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Original Research Article

Prevalence of Anaemia and Associated Dietary and Socio-Demographic Factors among Women of Reproductive Age

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Abstract

Background: Anaemia remains a major nutritional problem among women of reproductive age in India. This study assessed the prevalence of anaemia and its dietary, socioeconomic, and reproductive determinants among women attending a tertiary care hospital in Jodhpur, Rajasthan.

Methods: A hospital-based cross-sectional study was conducted during 2024–2025 among 400 women aged 15–49 years. Haemoglobin concentration, anthropometric measurements, dietary practices, socioeconomic characteristics, and reproductive factors were assessed. Associations with anaemia were evaluated using appropriate statistical tests and multivariable logistic regression.

Results: The overall prevalence of anaemia was 56.0%, comprising 22.8% mild, 29.5% moderate, and 3.8% severe anaemia. Anaemia was significantly associated with lower education, lower socioeconomic status, underweight, higher parity, heavy menstrual bleeding, inadequate dietary diversity, low consumption of iron-rich foods, and tea/coffee consumption near meals. Heavy menstrual bleeding was the strongest independent predictor (AOR 2.64; 95% CI: 1.52–4.58), followed by inadequate dietary diversity (AOR 2.21; 95% CI: 1.39–3.51) and underweight status (AOR 2.18; 95% CI: 1.31–3.63). Regular iron-folic acid supplementation showed a protective association (AOR 0.52; 95% CI: 0.32–0.84).

Conclusion: Anaemia affected more than half of the women studied and was associated with modifiable nutritional, socioeconomic, and reproductive factors. Dietary improvement, iron-folic acid supplementation, nutritional education, and identification of chronic blood loss may help reduce the burden.

Keywords: Anaemia; Women Of Reproductive Age; Dietary Diversity; Iron Deficiency; Haemoglobin; Socioeconomic Factors; Rajasthan.

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Introduction

Anaemia remains one of the most common nutritional and public health problems affecting women of reproductive age, particularly in low- and middle-income countries. It is associated with fatigue, reduced physical capacity, impaired cognitive performance, decreased productivity, and adverse reproductive outcomes. Despite improvements in healthcare and nutrition programs, the burden of anaemia among women remains substantial globally and in India. [1,2]

Iron deficiency is an important contributor to anaemia, although deficiencies of other micronutrients, infections, inflammation, haemoglobinopathies, and reproductive factors may also be involved. [3] The occurrence of anaemia is therefore influenced by multiple nutritional, biological, socioeconomic, and environmental determinants. [4] India continues to experience a considerable burden of anaemia among women of reproductive age. Recent evidence has demonstrated persistent variations in anaemia according to age, educational status, and socioeconomic position, place of residence, nutritional status, and reproductive characteristics. [5] Dietary factors are particularly important because inadequate dietary diversity and low consumption of iron-rich foods may increase the likelihood of anaemia. [6] Dietary practices are themselves influenced by household resources, food availability, cultural practices, and social norms. [7]

Understanding locally relevant determinants is essential for developing effective preventive strategies, particularly because anaemia cannot be addressed through iron supplementation alone. Therefore, the present study was undertaken to estimate the prevalence and severity of anaemia and

assess its association with dietary and socio-demographic factors among women of reproductive age attending Vyas Medical College & Hospital, Jodhpur, and Rajasthan.

Materials and Methods

Study Design and Setting: A hospital-based cross-sectional study was conducted at Vyas Medical College & Hospital, Jodhpur, Rajasthan, during 2024–2025.

Study Population and Sample Size: The study included 400 women of reproductive age (15–49 years) attending the outpatient and/or relevant clinical departments of the hospital during the study period. Participants fulfilling the eligibility criteria were enrolled consecutively until the required sample size was achieved.

Inclusion Criteria: Women aged 15–49 years attending the study hospital during the study period and willing to provide the required clinical, dietary, and socio-demographic information were included.

Exclusion Criteria: Women with known haemoglobinopathies, active major bleeding, recent blood transfusion, chronic renal disease, known hematological malignancy, or other conditions likely to markedly influence haemoglobin concentration independently of nutritional status were excluded. Women with incomplete laboratory or questionnaire data were also excluded from the final analysis.

