E-ISSN 2250-0944

ISSN 2250-1150
doi: 10.48047/ijprt/16.01.237

Research Article

A Cross-Sectional Study on the Prevalence of Anemia and Its Associated Factors Among Pregnant Women Attending a Tertiary Care Hospital

Dr Leela Vitthal Karpe, Assistant Professor, Department of Obstetrics & Gynaecology, Government Medical College, Hingoli, Maharashtra, India.
leelakarpe@gmail.com

Dr.Poonam Ramrao Kalyankar, Assistant Professor, Department of Obstetrics & Gynaecology, Government Medical College, Hingoli, Maharashtra, India.

Dr.Neelam Dilip Bagal, Assistant Professor, Department of Obstetrics & Gynaecology, DVVP Medical College, Vilad Ghat, Ahilyanagar, Maharashtra, India.
Corresponding Author: **Dr Leela Vitthal Karpe**
Received Date: 12/10/2025 Revised Date: 07/11/2025 Accepted Date: 20/12/2025

ABSTRACT

Background: Anemia in pregnancy is a major public health concern, particularly in developing countries, and is associated with adverse maternal and fetal outcomes. Despite ongoing national programs, the prevalence of anemia remains high, necessitating further evaluation of its burden and associated risk factors. **Aim:** To determine the prevalence of anemia and its associated factors among pregnant women attending a tertiary care hospital. **Materials and Methods:** This hospital-based cross-sectional study was conducted among 200 pregnant women attending antenatal services at a tertiary care center. Data were collected using a structured proforma, including socio-demographic, clinical, and obstetric details. Hemoglobin levels were estimated using an automated hematology analyzer, and anemia was classified based on standard criteria. Statistical analysis was performed using SPSS software, with chi-square test applied to determine associations. A p-value <0.05 was considered statistically significant. **Results:** The prevalence of anemia was found to be 56.5%. Moderate anemia (26.0%) was slightly more common than mild anemia (24.5%), while severe anemia was present in 6.0% of cases. Microcytic hypochromic anemia (65.5%) was the most common morphological type. Significant associations were observed between anemia and factors such as younger age (p=0.043), rural residence (p=0.010), lower socioeconomic status (p=0.002), multigravidity (p=0.021), short birth spacing (p=0.006), and poor compliance with iron and folic acid supplementation (p<0.001). **Conclusion:** Anemia remains highly prevalent among pregnant women, with multiple modifiable risk factors contributing to its occurrence. Strengthening antenatal care services, improving nutritional awareness, and ensuring compliance with supplementation programs are essential to reduce the burden of anemia and improve maternal and fetal health outcomes.

KEYWORDS: Anemia in pregnancy. Prevalence. Risk factors.

INTRODUCTION

Anemia during pregnancy remains a major public health concern, particularly in developing countries like India, where nutritional deficiencies and socioeconomic challenges are prevalent. According to the World Health Organization, anemia is defined in pregnancy as hemoglobin levels less than 11 g/dL and is considered one of the most common indirect causes of maternal morbidity and mortality worldwide. It affects nearly 40-50% of pregnant women globally, with a disproportionately higher burden in South Asia. In India, the prevalence remains alarmingly high, with national surveys indicating that more than half of pregnant women are anemic, reflecting persistent gaps in nutritional status, antenatal care, and public health interventions.[1]

The etiology of anemia in pregnancy is multifactorial. Iron deficiency remains the most common cause, accounting for nearly 50% of cases, followed by deficiencies of folic acid and vitamin B12. Other contributing factors include parasitic infections, chronic diseases, genetic hemoglobinopathies, and poor dietary intake. Physiological hemodilution during pregnancy further exacerbates the condition by increasing plasma volume disproportionately compared to red cell mass. Socio-demographic factors such as low socioeconomic status, early marriage, high parity, short inter-pregnancy intervals, and inadequate antenatal care have also been strongly associated with increased prevalence of anemia among pregnant women.[2]

