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Declarations

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Association of Anemia with Socio-Demographic and Dietary Factors among Non-Pregnant Women at Tertiary Care Hospital

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ABSTRACT

Background: Anemia is a significant public health concern among women of reproductive age, leading to fatigue, impaired cognition, reduced productivity, and maternal-perinatal complications. In Pakistan, anemia prevalence remains high, particularly among non-pregnant women, and is influenced by socio-demographic and dietary factors. **Objective:** The study aimed to determine the prevalence and severity of anemia and assess its association with socio-demographic and dietary factors among non-pregnant women at a tertiary care hospital of Hyderabad/Jamshoro. **Methods:** A descriptive cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Liaquat University Hospital, Hyderabad/Jamshoro, from July to November 2025. Using purposive sampling, 314 non-pregnant women aged 15–49 years were recruited. Hemoglobin levels were measured via complete blood count (CBC), and anemia was classified according to World Health Organization (WHO) criteria. Socio-demographic and dietary information was collected using a structured questionnaire. Data were analyzed with SPSS version 26, employing descriptive statistics, Chi-square tests, and binary logistic regression, with significance set at $p < 0.05$. **Results:** Anemia was observed in 236 (75.2%) participants, with mild 23.6%, moderate 30.9%, and severe 20.7%. Higher prevalence was observed among women aged ≤ 24 years, married, with school-level education, from low-income households, residing in joint families, and living in rural areas. Independent dietary predictors that were significant included skipping meals, irregular consumption of vegetables, meat, milk, and fruits, and non-use of iron (AOR 0.46; $p = 0.029$) and folic acid supplements (AOR 0.41; $p = 0.016$). **Conclusion:** Anemia is highly prevalent among non-pregnant women, with moderate anemia being the most common. Socio-demographic and dietary factors contribute to anemia. Programs for screening, nutrition education, and supplementation are recommended.

Keywords

Anemia, Dietary factors, Nutritional Status, Reproductive age, Socioeconomic Factors

INTRODUCTION

Anemia is defined as hemoglobin < 12.0 g/dL in non-pregnant women, and is a public health concern, especially in women aged 15–49 years (1, 2). Low hemoglobin hampers oxygen transport, causing fatigue, impaired cognition, reduced productivity, and maternal-perinatal risks (3). WHO categorizes anemia as mild (11–11.9 g/dL), moderate (8–10.9 g/dL), and severe (< 8 g/dL) (4). Biological causes include a deficiency in iron, vitamin B12, and folate, to inherited hemoglobinopathies and infections (5). The risk of anemia is further increased due to socioeconomic and environmental factors such as rural residence, poverty, poor dietary diversity, and limited access to health care. (6) Approximately 27% of the world is affected by anemia, and non-pregnant women are more affected (30%) (7). In South Asia, Bangladesh is 41.8%, Maldives is 58.5% Nepal is 40.6% and India is over 55% (8). The 2018 National Nutrition Survey of Pakistan reported that anemia affects 41.7% of women aged 15–49, with it being more prevalent in rural (44.3%) than urban areas (40.2%) (9). Sindh province shows rates from 45.7% to 62%, with local studies reporting as high as 71.5% (10). It is essential to understand the socio-demographic and dietary factors of anemia to ensure effective interventions can be formulated for hospital and community settings. So, the aim of the study was to determine the prevalence and severity of anemia and its socio-demographic and dietary associations in non-pregnant women attending a tertiary care hospital, Hyderabad/Jamshoro.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted from July to November 2025 at the Obstetrics and Gynecology Department of Liaquat University Hospital, Hyderabad/Jamshoro. This study involved non-pregnant women ages 15–49 attending outpatient or inpatient services. Participants who gave informed consent and had < 12 g/dL hemoglobin were included. Pregnant women, those with chronic blood disorders, recent blood transfusion (< 3 months), Hb ≥ 12 g/dL, and those who refused were excluded. The sample size was calculated using ‘OpenEpi software (version 3.01), using formula $n = (Z^2 \times P \times (1-P)) / d^2$, where n is the required sample size, $Z=1.96$ for a 95 % confidence interval, $P=0.715$ (estimated prevalence of anemia reported in a previous study) (11), and $d=0.05$ (margin of error), recruiting 314 participants. Purposive non-probability sampling was used. Data was collected through a structured questionnaire on socio-demographics, diet patterns, menstrual history, hemoglobin level, and anthropometric measurements. Hemoglobin (Hb) was measured using CBC and classified according to WHO criteria, while BMI was measured from height and weight. Data collection was undertaken by the principal investigator and a trained female research assistant.

Descriptive statistics described characteristics, while Chi-square tests assessed association. Binary logistic regression was done to identify independent predictors ($p < 0.05$) using SPSS 26.

