e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(8); 1587-1592

Original Research Article

# Study of Anemia Prevalence Among Women of Reproductive Age

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**Received: 27-06-2025 / Revised: 25-07-2025 / Accepted: 27-08-2025**
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**Conflict of interest: Nil**

**Abstract:**

**Background:** Anemia is a major global public health issue, particularly affecting women of reproductive age, and is associated with adverse maternal and fetal outcomes. In India, the prevalence remains high, especially in rural and socio-economically disadvantaged groups. This study aimed to assess the prevalence of anemia and associated factors among women of reproductive age at a tertiary care hospital.

**Methods:** A hospital-based cross-sectional study took place for 1 year among 174 women aged 15–49 years. Data were collected using a structured questionnaire, clinical examination, and hemoglobin estimation with a HemoCue analyzer. Anemia was classified based on WHO criteria. Associations between socio-demographic, reproductive, and lifestyle factors with anemia were analyzed using Chi-square test.

**Results:** Most participants were aged 25–34 years (44.8%), rural residents (62.1%), and homemakers (56.3%). Overall, 67.8% of women were anemic, with moderate anemia being most common (33.3%). Anemia prevalence was significantly higher among younger women ($p = 0.04$), those with low educational attainment ($p = 0.01$), and those from lower socioeconomic groups ($p = 0.03$). Rural residence showed a higher prevalence but was not statistically significant ($p = 0.07$).

**Conclusion:** Anemia remains highly prevalent among women of reproductive age, with strong associations to education and socioeconomic status, emphasizing the need for targeted interventions.

**Keywords:** Anemia, Women of reproductive age, Prevalence, Socio-demographic factors, India.



## Introduction

Anemia, defined as a reduced concentration of hemoglobin (Hb) or insufficient red blood cell count to meet physiological requirements, remains a widespread public health challenge [1]. Iron deficiency is recognized as the leading cause of anemia globally, with women of reproductive age, expecting mothers, and children being the most vulnerable groups [2,3]. In women, particularly during pregnancy, anemia is strongly linked to adverse outcomes, including increased risks of miscarriage, stillbirth, preterm birth, and low birth weight [4]. It is estimated that nearly 20% of perinatal deaths as well as 10% of maternal deaths in middle and low-income nations are attributable to iron deficiency [5].

Across the globe, around 1.76 billion individuals were affected by anemia in 2019 [2]. A study reported in 2011 revealed that the incidence among pregnant women was at 38% (32.4 million), which is much higher that the 29% reported in non-pregnant women [3]. The burden, however, is extremely higher in low- and middle-income countries compared to high-income regions [6]. The World Health Organization (WHO) classifies anemia as a public health concern based on prevalence: normal (<4.9%), mild (5.0–19.9%), moderate (20.0–39.9%), and severe (≥40.0%) [1].

Hemoglobin levels are influenced by several demographic and physiological factors, including age, sex, pregnancy status, altitude of residence, and smoking habits [1]. Beyond its clinical implications, anemia also affects socio-economic well-being by reducing physical capacity and cognitive performance [7]. Its prevalence in communities is shaped by a complex interaction of political, ecological, biological, and social factors [8]. Studies have identified multiple determinants of anemia in women, such as rural residence [8], younger age [9], pregnancy [10,11], poor nutritional status [9], frequent childbearing [12], breastfeeding [9,10], limited access to antenatal nutritional supplements [9], and exposure to domestic violence [13].

Infectious causes, including helminthic infestations [14] and malaria [15], further contribute to the problem. Additionally, anemia has been associated with progression of immunological disorders and higher mortality in women with HIV/AIDS [16]. Conversely, the use of hormonal contraceptives has been suggested to lower the risk of anemia [17].

Much of the available research on anemia has focused on adolescents [18–21], pregnant women [22], and younger women aged 13–35 years [23], often based on small-scale, region-specific studies. However, there is limited investigation into the relationship between women's autonomy in health decision-making, exposure to violence, and anemia prevalence. In India, anemia continues to be a major public health issue among women of reproductive age, but hospital-based studies providing focused insights are comparatively limited. Against this backdrop, this study was undertaken in a tertiary hospital setting to determine the incidence rates of anemia among women of reproductive age and to identify the factors predisposing them towards developing anemia.

## Methods

**Study Design and Setting:** This was a hospital-based cross-sectional study that took place at a tertiary care hospital in India for 1 year.

**Study Population and Sample Size:** The study included 174 women aged 15–49 years who attended the hospital during the study period. Both pregnant and non-pregnant women were considered eligible, while women with known hematological disorders (other than anemia) or those who declined consent were excluded. Participants were recruited using systematic sampling until the required sample size was achieved.

