

ORIGINAL ARTICLE

Iron Deficiency Anemia in pregnant women at GMMMC Teaching Hospital Sukkur.

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ABSTRACT... Objective: To determine iron deficiency anemia (IDA) among pregnant women at GMMMC Teaching Hospital, Sukkur, Pakistan. **Study Design:** A cross-sectional study. **Setting:** Department of Obstetrics & Gynecology, GMMMC Teaching Hospital, Sukkur. **Period:** June, 2024 to May, 2025. **Methods:** Pregnant women aged 18-40 years attending outpatient antenatal clinics were enrolled by consecutive sampling. Hemoglobin (Hb), red cell indices (MCV, MCH), serum ferritin and serum iron were measured (automated hematology analyzer and standard biochemical assays). Anemia was defined using WHO hemoglobin thresholds for pregnancy; IDA was diagnosed as anemia with ferritin <15 ng/mL together with low serum iron (<50 µg/dL) and microcytosis. Sociodemographic and obstetric variables (trimester, parity, interpregnancy interval, dietary iron intake and socioeconomic status) and symptoms were recorded on a structured questionnaire. Data were analyzed on SPSS 26 using descriptive statistics; was done using chi-square tests ($p < 0.05$). **Results:** Among 1,240 pregnant women, 726 (58.5%) were anemic and 514 (41.5%) met criteria for IDA (70.8% of anemic women). IDA was most frequent in the third trimester (249/514, 48.4%) and among multiparous women ($\geq G2$: 386/514, 75.1%). Mean Hb in IDA cases was 8.9 ± 1.2 g/dL, mean ferritin 10.8 ± 3.4 ng/mL and mean serum iron 38.6 ± 6.8 µg/dL. Common symptoms were fatigue (82.7%), pallor (78.2%) and dizziness (43.4%). Low dietary iron intake ($p < 0.001$), short birth spacing <2 years ($p = 0.002$), multiparity ($p = 0.01$) and low socioeconomic status ($p < 0.001$) were significantly associated with IDA. Parenteral iron was required in 48 (9.3%) women and 5 (1.0%) required blood transfusion. **Conclusion:** IDA remains highly prevalent among pregnant women in Sukkur, predominantly affecting women in late pregnancy and those with high parity and socioeconomic disadvantage. Strengthening routine screening, nutrition counseling, iron supplementation adherence and birth spacing is essential.

Key words: Ferritin, Iron Deficiency Anemia, Maternal Anemia, Pakistan, Pregnancy, Sukkur.

Article Citation: Abbasi M, Maqsood S, Shar RA. Iron Deficiency Anemia in pregnant women at GMMMC Teaching Hospital Sukkur. Professional Med J 2026; 33(10):2087-2092. <https://doi.org/10.29309/TPMJ/2026.33.10.11058>

INTRODUCTION

Anemia in pregnancy is a big health issue problem particularly in less income and remains a leading modifiable contributor to adverse maternal and perinatal outcomes. Global pooled analyses suggest that approximately one-third of pregnant women are anemic, with substantial regional variation and slower-than-required progress toward international targets. At the clinical level, anemia contributes to fatigue, reduced exercise tolerance and reduced work capacity, while severe anemia increases the risk of decompensating during obstetric hemorrhage.^{1,2}

Iron anemia deficiency is most common prominent cause during pregnancy due to increased iron requirements for expanded maternal red cell mass, placental development and fetal growth. Inadequate dietary intake, poor absorption, frequent closely spaced pregnancies and chronic infections can

deplete iron stores, leading to microcytosis and hypochromia. Serum ferritin is the most widely used biomarker of iron stores, although interpretation requires clinical context because ferritin can rise with inflammation.^{3,4}

WHO advises iron and folic acid daily utilization during pregnancy (30–60 mg elemental iron with 400 µg folic acid), with the higher dose preferred however anemia is a great severe health issue problem.⁵ However, programmatic effectiveness depends on early antenatal registration, consistent supply, counseling and adherence-factors that remain challenging in many settings.^{6,7}

In Pakistan, the burden of anemia among women of reproductive age remains high and nutrition-related inequities persist across regions, wealth and urban–rural residence.

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Article received on:

20/06/2025

Accepted for publication:

27/08/2026



Hospital-based studies from different provinces continue to report a high frequency of pregnancy-related anemia and iron deficiency, especially among multiparous women and those with poor dietary diversity.⁸⁻¹⁰ Data from upper Sindh are comparatively limited; therefore, this study was conducted to determine the prevalence, severity and determinants of iron deficiency anemia (IDA) among pregnant women attending antenatal clinics at GMMMC Teaching Hospital, Sukkur.

METHODS

This Descriptive cross-sectional study conducted from June, 2024 to July 2025 at Outpatient Antenatal Clinics, Department of Obstetrics & Gynecology, GMMMC Teaching Hospital, Sukkur, Pakistan.

