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KNOWLEDGE, ATTITUDES, AND PRACTICES RELATED TO ANEMIA PREVENTION AND MANAGEMENT AMONG PREGNANT WOMEN IN A TERTIARY CARE SETTING LAHORE

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Abstract

Background: *Anemia during pregnancy remains a major public health problem and is associated with increased maternal and neonatal morbidity and mortality, particularly in low- and middle-income countries. Adequate knowledge, positive attitudes, and appropriate preventive practices among pregnant women are essential for reducing the burden of anemia and improving pregnancy outcomes. Assessing these factors provides evidence for developing effective maternal health education and nutrition interventions.*

Aim: *To assess the knowledge, attitudes, and practices related to anemia prevention and management among pregnant women attending a tertiary care hospital.*

Methods: *A quantitative descriptive cross-sectional study was conducted among* ***150 pregnant women*** *attending the antenatal clinic of a tertiary care hospital. Participants were selected using a convenience sampling technique. Data were collected using a structured, pretested questionnaire comprising demographic characteristics and knowledge, attitude, and practice domains. Data were analyzed using IBM SPSS version 29. Descriptive statistics, Pearson's correlation, and multiple linear regression analyses were performed. Statistical significance was set at $p < .05$.*

Results: *The findings showed that participants had good knowledge ($M = 3.97 \pm 0.67$), positive attitudes ($M = 3.99 \pm 0.47$), and satisfactory practices ($M = 3.98 \pm 0.61$) regarding anemia prevention and management. Most participants recognized the importance of iron-rich diets, iron and folic acid supplementation, and regular antenatal care. Lower practice scores were observed for avoiding tea and coffee after meals, indicating an area requiring additional health education.*

Conclusion: *Pregnant women demonstrated satisfactory knowledge, positive attitudes, and appropriate practices regarding anemia prevention and management. Continuous antenatal education, nutritional counseling, and community awareness programs are recommended to address remaining knowledge gaps and strengthen preventive behaviors, ultimately improving maternal and neonatal health outcomes.*

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Introduction

Anemia is one of the most common nutritional disorders affecting women during pregnancy and remains a major public health concern worldwide. It is characterized by a reduction in the number of red blood cells or hemoglobin concentration below the normal level required to meet the physiological oxygen demands of the body. The World Health Organization defines anemia during pregnancy as a hemoglobin concentration of less than 11 g/dL. Iron deficiency is the leading cause of anemia in pregnancy, although deficiencies of folate, vitamin B12, vitamin A, chronic infections, parasitic infestations, inflammation, and inherited blood disorders also contribute to its development. Knowledge refers to the awareness and understanding of pregnant women regarding the causes, symptoms, prevention, and treatment of anemia. Attitude reflects their beliefs, perceptions, and willingness to adopt preventive measures, while practices represent their actual health behaviors, including adherence to iron and folic acid supplementation, consumption of iron-rich foods, and utilization of antenatal care services (World Health Organization [WHO], 2025).

Anemia continues to affect millions of pregnant women across the world despite advances in maternal healthcare. According to the WHO Global Anaemia Estimates (2025), approximately 37% of pregnant women worldwide are affected by anemia, representing nearly 32 million pregnant women. Low- and middle-income countries carry the greatest burden because of poverty, food insecurity, inadequate maternal nutrition, infectious diseases, and limited access to quality healthcare services. Maternal anemia is associated with increased risks of maternal mortality, postpartum hemorrhage, preterm birth, low birth weight, fetal growth restriction, stillbirth, and impaired neonatal development. The condition also contributes substantially to disability-adjusted life years and economic losses due to reduced productivity and increased healthcare expenditure (WHO, 2025).

South Asia remains the global epicenter of anemia among women of reproductive age. The region accounts for one of the highest numbers of anemic women worldwide because of persistent nutritional deficiencies, early marriage, frequent pregnancies, short birth spacing, poverty, and inadequate maternal health services. Recent reports indicate that nearly 259 million women and adolescent girls in South Asia are affected by anemia, with projections suggesting that the burden may continue to increase if effective interventions are not implemented. The persistence of anemia in this region poses a significant challenge to achieving the Sustainable Development Goals related to maternal and child health (United Nations, 2025).

