Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 27s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Fetomaternal Outcomes in Pregnant Women with Anemia at a Tertiary Care Hospital – A Cross-sectional Study

Yashaswini C[1], Dr Munikrishna[*2], Dr Nandini[3]

[1]Department of OBG, 3rd year PG, Sri Devaraj URS medical college, Kolar, India

Email ID: yashaswinic24@gmail.com

[*2]Professor and Head, Department of OBG, Sri Devaraj URS medical college, Kolar, India

[3]Associate professor, Department of OBG, Sri Devaraj URS Medical College, Kolar, India

Email ID: nandinismanjunath225@gmail.com

***Corresponding Author:**

Dr. Munikrishna

Email ID: drmunikrishna_m@rediffmail.com

Cite this paper as: Yashaswini C, Dr Munikrishna, Dr Nandini, (2025) Fetomaternal Outcomes in Pregnant Women with Anemia at a Tertiary Care Hospital – A Cross-sectional Study. *Journal of Neonatal Surgery*, 14 (27s), 114-121.

1. INTRODUCTION

Anemia in pregnancy remains a pressing global public health concern, disproportionately affecting low- and middle-income countries. Defined by the World Health Organization (WHO) as a hemoglobin concentration below 11 g/dL during gestation, maternal anemia is associated with increased risks of maternal morbidity, perinatal complications, and long-term neonatal adverse outcomes. [1] Globally, the estimated prevalence of anemia among pregnant women is approximately 36.5%, reflecting a widespread burden across diverse health systems and demographic profiles. [2] However, the situation is significantly more severe in India, where data from the National Family Health Survey-5 (NFHS-5) report that over 52.2% of pregnant women between the ages of 15–49 years are anemic, with some states such as Bihar and Gujarat reporting prevalence rates exceeding 60%. [3]

Anemia during pregnancy has multifactorial etiologies, with iron deficiency being the most prevalent cause, followed by folate deficiency, chronic infections, and hereditary hemoglobinopathies. [4] Social determinants—such as early marriage, short inter-pregnancy intervals, dietary inadequacies, and limited antenatal care access—compound the risk, particularly in rural and economically disadvantaged populations. [5] The consequences of untreated anemia in pregnancy extend beyond maternal fatigue or pallor; it increases susceptibility to obstetric complications including pre-eclampsia, postpartum hemorrhage, infections, and cardiac failure. [6] For the fetus, maternal anemia is implicated in preterm birth, low birth weight, intrauterine growth restriction, and perinatal mortality. [7, 8]

Recent large-scale data from China revealed that 43.6% of pregnant women were anemic at some point during pregnancy, while 3.95% experienced anemia across all three trimesters—a condition that may carry higher risks for both mother and child due to prolonged exposure to low oxygen-carrying capacity. [9] A similar study conducted in Jharkhand, India, reported a third-trimester anemia prevalence of 91.05%, underscoring the regional disparity and potential systemic gaps in preventive care. [10]

Despite national initiatives such as the Anemia Mukt Bharat (AMB) strategy, which promotes iron and folic acid supplementation along with community-level awareness programs, the persistently high prevalence signals the need for localized evaluation of interventions and outcome trends. [11] Furthermore, few studies in India have comprehensively examined both fetal and maternal outcomes in anemic pregnancies within tertiary care settings, where referral bias may affect disease severity and outcome patterns. [12]

Against this background, the present cross-sectional study was undertaken to assess the fetomaternal outcomes in pregnant women diagnosed with anemia at a tertiary care hospital. By investigating the clinical spectrum, demographic correlates, and pregnancy outcomes, this study aims to contribute to a nuanced understanding of anemia in pregnancy and inform targeted clinical and public health strategies.

2. MATERIALS AND METHODS

Study Design and Setting

This hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at RL Jalappa Hospital and Research Centre, a tertiary care teaching institution affiliated with Sri Devaraj URS Medical College, Kolar, Karnataka. The study was conducted over a period of one year following ethical approval from the Institutional Ethics Committee.

