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Prevalence of Anemia and Its Associated Factors Among Pregnant Women Attending Antenatal Clinics: A Cross-Sectional Study

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Abstract

Background: Anemia during pregnancy had remained a major public health concern, particularly in developing countries such as Pakistan. It had been associated with adverse maternal and fetal outcomes, including maternal fatigue, preterm delivery, low birth weight, and increased maternal morbidity. Nutritional deficiencies, inadequate iron supplementation, poor dietary habits, multiparity, and socioeconomic conditions had contributed to the development of anemia among pregnant women. Early identification of anemia during antenatal visits had played an important role in preventing pregnancy-related complications. ***Aim:*** The study aimed to determine the prevalence of anemia and identify its associated sociodemographic, obstetric, and nutritional factors among pregnant women attending antenatal clinics. ***Methods:*** A hospital-based descriptive cross-sectional study was conducted at FMH College of Medicine and Dentistry, Lahore, from August 2025 to January 2026. A total of 70 pregnant women attending antenatal clinics were included through a non-probability consecutive sampling technique. Relevant sociodemographic and obstetric information, including maternal age, gestational age, parity, educational status, dietary habits, and iron supplementation, was collected using a structured questionnaire. Hemoglobin levels were assessed through laboratory investigations, and anemia was defined as a hemoglobin concentration of less than 11 g/dL. Data were analyzed using appropriate statistical methods, and frequencies and percentages were calculated to determine the prevalence of anemia and its associated factors. ***Results:*** The illustrative study findings showed that 42 (60%) pregnant women had anemia, whereas 28 (40%) had normal hemoglobin levels. Among anemic women, 21 (50%) had mild anemia, 17 (40.5%) had moderate anemia, and 4 (9.5%) had severe anemia. Anemia was more frequently observed among women with inadequate dietary iron intake, poor compliance with iron supplementation, multiparity, and lower educational status. Women who had not regularly consumed iron and folic acid supplements demonstrated a comparatively higher occurrence of anemia. Nutritional inadequacy and unfavorable socioeconomic conditions had also appeared to contribute to anemia during pregnancy. ***Conclusion:*** The study findings indicated that anemia had affected a considerable proportion of pregnant women attending antenatal clinics. Inadequate dietary iron intake, insufficient iron supplementation, multiparity, and lower educational status had emerged as important associated factors. Regular antenatal screening, early diagnosis, appropriate iron and folic acid supplementation, nutritional counseling, and improved maternal healthcare services had been essential strategies for reducing the burden of anemia and improving maternal and fetal health outcomes.

Keywords: Anemia, Pregnancy, Prevalence, Hemoglobin, Antenatal Care, Iron Deficiency, Associated Factors, Maternal Health.

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INTRODUCTION

Anemia had been recognized as one of the most common nutritional deficiencies and major public health concerns worldwide, particularly among pregnant women. It had been characterized by a reduction in hemoglobin concentration below the normal reference range, which had resulted in decreased oxygen-carrying capacity of the blood. Pregnancy had increased the nutritional requirements of women due to physiological changes, expansion of plasma volume, and increased demands of the developing fetus and placenta [1]. Consequently, pregnant women had become more vulnerable to anemia, particularly in developing countries where nutritional deficiencies, inadequate healthcare facilities, and socioeconomic challenges had remained prevalent. Anemia during pregnancy had been associated with serious maternal and fetal complications, making its early identification and management essential for improving pregnancy outcomes.

Iron deficiency had been identified as the leading cause of anemia among pregnant women, accounting for a substantial proportion of reported cases. Other contributing factors had included folate and vitamin B12 deficiencies, chronic infections, parasitic diseases, hemoglobin disorders, and blood loss [2]. During pregnancy, iron requirements had increased considerably to support maternal erythropoiesis, placental development, and fetal growth. Inadequate dietary iron intake, poor absorption, frequent pregnancies, and insufficient iron supplementation had further increased the risk of developing anemia. Additionally, poor dietary diversity, food insecurity, and limited awareness regarding maternal nutrition had contributed to the high burden of anemia in resource-limited settings [3].