Pakistan has one of the highest burdens of maternal anemia in South Asia. National evidence indicates that nearly one-half of pregnant women are affected by anemia, primarily because of iron deficiency, poor dietary diversity, recurrent pregnancies, low socioeconomic status, food insecurity, inadequate antenatal care utilization, and poor adherence to iron and folic acid supplementation. Maternal anemia remains an important contributor to maternal morbidity, neonatal complications, and poor pregnancy outcomes in the country. Although national nutrition programs have promoted iron and folic acid supplementation, poor compliance and limited community awareness continue to hinder progress in reducing the prevalence of anemia among pregnant women (National Nutrition Survey, 2018; UNICEF Pakistan, 2024).

The burden of anemia is particularly evident in Khyber Pakhtunkhwa, where tertiary care hospitals frequently manage pregnant women presenting with moderate and severe anemia. Women residing in rural and underserved communities often experience limited access to healthcare facilities, inadequate nutritional counseling, poverty, and low educational attainment. Cultural beliefs, delayed initiation of antenatal care, poor dietary practices, and misconceptions regarding iron supplementation further increase the risk of anemia during pregnancy. These factors result in increased hospital admissions, higher rates of obstetric complications, and greater healthcare costs for families and healthcare institutions (WHO, 2025).

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Knowledge, attitudes, and practices play a critical role in the prevention and management of anemia during pregnancy. Adequate knowledge enables pregnant women to recognize the importance of balanced nutrition, iron-rich foods, vitamin C intake, routine antenatal visits, and adherence to iron and folic acid supplementation. Positive attitudes toward maternal nutrition and preventive healthcare improve compliance with medical recommendations. Inadequate knowledge and negative attitudes often lead to poor dietary habits, irregular supplement use, delayed healthcare-seeking behavior, and increased susceptibility to maternal complications. Educational interventions delivered through antenatal clinics have demonstrated significant improvements in maternal awareness and preventive behaviors related to anemia (WHO, 2025).

Several studies conducted in low- and middle-income countries have reported inadequate knowledge and poor preventive practices among pregnant women despite the availability of antenatal care services. Misconceptions regarding iron supplementation, fear of medication side effects, financial constraints, and insufficient counseling from healthcare providers reduce adherence to recommended preventive measures. Assessment of knowledge, attitudes, and practices among pregnant women attending tertiary care hospitals provides essential evidence for designing targeted educational interventions, strengthening maternal nutrition programs, improving compliance with iron and folic acid supplementation, and reducing the burden of maternal anemia. Such evidence supports policymakers and healthcare professionals in developing effective strategies to improve maternal and neonatal health outcomes and achieve global nutrition targets (WHO, 2025).

Methods

This study employed a quantitative, descriptive cross-sectional research design based on the positivist research philosophy. The study was conducted among pregnant women attending the antenatal clinic of a tertiary care hospital. The target population comprised pregnant women aged 15–40 years who were in the second or third trimester of pregnancy and attended routine antenatal care services during the study period. Women with normal singleton pregnancies who voluntarily agreed to participate were included in the study. Pregnant women with pregnancy-related complications such as pregnancy-induced hypertension, gestational diabetes mellitus, cardiac diseases, severe obstetric complications, or any condition requiring emergency management were excluded. A convenience sampling technique was used to recruit participants. The sample size consisted of 150 pregnant women. Data were collected using a structured, self-administered questionnaire adapted from previously validated studies. The questionnaire consisted of four sections, including demographic characteristics, knowledge regarding anemia prevention and management, attitudes toward anemia prevention, and preventive practices related to anemia during pregnancy. Responses to the knowledge, attitude, and practice items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Data Collection Procedure

Prior to data collection, ethical approval and administrative permission were obtained from the relevant institutional authorities and the study hospital. Eligible pregnant women attending the antenatal clinic were approached individually and informed about the objectives, significance, and voluntary nature of the study. Written informed consent was obtained from all participants before questionnaire administration. Participants were assured that their responses would remain anonymous and confidential and would be used solely for research purposes. The researcher distributed the questionnaires to eligible participants during their antenatal clinic visits and remained available to clarify any questions without influencing their responses. Completed questionnaires were checked for completeness before being collected to minimize missing data.

Data Analysis Procedure

The collected data were entered, cleaned, coded, and analyzed using IBM Statistical Package for the

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Social Sciences (SPSS) version 27.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics and participants' knowledge, attitudes, and practices regarding anemia prevention and management. The normality of continuous variables was assessed before conducting inferential analyses. Pearson's correlation analysis was performed to determine the relationship among knowledge, attitudes, and practices. Multiple linear regression analysis was conducted to examine the association between demographic variables and knowledge, attitude, and practice scores. Statistical significance was determined at a p-value of less than 0.05, and the findings were presented in tables and figures where appropriate.

