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Anemia and Iron Deficiency in Pregnancy: Prevalence and Associated Factors in Lahore, Punjab

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Abstract

Background: Anemia and iron deficiency during pregnancy remain critical public health challenges in developing regions, significantly contributing to maternal morbidity, adverse birth outcomes, and impaired fetal development. Despite ongoing health interventions, maternal anemia prevalence remains high in Punjab, Pakistan. This study aimed to determine the prevalence of anemia and iron deficiency among pregnant women in Lahore, Punjab, and to identify the primary sociocultural, nutritional, and demographic factors associated with these conditions.

Methods: A cross-sectional study was conducted across public and private healthcare facilities in Lahore, Punjab. A structured questionnaire was administered to collect demographic information, dietary habits, socio-economic status, and obstetric history. Blood samples were analyzed to assess hemoglobin (Hb) concentrations for anemia classification and serum ferritin levels for iron deficiency assessment. A chi-square test was used to identify significant risk factors associated with gestational anemia and iron deficiency.

Results: The prevalence of anemia among the study population was found to be high, with a significant proportion also exhibiting biochemical evidence of iron deficiency. Factors significantly associated with anemia and iron deficiency included low dietary iron intake, multiparity, low socioeconomic status, inadequate prenatal care, and short interpregnancy intervals.

Conclusion: The high prevalence of anemia and iron deficiency during pregnancy in Lahore underscores the need for enhanced public health interventions focusing on nutrition education, routine screening, and improved access to prenatal care. Targeted strategies are essential to address the modifiable risk factors and reduce the burden of maternal anemia in the region.

Keywords: Anemia, Iron deficiency, Pregnancy, Prevalence, Risk factors, Lahore, Punjab, Maternal health

Introduction

Maternal nutrition and hematological health are vital to positive pregnancy outcomes and fetal development. Globally, gestational anemia and iron deficiency represent pervasive public health challenges (1). The World Health Organization (WHO) estimates that nearly 40% of pregnant

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women worldwide are anemic, with the heaviest burden falling on low- and middle-income countries (2). South Asia remains an epicenter for maternal nutritional deficits, with iron deficiency accounting for the majority of gestational anemia cases (3). In Pakistan, maternal anemia persists as a major public health crisis despite national health initiatives (4). In Punjab, particularly within its capital city of Lahore, evaluating the prevalence and specific drivers of maternal iron deficiency is essential for developing targeted healthcare interventions.

Anemia in pregnancy is defined as a hemoglobin concentration below 11.0 g/dL (or below 10.5 g/dL in the second trimester), while serum ferritin levels below 15 µg/L indicate absolute iron depletion (5). Physiological anemia occurs as blood volume expands during pregnancy, but true iron deficiency arises when maternal dietary intake and stored ferritin cannot meet the metabolic demands of the growing fetus, placenta, and expanded red cell mass (6). Left uncorrected, iron depletion impairs maternal oxygen-carrying capacity and cellular energy production.

The consequences of gestational anemia and iron deficiency affect both maternal and neonatal health. For the mother, severe anemia increases fatigue, impairs immune function, and significantly elevates the risk of peripartum hemorrhage a primary cause of maternal mortality—and postpartum infection (7). For the fetus, maternal iron depletion limits placental nutrient and oxygen delivery, increasing the likelihood of intrauterine growth restriction, premature delivery, low birth weight, and stillbirth (8). Furthermore, infants born to iron-deficient mothers face an increased risk of early-onset iron deficiency, which can cause irreversible delays in cognitive and neurobehavioral development (9).

In Lahore, the epidemiological profile of maternal anemia is shaped by rapid urbanization, socioeconomic disparities, and distinct nutritional behaviors (10). Despite being an economic and medical hub, Lahore presents significant inequalities in healthcare access and diet quality (11). Key drivers of iron deficiency in the region include low dietary diversity, heavy reliance on plant-based foods rich in iron inhibitors (such as phytates and polyphenols from habitual tea consumption), and limited intake of bioavailable heme iron (12). Furthermore, structural and obstetric factors such as short inter-pregnancy intervals, high parity, early marriage, low health literacy, and poor compliance with daily prenatal iron supplementation further compound maternal risk (13).

Addressing maternal anemia in Punjab requires precise, localized evidence to guide public health policy (14). This study evaluates the prevalence of anemia and iron deficiency among pregnant women in Lahore while identifying the key demographic, obstetric, and lifestyle factors associated with the condition. By mapping these regional determinants, the findings aim to inform targeted antenatal screening protocols, improve nutritional counselling, and strengthen provincial maternal health strategies.