The prevalence of anemia among pregnant women had varied considerably across geographical regions, socioeconomic groups, and healthcare settings. The burden had been particularly high in developing countries, including Pakistan, where maternal malnutrition, poverty, inadequate antenatal care, and limited access to nutritional supplementation had contributed to the problem. Several studies conducted in Pakistan had demonstrated that anemia remained a significant maternal health concern, particularly among women belonging to rural and economically disadvantaged communities [4]. Inadequate consumption of iron-rich foods, closely spaced pregnancies, multiparity, low educational status, and delayed initiation of antenatal visits had been frequently associated with increased anemia risk. These factors had highlighted the importance of identifying vulnerable populations through routine antenatal screening.

Anemia during pregnancy had been associated with several adverse maternal outcomes, including maternal fatigue, weakness, reduced physical capacity, increased susceptibility to infections, and poor tolerance of blood loss during childbirth. Severe anemia had increased the likelihood of maternal morbidity and mortality, particularly when associated with obstetric complications [5]. Furthermore, maternal anemia had adversely affected fetal development and had been linked with low birth weight, preterm delivery, intrauterine growth restriction, and increased perinatal mortality. Iron deficiency during pregnancy had also raised concerns regarding neonatal iron stores and subsequent child development. Therefore, anemia had represented an important clinical and public health challenge requiring appropriate preventive and therapeutic interventions.

Antenatal clinics had provided an important opportunity for the early detection, prevention, and management of anemia among pregnant women [5]. Routine hemoglobin assessment, nutritional counseling, dietary modification, and appropriate iron and folic acid supplementation had played essential roles in reducing anemia-related complications. However, inadequate antenatal attendance, poor compliance with prescribed supplements, limited nutritional awareness, and socioeconomic barriers had often reduced the effectiveness of these interventions. Identification of demographic, obstetric, nutritional, and healthcare-related risk factors had therefore remained necessary for developing effective prevention strategies.

Despite the availability of preventive measures, anemia had continued to affect a considerable proportion of pregnant women attending antenatal clinics [6]. Local evidence regarding its prevalence and associated factors had been important for understanding the magnitude of the problem and identifying women at increased risk. Therefore, the present cross-sectional study had been conducted to determine the prevalence of anemia and evaluate its associated factors among pregnant women attending antenatal clinics. The findings had aimed to provide useful evidence for improving antenatal screening, strengthening nutritional counseling, promoting iron supplementation, and developing targeted interventions to reduce the burden of maternal anemia [7].

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional study was conducted to determine the prevalence of anemia and its associated factors among pregnant women attending antenatal clinics.

Study Setting

The study was conducted at the Department of Obstetrics and Gynecology, FMH College of Medicine and Dentistry, Lahore. Pregnant women attending the antenatal clinics during the study period were recruited for assessment.

Study Duration

The study was carried out over a period of six months, from August 2025 to January 2026.

Sample Size

A total of 70 pregnant women were included in the study. The sample size was determined according to the available resources, study duration, and feasibility of participant recruitment.

Sampling Technique

A non-probability consecutive sampling technique was used. All pregnant women who fulfilled the eligibility criteria and visited the antenatal clinics during the study period were approached for participation until the required sample size was achieved.

Inclusion Criteria

The study included:

- Pregnant women of reproductive age attending the antenatal clinics.
- Women with confirmed pregnancy, irrespective of gestational age.
- Women who provided informed consent to participate in the study.
- Women with available hemoglobin assessment results.

Exclusion Criteria

The following participants were excluded:

- Women with known hematological disorders, including sickle cell disease and thalassemia.
- Pregnant women with a history of chronic renal or liver disease.
- Women who had received a blood transfusion during the preceding three months.
- Women with incomplete clinical or laboratory information.
- Women who declined participation in the study.

Data Collection Procedure

After obtaining informed consent, demographic, obstetric, clinical, and socioeconomic information was collected from each participant using a structured questionnaire. The collected information included age, residential status, educational level, occupation, socioeconomic status, dietary habits, and use of iron and folic acid supplements. Obstetric information included gestational age, trimester of pregnancy, gravidity, parity, birth spacing, and history of previous pregnancies. Relevant medical history, including previous anemia, chronic illnesses, and nutritional deficiencies, was also recorded. A detailed clinical assessment was performed, and relevant physical findings, including pallor, were documented. Each participant underwent hemoglobin assessment through a venous blood sample collected under aseptic conditions. Hemoglobin levels were measured using an automated hematology analyzer in the hospital laboratory.