Anemia during pregnancy has significant adverse effects on both maternal and fetal outcomes. Maternal complications include fatigue, reduced work capacity, increased susceptibility to infections, preterm labor, postpartum hemorrhage, and even maternal death in severe cases. From the fetal perspective, anemia is associated with intrauterine growth restriction, low birth weight, preterm birth, and increased perinatal mortality. Furthermore, it may have long-term consequences on cognitive and physical development of the child. Therefore, early detection and appropriate management of anemia are crucial components of antenatal care.[3]

Despite various national programs such as the Anemia Mukt Bharat initiative, which aims to reduce the prevalence of anemia through iron and folic acid supplementation and awareness campaigns, the burden remains high. This suggests that underlying determinants such as dietary habits, education, healthcare access, and compliance with supplementation need to be explored in detail. Identifying these associated factors is essential for designing targeted interventions and improving maternal health outcomes.[4]

AIM

To determine the prevalence of anemia and its associated factors among pregnant women attending a tertiary care hospital.

OBJECTIVES

1. To estimate the prevalence of anemia among pregnant women.
2. To identify socio-demographic and clinical factors associated with anemia in pregnancy.
3. To assess the severity and types of anemia among the study population.

MATERIAL AND METHODOLOGY

Source of Data

The data were collected from pregnant women attending the antenatal outpatient department (OPD) and admitted in the obstetrics wards of a tertiary care teaching hospital. Clinical, demographic, and laboratory data were obtained from patient interviews, medical records, and laboratory reports.

Study Design

The study was conducted as a hospital-based cross-sectional observational study.

Study Location

The study was carried out in the Department of Obstetrics and Gynecology of a tertiary care teaching hospital.

Study Duration

The study was conducted over a period of 12 months, including patient recruitment, data collection, and analysis.

Sample Size

A total of 200 pregnant women were included in the study.

Inclusion Criteria

- All pregnant women attending antenatal OPD or admitted to the hospital during the study period
- Women of any gestational age
- Women who gave informed consent

Exclusion Criteria

- Pregnant women with known hematological disorders such as thalassemia or sickle cell disease
- Women with acute bleeding conditions
- Women who refused to participate
- Women with incomplete clinical or laboratory data

Procedure and Methodology

Eligible pregnant women were enrolled after obtaining informed consent. A detailed history was taken including age, parity, socioeconomic status, dietary habits, obstetric history, and antenatal care details. A thorough clinical examination was performed. Hemoglobin levels were recorded, and anemia was classified based on WHO criteria into mild, moderate, and severe anemia. Associated factors such as nutritional status, spacing between pregnancies, and compliance with iron supplementation were assessed.

Sample Processing

Venous blood samples were collected under aseptic conditions. Hemoglobin estimation was performed using an automated hematology analyzer. Peripheral smear examination was done where required to classify the type of anemia. Additional tests such as serum ferritin, vitamin B12, and folate levels were conducted in selected cases when indicated.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using statistical software such as SPSS version 25. Descriptive statistics were expressed as mean ± standard deviation for continuous variables and percentages for categorical variables. Chi-square test was used to assess association between anemia and categorical variables. A p-value of <0.05 was considered statistically significant.

Data Collection

Data were collected using a pre-designed and pre-tested structured proforma. Information regarding demographic profile, obstetric history, clinical findings, and laboratory investigations were systematically recorded. All collected data were verified for accuracy and completeness before analysis.