**Data Collection Tools and Procedures:** Data were collected using a pre-tested structured questionnaire and clinical examination. Information recorded included socio-demographic, reproductive history (age at first pregnancy, parity, adverse pregnancy outcomes, contraceptive use, iron supplementation), lifestyle and behavioral factors (smoking, dietary habits), and health-related details. Anthropometric measurements (height and weight) were obtained following standard protocols.

**Measurement of Hemoglobin and Definition of Anemia:** Capillary blood samples were collected by finger-prick and examined immediately using a portable, battery-operated HemoCue analyzer. Hemoglobin concentration was categorized according to World Health Organization (WHO) criteria. Anemia in non-pregnant women was defined as Hb <12 g/dL, while in pregnant women it was defined as Hb <11 g/dL. Further classification was made as mild, moderate, and severe anemia based on Hb levels.

**Data Analysis:** All data were coded and entered into SPSS version 20 for statistical analysis. Descriptive statistics were applied to summarize the study population. The Chi-square test ($\chi^2$) was used to evaluate associations between categorical predictors and anemia and a p-value <0.05 was considered statistically significant.

## Results

The socio-demographic profile of the participants revealed that the majority belonged to the 25–34 year age group (44.8%), with rural residents comprising 62.1% of the study population. Educational status varied, with 31.0% having secondary education and 24.1% being graduates, while 20.7% were illiterate. Most women were homemakers (56.3%), and a large proportion fell under the lower middle (32.2%) and upper lower (28.7%) socioeconomic classes, indicating a predominantly middle-to-lower socio-economic background (Table 1).

**Table 1: Characteristics of the study cohort (N = 174)**

| Characteristics | Categories | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Age group (years)** | 15–24 | 42 | 24.1 |
| | 25–34 | 78 | 44.8 |
| | 35–44 | 40 | 23.0 |
| | 45–49 | 14 | 8.1 |
| **Residence** | Rural | 108 | 62.1 |
| | Urban | 66 | 37.9 |
| **Education** | Illiterate | 36 | 20.7 |
| | Primary | 42 | 24.1 |
| | Secondary | 54 | 31.0 |
| | Graduate & above | 42 | 24.1 |
| **Occupation** | Homemaker | 98 | 56.3 |
| | Unskilled worker | 32 | 18.4 |
| | Skilled worker | 26 | 14.9 |
| | Service/professional | 18 | 10.3 |
| **Socioeconomic status*** | Upper | 10 | 5.7 |

| | | | |
|---|---|---|---|
| | Upper middle | 38 | 21.8 |
| | Lower middle | 56 | 32.2 |
| | Upper lower | 50 | 28.7 |
| | Lower | 20 | 11.5 |

In terms of clinical and reproductive characteristics, half of the women (50.6%) had 1–2 children, and a considerable number (26.4%) were nulliparous. The majority were in their second trimester (48.3%), followed by the third trimester (35.6%). A large proportion (75.9%) reported regular menstrual history, while 24.1% had irregular cycles. Dietary assessment showed that 69.0% consumed a mixed diet compared to 31.0% who were vegetarians, highlighting the dietary diversity within the group (Table 2).

**Table 2: Clinical and reproductive profile of study cohort (N = 174)**

| Characteristics | Categories | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Parity** | Nulliparous | 46 | 26.4 |
| | 1–2 children | 88 | 50.6 |
| | ≥3 children | 40 | 23.0 |
| **Trimester of pregnancy** | First | 28 | 16.1 |
| | Second | 84 | 48.3 |
| | Third | 62 | 35.6 |
| **Menstrual history** | Regular | 132 | 75.9 |
| | Irregular | 42 | 24.1 |
| **Dietary habits** | Vegetarian | 54 | 31.0 |
| | Mixed diet | 120 | 69.0 |

Analysis of anemia severity indicated that only 32.2% of women were free from anemia, while the remaining two-thirds were affected to varying degrees. Moderate anemia was most prevalent (33.3%), followed by mild anemia (25.3%) and severe anemia (9.2%). This distribution suggests a high overall burden of anemia among the study population, with a considerable number experiencing moderate-to-severe forms, which may have significant maternal and fetal health implications (Table 3).