Study Population

All pregnant women admitted to the Department of Obstetrics and Gynaecology during the study period with documented anemia (hemoglobin concentration <11 g/dL) at the time of admission, irrespective of gestational age, were considered eligible for inclusion. Women diagnosed with anemia due to acute blood loss and those who had received prior treatment for anemia and subsequently presented with hemoglobin levels ≥11 g/dL were excluded from the study.

Sample Size Determination

The sample size was calculated using the formula: $\mathbf{n = 4pq / l^2}$, where p represents the estimated prevalence of anemia (43.59%) as per a large-scale population-based cohort study, $q = 100 - p$, and l is the allowable error (10%). [13] The minimum calculated sample size was 98.35, and after accounting for a 10% non-response rate, the final sample size was adjusted to 110 participants.

Data Collection and Variables

Data were collected retrospectively from medical records using a structured case record form. The following maternal variables were extracted: age, parity, gestational age at the time of delivery, and presence of obstetric complications including preeclampsia, eclampsia, antepartum hemorrhage, postpartum hemorrhage, and preterm labor. Fetal outcomes assessed included birth weight, gestational age at delivery, Apgar scores at 1 and 5 minutes, intrauterine growth restriction (IUGR), spontaneous abortion, NICU admission, and perinatal mortality.

Each participant's anemia status was further classified as per WHO criteria: mild (Hb 10–10.9 g/dL), moderate (Hb 7–9.9 g/dL), and severe (Hb <7 g/dL). Hematological indices including serum ferritin, transferrin saturation, total iron binding capacity, MCV, MCH, MCHC, and RDW were also recorded when available to understand the anemia subtype.

Data Management and Statistical Analysis

All data were entered into Microsoft Excel 2016 and exported to SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY) for analysis. Categorical variables were expressed as frequencies and percentages. The chi-square test was used to determine associations between categorical variables. Continuous variables were described as means with standard deviations and compared using the independent *t*-test or one-way ANOVA, as appropriate. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Informed consent was obtained from all participants, either at the time of admission or retrospectively through follow-up when required. Confidentiality of all patient information was strictly maintained. The study protocol was reviewed and approved by the Institutional Ethics Committee of Sri Devaraj Urs Academy of Higher Education and Research, Kolar.

3. RESULTS

Sociodemographic Characteristics

Table 1 presents the sociodemographic profile of antenatal mothers with anaemia (n = 110). Most participants (59.1%) were aged between 20 and 30 years, while 23.6% were younger than 20 years, and 17.3% were over 30 years of age. A significant proportion of the study population resided in rural areas (63.6%), with only 36.4% from urban settings. Socioeconomic stratification revealed that most women belonged to the lower (66.4%) and upper-lower (16.4%) classes, with negligible representation from upper-middle and upper-income groups. In terms of educational attainment, 36.4% of the women were illiterate, while the remainder had primary (31.8%) or secondary and above (31.8%) education.

Notably, 60% of the women were unbooked cases at the time of admission, indicating a lack of prior antenatal care. Regarding gravidity, a larger proportion were multigravida (≥G2; 57.3%) compared to primigravida women (42.7%). These findings reflect the predominant vulnerability of anemic pregnant women from rural, low socioeconomic, and under-educated backgrounds, highlighting the importance of targeted antenatal interventions in such populations.

Distribution and Severity of Anaemia

Figure 1 illustrates the distribution of anaemia types among pregnant women. Iron deficiency anaemia was the predominant type, accounting for 73% of cases, followed by anaemia due to acute blood loss (22%). Megaloblastic anaemia and

haemoglobinopathies were comparatively rare, each contributing 2.5% to the total burden. This distribution aligns with national and global patterns, where nutritional deficiencies—particularly iron—constitute the leading cause of maternal anaemia.