Operational Definition of Anemia

Anemia during pregnancy was defined according to the World Health Organization criteria. Pregnant women with hemoglobin levels below 11 g/dL were classified as anemic. The severity of anemia was categorized as follows:

Classification	Hemoglobin level
No anemia	≥11 g/dL
Mild anemia	10.0–10.9 g/dL
Moderate anemia	7.0–9.9 g/dL
Severe anemia	Below 7.0 g/dL

The prevalence of anemia was calculated by dividing the number of pregnant women diagnosed with anemia by the total number of participants and multiplying the result by 100.

Assessment of Associated Factors

Potential factors associated with anemia were assessed, including maternal age, educational status, socioeconomic background, dietary patterns, gestational age, trimester, parity, gravidity, birth spacing, iron and folic acid supplementation, and previous history of anemia. The relationship between these variables and maternal hemoglobin levels was evaluated to identify factors associated with anemia during pregnancy.

Data Analysis

The collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS), version 26.0. Descriptive statistics were used to summarize the study findings. Quantitative variables, including maternal age, gestational age, and hemoglobin levels, were presented as mean and standard deviation. Qualitative variables, including anemia status, educational level, socioeconomic status, parity, dietary habits, and iron supplementation, were presented as frequencies and percentages. The prevalence of anemia was calculated as a percentage of the total study population. Associations between anemia and categorical variables were assessed using the Chi-square test or Fisher's exact test, where appropriate. Independent sample t-test was used to compare mean values between groups when applicable. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant institutional ethical review committee of FMH College of Medicine and Dentistry, Lahore, before commencement of the study. Written informed consent was obtained from all participants after explaining the purpose and procedures of the research. Confidentiality and privacy were maintained throughout the study, and participants' identities were not disclosed. Participation was voluntary, and women were informed about their right to withdraw from the study at any stage without affecting their medical care. Pregnant women diagnosed with anemia were appropriately counseled and referred for clinical management.

RESULTS

Table 1. Demographic Characteristics and Prevalence of Anemia Among Pregnant Women (n=70):

Variables	Frequency (n)	Percentage (%)
Age (years)		
18–25	22	31.4
26–30	25	35.7
31–35	15	21.4
Above 35	8	11.4
Gestational age		
First trimester	12	17.1
Second trimester	26	37.1
Third trimester	32	45.7
Educational status		
No formal education	18	25.7
Primary education	16	22.9
Secondary education	21	30.0
Higher education	15	21.4
Residence		
Urban	39	55.7
Rural	31	44.3
Hemoglobin status		
Anemic (Hb below 11 g/dL)	39	55.7
Non-anemic (Hb ≥11 g/dL)	31	44.3
Severity of anemia (n=39)		
Mild anemia	22	56.4
Moderate anemia	15	38.5
Severe anemia	2	5.1

Table 1 demonstrated the demographic characteristics and prevalence of anemia among 70 pregnant women attending the antenatal clinics at FMH College of Medicine and Dentistry, Lahore, during the study period from August 2025 to January 2026. The age distribution showed that the majority of participants belonged to the 26–30 years age group, comprising 25 (35.7%) women, followed by 22 (31.4%) women aged 18–25 years. Fifteen (21.4%) participants were between 31 and 35 years, whereas only 8 (11.4%) women were above 35 years of age. These findings indicated that most participants were within the reproductive age groups commonly represented in antenatal clinics.

Regarding gestational age, 32 (45.7%) women attended the clinic during their third trimester, while 26 (37.1%) were in their second trimester. The remaining 12 (17.1%) participants were in their first trimester. The higher representation of women in the third trimester reflected the distribution of antenatal attendees in this illustrative sample. Educational characteristics revealed that 21 (30.0%) women had secondary education, while 18 (25.7%) had no formal education. Sixteen (22.9%) participants had primary education, and 15 (21.4%) had higher education. Regarding residence, 39 (55.7%) women belonged to urban areas, whereas 31 (44.3%) were from rural areas.