RESULTS

A total of 314 non-pregnant women participated in the study, in which 236 (75.2%) were anemic. Among these, 74 (23.6%) had mild, 97 (30.9%) moderate, and 65 (20.7%) severe anemia (Figure 1). Most participants were ≤ 24 years (51.3%), married (65.6%), had school-level education (57.6%), belonged to lower socio-economic status (39.8%), and resided in rural areas (66.6%) (Table 1). Chi-square analysis showed a significantly higher prevalence of anemia among younger participants (≤ 24 years), married, had school-level education, belonged to lower socio-economic groups, lived in rural areas, or had larger family sizes (≥ 9 members) ($p < 0.05$). Dietary factors, including skipping meals, irregular consumption of vegetables, meat, and fruits, and inadequate iron supplements, were also significantly associated with anemia (Table 2). Binary logistic regression identified independent predictors of anemia: lower socio-economic status (AOR = 10.90; 95% CI: 4.92–24.13; $p = 0.01$), married status (AOR = 3.82; 95% CI: 2.02–7.24; $p = 0.01$), school-level education (AOR = 2.97; 95% CI: 1.31–6.73; $p = 0.01$), rural residence (AOR = 2.48; 95% CI: 1.32–4.65; $p = 0.01$), and irregular consumption of meat (AOR = 0.28; 95% CI: 0.09–0.88; $p = 0.03$) and fruits (AOR = 0.25; 95% CI: 0.08–0.80; $p = 0.02$) (Table 3).

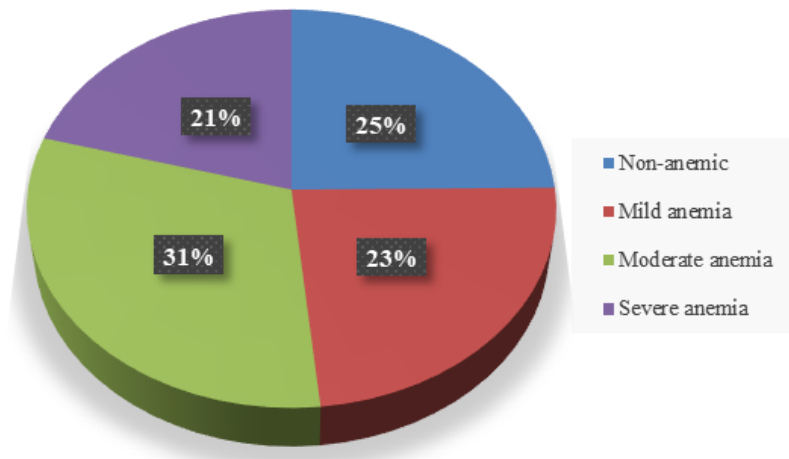


Figure 1 Prevalence and severity of anemia among participants ($n = 314$)

Table 1. Socio-demographic characteristics ($n = 314$)

Socio-demographics	Category	Frequency (%)
Age (years)	≤ 24	161 (51.3)
	25–34	85 (27.1)
	35–49	68 (21.7)
Marital status	Married	206 (65.6)
	Unmarried	108 (34.4)
Education	School	181 (57.6)
	Higher Secondary	75 (23.9)
	Graduate or Above	58 (18.5)
Socio-economic status (SES)	Lower	125 (39.8)
	Middle	93 (29.6)
	Upper	96 (30.6)
Family type	Joint	193 (61.5)
	Nuclear	121 (38.5)
Family size	1–4 members	125 (39.8)
	5–8 members	85 (27.1)
	≥ 9 members	104 (33.1)
Residential area	Rural	209 (66.6)
	Urban	105 (33.4)

Table 2. Association of socio-demographic and dietary factors with anemia ($n = 314$)

Variable	Category	Non-Anemic n (%)	Anemic n (%)	χ^2	p-value
Age (years)	≤ 24	32 (19.9)	129 (80.1)	6.0	0.04
	25–34	29 (34.1)	56 (65.9)		
	35–49	17 (25.0)	51 (75.0)		
Marital Status	Married	37 (18.0)	169 (82)	15.1	0.01

Variable	Category	Non-Anemic n (%)	Anemic n (%)	χ^2	p-value
Education	Unmarried	41 (38.0)	67 (62.0)	8.4	0.01
	School	34 (18.8)	147 (81.2)		
	Higher Secondary	25 (33.3)	50 (66.7)		
Family Size	Graduate or Above	19 (32.8)	39 (67.2)	12.7	0.02
	Small (1–4)	44 (35.2)	81 (64.8)		
	Medium (5–8)	18 (21.2)	67 (78.8)		
Socio-Economic Status	Large (≥ 9)	16 (15.4)	88 (84.6)	52.9	0.01
	Lower	12 (9.6)	113 (90.4)		
	Middle	17 (18.3)	76 (81.7)		
Residential Area	Upper	49 (51.0)	47 (49.0)	9.1	0.03
	Rural	41 (19.6)	168 (80.4)		
	Urban	37 (35.2)	68 (64.8)		
Meal Skipping	Yes	32 (19.9)	129 (80.1)	10.8	0.01
	No	29 (34.1)	56 (65.9)		
Iron Supplement	Yes	17 (25.0)	51 (75.0)	54.2	0.01
	No	37 (18.0)	169 (82.0)		
Vegetable Intake	Regular	41 (38.0)	67 (62.0)	9.05	0.03
	Irregular	34 (18.8)	147 (81.2)		
Meat Intake	Regular	44 (35.2)	81 (64.8)	61.1	0.01
	Irregular	18 (21.2)	67 (78.8)		
Fruit Intake	Regular	17 (18.3)	76 (81.7)	67.9	0.01
	Irregular	49 (51.0)	47 (49.0)		