Results

Demographic Analysis

Table 1

Demographic Characteristics of the Participants (N = 150)

Variable	Category	n	%
Age (years)	<20	28	18.7
	21–30	64	42.6
	31–40	58	38.7
Residence	Urban	105	70.0
	Rural	45	30.0
Occupation	Working	76	50.7
	Housewife	74	49.3
Educational Level	University	51	34.0
	Above Secondary	55	36.7
	Secondary	29	19.3
	Read and Write	15	10.0
Monthly Income	Sufficient	60	40.0
	Sufficient and Safe	50	33.3
	Insufficient	40	26.7

Table 1 presents the demographic characteristics of the 150 pregnant women included in the study. The largest proportion of participants (42.6%, *n* = 64) belonged to the 21–30 years age group, followed by those aged 31–40 years (38.7%, *n* = 58), while participants younger than 20 years constituted 18.7% (*n* = 28). Most respondents resided in urban areas (70.0%, *n* = 105), whereas 30.0% (*n* = 45) were from rural areas. Regarding occupation, almost equal proportions of participants were working (50.7%, *n* = 76) and housewives (49.3%, *n* = 74). More than one-third of the respondents had above secondary education (36.7%, *n* = 55), followed by university education (34.0%, *n* = 51), secondary education (19.3%, *n* = 29), and only 10.0% (*n* = 15) had basic literacy. In terms of monthly income, 40.0% (*n* = 60) reported having sufficient income, 33.3% (*n* = 50) reported sufficient and safe income, and 26.7% (*n* = 40) had insufficient income. Overall, the findings indicate that the majority of participants were educated urban women within the reproductive age group of 21–30 years

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Table 2

Descriptive Statistics of Knowledge Regarding Anemia Prevention and Management (N = 150)

Knowledge Item	Mean	SD
Awareness of the definition of iron deficiency anemia	3.91	1.15
Knowledge of signs and symptoms	4.03	1.08
Knowledge of causes of anemia	3.81	1.08
Knowledge of maternal and fetal complications	3.93	0.98
Awareness of diagnostic tests	3.99	1.03
Knowledge of preventive measures	4.01	0.94
Knowledge of iron-rich foods	4.11	0.77
Knowledge of foods that inhibit iron absorption	3.89	0.93
Knowledge of vitamin C-rich foods	4.00	0.95
Overall Knowledge Score	**3.97**	**0.67**

Table 2 summarizes the descriptive statistics of participants' knowledge regarding anemia prevention and management. The overall mean knowledge score was **3.97 ± 0.67**, indicating that respondents generally possessed good knowledge about anemia. The highest mean score was observed for knowledge of iron-rich foods (M = 4.11, SD = 0.77), followed by knowledge of signs and symptoms (M = 4.03, SD = 1.08), preventive measures (M = 4.01, SD = 0.94), and vitamin C-rich foods (M = 4.00, SD = 0.95). The lowest mean score was related to knowledge of the causes of anemia (M = 3.81, SD = 1.08), although it remained above the midpoint of the scale. These findings suggest that pregnant women demonstrated an overall satisfactory level of knowledge regarding anemia prevention and management, with comparatively greater awareness of nutritional prevention strategies than disease etiology.

Table 3

Descriptive Statistics of Attitude and Practice Regarding Anemia Prevention and Management (N = 150)

Variable	Mean	SD
Attitude		
Anemia is a serious problem during pregnancy	3.98	0.92
Anemia reduces women's ability to work	4.05	0.99
Birth spacing reduces anemia risk	3.89	0.99
Awareness of adverse effects of anemia	3.95	0.82
Importance of preventing anemia	3.97	0.95
Searches for anemia-related information	4.00	0.84
Importance of regular antenatal checkups	4.04	0.91
Importance of dietary iron	3.99	0.86
Anemia during pregnancy can be prevented	4.03	0.92
Overall Attitude Score	**3.99**	**0.47**
Practice		
Regular antenatal visits	3.97	0.96
Regular iron supplementation	4.07	0.90
Consumption of vitamin C-rich fruits	3.97	0.89
Consumption of meat, poultry, and fish	3.99	0.92
Consumption of green vegetables	4.04	0.94
Consumption of fruits	3.95	0.95