OBSERVATION AND RESULTS

Table 1: Baseline Characteristics of Study Participants (N = 200)

Variable	Category / Mean ± SD	n (%) / Mean ± SD	Test value	95% CI	p-value
Age	Mean age (years)	25.84 ± 4.31	t = 84.76	25.24-26.44	<0.001
Age group	<20 years	23 (11.5)	χ^2 = 18.64	7.4-16.7	0.001
	20-24 years	61 (30.5)		24.2-37.4	
	25-29 years	73 (36.5)		29.9-43.6	
	≥30 years	43 (21.5)		16.0-27.8	
Gestational age	Mean weeks	27.18 ± 6.42	t = 59.86	26.29-28.07	<0.001
Gravida	Primigravida	87 (43.5)	χ^2 = 3.38	36.5-50.7	0.066
	Multigravida	113 (56.5)		49.3-63.5	
Residence	Rural	119 (59.5)	χ^2 = 7.22	52.3-66.4	0.007
	Urban	81 (40.5)		33.6-47.7	
Socioeconomic status	Lower	68 (34.0)	χ^2 = 12.47	27.5-41.0	0.002
	Middle	94 (47.0)		39.9-54.2	
	Upper	38 (19.0)		13.8-25.1	

The baseline characteristics of the study participants (N = 200) showed that the mean age of pregnant women was 25.84 ± 4.31 years (95% CI: 25.24-26.44), which was statistically significant ($p < 0.001$). The majority of participants belonged to the 25-29 years age group (36.5%), followed by 20-24 years (30.5%), ≥30 years (21.5%), and <20 years (11.5%), with a significant distribution ($p = 0.001$). The mean gestational age was 27.18 ± 6.42 weeks (95% CI: 26.29-28.07), also statistically significant ($p < 0.001$). Regarding parity, 56.5% were multigravida and 43.5% primigravida, though this difference was not statistically significant ($p = 0.066$). A higher proportion of participants were from rural areas (59.5%) compared to urban areas (40.5%), which was statistically significant ($p = 0.007$). In terms of socioeconomic status, the majority belonged to the middle class (47.0%), followed by lower (34.0%) and upper class (19.0%), with a significant association ($p = 0.002$).

Table 2: Prevalence of Anemia Among Pregnant Women (N = 200)

Anemia status	n	%	Test value	95% CI	p-value
Anemia present	113	56.5	Z = 1.84	49.3-63.5	0.033
Anemia absent	87	43.5		36.5-50.7	
Total	200	100.0			

The prevalence of anemia among pregnant women in the study population was found to be 56.5% (113/200), while 43.5% were non-anemic. This prevalence was statistically significant ($Z = 1.84$, $p = 0.033$), with a 95% confidence interval of 49.3-63.5%. These findings indicate that anemia is highly prevalent among pregnant women attending the tertiary care hospital.

Table 3: Socio-Demographic and Clinical Factors Associated with Anemia in Pregnancy (N = 200)

Factor	Category	Anemia Present n (%)	Anemia Absent n (%)	Test value	95% CI / OR	p-value
Age group	<25 years	54 (64.3)	30 (35.7)	χ^2 = 4.11	OR 1.74; CI 0.98-3.09	0.043
	≥25 years	59 (50.9)	57 (49.1)		Reference	
Residence	Rural	76 (63.9)	43 (36.1)	χ^2 = 6.62	OR 2.05; CI 1.14-3.69	0.010
	Urban	37 (45.7)	44 (54.3)		Reference	
Socioeconomic status	Lower	48 (70.6)	20 (29.4)	χ^2 = 9.84	OR 2.51; CI 1.35-4.68	0.002
	Middle/Upper	65 (49.2)	67 (50.8)		Reference	
Gravida	Multigravida	72 (63.7)	41 (36.3)	χ^2 = 5.31	OR 1.97; CI 1.10-3.54	0.021
	Primigravida	41 (47.1)	46 (52.9)		Reference	
Birth spacing	<2 years	39 (72.2)	15 (27.8)	χ^2 = 7.48	OR 2.52; CI 1.24-5.11	0.006
	≥2 years	74 (50.7)	72 (49.3)		Reference	
IFA compliance	Poor	67 (73.6)	24 (26.4)	χ^2 = 22.46	OR 3.97; CI 2.13-7.39	<0.001
	Good	46 (42.2)	63 (57.8)		Reference	