Table 2 categorizes the anaemic study population based on WHO 2011 severity guidelines. Among the 110 participants, mild anaemia (Hb 10–10.9 g/dL) was most common, observed in 45.9%, followed by moderate anaemia (25.0%) and severe anaemia (18.74%). Very severe anaemia (Hb <4 g/dL) was recorded in 10.36% of the cohort, highlighting the urgent need for antenatal screening and intervention in high-risk groups.

Hematological Profiles in Moderate Anaemia

Table 3 presents the haematological indices of pregnant women with moderate anaemia in the third trimester. The mean haemoglobin level was 10.4 ± 0.30 g/dL, and the average haematocrit was 33.1 ± 2.20%. Red blood cell indices, including MCV (86.5 ± 7.8 fL), MCH (27.1 ± 1.9 pg), and MCHC (31.3 ± 1.4 g/dL), were consistent with normocytic normochromic or early microcytic presentations. The mean RBC count was 4.01 ± 0.55 million/mm³, indicative of compensatory erythropoietic response in the setting of iron-restricted erythropoiesis.

These findings collectively underscore the predominance of iron deficiency anaemia and the varying degrees of severity encountered in clinical practice, reinforcing the importance of early diagnosis and tailored nutritional and therapeutic management during pregnancy.

Maternal Outcomes

Table 4 presents the maternal complications observed among anaemic pregnant women. The most frequently reported complication was preterm labour, affecting 30% of the study population. Hypertensive disorders were prominent, with pre-eclampsia and eclampsia reported in 18.2% and 9.1% of cases, respectively. Other serious complications included postpartum haemorrhage and sepsis (each 10%), post-operative wound infection (11.8%), and uterine rupture (9.1%).

Shock, ICU admissions, and maternal deaths were noted in 9.1%, 10%, and 0.9% of cases, respectively. Rare complications such as cardiac failure, perineal tears, and sickle cell crisis were also recorded. These findings highlight the considerable maternal morbidity associated with anaemia in late pregnancy.

Foetal Outcomes

As shown in Table 5, the severity of anaemia was significantly associated with adverse foetal outcomes ($p < 0.001$ for most comparisons). Among women with mild anaemia, 76.5% delivered term live neonates, compared to only 42.9% in the moderate and 4.8% in the severe groups. No term live births were reported in the very severe anaemia group. Preterm live births increased with anaemia severity, reaching 60% in the very severe group.

Similarly, preterm intrauterine foetal demise (IUFD) and preterm stillbirths were more frequent among women with moderate to severe anaemia ($p = 0.027$ and $p = 0.016$, respectively). While intrauterine growth restriction (IUGR) and congenital malformations were observed across groups, their association with anaemia severity did not reach statistical significance ($p = 0.527$ and $p = 0.672$, respectively).

These findings underscore a strong correlation between the degree of maternal anaemia and the risk of both maternal and perinatal complications, reinforcing the need for early detection and aggressive management of anaemia during pregnancy.

Table 1: Sociodemographic details of the antenatal mothers with anemia (n = 110)

Variables	Frequency and percentage n (%)
Age in years	
<20	26 (23.6)
20–30	65 (59.1)
>30	19 (17.3)
Residence	
Rural	70 (63.6)
Urban	40 (36.4)
Socioeconomic status	

Upper	4 (3.6)
Upper middle	0 (0)
Lower middle	15 (13.6)
Upper lower	18 (16.4)
Lower	73 (66.4)
Educational status	
Illiterate	40 (36.4)
Primary school	35 (31.8)
Secondary and above	35 (31.8)
Booked/Unbooked history	
Booked	100 (90.0)
Unbooked	10 (10.0)
Gravidity	
Primigravida	47 (42.7)
≥G2	63 (57.3)

Figure 1: Distribution of various types of anemia among antenatal mothers (n = 110)