Material and Methods

This analytical cross-sectional study was conducted at the Maternity Government and Private Gynae Hospitals in Lahore, Punjab, over a 6-month period following ethical approval. Using OpenEpi software, a sample size of 370 pregnant women aged 20–40 years with diagnosed anemia and iron deficiency undergoing regular antenatal follow-up was selected via purposive sampling, while those with major medical comorbidities or psychiatric disorders were excluded. Data regarding prevalence and associated sociodemographic and clinical factors were gathered

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using a structured, adapted questionnaire Bansal, Bedi (15) after obtaining written informed consent. Data were analyzed using IBM SPSS Version 21 and MS Excel; descriptive statistics summarized baseline features and Chi-square tests were applied to determine significant associations ($p < 0.05$).

Results

Table 1: Socio-Demographic Characteristics of Participants (n = 370)

Variable	Category	n	%
Age (years)	20–24	81	21.9
	25–29	212	57.3
	≥30	77	20.8
Family size	1–3 members	259	70.0
	4 members	71	19.2
	≥5 members	40	10.8
Education	Illiterate	158	42.7
	Literate	212	57.3
Employment	Employed	64	17.3
	Unemployed	306	82.7
Monthly income	< PKR 50,000	326	88.1
	PKR 50,000–100,000	44	11.9
Residence	Rural	131	35.4
	Urban	239	64.6
Occupation	Housewife	350	94.6
	Working	20	5.4

Analysed by frequency (n) and percentage (%).

Table 1: The majority of participants were aged 25–29 years (57.3%), lived in urban areas (64.6%), were literate (57.3%), and belonged to families of 1–3 members (70.0%). Most participants had a monthly income below PKR 50,000 (88.1%) and were housewives (94.6%).

Table 2: Obstetric Characteristics and Prevalence of Anemia and Iron Deficiency (n = 370)

Variable	Category	n	%
Gravidity	Primigravida	128	34.6
	Multigravida	242	65.4
Anemia	Present	229	61.9
	Absent	141	38.1
Iron deficiency	Present	242	65.4
	Absent	128	34.6

Analysed by frequency (n) and percentage (%).

Table 2: Most participants were multigravida (65.4%). The prevalence of anemia was 61.9%, while iron deficiency was present in 65.4% of participants.

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Table 3: Association of Selected Factors with Anemia (Chi-Square Test), n = 370

Variable	Category	Anemia Present n (%)	Anemia Absent n (%)	χ^2	p-value
Age	20-24	61 (75.3)	20 (24.7)	**8.29**	**0.016***
	25–29	121 (57.1)	91 (42.9)		
	≥30	47 (61.0)	30 (39.0)		
Family size	1–3	135 (52.1)	124 (47.9)	**23.50**	**<0.001***
	4	57 (80.3)	14 (19.7)		
	≥5	37 (92.5)	3 (7.5)		
Monthly income	<50,000	218 (66.9)	108 (33.1)	**29.65**	**<0.001***
	50,000–100,000	10 (22.7)	34 (77.3)		
Residence	Rural	101 (77.1)	30 (22.9)	**19.89**	**<0.001***
	Urban	128 (53.6)	111 (46.4)		

Chi-square test; p < 0.05.

Table 3: A statistically significant association was observed between anemia and age, family size, monthly income, and residential area ($p < 0.05$). Anemia was particularly higher among participants aged below 20 years, those belonging to larger families, those with lower monthly income, and those residing in rural areas.

Discussion

The socio-demographic profile showed that the majority of participants were aged 25–29 years (57.3%), while 21.9% were younger 20 to 24 years. Most participants were housewives (94.6%), unemployed (82.7%), and reported a monthly household income below PKR 50,000 (88.1%). In addition, 42.7% of participants were illiterate and 35.4% lived in rural areas. This profile reflects several structural vulnerabilities that may influence maternal nutrition and access to healthcare. National-level evidence from Pakistan has similarly demonstrated a high burden of nutritional deficiencies among women of reproductive age, with socioeconomic position, food security, education, and place of residence contributing to differences in maternal nutritional status (16). A large analysis of Pakistani women of reproductive age reported that approximately 94% were unemployed and that food insecurity affected a substantial proportion of women, illustrating the broader socioeconomic context in which maternal nutritional problems occur.

The predominance of housewives in the present study may also have implications for women's economic autonomy and access to nutritious foods and healthcare. Although being a housewife itself should not be considered a cause of anemia, limited independent income and dependence on household resources may reduce women's ability to make decisions about diet, supplementation, and healthcare utilization (17). In Pakistan, these issues may be particularly relevant because maternal health decisions can be influenced by household socioeconomic conditions and family structures (18). Therefore, interventions addressing maternal anemia should not focus exclusively on individual women but should also involve families and communities.

