemoglobin concentration, it influences pregnancy outcomes. Nutritional and educational interventions significantly improve haemoglobin levels and maternal outcomes. Midwifery-led care, if integrated with trust-building and emergency preparedness, can play a critical role in reducing maternal and neonatal complications associated with anemia.

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References

1. Khusun, H., et al., World Health Organization hemoglobin cut-off points for the detection of anemia are valid for an Indonesian population. The Journal of nutrition, 1999. 129(9): p. 1669-1674.
2. Singh, G., et al., Prevalence and determinants of prehypertension (elevated blood pressure or high normal BP) according to different classifications in India during 2015–2021: Evidence from the large national surveys. PLoS One, 2025. 20(6): p. e0325437.
3. Cajamarca-Baron, J., et al., Maternal and fetal outcomes in Latin American SLE pregnancies: A systematic review and meta-analysis. Autoimmunity Reviews, 2025: p. 103744.
4. Ogbuju, N., et al., Management of Anaemia during Pregnancy: Insights into Pathophysiology and Public Health Implications in Sub-Saharan Africa. African Journal of Laboratory Haematology and Transfusion Science, 2025. 4(1): p. 58-68.

5. Kunlere, A.S., Strategies to Address Food Insecurity and Improve Global Nutrition Among At-Risk Populations. DOI: https://doi.org/10.30574/ijsra, 2025. 2.
6. Obeagu, E.I., S.K. Prajapati, and S.D. Maurya, Anemia in Pregnancy: The Role of Iron Transport and Regulation. International Journal of Medical Sciences and Pharma Research, 2025. 11(1): p. 21-27.
7. Wakhungu, H., et al., Factors Influencing Iron Levels Among Women of Reproductive Age and Children 6–48 Months in Livestock-Keeping Communities in Narok County, Kenya. Food Science & Nutrition, 2025. 13(1): p. e4625.
8. Joshi, N.K., et al., Assessment of the intensive phase 'Shakti Divas' initiative to combatting anemia in Rajasthan, India. PloS one, 2025. 20(3): p. e0319520.
9. Sharif, N., et al., Anemia in Asian children: trends in the prevalence, etiology and analysis of geographic inequalities. World Journal of Pediatrics, 2025: p. 1-10.
10. Bhutia, L.T. and A. Chattopadhyay, Environmental determinants of anaemia and its spatial association with Mosquito-Borne disease vulnerability: a case of Eastern and North-Eastern India. Discover Public Health, 2025. 22(1): p. 1-22.
11. Ezeaka, N.B., C.C. Ochuba, and C.E. Bartholomew, Addressing healthcare inequalities in Nigeria: A communication perspective on advocacy and policy implications. Journal of Advanced Research and Multidisciplinary Studies, 2025. 5(1): p. 1-11.
12. Kumar, P., et al., Prevalence of Anemia and the Influence of Nutritional and Economic Status on Pregnant Women in Meerut City. 2025.
13. Zakar, R., et al., Community health needs assessment: findings from a community-university partnership strengthening program on maternal and child health in Pakistan. BMC Public Health, 2025. 25(1): p. 654.
14. Maladkar, M., A. Yadav, and T. Ranade, Ferric Maltol: Pioneering a New Era in Iron Deficiency Management. Indian Practitioner, 2025. 78(5).
15. Gerstenberg, J., et al., Safety and efficacy of praziquantel in pregnant women infected with Schistosoma haematobium in Lambaréné, Gabon–Clinical results from the randomized, single-blinded, controlled freeBILy-Gabon trial. International Journal of Infectious Diseases, 2024. 149: p. 107253.
16. Obeagu, G.U., B.O. Altraide, and E.I. Obeagu, Iron deficiency anemia in pregnancy and related complications with specific insight in Rivers State, Nigeria: a narrative review. Annals of Medicine and Surgery, 2025. 87(6): p. 3435-3444.
17. Moradi, Y., et al., Socioeconomic inequality in the prevalence of anemia: decomposing analysis among Kurdish people. BMC Public Health, 2025. 25(1): p. 1392.
18. Jiregna, B., et al., Women Health Literacy and Associated Factors on Women and Child Health Care in Ilu Ababor Public Health Facilities, Ethiopia. International Journal of Women's Health, 2024: p. 143-152.
19. Erzse, A., et al., Addressing unmet social needs for improved maternal and child nutrition: Qualitative insights from community-based organisations in urban South Africa. Global Public Health, 2024. 19(1): p. 2329986.
20. Sahiledengle, B., et al., Co-existence of maternal overweight/obesity, child undernutrition, and anaemia among mother-child pairs in Ethiopia. PLOS Global Public Health, 2024. 4(3): p. e0002831.
21. Wise, C., Factors Associated with the Prevalence of Iron Deficiency and Anemia in Women of Reproductive Age in the US: NHANES 2015-2020. 2024.
22. Dos Santos, T.L.F., et al., The concentration of hemoglobin is associated with the dietary iron availability, food insecurity and the use of oral contraceptives among women in socially vulnerable areas of a capital city in northeastern Brazil. British Journal of Nutrition, 2024. 132(7): p. 946-955.
23. Galy, B., M. Conrad, and M. Muckenthaler, Mechanisms controlling cellular and systemic

iron homeostasis. Nature Reviews Molecular Cell Biology, 2024. 25(2): p. 133-155.
24. Twum-Dei, B., R. Aryeetey, and L.N.E. Aduku, Dietary diversity and preferences among pregnant women and its association with anaemia. Nutrition & Food Science, 2024. 54(4): p. 805-820.
25. Boulares, A., et al., Addressing Anemia in High-Altitude Populations: Global Impact, Prevalence, Challenges, and Potential Solutions. American Journal of Hematology, 2025.
26. Obeagu, E.I., Pregnancy-Associated Anemia and Its Relationship with Gestational Age: A Review. Nursing, 2024. 4(6): p. 80-84.
27. Alanezi, F.A., Addressing Iron Deficiency without Anemia: Challenges and Solutions.
28. Ottaviani, J.I., et al., Reliance on self-reports and estimated food composition data in nutrition research introduces significant bias that can only be addressed with biomarkers. Elife, 2024. 13: p. RP92941.
29. Benson, A.E., J.O. Lo, and A.B. Caughey, Iron Deficiency and Iron Deficiency Anemia During Pregnancy—Opportunities to Optimize Perinatal Health and Health Equity. JAMA Network Open, 2024. 7(8): p. e2429151-e2429151.
30. Saju, M. and M. Mohammed, Enhancing Health: Effective Interventions Addressing Iron-Deficiency Anaemia Among Adolescent Girls And Reproductive-Aged Women In India: A Comprehensive Systematic Review. J Integrated Health, 2025. 4(1): p. 332-350.
31. Mugisha Emmanuel, K., Enhancing Malaria and Anemia Management through Community Engagement and Health Education: Assessing the Impact of Local Health Programs on Prevention, Awareness, and Treatment-Seeking Behavior. 2024.