Data Collection

Data were collected using a pre-designed and structured questionnaire administered through face-to-face interviews. Information was recorded regarding:

- Age
- Residence
- Educational status
- Occupation
- Marital status
- Family type and family size
- Socioeconomic status
- Parity
- Menstrual characteristics
- Dietary pattern
- Consumption of iron-rich foods
- Dietary diversity
- Tea and coffee consumption
- History of iron-folic acid supplementation
- Relevant medical and reproductive history

Anthropometric Assessment

Height and weight were measured using standardized procedures. Body mass index (BMI) was calculated as:

$$BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$$

Participants were categorized according to standard BMI classifications.

Dietary Assessment: Dietary practices were assessed using a structured food-frequency questionnaire and/or 24-hour dietary recall. Particular attention was given to the frequency of consumption of:

- Green leafy vegetables
- Pulses and legumes
- Fruits
- Milk and dairy products
- Eggs
- Meat and fish
- Iron-fortified foods
- Vitamin C-rich foods
- Tea and coffee

Dietary diversity was assessed according to the number of food groups consumed during the reference period and categorized as adequate or inadequate dietary diversity based on the predetermined study criteria.

Participants were also classified as predominantly vegetarian or non-vegetarian according to their usual dietary practices.

Haemoglobin Estimation: Venous blood samples were collected under aseptic precautions. Haemoglobin concentration was measured using an automated hematology analyzer following standard laboratory procedures.

Anaemia was defined and graded according to the applicable World Health Organization haemoglobin thresholds for women of reproductive age used during the study period. Participants were categorized as:

- Non-anaemic
- Mild anaemia
- Moderate anaemia
- Severe anaemia

Where appropriate, haemoglobin values were interpreted according to pregnancy status and other relevant physiological considerations.

Outcome Measures: The primary outcome was the prevalence of anaemia among women aged 15–49 years.

Secondary outcomes included the distribution of anaemia according to severity and its association with:

- Age
- Educational status
- Occupation
- Socioeconomic status
- BMI
- Parity
- Menstrual characteristics

- Dietary pattern
- Dietary diversity
- Consumption of iron-rich foods
- Tea/coffee intake
- Iron-folic acid supplementation

Statistical Analysis: Data were entered and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages. The prevalence of anaemia was calculated with a 95% confidence interval. Mean haemoglobin levels between relevant groups were compared using the independent Student's t-test or analysis of variance (ANOVA), as appropriate. Associations between anaemia and categorical dietary or socio-demographic factors were assessed using the Chi-square test or Fisher's exact test. Variables showing significant or clinically relevant associations on univariate analysis were entered into a multivariable binary logistic regression model to identify independent predictors of anaemia. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A p-value <0.05 was considered statistically significant.

Results

A total of 400 women of reproductive age (15–49 years) were included in the study. The mean age of participants was 30.8 ± 8.1 years, and the mean haemoglobin concentration was 11.2 ± 1.6 g/dL. Overall, 224 (56.0%) women were anaemic, while 176 (44.0%) were non-anaemic. Moderate anaemia was the most frequent category.

Table 1: Prevalence and Severity of Anaemia among Study Participants (n=400)

Anaemia status	Number (n)	Percentage (%)
Non-anaemic	176	44.0
Mild anaemia	91	22.8
Moderate anaemia	118	29.5
Severe anaemia	15	3.8
Total anaemic	**224**	**56.0**
Mean haemoglobin (g/dL)	**11.2 ± 1.6**	—

The overall prevalence of anaemia was 56.0%. Moderate anaemia was observed in 29.5% of participants, followed by mild anaemia in 22.8%. Severe anaemia was comparatively uncommon, affecting 3.8% of women.