Analysis of socio-demographic and clinical factors revealed several significant associations with anemia in pregnancy. Women aged <25 years had a higher prevalence of anemia (64.3%) compared to those ≥25 years (50.9%), showing a significant association ($p = 0.043$). Rural residence was significantly associated with anemia (63.9% vs. 45.7% in urban; OR = 2.05, $p = 0.010$). Similarly, women from lower socioeconomic status had a significantly higher prevalence of anemia (70.6%) compared to middle/upper classes (49.2%) (OR = 2.51, $p = 0.002$). Multigravida women showed a higher prevalence (63.7%) than primigravida (47.1%) (OR = 1.97, $p = 0.021$). Short birth spacing of <2 years was also significantly associated with anemia (72.2% vs. 50.7%; OR = 2.52, $p = 0.006$). The strongest association was observed with poor iron and folic acid (IFA) compliance, where 73.6% were anemic compared to 42.2% among those with good compliance (OR = 3.97, $p < 0.001$).

Table 4: Severity and Type of Anemia Among Study Participants (N = 200)

Variable	Category	n (%)	Test value	95% CI	p-value
Severity of anemia	No anemia	87 (43.5)	χ^2 = 94.72	36.5-50.7	<0.001
	Mild anemia	49 (24.5)		18.7-31.1	
	Moderate anemia	52 (26.0)		20.1-32.7	
	Severe anemia	12 (6.0)		3.1-10.2	
Type of anemia	Microcytic hypochromic	74 (65.5)*	χ^2 = 68.83	56.0-74.2	<0.001

	Normocytic normochromic	26 (23.0)*		15.6-31.9	
	Dimorphic anemia	13 (11.5)*		6.3-18.8	

Regarding severity, 56.5% of women were anemic, with moderate anemia (26.0%) being slightly more common than mild anemia (24.5%), while severe anemia was observed in 6.0% of cases. The distribution of anemia severity was statistically significant ($p < 0.001$). Among the anemic women ($n = 113$), the most common morphological type was microcytic hypochromic anemia (65.5%), followed by normocytic normochromic (23.0%) and dimorphic anemia (11.5%), with a highly significant distribution ($p < 0.001$).

DISCUSSION

In the present study, the mean age of pregnant women was 25.84 ± 4.31 years, with the majority belonging to the 25-29 years age group (36.5%), followed by 20-24 years (30.5%). This indicates that most participants were in the peak reproductive age group. Similar findings were reported by Abdilahi et al.(2024)[1] and Qiao et al.(2024)[7], who observed that anemia in pregnancy was commonly seen among women in the 20-30 years age group. The mean gestational age in the present study was 27.18 ± 6.42 weeks, suggesting that most women were evaluated during the second and third trimesters, when iron requirements are increased due to fetal growth and expansion of maternal blood volume. Comparable trimester distribution has also been reported by Lema et al.(2023)[2], where anemia prevalence increased with advancing gestational age.

In relation to obstetric profile, 56.5% were multigravida, while 43.5% were primigravida. Although gravida distribution was not statistically significant in baseline characteristics, anemia was significantly higher among multigravida women in the association analysis. This finding is comparable with Kejela et al.(2020)[3] and Balcha et al.(2023)[5], who reported that repeated pregnancies increase the risk of anemia due to depleted iron stores and inadequate nutritional replenishment between pregnancies. In the present study, 59.5% of women belonged to rural areas, and rural residence showed a significant association with anemia. This is consistent with Udho et al.(2023)[9], who found a higher burden of anemia among rural pregnant women due to poor dietary diversity, low socioeconomic status, and limited access to antenatal services.