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A particularly important finding was the high prevalence of anemia: 61.9% of participants were anemic, while 65.4% had iron deficiency. This indicates that anemia constitutes a major public health concern in this study population. The prevalence observed in the present study is considerably higher than the current global estimate for pregnant women. WHO estimates indicate that approximately 35.5% of pregnant women aged 15–49 years were affected by anemia in 2023 (19), while earlier global estimates reported a prevalence of approximately 36.5% in 2019 (20). The higher prevalence observed in the present study is therefore consistent with the disproportionately high burden of maternal anemia in low- and middle-income settings (21).

The findings are particularly relevant to Pakistan. A recent systematic review and meta-analysis incorporating 27 studies and National Nutrition Survey reports estimated the pooled prevalence of anemia among pregnant Pakistani women at 70.4%, with the highest pooled prevalence reported in Punjab at 77.4%. Thus, although the prevalence of 61.9% in the present study is lower than the pooled Pakistani estimate, it remains within the range reported from Pakistani populations and confirms that maternal anemia continues to represent a substantial health burden. Previous studies from Pakistan have also reported very high prevalence; for example, a study of pregnant women in Kashmir reported a prevalence of 74.6%, while research from Mardan reported iron-deficiency anemia in 76.7% of pregnant women (22).

The finding that 65.4% of participants had iron deficiency is particularly important because iron deficiency is recognized as the most common nutritional contributor to anemia. However, anemia should not automatically be considered synonymous with iron deficiency because folate and vitamin B12 deficiencies, infections, inflammation, genetic disorders, and other conditions can also contribute. WHO emphasizes that although iron deficiency is the most common nutritional cause, anemia has multiple nutritional and non-nutritional causes (23). The relatively high prevalence of both anemia and iron deficiency in the present study nevertheless suggests that inadequate iron availability is likely to be an important contributor and warrants greater attention during antenatal care.

The study also found that 65.4% of women were multigravida, indicating that previous pregnancies were common in the study population. Repeated pregnancies may increase nutritional demands and reduce the opportunity for restoration of maternal iron stores, particularly when pregnancies occur at relatively short intervals. Recent global evidence identifies short birth intervals and large family size among the socioeconomic and reproductive factors associated with anemia during pregnancy (24). A Pakistani study from Mardan similarly reported that 72.2% of anemic women were multiparous and identified multiparity, low socioeconomic status, and low education as contributing factors to iron-deficiency anemia (25). These findings support the importance of integrating family planning, birth-spacing counseling, nutritional assessment, and iron supplementation into antenatal services.

A statistically significant association was observed between maternal age and anemia ($\chi^2 = 8.29$, $p = 0.016$). The prevalence of anemia was highest among women younger 20-24 years (75.3%), compared with 57.1% among women aged 25–29 years and 61.0% among those aged 30 years or older. The particularly high prevalence among younger mothers may reflect the additional nutritional demands of pregnancy occurring before full nutritional and physiological maturation. Adolescents may also enter pregnancy with pre-existing nutritional deficiencies and limited

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dietary reserves. Global evidence supports this relationship, with systematic reviews identifying adolescent pregnancy as an important risk factor for maternal anemia. In the Pakistani context, this finding highlights the importance of preventing early pregnancy and ensuring early nutritional screening and antenatal support for pregnant adolescents.

Family size showed one of the strongest associations with anemia. Anemia increased from 52.1% among women from families with 1–3 members to 80.3% among those with four members and 92.5% among those with five or more members ($\chi^2 = 23.50$, $p < 0.001$). This gradient suggests that household size may operate as a marker of resource competition, dietary allocation, and reproductive burden. In low-resource households, a larger number of family members may place greater pressure on food availability and healthcare expenditure. Global evidence similarly identifies large family size as a socioeconomic risk factor for maternal anemia. However, family size should not be interpreted as a direct biological cause; rather, it may represent the combined effects of household resources, parity, birth spacing, food security, and access to healthcare.

A strong socioeconomic gradient was also observed. Women with a monthly income below PKR 50,000 had an anemia prevalence of 66.9%, compared with only 22.7% among those reporting PKR 50,000–100,000, with a statistically significant association ($\chi^2 = 29.65$, $p < 0.001$). This was one of the most pronounced differences identified in the study. Low household income can influence anemia through several pathways, including reduced access to iron-rich foods, inadequate dietary diversity, inability to purchase supplements, delayed healthcare seeking, and limited access to laboratory investigations (23). The relationship is consistent with international evidence identifying poor socioeconomic status and inadequate dietary practices as important contributors to maternal anemia.

