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PREVALENCE OF ANEMIA AND ITS SOCIOECONOMIC DETERMINANTS IN PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT LAHORE GENERAL HOSPITAL, LAHORE, PAKISTAN

Original Research

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ABSTRACT

Background: Anemia during pregnancy is a persistent public health challenge, particularly in low- and middle-income countries, where it contributes significantly to maternal morbidity, preterm births, and low birth weight. The World Health Organization identifies anemia in pregnancy as a condition affecting over one-third of pregnant women globally, with South Asian countries bearing a disproportionate burden. Addressing socioeconomic determinants is crucial for designing effective maternal health interventions and reducing anemia-related complications.

Objective: To determine the prevalence of anemia and assess its association with key socioeconomic variables among pregnant women attending antenatal care at Lahore General Hospital (LGH), Lahore.

Methods: This descriptive cross-sectional study was conducted at the antenatal clinic of LGH between September 1 and 30, 2022. A total of 224 pregnant women aged 18–45 years were recruited through non-probability convenience sampling. Data were collected using a structured, interviewer-administered questionnaire covering age, education, employment, income, family structure, and meal frequency. Hemoglobin levels were measured using the Sysmex XN-1000 automated analyzer. Anemia was defined as hemoglobin <11.0 g/dL. Associations between anemia and socioeconomic variables were analyzed using the chi-square test, with $p<0.05$ considered statistically significant.

Results: Anemia was observed in 157 out of 224 participants (70.1%). Women from joint families had a significantly higher prevalence (73.2%) compared to those in nuclear families (62.7%, $p=0.004$). Similarly, participants with household income below PKR 50,000 showed a higher anemia rate (84.4%) than those earning ≥PKR 50,000 (66.5%, $p=0.03$). No significant associations were found for education level ($p=0.52$), employment status ($p=0.84$), or meal frequency ($p=0.65$).

Conclusion: Anemia in pregnancy remains highly prevalent and is significantly influenced by household income and family structure. Addressing these socioeconomic factors is essential in planning effective antenatal nutritional strategies.

Keywords: Anemia, Antenatal Care, Family Structure, Hemoglobin, Maternal Health, Pregnancy, Socioeconomic Factors.

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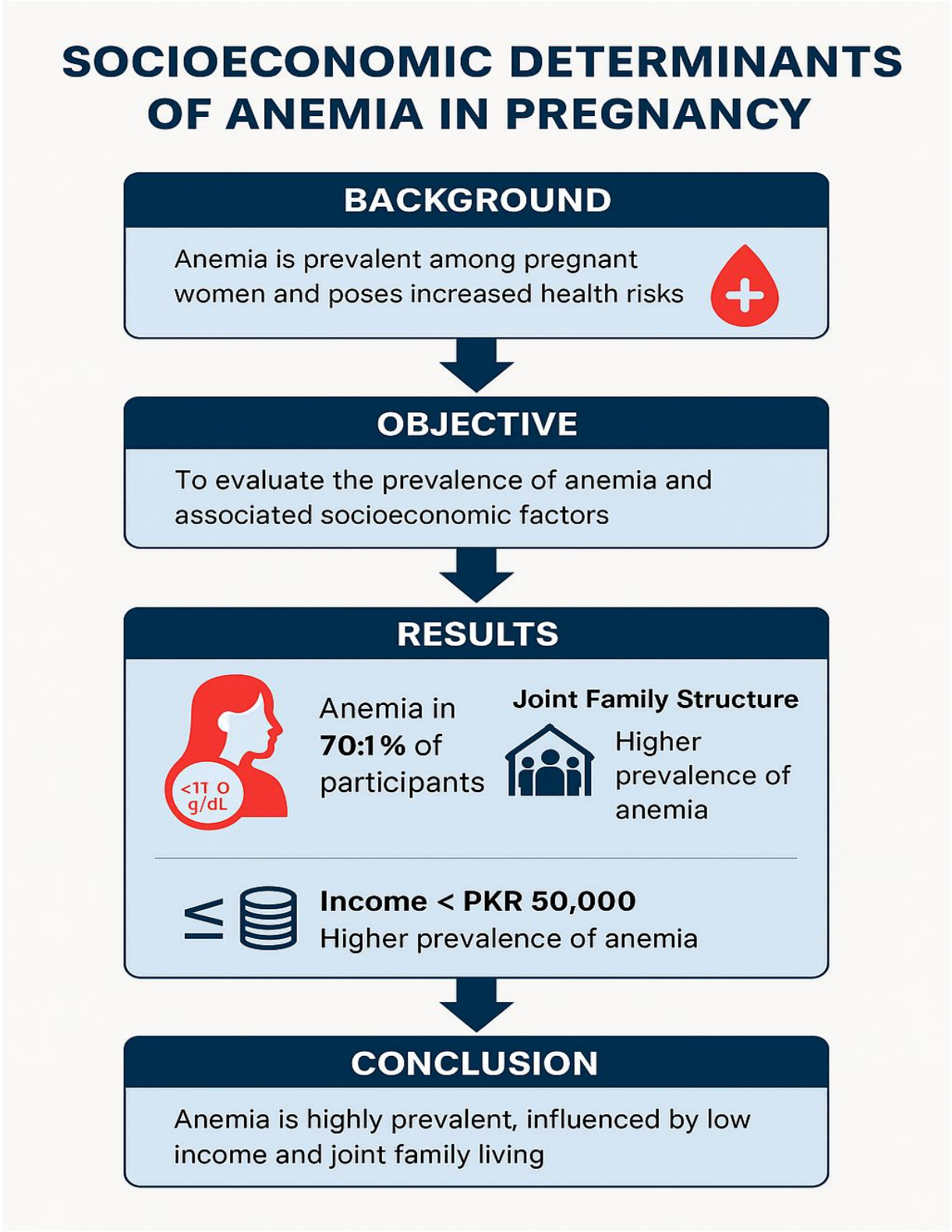