The prevalence of anemia in the present study was 56.5%, which indicates that anemia remains a major public health problem among pregnant women. This finding is comparable with Bansal et al.(2020)[4] and Azhar et al.(2021)[10], who reported a high prevalence of anemia among pregnant women and emphasized its contribution to maternal morbidity and adverse pregnancy outcomes. Similarly, Geta et al.(2022)[11] in their meta-analysis reported that anemia continues to be highly prevalent in developing countries, particularly among pregnant women. The statistically significant prevalence in the present study supports the need for early screening and effective antenatal intervention.

In the present study, anemia was significantly higher among women aged <25 years (64.3%) compared to those aged ≥25 years (50.9%). This may be due to early marriage, early conception, poor nutritional status, and inadequate awareness regarding antenatal care among younger women. Similar observations were made by Keokenchanh et al.(2021)[6], who highlighted that anemia in low- and middle-income countries is strongly influenced by age, nutrition, reproductive pattern, and social determinants.

Residence and socioeconomic status were important associated factors. Anemia was more common among rural women (63.9%) compared to urban women (45.7%) and among women from lower socioeconomic status (70.6%) compared to middle/upper socioeconomic groups

(49.2%). These findings are in agreement with Alreshidi et al.(2021)[8], who reported that poor socioeconomic status, low dietary iron intake, and inadequate antenatal care were important contributors to anemia in pregnancy. Rural women may have reduced access to healthcare services, delayed antenatal registration, and poor compliance with nutritional supplementation.

The present study also showed that anemia was significantly higher among multigravida women (63.7%), women with birth spacing <2 years (72.2%), and women with poor IFA compliance (73.6%). Poor IFA compliance showed the strongest association with anemia, with an odds ratio of 3.97, indicating that women with poor compliance were nearly four times more likely to be anemic. This finding is supported by Balcha et al.(2023)[5] and Lema et al.(2023)[2], who reported that iron and folic acid supplementation during pregnancy significantly reduces the risk of maternal anemia and improves birth outcomes. Short birth spacing and repeated pregnancies may not allow adequate time for restoration of maternal iron stores, thereby increasing susceptibility to anemia.

Regarding severity, moderate anemia (26.0%) was slightly more common than mild anemia (24.5%), while severe anemia was seen in 6.0% of women. This pattern suggests that although severe anemia was less frequent, a considerable proportion of pregnant women had clinically important anemia requiring active correction. Similar findings were reported by Qiao et al.(2024)[7] and Udho et al.(2023)[9], who noted that mild and moderate anemia account for the majority of anemia cases in pregnancy, but severe anemia contributes disproportionately to maternal and perinatal complications.

Among anemic women, the most common morphological type was microcytic hypochromic anemia (65.5%), followed by normocytic normochromic anemia (23.0%) and dimorphic anemia (11.5%). This strongly suggests that iron deficiency was the predominant cause of anemia in the study population. Similar findings were observed by Azhar et al.(2021)[10] and Geta et al.(2022)[11], who reported iron deficiency as the leading cause of anemia among pregnant women. The presence of dimorphic anemia also indicates the possible coexistence of iron, folate, and vitamin B12 deficiencies in some women.

CONCLUSION

The present cross-sectional study demonstrated that anemia remains highly prevalent among pregnant women attending a tertiary care hospital, with more than half of the study population affected. The majority of cases were of mild to moderate severity, while a smaller proportion had severe anemia, which still poses significant clinical concern. The predominance of microcytic hypochromic anemia indicates that iron deficiency continues to be the leading etiological factor in this population.

The study also identified several significant socio-demographic and clinical determinants of anemia. Younger maternal age, rural residence, lower socioeconomic status, multigravidity, short inter-pregnancy interval, and poor compliance with iron and folic acid supplementation were found to be strongly associated with increased risk of anemia. Among these, poor IFA compliance emerged as the most significant modifiable risk factor, highlighting the need for improved awareness, counseling, and adherence strategies.

These findings underscore the importance of early screening, regular antenatal follow-up, nutritional education, and strengthening of existing public health programs aimed at anemia control. Targeted interventions focusing on high-risk groups, especially rural and socioeconomically disadvantaged women, are essential to reduce the burden of anemia and improve both maternal and fetal outcomes.