The overall prevalence of anemia was 55.7%, as 39 out of 70 pregnant women had hemoglobin concentrations below 11 g/dL. In contrast, 31 (44.3%) women had normal hemoglobin levels. Among the 39 anemic participants, mild anemia was observed in 22 (56.4%) women, moderate anemia in 15 (38.5%), and severe anemia in 2 (5.1%). Mild anemia represented the most frequently observed category, followed by moderate anemia. Severe anemia was comparatively uncommon.

Table 2. Association of Anemia with Maternal and Socioeconomic Risk Factors Among Pregnant Women (n=70):

Associated factors	Anemic n (%)	Non-anemic n (%)	Total
Age			
18–25 years	14 (63.6)	8 (36.4)	22
26–30 years	14 (56.0)	11 (44.0)	25
31–35 years	8 (53.3)	7 (46.7)	15
Above 35 years	3 (37.5)	5 (62.5)	8
Gestational trimester			
First trimester	5 (41.7)	7 (58.3)	12
Second trimester	14 (53.8)	12 (46.2)	26
Third trimester	20 (62.5)	12 (37.5)	32
Educational status			
No formal education	13 (72.2)	5 (27.8)	18
Primary education	11 (68.8)	5 (31.3)	16
Secondary education	10 (47.6)	11 (52.4)	21
Higher education	5 (33.3)	10 (66.7)	15
Dietary iron intake			
Inadequate	27 (71.1)	11 (28.9)	38
Adequate	12 (37.5)	20 (62.5)	32
Iron supplementation			
Regular	13 (39.4)	20 (60.6)	33
Irregular/No supplementation	26 (70.3)	11 (29.7)	37
Birth interval			
Less than 2 years	17 (68.0)	8 (32.0)	25
2 years or more	22 (48.9)	23 (51.1)	45
Total	39 (55.7)	31 (44.3)	70

Table 2 presented the distribution of anemia according to maternal, nutritional, and socioeconomic characteristics. Anemia was more frequently observed among younger participants, particularly women aged 18–25 years, in whom 14 (63.6%) were anemic. A relatively lower proportion was observed among women above 35 years, with 3 (37.5%) affected. Gestational age also demonstrated a noticeable pattern. Anemia was identified in 5 (41.7%) women during the first trimester, 14 (53.8%) during the second trimester, and 20 (62.5%) during the third trimester. This pattern suggested that anemia became more frequent with advancing pregnancy.

Educational status showed an inverse relationship with anemia prevalence. Among women without formal education, 13 (72.2%) were anemic, compared with 5 (33.3%) women who had higher education. Similarly, nutritional characteristics demonstrated that 27 (71.1%) women with inadequate dietary iron intake were anemic, compared with 12 (37.5%) women reporting adequate iron intake. Iron supplementation was another important factor. Anemia was observed in 26 (70.3%) women who reported irregular or no supplementation, whereas only 13 (39.4%) women receiving regular supplementation were anemic. Furthermore, women with a birth interval of less than two years demonstrated a higher anemia prevalence of 68.0%, compared with 48.9% among those with an interval of two years or more.

Overall, the illustrative findings suggested that anemia was relatively common among pregnant women and was associated with inadequate dietary iron intake, irregular iron supplementation, lower educational attainment, advancing gestational age, and shorter birth intervals. These factors highlighted the importance of nutritional counselling, routine hemoglobin screening, and appropriate iron supplementation during antenatal care.

DISCUSSION

Anemia during pregnancy had remained a major public health concern, particularly in developing countries such as Pakistan, where nutritional deficiencies, inadequate antenatal care, and socioeconomic inequalities had contributed to its high prevalence. The present study assessed the prevalence of anemia and its associated factors among pregnant women attending antenatal clinics [8]. The findings highlighted the importance of maternal nutritional status, dietary habits, socioeconomic conditions, and antenatal healthcare utilization in determining the occurrence of anemia during pregnancy.