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INTRODUCTION

Anemia during pregnancy continues to be a significant public health issue, particularly in low- and middle-income countries, where its consequences extend beyond maternal health to adversely affect neonatal outcomes. Characterized by a reduction in hemoglobin levels, anemia compromises the oxygen-carrying capacity of blood, posing risks such as maternal fatigue, increased susceptibility to infections, preterm delivery, and low birth weight infants (1,2). Globally, the World Health Organization (WHO) estimates that approximately 36% of pregnant women are affected by anemia, with prevalence rates in developing regions ranging from 35% to as high as 75% (3). This burden is especially pronounced in South Asia, where socio-cultural and nutritional factors contribute heavily to the condition. In Pakistan, the situation is particularly alarming, with iron deficiency anemia—the most common form—affecting an estimated 70% to 80% of pregnant women (4-7). This high prevalence reflects the intersection of multiple determinants, including poor dietary intake, limited access to healthcare, and deep-rooted socioeconomic inequalities. Diets in the region are predominantly cereal-based, low in heme iron, and often lack diversity, reducing the bioavailability of essential micronutrients necessary for hematological health (8,9). Compounding these dietary limitations are broader structural challenges such as low educational attainment, financial instability, and restricted healthcare utilization, all of which can exacerbate nutritional deficiencies during pregnancy (10,11). Despite the availability of iron supplementation programs and antenatal care guidelines, anemia in pregnancy remains under-addressed at the population level, partly due to limited data from local clinical settings and insufficient integration of social determinants in screening strategies. Understanding the contextual factors associated with maternal anemia is therefore essential for developing targeted interventions. In light of this, the present study seeks to determine the prevalence of anemia among pregnant women attending the antenatal clinic at Lahore General Hospital (LGH), and to explore its relationship with key socioeconomic variables, including education level, income status, employment, and family structure.

METHODS

This cross-sectional study was carried out at the antenatal clinic of Lahore General Hospital (LGH), Lahore, over a one-month period from September 1 to September 30, 2022. The study aimed to assess the prevalence of anemia among pregnant women and its association with various socioeconomic factors. A total of 224 pregnant women, aged between 18 and 45 years, were recruited through non-probability convenience sampling (1,2). This approach, while practical in clinical settings, may introduce selection bias and limit the generalizability of findings. However, the sample size was sufficient to perform the intended statistical analyses and derive meaningful associations. Eligible participants included pregnant women who provided written informed consent to participate in the study. Women with pre-existing hematological disorders such as thalassemia, aplastic anemia, or sickle cell disease were excluded to avoid confounding factors. Additionally, healthcare professionals or their spouses were not included, as their awareness and health-seeking behavior could differ significantly from the general population, potentially skewing the results. Those who declined to participate were also excluded without prejudice.