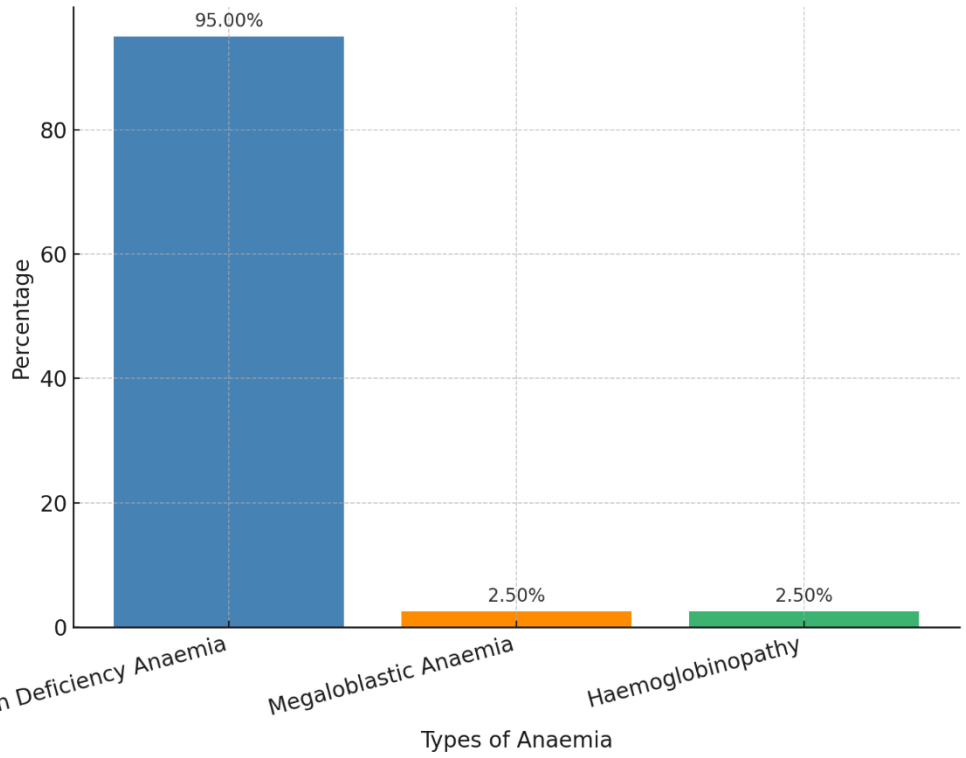

Table 2: Anemia severity classification (n = 110)

Severity	Hemoglobin Range (g/dL)	Percentage	Frequency (n)
Mild	10.0 – 10.9	45.90%	51
Moderate	7.0 – 9.9	25.00%	28
Severe	4.0 – 6.9	18.74%	21
Very Severe	< 4.0	10.36%	11
Total		100%	110

Table 3: Haematological profiles of expectant women in the third trimester with moderate anemia (mean ± SD)

Complete Blood Count Results	Mean ± SD
Haemoglobin (g/dl)	10.4 ± 0.30
Haematocrit (%)	33.1 ± 2.20
MCV (fL)	86.5 ± 7.8
MCH (pg)	27.1 ± 1.9
MCHC (g/dl)	31.3 ± 1.4
RBCs (million/mm^3)	4.01 ± 0.55

Table 4: Maternal outcomes

Maternal Complications	Number and Percentage
Pre-eclampsia	22 (20%)
Eclampsia	10 (9.1%)
Preterm labour	36 (32%)
Abruptio placentae	8 (7.3%)
Sickle cell crisis	1 (0.9%)
Postpartum haemorrhage	11 (10.0%)
Infections	11 (10.0%)
Post-operative wound infection	6 (11.8%)
Cardiac failure	1 (0.9%)
Maternal death	1 (0.9%)
LSCS	8 (7.3%)
Maternal ICU admission	5 (10.0%)