LIMITATIONS OF THE STUDY

1. The study was conducted in a single tertiary care hospital, which may limit the generalizability of findings to the broader community.
2. Being a cross-sectional study, causal relationships between anemia and associated factors could not be established.
3. The sample size, though adequate, may not fully represent all population subgroups.
4. Dietary intake and nutritional assessment were based on self-reported data, which may be subject to recall bias.
5. Compliance with iron and folic acid supplementation was not objectively verified.
6. Advanced biochemical investigations (e.g., serum ferritin, vitamin B12, folate levels) were not performed for all participants.
7. Socioeconomic status classification may have inherent subjectivity and variability.
8. Possible confounding factors such as parasitic infections and chronic diseases were not extensively evaluated.
9. Selection bias may be present as only hospital-attending women were included.
10. Follow-up of maternal and fetal outcomes was not included in the study design.

REFERENCES

1. Abdilahi MM, Kiruja J, Farah BO, Abdirahman FM, Mohamed AI, Mohamed J, Ahmed AM. Prevalence of anemia and associated factors among pregnant women at Hargeisa Group Hospital, Somaliland. BMC Pregnancy and Childbirth. 2024 May 9;24(1):332.
2. Lema EJ, Seif SA. Prevalence of anemia and its associated factors among pregnant women in Ilala Municipality-Tanzania: Analytical cross-sectional study. Medicine. 2023 Jun 9;102(23):e33944.
3. Kejela G, Wakgari A, Tesfaye T, Turi E, Adugna M, Alemu N, Jebessa L. Prevalence of anemia and its associated factors among pregnant women attending antenatal care follow up at Wollega University referral hospital, Western Ethiopia. Contraception and reproductive medicine. 2020 Oct 9;5(1):26.
4. Bansal R, Bedi M, Kaur J, Kaur K, Shergill HK, Khaira HK, Suri V. Prevalence and factors associated with anemia among pregnant women attending antenatal clinic. Adesh University Journal of Medical Sciences & Research. 2020 Jul 23;2(1):42-8.
5. Balcha WF, Eteffa T, Tesfu AA, Alemayehu BA, Chekole FA, Ayenew AA, Gessesse NA, Getu AA, Kassahun EA, Gezahegn TW, Adugna KF. Factors associated with anemia among pregnant women attended antenatal care: a health facility-based cross-sectional study. Annals of Medicine and Surgery. 2023 May 1;85(5):1712-21.
6. Keokenchanh S, Kounnavong S, Tokinobu A, Midorikawa K, Ikeda W, Morita A, Kitajima T, Sokejima S. Prevalence of anemia and its associate factors among women of reproductive age in Lao PDR: evidence from a nationally representative survey. Anemia. 2021;2021(1):8823030.
7. 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 Apr 22;24(1):1100.
8. Alreshidi MA, Haridi HK. Prevalence of anemia and associated risk factors among pregnant women in an urban community at the North of Saudi Arabia. Journal of preventive medicine and hygiene. 2021 Sep 15;62(3):E653.

9. Udho S, Nankumbi J, Namutebi M, Mukunya D, Ndeezi G, Tumwine JK. Prevalence of anaemia in pregnancy and associated factors in northern Uganda: a cross-sectional study. South African Journal of Clinical Nutrition. 2023 Dec 1;36(4):136-41.
10. Azhar BS, Islam MS, Karim MR. Prevalence of anemia and associated risk factors among pregnant women attending antenatal care in Bangladesh: a cross-sectional study. Primary health care research & development. 2021 Jan;22:e61.
11. Geta TG, Gebremedhin S, Omigbodun AO. Prevalence and predictors of anemia among pregnant women in Ethiopia: Systematic review and meta-analysis. PloS one. 2022 Jul 27;17(7):e0267005.