Data were collected using a structured, interviewer-administered questionnaire, which recorded demographic and socioeconomic variables such as age, educational attainment, employment status, type of family structure (nuclear or joint), monthly household income, and daily meal frequency. Hemoglobin concentrations were determined using an automated hematology analyzer (Sysmex XN-1000), following standard operating procedures and internal quality control measures to ensure accuracy and consistency. All ethical considerations were strictly observed. The study protocol received approval from the Institutional Review Board of Lahore General Hospital (Reference: IRB/LGH/2022/09-01). Written informed consent was obtained from each participant prior to data collection, ensuring voluntary participation and confidentiality of information. The data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize the data. The chi-square test was applied to examine associations between anemia status and selected socioeconomic variables. A p-value of less than 0.05 was considered statistically significant. While the statistical methods were appropriately selected for categorical data analysis, the use of convenience sampling remains a limitation that should be considered when interpreting the findings.

RESULTS

The mean age of the 224 pregnant women enrolled in the study was 30 years, with an age range of 19 to 40 years. Among these participants, 60% were under the age of 30. Nearly all participants (99%) were married, while 55% had education up to the undergraduate

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level. A significant majority (89%) were housewives, 70% resided in joint family systems, and 80% reported a monthly household income of PKR 50,000 or above. Dietary habits revealed that 70% of the women consumed fewer than three meals per day. Hemoglobin levels indicated that 157 women (70.1%) were anemic, defined as hemoglobin concentration below 11.0 g/dL. The prevalence of anemia showed statistically significant associations with certain socioeconomic variables. Among women from joint families, 73.2% were anemic compared to 62.7% in nuclear families ($p = 0.004$). Similarly, those with household incomes below PKR 50,000 exhibited a notably higher prevalence of anemia (84.4%) than those earning PKR 50,000 or above (66.5%), with this association also reaching statistical significance ($p = 0.03$). No significant association was observed between anemia and patient education level; 69.4% of women with undergraduate education and 71.0% with graduate or postgraduate qualifications were anemic ($p = 0.52$). Likewise, employment status did not demonstrate a significant correlation; 70.5% of housewives and 66.7% of employed women were anemic ($p = 0.84$). Meal frequency also showed no significant difference, with 69.4% of women consuming fewer than three meals per day being anemic, compared to 71.6% of those eating three or more meals daily ($p = 0.65$). Further analysis explored the prevalence of anemia in relation to maternal age, parity, and trimester of pregnancy. Among women younger than 30 years, 73.1% were found to be anemic, compared to 65.6% among those aged 30 years or older; however, this difference was not statistically significant ($p = 0.21$). Similarly, anemia was slightly more prevalent among primigravida women (73.1%) than among multigravida women (67.5%), though the association did not reach statistical significance ($p = 0.33$). Notably, a significant relationship was observed between anemia and the trimester of pregnancy ($p = 0.04$), with the highest prevalence in the second trimester (76.1%), followed by the third trimester (69.5%) and first trimester (60.0%). These findings highlight the importance of gestational timing in anemia screening and intervention strategies.

Table 1: Association of Socioeconomic Variables with Anemia

Variable	Category	Anemic (%)	Non-Anemic (%)	p-value
Family Structure	Joint (n=157)	115 (73.2)	42 (26.8)	0.004
	Nuclear (n=67)	42 (62.7)	25 (37.3)	
Monthly Income	< PKR 50,000 (n=45)	38 (84.4)	7 (15.6)	0.03
	≥ PKR 50,000 (n=179)	119 (66.5)	60 (33.5)	
Education (Patient)	Undergraduate (n=124)	86 (69.4)	38 (30.6)	0.52
	Graduate/Postgraduate (n=100)	71 (71.0)	29 (29.0)	
Employment Status (Patient)	Housewife (n=200)	141 (70.5)	59 (29.5)	0.84
	Employed (n=24)	16 (66.7)	8 (33.3)	
Meal Frequency	<3 meals/day (n=157)	109 (69.4)	48 (30.6)	0.65
	≥3 meals/day (n=67)	48 (71.6)	19 (28.4)	