Table 2: Association of Socio-Demographic and Reproductive Factors with Anaemia

Variable	Total (n)	Anaemic n (%)	Non-anaemic n (%)	p-value
Age group (years)				
15–24	112	56 (50.0)	56 (50.0)	0.172
25–34	143	79 (55.2)	64 (44.8)	
35–49	145	89 (61.4)	56 (38.6)	
Education				
No formal/primary	104	72 (69.2)	32 (30.8)	<0.001*
Secondary	178	99 (55.6)	79 (44.4)	
Higher secondary/graduate	118	53 (44.9)	65 (55.1)	
Socioeconomic status				
Lower	137	91 (66.4)	46 (33.6)	0.002*
Middle	191	101 (52.9)	90 (47.1)	
Upper	72	32 (44.4)	40 (55.6)	
BMI				
<18.5 kg/m²	92	66 (71.7)	26 (28.3)	<0.001*
18.5–24.9 kg/m²	215	113 (52.6)	102 (47.4)	
≥25 kg/m²	93	45 (48.4)	48 (51.6)	
Parity				
0–1	152	72 (47.4)	80 (52.6)	0.002*
2	134	76 (56.7)	58 (43.3)	
≥3	114	76 (66.7)	38 (33.3)	
Heavy menstrual bleeding				
Yes	87	65 (74.7)	22 (25.3)	<0.001*
No	313	159 (50.8)	154 (49.2)	

***Statistically significant at p<0.05.**

Anaemia was significantly more common among women with lower educational attainment and socioeconomic status. Underweight women had a substantially higher prevalence (71.7%) than women with normal BMI (52.6%)

or BMI ≥25 kg/m² (48.4%). Anaemia also increased with parity and was particularly frequent among women reporting heavy menstrual bleeding (74.7%).

Table 3: Association of Dietary Factors with Anaemia

Dietary factor	Total (n)	Anaemic n (%)	Non-anaemic n (%)	p-value
Dietary diversity				
Inadequate	167	116 (69.5)	51 (30.5)	<0.001*
Adequate	233	108 (46.4)	125 (53.6)	
Iron-rich foods ≥4 times/week				
Yes	184	82 (44.6)	102 (55.4)	<0.001*
No	216	142 (65.7)	74 (34.3)	
Green leafy vegetables ≥4 times/week				
Yes	239	119 (49.8)	120 (50.2)	0.002*
No	161	105 (65.2)	56 (34.8)	
Vitamin C-rich foods regularly				
Yes	205	96 (46.8)	109 (53.2)	<0.001*
No	195	128 (65.6)	67 (34.4)	
Tea/coffee within 1 hour of meals				
Yes	173	114 (65.9)	59 (34.1)	0.001*
No	227	110 (48.5)	117 (51.5)	
Regular iron-folic acid supplementation				
Yes	142	60 (42.3)	82 (57.7)	<0.001*
No	258	164 (63.6)	94 (36.4)	
Dietary pattern				
Vegetarian	257	153 (59.5)	104 (40.5)	0.075
Non-vegetarian	143	71 (49.7)	72 (50.3)	

***Statistically significant at p<0.05.**

Inadequate dietary diversity was strongly associated with anaemia, with 69.5% of women with inadequate dietary diversity being anaemic compared with 46.4% of those with adequate dietary diversity. Lower consumption of iron-rich foods, green leafy vegetables, and vitamin C-rich foods was also significantly associated with anaemia.

Women consuming tea or coffee within one hour of meals showed a higher prevalence of anaemia. Regular iron-folic acid supplementation was associated with a lower prevalence.

Table 4: Multivariable Logistic Regression for Independent Predictors of Anaemia

Predictor	Adjusted Odds Ratio (AOR)	95% CI	p-value
Low educational status	1.78	1.10–2.89	0.019*
Lower socioeconomic status	1.69	1.05–2.73	0.031*
BMI <18.5 kg/m²	2.18	1.31–3.63	0.003*
Parity ≥3	1.73	1.05–2.85	0.032*
Heavy menstrual bleeding	2.64	1.52–4.58	<0.001*
Inadequate dietary diversity	2.21	1.39–3.51	<0.001*
Low consumption of iron-rich foods	1.92	1.21–3.04	0.006*
Tea/coffee within 1 hour of meals	1.66	1.04–2.64	0.034*
Regular iron-folic acid supplementation	0.52	0.32–0.84	0.008*

***Statistically significant at p<0.05.**

After adjustment for potential confounders, heavy menstrual bleeding was the strongest predictor of anaemia (AOR 2.64; 95% CI: 1.52–4.58). Inadequate dietary diversity (AOR 2.21), underweight status (AOR 2.18), low consumption of iron-rich foods (AOR 1.92), low education, lower socioeconomic status, higher parity, and tea/coffee consumption near mealtimes also remained independently associated with anaemia. Regular iron-folic acid supplementation showed a protective association (AOR 0.52).