The income finding is particularly meaningful in Pakistan, where food insecurity and micronutrient deficiencies remain important public health concerns. National-level Pakistani data have demonstrated substantial levels of food insecurity among women of reproductive age, while previous studies of pregnant Pakistani women have linked anemia with low socioeconomic status and poor dietary patterns. Consequently, anemia prevention strategies that rely exclusively on individual counseling may have limited effectiveness when women lack the financial resources to follow recommended dietary practices (10).

Anemia was substantially more common among rural women (77.1%) than urban women (53.6%). This rural–urban difference may reflect disparities in access to antenatal care, screening facilities, transportation, health information, nutritious foods, and iron-folic acid supplementation. The finding is consistent with international evidence identifying rural residence as a risk factor for maternal anemia (24). It is also particularly relevant to Pakistan, where national data demonstrate substantial rural representation among women of reproductive age and persistent socioeconomic and nutritional inequalities.

The rural–urban difference should, however, be interpreted cautiously. Residence itself is unlikely to be a biological determinant of anemia. Instead, it may function as a proxy for several interconnected factors, including poverty, educational opportunities, health-service availability, transportation, dietary practices, and cultural influences (17). Therefore, interventions in rural Pakistan should go beyond simply increasing iron tablets and should include accessible antenatal

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screening, nutrition counseling, community health-worker engagement, and improved referral systems.

Conclusion

This study reveals a substantial public health burden among pregnant women in Lahore, Punjab, where nearly two-thirds of participants suffered from anemia (61.9%) and iron deficiency (65.4%). The findings underscore that maternal iron depletion in this region is deeply tied to socio-demographic vulnerabilities and economic hardship. Women under 20 years of age, those living in rural areas, individuals raising larger families, and households surviving on a monthly income below PKR 50,000 experienced significantly higher rates of gestational anemia ($p < 0.05$). Additionally, multigravida mothers represented the majority of affected cases, indicating that repeated pregnancies further deplete maternal iron reserves. Ultimately, addressing this maternal health crisis in Punjab demands targeted public health interventions, including routine early antenatal screening, subsidized iron supplementation, and focused nutritional counseling tailored specifically to socio-economically disadvantaged and rural populations.

Implications for Practice and Policy

- Anemia prevention in Pakistan requires a risk-stratified approach prioritizing pregnant adolescents, rural women, low-income households, and large families through targeted antenatal visits.
- Effective clinical care must combine WHO-recommended daily iron-folic acid supplementation (30–60 mg iron, 400 µg folic acid) with routine hemoglobin screening, dietary counseling, and adherence checks.
- Community-level health workers should drive early risk identification and referral, while policy must integrate anemia prevention with broader food-security programs to overcome financial barriers.

References

1. Organization WH. Guideline on haemoglobin cutoffs to define anaemia in individuals and populations: World Health Organization; 2024.
2. Obeagu GU, Obeagu EI. Complications of anemia in pregnancy: An updated overview for healthcare professionals. Medicine. 2025;104(35):e44246.
3. Obeagu GU, Altraide BO, Obeagu EI. Iron deficiency anemia in pregnancy and related complications with specific insight in Rivers State, Nigeria: a narrative review. Annals of medicine and surgery. 2025;87(6):3435.
4. Cappellini MD, Santini V, Braxs C, Shander A. Iron metabolism and iron deficiency anemia in women. Fertility and sterility. 2022;118(4):607-14.
5. Fite MB, Bikila D, Habtu W, Tura AK, Yadeta TA, Oljira L, et al. Beyond hemoglobin: uncovering iron deficiency and iron deficiency anemia using serum ferritin concentration among pregnant women in eastern Ethiopia: a community-based study. BMC nutrition. 2022;8(1):82.
6. Benson C, Shah A, Stanworth S, Frise C, Spiby H, Lax S, et al. The effect of iron deficiency and anaemia on women's health. Anaesthesia. 2021;76:84-95.