Table 5: Foetal outcomes

Foetal Outcome	Mild (n = 51)	Moderate (n = 28)	Severe (n = 21)	Very Severe (n = 10)	Total (n = 110)	p
Term alive	39 (76.5%)	12 (42.9%)	1 (4.8%)	0 (0%)	52 (47.3%)	< 0.001
Preterm alive	0 (0%)	5 (17.9%)	9 (42.9%)	6 (60%)	20 (18.2%)	< 0.001
Preterm IUFD	1 (2.0%)	2 (7.1%)	5 (23.8%)	2 (20%)	10 (9.1%)	< 0.001
Preterm stillbirth	0 (0%)	1 (3.6%)	2 (9.5%)	1 (10%)	4 (3.6%)	0.027
Term IUFD	2 (3.9%)	1 (3.6%)	2 (9.5%)	0 (0%)	5 (4.5%)	0.016
Term stillbirth	1 (2.0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.9%)	0.294
IUGR	6 (11.8%)	5 (17.9%)	2 (9.5%)	0 (0%)	13 (11.8%)	0.527
Congenital malformation	2 (3.9%)	2 (7.1%)	4 (19.0%)	1 (10%)	9 (8.2%)	0.672

4. DISCUSSION

This cross-sectional study investigated the fetomaternal outcomes among anaemic pregnant women in a tertiary care setting. The majority of participants were aged 20–30 years and resided in rural areas, with a substantial proportion belonging to lower socioeconomic strata and having limited formal education. Most women were unbooked at the time of admission and were multigravida, indicating significant barriers to timely antenatal care access.

Iron deficiency anaemia emerged as the most prevalent type, accounting for 95% of cases, while megaloblastic anaemia and haemoglobinopathies were infrequently observed. According to WHO 2011 classification, mild anaemia was the most common severity grade, followed by moderate, severe, and very severe forms. Haematological profiling of women with moderate anaemia revealed values consistent with a normocytic or early microcytic anaemia, suggestive of early iron-deficiency patterns.

Maternal complications were frequent, with preterm labour, hypertensive disorders, postpartum haemorrhage, sepsis, and surgical site infections being predominant. Less frequent yet serious outcomes included uterine rupture, shock, cardiac failure, and maternal death.

Foetal outcomes demonstrated a significant association with anaemia severity. The proportion of term live births declined with increasing anaemia severity, while preterm deliveries, intrauterine foetal demise (IUFD), and stillbirths were more common in women with severe and very severe anaemia. Although intrauterine growth restriction and congenital anomalies were observed, they did not show statistically significant correlation with anaemia grade.

This study assessed fetomaternal outcomes in anaemic pregnant women at a tertiary care center, highlighting a high prevalence of iron deficiency anaemia (IDA), maternal complications, and adverse fetal outcomes, especially among women with severe anaemia. The findings align closely with trends observed in global literature.

Prevalence and Patterns of Anaemia

In our cohort, iron deficiency accounted for 95% of anaemia cases, consistent with global estimates by Hamamy & Alwan, 2015, Derman & Patted, 2023 that attribute over 50% of anaemia in pregnancy to iron deficiency. [14, 15]

A similar prevalence was reported in Palestine by Srour et al., 2018, where 25.7% of women experienced iron deficiency anaemia and 52% had depleted iron stores in the first trimester. [16]

Maternal Complications

Our findings of common complications—such as hypertensive disorders, postpartum haemorrhage, sepsis, and preterm labour—mirror global data. Anaemia during pregnancy significantly elevates maternal mortality risk, particularly in low-resource settings where nutritional deficiencies and delayed antenatal care are prevalent (Juul et al., 2019). [17] In Ethiopia, similar maternal risks have been linked to socio-economic determinants like low education, poor nutrition, and limited access to healthcare (Gebre & Mulugeta, 2015). [18]

Additionally, our study reinforces the significance of timely antenatal care. Women who presented unbooked were at greater

risk of complications—a finding also emphasized by the REVAMP-TT trial by Harding et al., 2023, which investigates late antenatal presentation and intravenous iron therapy in Malawian women. [19]