**Table 3: Distribution of anemia severity among study participants (N = 174)**

| Anemia status (WHO criteria) | Hemoglobin level (g/dl) | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **No anemia** | ≥11.0 | 56 | 32.2 |
| **Mild anemia** | 10.0–10.9 | 44 | 25.3 |
| **Moderate anemia** | 7.0–9.9 | 58 | 33.3 |
| **Severe anemia** | <7.0 | 16 | 9.2 |

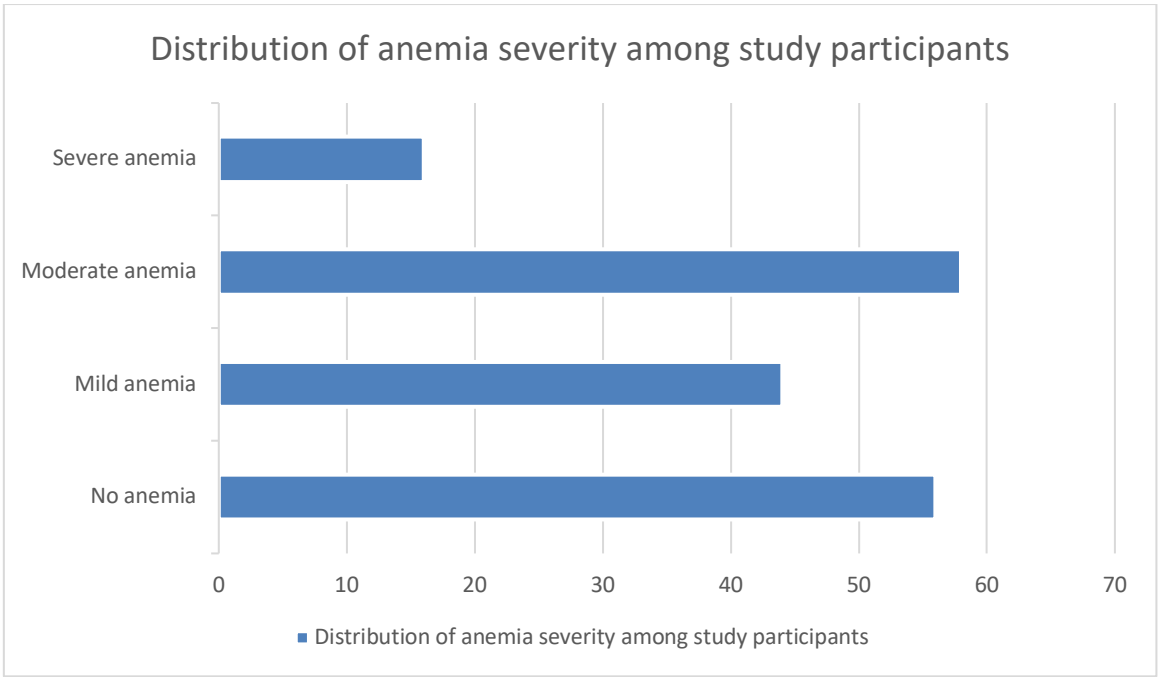


**Figure 1: Distribution of anemia severity among the study cohort.**

The correlation between socio-demographic variables and anemia status showed significant trends. Younger women (≤24 years) had higher anemia prevalence (81.0%) compared to older age groups (p = 0.04). Education had a strong association, with illiterate women showing the highest anemia prevalence (88.9%) versus 42.9% among graduates (p = 0.01). Similarly, lower and upper-lower socioeconomic groups had significantly higher anemia prevalence (82.4%) compared to middle and upper classes (62.0%) (p = 0.03). However, residence (rural vs. urban) did not show a statistically significant association (p = 0.07), although rural women had higher anemia prevalence (75.9%) (Table 4).

**Table 4: Correlation between demographic characteristics and anemia status (N = 174)**

| Socio-demographic factor | Categories | Anemia present n (%) | Anemia absent n (%) | $\chi^2$ (p-value) |
|---|---|---|---|---|
| **Age group** | ≤24 years | 34 (81.0) | 8 (19.0) | 4.12 (0.04) |
| | 25–34 years | 56 (71.8) | 22 (28.2) | |
| | ≥35 years | 28 (58.3) | 20 (41.7) | |
| **Residence** | Rural | 82 (75.9) | 26 (24.1) | 3.28 (0.07) |
| | Urban | 36 (54.5) | 30 (45.5) | |
| **Education** | Illiterate | 32 (88.9) | 4 (11.1) | 10.45 (0.01) |
| | Primary/Secondary | 68 (75.6) | 22 (24.4) | |
| | Graduate+ | 18 (42.9) | 24 (57.1) | |
| **Socioeconomic status** | Lower/Upper lower | 56 (82.4) | 12 (17.6) | 8.76 (0.03) |
| | Middle/Upper | 62 (62.0) | 38 (38.0) | |