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Avoidance of tea/coffee after meals	3.83	1.08
Overall Practice Score	**3.98**	**0.61**

Table 3 presents the descriptive statistics of participants' attitudes and practices regarding anemia prevention and management. The overall mean attitude score was **3.99 ± 0.47**, reflecting a generally positive attitude toward anemia prevention. Participants strongly agreed that anemia is a serious health problem during pregnancy, that regular antenatal checkups are essential, and that anemia can be prevented. Similarly, the overall practice score was **3.98 ± 0.61**, indicating good preventive practices among the respondents. Regular iron supplementation ($M = 4.07$, $SD = 0.90$) and consumption of green vegetables ($M = 4.04$, $SD = 0.94$) received the highest practice scores, whereas avoidance of tea and coffee immediately after meals showed the lowest mean score ($M = 3.83$, $SD = 1.08$). These findings indicate that although participants generally practiced appropriate anemia prevention behaviors, certain dietary practices require further improvement through health education.

Table 4

Overall Descriptive Statistics of Knowledge, Attitude, and Practice (N = 150)

Variable	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Knowledge	1.56	5.00	3.97	0.67	-1.10	1.26
Attitude	2.67	4.89	3.99	0.47	-0.55	0.18
Practice	2.00	5.00	3.98	0.61	-1.01	1.01

Table 4 presents the overall descriptive statistics for knowledge, attitude, and practice scores. Among the three domains, attitude had the highest mean score (**3.99 ± 0.47**), followed closely by practice (**3.98 ± 0.61**) and knowledge (**3.97 ± 0.67**). The negative skewness values for all three variables indicate that most respondents reported relatively high scores, suggesting favorable knowledge, positive attitudes, and good preventive practices toward anemia prevention and management. The kurtosis values ranged from 0.18 to 1.26, indicating that the data were approximately normally distributed without substantial deviation from normality. Overall, the descriptive findings demonstrate that pregnant women attending the tertiary care hospital exhibited adequate knowledge, positive attitudes, and satisfactory practices regarding anemia prevention and management.

Discussion

The current study found that pregnant women studying at that tertiary care hospital had an above average knowledge and appreciation regarding anemia with above average practices that are likely to prevent and manage anemia. The average scores for knowledge ($M = 3.97$, $SD = 0.67$), attitude ($M = 3.99$, $SD = 0.47$), and practice ($M = 3.98$, $SD = 0.61$) showed that the respondents had a positive view of anemia and practiced the required preventive measures. These results may mean that the education given during the antenatal period and the ongoing routine maternal health services may have resulted in a positive change in the pregnant women's health related practices and behaviors. The findings of Gebremeskel et al. (2022) are aligned to these findings, as they found that women who received ongoing antenatal care had a higher knowledge score and a higher score for anemia preventive practices. The findings of Bansal et al. (2023) are also aligned, as they found that antenatal counseling helped to improve maternal knowledge and to improve the practices of iron supplementation.

Most participants in this research were aged 21–30, lived in urban areas, and had at least secondary education. These factors likely contributed to the study's higher scores for knowledge and practice, as education and urbanization positively affect health literacy and the availability of health services. Geta et al. (2021) reported similar findings regarding maternal education and urban

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residence and their influences on maternal knowledge regarding anemia prevention. Alene et al. (2022) reported lower knowledge of anemia prevention in rural pregnant women, attributing this to the lack of rural health care and the low level of education in rural areas.

The participants in this study exhibited a good level of knowledge regarding the diagnosis of anemia and its symptoms and complications, as well as the prevention of anemia. Knowledge of iron-rich foods to prevent anemia was highest and indicated the success of the nutritional education provided in the antenatal visits. Knowledge of the causes of anemia was low and indicated some remaining misconceptions that pregnant women have regarding anemia. Nti et al. (2023) reported similar findings regarding the knowledge of nutrition and the lack of knowledge regarding the causes and pathophysiology of anemia. Tesema et al. (2022) reported overall low knowledge among pregnant women and attributed this to the low level of health education and the low utilization of antenatal care services.

Regarding attitudes, participants considered anemia in pregnancy a critical issue, acknowledging the role of early, consistent antenatal care, birth spacing, and iron-rich diets in preventive care. Effective maternal nutritional attitudes and preventive care are crucial to improving health-seeking behavior. Ahmed et al. (2024) reported the same observation, where positive maternal attitudes were associated with greater adherence to iron and folate supplementation. A different observation was made by Mohammed et al. (2022). In this case, perceived side effects of metallic iron were a barrier to the uptake of preventive care, despite adequate knowledge of the benefits.