Discussion

The present study assessed the prevalence and determinants of anaemia among 400 women of reproductive age attending a tertiary care hospital in Jodhpur, Rajasthan. The overall prevalence of anaemia was 56.0%, with moderate anaemia being the most common category (29.5%), followed by mild (22.8%) and severe anaemia (3.8%). These findings indicate that anaemia continues to represent a substantial nutritional and public health problem among women of reproductive age.

Anaemia in women has a multifactorial etiology involving nutritional deficiencies, socioeconomic

disadvantage, infections, reproductive factors, and chronic blood loss. Balarajan et al. [8] emphasized that poor nutrition, socioeconomic inequalities, and inadequate access to healthcare contribute substantially to the burden of anaemia in low- and middle-income countries. Similarly, Bentley and Griffiths [9] reported a high burden of anaemia among Indian women and demonstrated important associations with socioeconomic and demographic characteristics.

In the present study, anaemia was significantly more frequent among women with lower educational and socioeconomic status. Bharati et al. [10] similarly identified socioeconomic and demographic factors as important determinants of anaemia among Indian women. Education may influence nutritional awareness, food choices, healthcare utilization, and adherence to preventive measures, while limited household resources can restrict access to diverse and micronutrient-rich foods.

Nutritional status was also strongly associated with anaemia. Underweight women had a prevalence of 71.7%, and BMI <18.5 kg/m² remained an independent predictor of anaemia (AOR 2.18). Little et al. [11] demonstrated that nutritional and socioeconomic factors contribute significantly to anaemia among women in rural India. The association between undernutrition and anaemia may reflect inadequate overall dietary intake and concurrent deficiencies of iron and other micronutrients. Dietary factors were particularly important in the present study. Anaemia occurred in 69.5% of women with inadequate dietary diversity compared with 46.4% among those with adequate diversity. Low consumption of iron-rich foods and vitamin C-rich foods was also associated with anaemia. These findings are consistent with evidence demonstrating that changes in dietary, nutritional, and socioeconomic factors contribute to variations in anaemia prevalence among Indian women. [12]

Reproductive factors also influenced anaemia. Women with parity ≥3 had higher odds of anaemia, while heavy menstrual bleeding was the strongest independent predictor (AOR 2.64). Repeated pregnancies may progressively reduce maternal iron stores when nutritional replacement is inadequate, whereas excessive menstrual blood loss directly increases iron requirements. Similar multifactorial patterns involving nutritional, socioeconomic, and reproductive characteristics have been reported among women in South Asian populations. [13]

Tea or coffee consumption within one hour of meals was independently associated with anaemia, whereas regular iron-folic acid supplementation showed a protective association (AOR 0.52). These findings highlight the importance of dietary counselling in addition to supplementation. Appropriate assessment of haemoglobin concentration and standardized definitions are also important for accurately estimating the population burden of anaemia. [14]

Anaemia among women of reproductive age has implications beyond reduced physical capacity and quality of life. Severe maternal anaemia has been associated with increased risk of adverse pregnancy outcomes and maternal mortality. [15] Therefore, prevention should include early identification of anaemia, dietary diversification, promotion of iron-rich and vitamin C-rich foods, appropriate iron-folic acid supplementation, and evaluation of women with heavy menstrual bleeding or other potential causes of chronic blood loss.

Conclusion

Anaemia was highly prevalent among women of reproductive age, affecting 56.0% of participants. Heavy menstrual bleeding, inadequate dietary diversity, underweight status, low intake of iron-rich foods, higher parity, lower education and socioeconomic status, and tea/coffee consumption near mealtimes were independently associated with anaemia. Regular iron-folic acid supplementation was associated with lower odds of anaemia. These findings emphasize the need for an integrated approach combining nutritional counselling, dietary diversification, supplementation, screening, and appropriate management of reproductive causes of blood loss.

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