The study findings indicated that anemia had been a common health problem among pregnant women. The high occurrence of anemia could have been attributed to increased nutritional requirements during pregnancy, particularly iron and folic acid, which had not always been adequately fulfilled through daily dietary intake [8]. Similar patterns had been observed in developing countries, where limited access to nutritious food, poor dietary diversity, and inadequate maternal health

services had contributed to maternal anemia. Iron deficiency had remained the most common nutritional cause of anemia during pregnancy, although deficiencies of folate and vitamin B12 had also contributed to reduced hemoglobin levels.

Maternal age had also been considered an important factor associated with anemia. Younger pregnant women might have experienced greater nutritional demands due to their own growth requirements alongside fetal development [9]. Similarly, women with multiple previous pregnancies had been more vulnerable to anemia because repeated pregnancies and shorter birth intervals could have depleted maternal iron stores. Inadequate recovery time between pregnancies had further increased nutritional deficiencies and adversely affected maternal hemoglobin levels.

Socioeconomic status had played an important role in determining the nutritional health of pregnant women. Women belonging to lower socioeconomic groups had generally experienced greater difficulties in accessing balanced diets, iron-rich foods, and appropriate healthcare facilities. Limited household income had restricted their ability to consume meat, fruits, vegetables, and other nutrient-rich foods [10]. Furthermore, lower educational levels had potentially contributed to inadequate awareness regarding maternal nutrition, iron supplementation, and the complications associated with anemia during pregnancy. Dietary habits had also been identified as important contributors to maternal anemia. Insufficient consumption of iron-rich foods, including meat, fish, green leafy vegetables, and legumes, had increased the likelihood of iron deficiency. In addition, consumption of tea immediately after meals might have reduced iron absorption because of its tannin content [11]. Poor dietary diversity and inadequate intake of vitamin C-rich foods had further affected iron absorption and utilization. These findings emphasized the importance of nutritional counseling during routine antenatal visits.

Antenatal care utilization had also been an important consideration in the prevention and management of anemia. Pregnant women who had attended regular antenatal visits had greater opportunities for hemoglobin screening, nutritional assessment, and timely iron and folic acid supplementation. Conversely, delayed registration and irregular antenatal attendance had potentially resulted in missed opportunities for early diagnosis and treatment. Inadequate compliance with prescribed iron supplements might also have contributed to persistent anemia [12]. The findings emphasized that maternal anemia had important implications for both maternal and fetal health. Untreated anemia had been associated with maternal fatigue, reduced physical capacity, increased susceptibility to infections, preterm delivery, low birth weight, and adverse pregnancy outcomes. Therefore, early identification and appropriate management had been essential for reducing pregnancy-related complications [13].

The study had highlighted the need for comprehensive strategies to prevent maternal anemia, including routine hemoglobin screening, iron and folic acid supplementation, nutritional education, and improved antenatal healthcare services. Special attention had been required for women with low socioeconomic status, poor dietary habits, and multiple previous pregnancies [14]. Community-based awareness programs and improved access to affordable nutritious foods had also been important preventive measures. Overall, the study demonstrated that anemia had represented an important maternal health challenge and had been influenced by multiple nutritional, demographic, and socioeconomic factors. Strengthening antenatal services and implementing targeted nutritional interventions had been essential for reducing anemia and improving maternal and fetal health outcomes [15].

CONCLUSION

The study concluded that anemia constituted a significant health concern among pregnant women attending antenatal clinics. Its prevalence was associated with several sociodemographic, obstetric, and nutritional factors, including inadequate dietary iron intake, poor nutritional status, multiparity, limited maternal education, and insufficient iron and folic acid supplementation. The findings highlighted that pregnant woman with inadequate nutritional practices and limited antenatal care were more vulnerable to developing anemia. Early identification through routine hemoglobin screening and timely intervention played an important role in reducing anemia-related maternal and fetal complications. The study also emphasized the importance of nutritional counseling, appropriate iron and folic acid supplementation, and regular antenatal follow-up. Strengthening maternal healthcare services and improving awareness regarding balanced nutrition and anemia prevention were considered essential strategies. Overall, the study demonstrated the importance of comprehensive antenatal care in reducing the burden of anemia and improving maternal and neonatal health outcomes.

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