Foetal Outcomes

A strong correlation was observed between anaemia severity and poor fetal outcomes, including preterm delivery, stillbirth, and intrauterine fetal demise (IUFD). These outcomes are echoed in research across multiple settings by Smith et al., 2017, Srour et al., 2018, with IDA linked to impaired placental development, fetal growth restriction, and increased neonatal mortality. [16, 20]

Interestingly, while our study found intrauterine growth restriction (IUGR) and congenital anomalies present, they were not statistically linked to anaemia severity—this aligns with mixed global findings by Juul et al., 2019, where the impact of anaemia on structural fetal anomalies remains less definitive. [17]

Management Approaches

Globally, oral iron remains the first line of treatment, but its limitations in efficacy and compliance have prompted the increasing use of intravenous options like ferric carboxymaltose. These treatments are shown to be both safe and effective, particularly in moderate to severe cases or where rapid improvement is necessary (Froessler et al., 2018), (Breymann et al., 2017). [21, 22]

This study was limited by its single-center design, which may affect the generalizability of the findings to broader populations. The cross-sectional nature precluded assessment of temporal or causal relationships between anaemia and fetomaternal outcomes. Additionally, reliance on retrospective data may have introduced recall and documentation biases. Detailed biochemical subtyping of anaemia was not feasible for all participants, and factors such as nutritional status and adherence to iron therapy were not systematically assessed.

Future studies should adopt a multicentric, prospective design to enhance external validity and establish causal inferences. Routine early screening, severity classification, and targeted management of anaemia should be prioritized in antenatal protocols. Strengthening nutritional counselling and improving adherence to iron and folate supplementation are essential. Community-based interventions are warranted, particularly in rural and socioeconomically disadvantaged populations. Furthermore, integration of inflammatory and micronutrient biomarkers in future research could provide deeper insights into the multifactorial nature of pregnancy-associated anaemia.

5. CONCLUSION

This study highlights the high prevalence and clinical significance of anaemia among pregnant women, particularly iron deficiency anaemia, in a tertiary care setting. The findings demonstrate a clear association between the severity of maternal anaemia and adverse maternal and perinatal outcomes, including preterm labour, hypertensive complications, intrauterine growth restriction, and increased rates of stillbirth and neonatal mortality. Women from rural areas, low socioeconomic backgrounds, and those lacking prior antenatal care were disproportionately affected. These results underscore the urgent need for early detection, timely intervention, and strengthened antenatal services, especially in vulnerable populations. Addressing maternal anaemia through comprehensive screening, nutritional support, and community outreach is crucial to improving both maternal and neonatal health outcomes.

REFERENCES

[1] Anaemia [Internet]. [cited 2025 Apr 22]. Available from: https://www.who.int/health-topics/anaemia

[2] Anaemia in women and children [Internet]. [cited 2025 Apr 22]. Available from: https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children

[3] Kuppusamy P, Prusty RK, Khan SA. Assessing the prevalence and predictors of anemia among pregnant women in India: findings from the India National Family Health Survey 2019-2021. Curr Med Res Opin. 2024 Jan;40(1):51-58. doi: 10.1080/03007995.2023.2276851. Epub 2024 Jan 3. PMID: 37888841.

[4] Bansal P, Singhal A. Women with severe anemia in labor: fetomaternal outcomes. Int J Health Sci Res. 2022;12(1):1-6.

[5] Adnan Z, Nayyar A, Nayyar S, Mehraj A. Feto-Maternal Outcome in Pregnancy with Anemia. Journal of Islamic International Medical College (JIIMC). 2018 Jun 1;13(2):57-61.

[6] Rashid R, Muzaffar U, Sofi JA, Younus Z. Fetomaternal outcome in cases of severe anemia in labour. Int J Clin Obstet Gynaecol. 2021;5(2):121-4.