Table 3. Socio-Demographic and Dietary Predictors of Anemia: Binary Logistic Regression (n = 314)

Variable	Category	AOR [95% CI]	p-value
Age (years)	≤ 24	1.68 [0.76–3.73]	0.20
	25–34 (Ref)	1	
	35–49	0.75 [0.32–1.76]	0.51
Marital Status	Married	3.82 [2.02–7.24]	0.01
	Unmarried (Ref)	1	
Education	School	2.97 [1.31–6.73]	0.01
	Higher Secondary	1.29 [0.54–3.10]	0.57
	Graduate or Above (Ref)	1	
Family Size	Large (≥ 9)	0.34 [0.18–0.83]	0.01
	Small/Medium (Ref)	1	
Socio-Economic Status	Lower	10.90 [4.92–24.13]	0.01
	Middle	5.87 [2.77–12.44]	0.01
	Upper (Ref)	1	
Residential Area	Rural	2.48 [1.32–4.65]	0.01
	Urban (Ref)	1	
Meal Skipping	Yes	1.04 [0.43–2.56]	0.93
	No (Ref)	1	
Iron Supplement	Yes	0.30 [0.09–1.02]	0.05
	No (Ref)	1	
Vegetable Intake	Regular	1.10 [0.32–3.83]	0.88
	Irregular (Ref)	1	
Meat Intake	Regular	0.28 [0.09–0.88]	0.03
	Irregular (Ref)	1	
Fruit Intake	Regular	0.25 [0.08–0.80]	0.02
	Irregular (Ref)	1	

DISCUSSION

This study determined the association of socio-demographic and dietary factors with anemia in 314 non-pregnant women attending a tertiary care hospital in Hyderabad/Jamshoro. Anemia was found to be prevalent at 75.2% with moderate anemia being the most common. The prevalence is significantly greater than the estimates of national (41.7%) and global (29.9%) levels (10, 11). The high rates reported are similar to research

conducted in Sindh and other low-resource settings, indicating steady prevalence of anemia in women of reproductive age(12). Women under 24 years of age are significantly anemic ($p = 0.04$), probably due to increased iron needs from increased growth and menstruation, along with limited dietary intake. The finding is consistent with the reports from Bangladesh and India, where younger women were recognized as a vulnerable group (13, 14). Married women were at increased risk ($p = 0.01$) due to high nutritional demand, probably for pregnancy and lactation. The finding supports a previous study from Pakistan (15). Anemia was associated with education level, where women with school-level education had higher odds of anemia ($p = 0.01$).

Health literacy and awareness of nutrition are protective factors, which are consistent with the regional studies(16, 17). Women from low-income households were more prone to be anemic. (AOR=10.90; $p=0.01$) Socio-economic status was a strong predictor. Previous research has found that poverty and limited access to nutrient-rich food raise risk for anemia(18). Anemia was also linked to family structure and residential area. Women from joint or larger families had a higher prevalence of anemia ($p = 0.02$), possibly due to resource dilution and restricted access to nutritious food. Residing in rural settings was found to independently increase anemia risk ($p = 0.03$). Previous studies conducted in Pakistan and Ethiopia have similarly reported on this association. Studies have attributed this association to discrepancies in dietary diversity, healthcare accessibility, and economic opportunities.(19, 20). Dietary habits strongly influence anemia risk. Skipping meals and consuming irregular vegetables, meat, and fruits were significantly associated with anemia ($p < 0.05$, respectively). Consumption of meat and fruits was protective (AOR = 0.28 and 0.25, respectively), while not using iron and folic acid supplements increased the odds of anemia (AOR = 0.46; $p = 0.029$ and AOR = 0.41; $p = 0.016$). Based on the findings, dietary diversity and supplementation can prevent anemia in reproductive age women. These results correspond with the study by Channar et al. and earlier research that dietary diversity and iron supplementation help reduce anemia in reproductive-age women (3, 21-23). This study provides novel evidence regarding the association of anemia with diet and socio-demographic factors. It confirms that socio-demographic characteristics and dietary behavior are associated with anemia among non-pregnant women. To reduce the burden of anemia in young and married women, lower-educated, rural residents, and low-income households, we need interventions along with a balanced diet and regular supplementation.

CONCLUSION

The study found a high prevalence of anemia among non-pregnant women, with moderate anemia being the most common. Younger, married women with lower education, residing in joint families, larger households, low socio-economic status, and rural areas were more affected. Dietary factors significantly associated with anemia included skipping meals, irregular intake of iron and folic acid supplements, and low consumption of vegetables, fruits, milk, and meat. Rural and low-income women were particularly vulnerable. Community education on balanced diets, regular supplementation, and routine screening is recommended to reduce the anemia burden among at-risk populations.

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