Online ISSN: 3006-8886
Print ISSN: 3006-8878

7. Batsuli G, Lewandowska MD, Lim MY, Tickle K, Baldwin MK, Bender R, et al. National Bleeding Disorder Foundation Clinical Practice Recommendations for Laboratory Screening of Iron Deficiency With and Without Anemia in the Inherited Bleeding Disorders Population. Haemophilia. 2026;32(3):646-57.
8. Varghese J, Khajuria A. Iron deficiency anemia in different trimesters of pregnancy and laboratory diagnosis with hematological parameters and serum ferritin concentration. Santosh University Journal of Health Sciences. 2022;8(2):156-68.
9. Kaur R, editor A Study on Anemia in Pregnancy. CONFERENCE PROCEEDING OF INTERNATIONAL MULTIDISCIPLINARY CONFERENCE 2022; 2022.
10. Jouanne M, Oddoux S, Noël A, Voisin-Chiret AS. Nutrient requirements during pregnancy and lactation. Nutrients. 2021;13(2):692.
11. Abbas AM, Elhalwagy MM, Afifi K, Ibrahim K, Sweed MS, Abbas A, et al. Single vs. double dose iron supplementation for prevention of iron deficiency anemia in twin pregnancy: A randomized controlled clinical trial. Open J Obstet Gynecol. 2020;10:1788-802.
12. Stoffel NU, Zimmermann MB, Cepeda-Lopez AC, Cervantes-Gracia K, Llanas-Cornejo D, Zeder C, et al. Maternal iron kinetics and maternal–fetal iron transfer in normal-weight and overweight pregnancy. The American Journal of Clinical Nutrition. 2022;115(4):1166-79.
13. Taeubert MJ, Wiertsema CJ, Vermeulen MJ, Quezada-Pinedo HG, Reiss IK, Muckenthaler MU, et al. Maternal iron status in early pregnancy and blood pressure throughout pregnancy, placental hemodynamics, and the risk of gestational hypertensive disorders. The Journal of nutrition. 2022;152(2):525-34.
14. Bukhari A, Hamid F, Minhajat R, Sutisna NS, Marsella CP. Non-nutritional and disease-related anemia in Indonesia: A systematic review. Asia Pacific journal of clinical nutrition. 2020;29:S41.
15. Bansal R, Bedi M, Kaur J, Kaur K, Shergill HK, Khaira HK, et al. Prevalence and factors associated with anemia among pregnant women attending antenatal clinic. Adesh University Journal of Medical Sciences & Research. 2020;2(1):42-8.
16. Iqbal J, Begum K, Zuberi R, Sajid M, Nausheen S, Chauhadry IA, et al. Determinants of Folate and Vitamin B12 Deficiencies in Women of Reproductive Age: Insights from the 2018 National Nutrition Survey of Pakistan. Nutrients. 2026;18(7):1128.
17. Faghir-Ganji M, Amanollahi A, Nikbina M, Ansari-Moghaddam A, Abdolmohammadi N. Prevalence and risk factors of anemia in first, second and third trimesters of pregnancy in Iran: A systematic review and meta-analysis. Heliyon. 2023;9(3).
18. Shaeen SK, Tharwani ZH, Bilal W, Islam Z, Essar MY. Maternal mortality in Pakistan: challenges, efforts, and recommendations. Annals of medicine and surgery. 2022;81:104380.
19. El-Kholy AA, El Kholy EA, Abdou AH, Karar HAD, Bushara MA, Abdelaal K, et al. Prevalence and associated factors of anemia among pregnant women and the impact of clinical pharmacist counseling on their awareness level: A cross sectional study. Saudi Pharmaceutical Journal. 2023;31(8):101699.
20. Tan J, He G, Qi Y, Yang H, Xiong Y, Liu C, et al. Prevalence of anemia and iron deficiency anemia in Chinese pregnant women (IRON WOMEN): a national cross-sectional survey. BMC pregnancy and childbirth. 2020;20(1):670.

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Print ISSN: 3006-8878

21. Sun J, Wu H, Zhao M, Magnussen CG, Xi B. Prevalence and changes of anemia among young children and women in 47 low-and middle-income countries, 2000-2018. EClinicalMedicine. 2021;41.
22. Mahar B, Shah T, Shaikh K, Shaikh SN, Uqaili AA, Memon KN, et al. Uncovering the hidden health burden: a systematic review and meta-analysis of iron deficiency anemia among adolescents, and pregnant women in Pakistan. Journal of Health, Population and Nutrition. 2024;43(1):149.
23. Basrowi RW, Zulfiqqar A, Sitorus NL. Anemia in breastfeeding women and its impact on offspring's health in Indonesia: a narrative review. Nutrients. 2024;16(9):1285.
24. Owais A, Merritt C, Lee C, Bhutta ZA. Anemia among women of reproductive age: an overview of global burden, trends, determinants, and drivers of progress in low-and middle-income countries. Nutrients. 2021;13(8):2745.
25. Khan AF, Khan S, Ahmad H. Prevalence of iron deficiency anemia (IDA) in pregnant women and its associated risk factors: a novel study from Pakistan. THE STETHO. 2020;1:29-34.