Sample Size and Sampling

A total of 1240 pregnant women were screened using consecutive (non-probability) sampling.

Inclusion Criteria

Pregnant women aged 18–40 years, in any trimester, who consented to clinical evaluation and laboratory testing.

Exclusion Criteria

Known hemoglobinopathies (thalassemia trait/major), chronic kidney disease, chronic infections/inflammatory disorders, vitamin B₁₂ or folate deficiency, and recent blood transfusion.

Data Collection

A structured proforma recorded age, trimester, parity, interpregnancy interval, dietary pattern (with emphasis on iron-rich foods), socioeconomic status and symptoms (fatigue, pallor, dizziness, dyspnea and palpitations).

Specimen Collection and Processing

A 5 mL blood was taken aseptically. EDTA samples were used for complete blood count, while serum was separated for ferritin and iron assays according to manufacturer instructions and standard laboratory procedures. Internal quality control measures were applied for analyzer performance (daily controls and calibration as per laboratory protocol).

Laboratory Assessment

Venous blood samples were analyzed for complete blood count (Hb, hematocrit, MCV, MCH) on an automated hematology analyzer (NihonKohdan Japan). Serum ferritin was measured by ELISA and serum iron by UV-Visible double beam spectrophotometer (Lambda 365, USA) using ferrozine as complexing agent and absorbance was measured at λ_{max} 562 nm. Total iron-binding capacity (TIBC) and transferrin saturation were calculated where available.

Operational Definitions

Anemia was defined using WHO hemoglobin thresholds for pregnancy.¹¹ IDA was diagnosed as anemia with ferritin <15 ng/mL together with low serum iron (<50 µg/dL) and microcytosis (MCV <80 fL). Severity was categorized as mild (Hb 10–10.9 g/dL), moderate (Hb 7–9.9 g/dL) and severe (Hb <7 g/dL).

Statistical Analysis

Data were analyzed using SPSS version 26. Associations of IDA with trimester, parity, dietary iron intake, birth spacing and socioeconomic status were determined using chi-square tests; $p < 0.05$ which was found significant.

Ethical Approval

Ethical approval was obtained from the institutional ethical review board of GMMMC (No. 562/2024). Written informed consent was obtained from all participants.

Socioeconomic and Dietary Assessment

Socioeconomic status was assessed by self-reported household income and basic indicators (education and household assets) and grouped into low vs non-low categories for analysis. Dietary iron intake was assessed by reported frequency of iron-rich foods (meat, legumes, fortified products) and categorized as low vs adequate based on routine antenatal counseling thresholds.

RESULTS

A total of 1,240 pregnant women were evaluated. Overall, 726 (58.5%) women were anemic and 514 (41.5%) met diagnostic criteria for iron deficiency anemia (IDA), representing 70.8% of anemic

women. The mean age of IDA cases was 27.1 ± 4.8 years. Distribution of IDA cases by age group, trimester and parity is presented in Table-I.

Among IDA cases ($n=514$), the largest proportion belonged to the 25–30-year age group (44.0%), followed by 18–24 years (35.8%). Nearly half of cases were in the third trimester (48.4%). With respect to parity, 75.1% were multiparous ($\geq G2$), highlighting cumulative nutritional depletion with repeated pregnancies (Table-I).

The laboratory profile of IDA cases is summarized in Table-II. Fatigue, pallor and dizziness were the most frequently reported symptoms (Table-III).

Low dietary iron intake, short birth spacing (<2 years), multiparity and low socioeconomic status were significantly associated with IDA (Table-IV). Most women were managed with oral iron supplementation; 48 (9.3%) required parenteral iron; Iron sucrose is given IV in multiple doses of 200-300 mg per session, while ferric carboxymaltose allows single large dose IV up to 1000 mg in one sitting, making it faster and more convenient for correcting iron deficiency anemia in pregnancy and 5 (1.0%) required blood transfusion.

TABLE-I

Distribution of IDA cases by age group, trimester and parity ($n=514$)

Variable	n (%)
Age group	
18–24 years	184 (35.8)
25–30 years	226 (44.0)
31–35 years	86 (16.7)
>35 years	18 (3.5)
Trimester	
1st trimester	82 (16.0)
2nd trimester	183 (35.6)
3rd trimester	249 (48.4)
Parity	
Primigravida	128 (24.9)
G2–G3	262 (51.0)
$\geq G4$	124 (24.1)

TABLE-II

Laboratory profile in IDA cases (mean $\pm$ SD)

Parameter	Mean $\pm$ SD
Hemoglobin (g/dL)	8.9 ± 1.2
Serum ferritin (ng/mL)	10.8 ± 3.4
Serum iron (μ g/dL)	38.6 ± 6.8
MCV (fL)	72.4 ± 4.3
MCH (pg)	23.8 ± 2.5

TABLE-III

Symptoms among IDA cases ($n=514$)