Table 2: Association of Age, Parity, and Trimester with Anemia

Variable	Category	Anemic (n)	Anemic (%)	Non-Anemic (n)	Non-Anemic (%)	p-value
Age Group	<30 years (n=134)	98	73.1%	36	26.9%	0.21
	≥30 years (n=90)	59	65.6%	31	34.4%	
Parity	Primigravida (n=104)	76	73.1%	28	26.9%	0.33
	Multigravida (n=120)	81	67.5%	39	32.5%	
Trimester	First Trimester (n=50)	30	60.0%	20	40.0%	0.04
	Second Trimester (n=92)	70	76.1%	22	23.9%	
	Third Trimester (n=82)	57	69.5%	25	30.5%	

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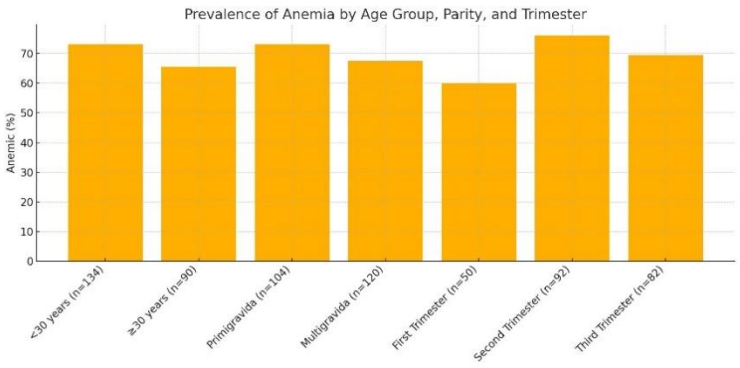