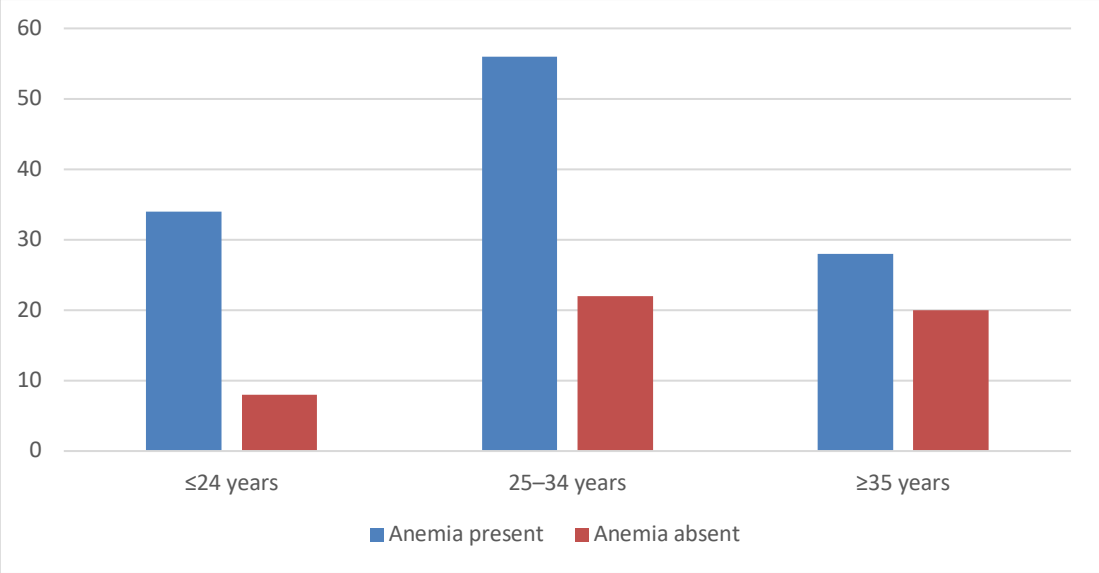


**Figure 2: Distribution of anemia in patients based on age group.**

## Discussion

This hospital-based study found a high incidence rate of anemia among women of reproductive age, with nearly two-thirds affected, and moderate anemia being the most common type. The prevalence observed in our study is greater than the global mean (32.8%) and the national average reported in earlier studies (35.1%) [1,2], underscoring anemia as a persistent public health concern. Consistent with findings from other South-Asian countries such as Pakistan (51.1%) and Bangladesh (41.3%) [3,4], the high burden of anemia in our setting may be attributed to poor dietary diversity, recurrent pregnancies, and limited access to healthcare.

Our study identified strong associations between socio-demographic factors and anemia. Younger women had significantly higher anemia prevalence, similar to earlier studies that reported increased risk due to menstrual blood loss, early pregnancies, and higher nutritional demands [6,7]. Educational attainment showed a protective effect, as illiterate women were significantly more anemic compared to graduates. This aligns with evidence that women's education improves health-seeking behavior, dietary practices, and autonomy in healthcare decisions [8]. Likewise, socioeconomic status emerged as an important determinant, with women from lower and upper-lower classes experiencing greater anemia prevalence, echoing previous research from South Asia linking poverty, inadequate access to iron-rich food, and parasitic infections to anemia risk [9]. Although rural women had higher prevalence than their urban counterparts, this was not statistically significant, possibly due to better coverage of iron supplementation programs in rural antenatal care [10].

Nutritional and reproductive factors also play a key role in anemia risk. Our findings showed that multiparous women and those in later pregnancy trimesters had higher prevalence, supporting the hypothesis that repeated pregnancies and increased iron demands during gestation contribute significantly to anemia [11]. The association of dietary patterns with anemia, although not statistically analyzed in detail, highlights the importance of balanced diets rich in iron and micronutrients. Similar to reports from Nepal, undernutrition and low BMI likely exacerbate the problem, while overweight women may have a lower anemia risk due to better iron reserves [12]. Importantly, anemia remains preventable and manageable through interventions such as iron-folic acid supplementation, deworming, and dietary diversification [13]. Targeted strategies focusing on adolescent girls, pregnant women, and socioeconomically disadvantaged groups are essential to address the high burden observed in this study.

## Conclusion

The study highlights a high prevalence of anemia among women of reproductive age attending a tertiary care hospital in India, with younger, less-educated, and socioeconomically disadvantaged women being disproportionately affected. Reproductive factors, including parity and pregnancy status, as well as nutritional status, significantly influenced anemia risk. These findings emphasize the need for improved interventions, such as iron-folic acid supplementation, dietary counseling, and health education programs, particularly for high-risk groups, to lower the burden of anemia and enhance maternal health outcomes.

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