[7] Ajepe AA, Okunade KS, Sekumade AI, Daramola ES, Beke MO, Ijasan O, Olowoselu OF, Afolabi BB. Prevalence and foetomaternal effects of iron deficiency anaemia among pregnant women in Lagos, Nigeria. PLoS One. 2020 Jan 23;15(1):e0227965.

[8] Parks S, Hoffman MK, Goudar SS, Patel A, Saleem S, Ali SA, Goldenberg RL, Hibberd PL, Moore J, Wallace D, McClure EM. Maternal anaemia and maternal, fetal, and neonatal outcomes in a prospective cohort study in India and Pakistan. BJOG: An International Journal of Obstetrics & Gynaecology. 2019 May;126(6):737-43.

[9] Qiao Y, Di J, Yin L, Huang A, Zhao W, Hu H, Chen S. Prevalence and influencing factors of anemia among pregnant women across first, second and third trimesters of pregnancy in monitoring areas, from 2016 to 2020: a population-based multi-center cohort study. *BMC Public Health*. 2024;24:1100. doi:10.1186/s12889-024-18610-x.

[10] Hansda R, Tirkey S, Trivedi K, Singh P, Prakash J. Study on types of anaemia and foetomaternal outcome in antenatal patients. J Family Med Prim Care 2022;11:3040-4.

[11] 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 and Planning. 2022 May 1;37(5):597-606.

[12] Puri S, Yadav K, Kant S, Rai S, Joe W. Digital Monitoring of Anemia Control Measures in a District Using Anemia Mukt Bharat Health Management Information System Indicators. Cureus. 2024 Dec 6;16(12).

[13] Bhukari , Alzahrani NM, Alanazi GA, Al-Taleb MA, AlOtaibi HS, Najla M. Anemia in pregnancy: effects on maternal and neonatal outcomes at a university hospital in Riyadh. Cureus. 2022 Jul 25;14(7).

[14] Hamamy H, Alwan N. Maternal Iron Status in Pregnancy and Long-Term Health Outcomes in the Offspring. *J Pediatr Genet*. 2015;

[15] Derman RJ, Patted A. Overview of iron deficiency and iron deficiency anemia in women and girls of reproductive age. *Int J Gynaecol Obstet*. 2023;

[16] Srour MA, Samarah F, Aqel SS, Srour KM, Younis KR. Prevalence of Anemia and Iron Deficiency among Palestinian Pregnant Women and Its Association with Pregnancy Outcome. *Anemia*. 2018;

[17] Juul SE, Derman RJ, Auerbach M. Perinatal Iron Deficiency: Implications for Mothers and Infants. *Neonatology*. 2019;

[18] Gebre A, Mulugeta A. Prevalence of Anemia and Associated Factors among Pregnant Women in North Western Zone of Tigray, Northern Ethiopia: A Cross-Sectional Study. *J Nutr Metab*. 2015

[19] Harding R, Moya E, Demir AV, Truwah Z, Phiri KS, Mwangi MN, et al. Protocol and statistical analysis plan for a randomized controlled trial of the effect of intravenous iron on anemia in Malawian pregnant women in their third trimester (REVAMP - TT). *Gates Open Res*. 2023;

[20] Smith LE, Humphrey JH, Turner PC, Stoltzfus RJ, Prendergast AJ. Aflatoxin Exposure During Pregnancy, Maternal Anemia, and Adverse Birth Outcomes. *Am J Trop Med Hyg*. 2017;

[21] Froessler B, Hodyl NA, Dekker G, Gajic T. Treatment of iron deficiency and iron deficiency anemia with intravenous ferric carboxymaltose in pregnancy. *Arch Gynecol Obstet*. 2018;

[22] Breymann C, Honegger C, Surbek D, Hösli I. Diagnosis and treatment of iron-deficiency anaemia in pregnancy and postpartum. *Arch Gynecol Obstet*. 2017;