Figure 1 Prevalence of Anemia by Age Group, Parity and Trimester

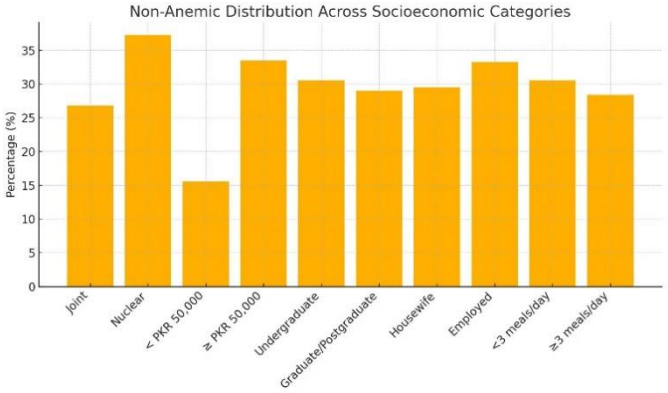

Figure 2 Non-Anemic Distribution Across Socioeconomic Categories

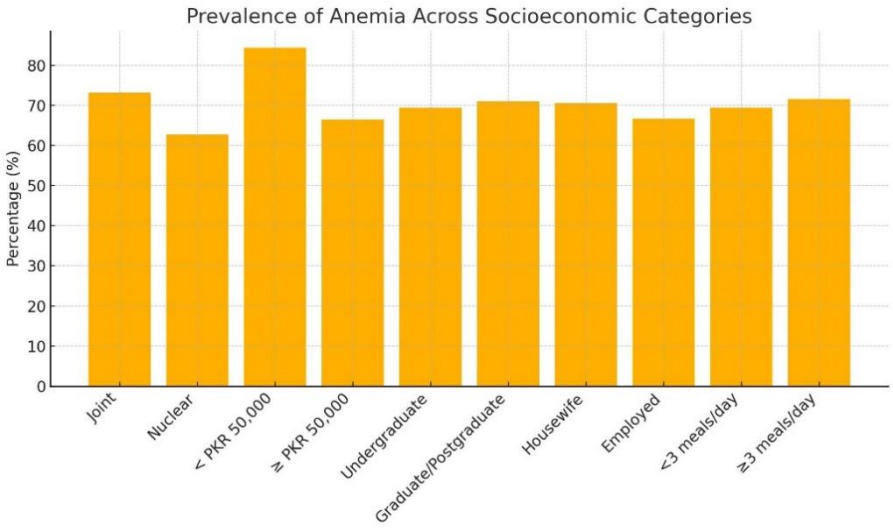

Figure 3 Prevalence of Anemia Across Socioeconomic Categories

DISCUSSION

The present study highlighted a notably high prevalence of anemia (70.1%) among pregnant women attending the antenatal clinic at Lahore General Hospital, which is consistent with national and regional figures reported in South Asian populations, particularly in Pakistan, where similar estimates range between 70% and 80% (12,13). This persistently elevated burden underscores the ongoing public health challenge of maternal anemia in resource-constrained settings, despite decades of targeted nutritional programs and antenatal supplementation efforts. A significant association was observed between anemia and family structure, with women residing in joint households demonstrating higher anemia rates compared to those in nuclear setups. This finding suggests the potential impact of shared household dynamics on maternal nutritional status, where intra-household food allocation and prioritization may be less favorable for pregnant women, especially in multigenerational families (14-16). Furthermore, the association of lower household income with increased anemia prevalence reinforces the role of economic vulnerability as a barrier to accessing iron-rich and nutrient-dense foods. Limited financial resources likely restrict dietary diversity, reduce the ability to afford supplements, and diminish access to healthcare services that could aid in early diagnosis and management. Interestingly, no statistically significant associations were found between anemia and participants' education level, employment status, or daily meal frequency (17,18). These results challenge the common assumption that higher education or employment alone suffices to mitigate health risks during pregnancy. While knowledge may increase awareness of healthy dietary practices, it does not necessarily equate to behavioral change in the absence of financial independence,

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food availability, and control over dietary choices. The lack of association with meal frequency further suggests that the nutritional content and bioavailability of consumed food may have greater influence than the number of meals alone (19,20). This reinforces the need to address not just caloric sufficiency, but also micronutrient quality and iron absorption efficiency in maternal diets.

Additionally, gestational age appeared to be an important factor, with the second trimester showing the highest prevalence of anemia. This may be attributed to increased iron demand during mid-pregnancy, which often coincides with a decline in maternal iron stores if supplementation is inadequate or poorly absorbed. Although associations with maternal age and parity were not statistically significant, trends indicated that younger and first-time mothers were slightly more affected, suggesting a need for early nutritional interventions in this subgroup. The study's strengths lie in its focus on contextual socioeconomic determinants of anemia, offering insight into real-world barriers that persist despite antenatal coverage. However, several limitations warrant consideration. The cross-sectional design precludes causal inference, and the use of non-probability convenience sampling may limit external validity. Additionally, important confounding variables such as dietary intake specifics, iron supplementation adherence, comorbidities, and serum ferritin levels were not assessed, restricting the ability to stratify anemia by etiology. Future research should consider a longitudinal design with biochemical profiling and dietary assessments to more precisely identify causal pathways and evaluate intervention effectiveness (21). In summary, this study contributes to the growing body of evidence emphasizing the structural and economic dimensions of maternal anemia. Interventions must move beyond individual-level education to include policies that enhance household food security, empower women within family systems, and ensure timely nutritional support during pregnancy.

CONCLUSION

This study concludes that anemia remains a significant health concern among pregnant women attending antenatal care at Lahore General Hospital, with socioeconomic disparities playing a central role in its persistence. The findings underscore the influence of low household income and joint family living on maternal nutritional status, highlighting the need for context-specific interventions. Efforts to reduce anemia should go beyond routine supplementation and include comprehensive strategies such as targeted nutritional education, improved dietary access, and tailored support mechanisms for economically vulnerable and multi-generational households. These insights reinforce the importance of integrating social determinants into maternal health planning to ensure effective and equitable outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Ali Huzaifa*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Haris Hanif	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Rozina Shahadat Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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