As for practice, the majority of the participants attended antenatal clinics, practiced iron supplementation, consumed iron-rich foods, and included iron-rich foods and vegetables as well as vitamin C in their diets. It was noted that participants scored poorly in the practice of avoiding tea and coffee after meals, indicating suboptimal practice of iron absorption enhancing dietary behavior. Similar findings were reported by Fite et al. (2022), who found that there was a high adherence to iron supplementation, but poor adherence to dietary practices that promote the absorption of iron. Lower preventive practice scores for women attending rural clinics were attributed to food insecurity and a lack of antenatal care. Chaka et al. (2023) showed the same findings.

The current results confirm that knowledge leads to positive attitudes and preventive practices. Women who know about the prevention of anemia are more likely to follow the diet, take antenatal iron and folic acid supplements, and attend antenatal clinics. There is evidence to support this. Gebre et al. (2021) noted that better knowledge of pregnant women positively predicted better practices and lower prevalence of anemia. Sharma et al. (2023) said that the teaching and learning of antenatal education improved the knowledge, attitudes, and self-care of pregnant women.

The results show that, even when the knowledge, attitudes, and practices of the pregnant women are at a satisfactory level, there is a need for the education of pregnant women. The education should focus on the misinterpretations of the causes of anemia, on the education of the diet in the absorption of iron, and the education to strengthen the use of iron and folic acid. Pregnant women in rural areas and in the lower educational levels are an at-risk group for poor maternal nutrition and anemia. Strengthening counseling during antenatal care and community-based nutrition programs for mothers may improve the nutrition of mothers and the outcome of pregnancy.

Conclusion

The current research study aims to analyze the knowledge, attitudes, and practices towards anemia prevention and management among pregnant women visiting a tertiary care hospital. The results demonstrated that the responding women had appropriate knowledge and adopted preventive practices related to anemia. The majority of pregnant women recognized the value of consumption of iron-rich diet, supplements of iron and folic acid, planning and attending regular antenatal care, and proper meal planning during

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pregnancy to prevent anemia. The participants had positive attitudes towards the seriousness of anemia and appreciated the value of routine assessments and nutritional support during pregnancy. There was a high degree of regularity of antenatal visits, consumption of iron supplements, and of eating a well-balanced diet. There was some knowledge about the prevention of anemia; however, there was a gap related to dietary practices of avoiding beverages that contain high concentrations of tea and coffee and that and that interfere with the absorption of iron, which the women practiced post meal. Although the results of the study indicated a good knowledge base, attitudes, and practices among the pregnant women studied, the formal nutritional counseling, and health education during pregnancy would help in better maternal adherence to anemia prevention practices. Improving maternal health care in Canada would help in reducing the incidence of anemia in pregnancy and its associated poor pregnancy and neonatal outcomes.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Healthcare providers should strengthen health education and counseling on anemia prevention during every antenatal care visit.
2. Educational programs should emphasize the causes, consequences, prevention, and management of anemia, with particular attention to dietary factors that enhance or inhibit iron absorption.
3. Pregnant women should be encouraged to adhere to daily iron and folic acid supplementation as recommended by national and international maternal health guidelines.
4. Community-based awareness campaigns should be conducted to improve knowledge regarding maternal nutrition and anemia prevention, particularly in rural and underserved communities.
5. Healthcare professionals should provide individualized nutritional counseling focusing on iron-rich foods, vitamin C-rich foods, and appropriate meal planning during pregnancy.
6. Family members, especially husbands and caregivers, should be involved in maternal health education to improve support for healthy dietary practices and adherence to antenatal care.
7. Hospital administrators should ensure the continuous availability of iron and folic acid supplements and educational materials in antenatal clinics.
8. Policymakers should strengthen maternal nutrition programs and integrate regular anemia screening and counseling into routine antenatal care services.
9. Future research should include larger sample sizes from multiple healthcare facilities and use analytical study designs to identify factors associated with knowledge, attitudes, practices, and maternal anemia.
10. Longitudinal and interventional studies should be conducted to evaluate the effectiveness of educational interventions in improving anemia-related knowledge, attitudes, practices, and pregnancy outcomes.

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