Symptom	n (%)
Fatigue	425 (82.7)
Pallor	402 (78.2)
Dizziness	223 (43.4)
Exertional dyspnea	146 (28.4)
Palpitations	118 (23.0)

TABLE-IV

Associated risk factors and management among IDA cases

Variable	Category/Note	P-Value / n (%)
Low dietary iron intake	Self-reported low intake of iron-rich foods	<0.001
Birth spacing <2 years	Short interpregnancy interval	0.002
Multiparity	Higher parity	0.01
Low socioeconomic status	Low household income/poverty	<0.001
Management		
Oral iron supplementation	Ferrous salts/combined IFA	461 (89.7)
Parenteral iron sucrose/carboxymaltose	As per clinician decision (severe/moderate with intolerance)	48 (9.3)
Blood transfusion	For very severe anemia / near term or symptomatic	5 (1.0)

Abbreviations: G = gravida. Percentages are calculated within IDA cases ($n=514$). G2–G3 = gravida 2–3; $\geq G4$ = gravida ≥ 4 .

Risk-factor p-values were obtained using χ^2 (chi-square) test ($p < 0.05$ considered significant). Management values are n (%) among IDA cases ($n=514$). Abbreviations: IFA = iron-folic acid

DISCUSSION

This study demonstrated a high burden of IDA (41.5%) among pregnant women attending antenatal care at a tertiary care hospital in Sukkur. This prevalence meets the WHO threshold for a severe public health problem ($\geq 40\%$).¹¹ It is consistent with recent syntheses and local reports from Pakistan.^{10,12} A 2024 review article for Pakistan reported substantial anemia prevalence among pregnant women, with heterogeneity by province, trimester and socioeconomic status.

Third-trimester predominance in our cohort likely reflects cumulative depletion of iron stores, rising fetal iron demand and dilutional anemia. Similar trimester and parity related patterns have been reported from Sindh and other parts of Pakistan.¹³⁻¹⁵ Multiparity and short interpregnancy intervals can compromise maternal iron repletion between pregnancies, explaining the observed association with IDA.

The symptom profile in our study was largely non-specific, with fatigue and pallor being most common. This reinforces the need for routine laboratory screening rather than reliance on symptoms alone, particularly in resource-limited settings where women may normalize chronic tiredness.¹⁶

Low dietary iron intake and socioeconomic disadvantage were strongly associated with IDA in this study. Pakistan-specific evidence highlights persistent inequities in women's nutrition and access to quality antenatal care, which influence supplementation uptake and adherence.¹⁷ Analyses also indicate that antenatal care engagement and counseling are among the strongest predictors of supplementation of iron during pregnancy.^{7,18}

The mean ferritin concentration (10.8 ng/mL) supports true iron deficiency rather than anemia of chronic inflammation. WHO advised daily intake iron and folic acid nutrient (30–60 mg iron elemental and 400 µg folic acid), where higher doses of iron are required and is a big health issue health problem.⁵ In practice, suboptimal adherence due to gastrointestinal side effects and inconsistent supply chains can limit impact; therefore, counseling and follow-up are essential.^{18,19}

For women with moderate-to-severe anemia or intolerance/poor response to oral therapy, the iron is increasingly used and is supported by emerging evidence and practice recommendations.^{3,4,16,19} In our cohort, around one-tenth required parenteral iron, highlighting the clinical workload and the scope of prior investigation and protection from severe anemia problem issue. Severe anemia is clinically important due to links with weight during birth, during preterm birth and postpartum hemorrhage.^{20,21} International Federation of Gynecology and Obstetrics (FIGO) guidance emphasizes optimizing antenatal diagnosis and treatment as part of postpartum hemorrhage risk reduction, especially in settings with limited blood banking capacity.

This study include large number of sample size and laboratory-confirmed case definition using ferritin and iron indices. Shortcoming due to one designed center and rely upon reported investigation, dietary assessment; additionally, inflammatory markers were not measured to further characterize anemia etiology. Future multicenter studies in upper Sindh incorporating biomarkers of inflammation and dietary diversity scores may help refine targeted interventions.

CONCLUSION

Iron deficiency anemia is highly prevalent among pregnant women attending antenatal clinics at GMMMC Teaching Hospital, Sukkur. Women in the third trimester, those with high parity, short birth spacing, poor dietary intake and low socioeconomic status were at greatest risk. Strengthening routine screening, nutrition counseling, timely iron therapy and family planning/birth spacing interventions should be prioritized to improve maternal and perinatal outcomes.

ACKNOWLEDGEMENT

The authors acknowledge the nursing and laboratory staff of the Obstetrics & Gynecology Department, GMMMC Teaching Hospital, Sukkur, for support in sample collection and processing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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1	Maria Abbasi: Study design, data collection, drafting.
2	Safia Maqsood: Supervision, methodology, proof reading.
3	Rafique Abbas Shar: Data analysis, results interpretations.