

Pharmacological, and Community Determinants of Iron Deficiency Anemia in Reproductive-Age Women: A Multi-Level Study in Urban Slums of Karachi

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ABSTRACT

Background: Iron deficiency anemia (IDA) is a most common nutritional problem in women of child bearing age in resource poor urban areas. It is affected by a host of pharmacologic, dietary and environmental factors.

Objective: To determine the prevalence and identify pharmacological and community determinants of iron deficiency anemia among reproductive-age women.

Methods: This was a cross-sectional analytical study with data collected over a period of one year (January 2022-January 2023) at Tertiary Care Hospital of Karachi. The study involved 72 women between the ages of 18 and 45 years (using non-probability consecutive sampling method). Participants were asked questions about socio-demographic, diet, medication, reproductive and community factors via a questionnaire. Iron deficiency anemia was diagnosed based on hemoglobin and serum ferritin. IBM SPSS Statistics version 25 was used for data analysis. The chi-square test was used to examine associations with $p \leq 0.05$ and multivariate logistic regression was used to determine independent predictors, with $p \leq 0.05$

Results: The prevalence of iron deficiency anemia was 63.9%. Moderate anemia was the most common form. Poor dietary intake, low use of iron supplementation, and inadequate sanitation were significantly associated with anemia ($p < 0.05$). Multivariate analysis showed that poor diet (AOR = 3.8), lack of iron supplementation (AOR = 2.6), and poor sanitation (AOR = 2.9) were independent predictors of iron deficiency anemia.

Conclusion: Iron deficiency anemia is highly prevalent among reproductive-age women and is strongly influenced by nutritional, pharmacological, and environmental factors. Multi-level interventions focusing on dietary improvement, increased supplementation, and enhanced community health conditions are essential to reduce its burden.

Keywords: Iron Deficiency Anemia, Women, Nutrition, Iron Supplementation, Public Health, Sanitation

INTRODUCTION

Iron deficiency anemia (IDA) is a significant public health issue and the most common form of anemia in women of child bearing age. It has a profound impact on physical performance, cognitive function and quality of life. In women of child bearing age, menstruation, greater nutritional demands, and multiple pregnancies lead to low iron stores¹⁻³.

Iron deficiency anemia is more prevalent in low- and middle-income countries with high levels of poverty, malnutrition and poor access to health care. In densely populated urban slums, the problem is further exacerbated by poor housing conditions, lack of hygiene and scarce access to nutritious food. This contributes to a greater burden of anemia in these areas⁴⁻⁶.

Drugs are also important factors in the development and treatment of iron deficiency anemia. While iron supplementation is often advised, its use is sub-optimal due to low compliance, side effects and limited awareness. Moreover, the consumption of certain drugs, such as antacids and proton pump inhibitors, can reduce iron absorption, thereby worsening the situation⁶.

Nutritional factors are also important. Low consumption of iron-rich foods, and dietary suppressors (such as tea and coffee), impairs iron absorption. On the other hand, the presence of vitamin C-rich foods increases iron absorption. But in resource-poor communities, dietary diversity is often poor, leading to nutritional deficiencies¹.

Apart from individual factors, community-level determinants, including access to water, sanitation and health care, play a critical role in the prevalence of anemia. Unfavourable environmental factors increase the risk of infections and parasitic diseases, which result in chronic blood loss and malabsorption⁷⁻⁹.

Despite the known burden of iron deficiency anemia, there is limited data integrating pharmacological and community-level determinants in a single framework. Therefore, this study was conducted to assess the prevalence and identify multi-level determinants of iron deficiency anemia among reproductive-age women, providing evidence for targeted interventions at both individual and community levels.

METHODOLOGY

This cross-sectional analytical study was conducted over a period of one year, from January 2022 to January 2023 at Tertiary Care Hospital of Karachi, to investigate the pharmacological and community-level determinants of iron deficiency anemia among reproductive-age women. A total of 72 participants were included in the study using a non-probability consecutive sampling technique. The sample size was determined based on feasibility and the expected prevalence of iron deficiency anemia in similar populations reported in previous literature, with a 95% confidence level and an acceptable margin of error.

Participants were women between the ages of 18 and 45. Women with underlying chronic diseases including chronic kidney disease, cancer, and other hematological disorders except iron deficiency anemia were not included to avoid confounding factors. Women who were pregnant and those who had received a blood transfusion in the past three months were also excluded. All participants provided written informed consent, and data were kept confidential throughout the study according to research ethics guidelines.

A pre-tested questionnaire was used to gather data, which covered socio-demographic information, dietary patterns, pharmacologic factors (such as iron supplementation use, compliance, and side effects), reproductive health factors, and community determinants of health (such as housing and sanitation, and access to health services). A clinical examination was

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conducted to detect signs and symptoms of anemia such as pallor, weakness, and vertigo.

Blood samples were collected from all participants in a sterile manner from a vein. Anemia was diagnosed based on hemoglobin levels and iron deficiency by measuring serum ferritin. Other hematological indices, such as mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) were also used.

Data were entered and analyzed using the IBM SPSS Statistics version 25. Mean ± standard deviation was used to represent continuous variables, whereas categorical variables were represented as frequencies and percentages. The prevalence of iron deficiency anemia was determined. The chi-square test was used to test the associations of independent variables and anemia. P-values less than 0.05 were considered significant. Multivariate logistic regression was used to assess factors associated with iron deficiency anemia and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were reported.

RESULTS

Out of 72 reproductive-age women, 46 (63.9%) were diagnosed with iron deficiency anemia (IDA), while 26 (36.1%) were non-anemic.

The mean age of participants was 28.7 ± 5.6 years. Most women were married (81.9%) and belonged to low-income households (66.7%). A significant proportion of anemic women had low education levels and higher parity.

The average hemoglobin level was 9.8 ± 1.4 g/dL in anemic women. The predominant type of anemia was moderate. Serum ferritin was decreased in IDA.

Only 34.7% of women were receiving iron supplements and compliance was low. Drinking tea during meals was very common among anemic women.

Poor living conditions were evident, with the majority lacking access to clean water and sanitation, which contributed significantly to anemia prevalence.

Table 1: Socio-Demographic Characteristics

Variable	Category	Frequency (%)
Age (years)	18–25	22 (30.6)
	26–35	34 (47.2)
	>35	16 (22.2)
Marital Status	Married	59 (81.9)
	Unmarried	13 (18.1)
Education	Illiterate	28 (38.9)
	Primary	20 (27.8)
	Secondary+	24 (33.3)
Monthly Income	<25,000 PKR	48 (66.7)
	≥25,000 PKR	24 (33.3)
Parity	≤2	30 (41.7)
	>2	42 (58.3)

Table 2: Clinical & Hematological Profile

Variable	Category	Frequency (%)
Hemoglobin (g/dL)	Mean ± SD	9.8 ± 1.4
Severity of Anemia	Mild	12 (26.1)
	Moderate	24 (52.2)
	Severe	10 (21.7)
Serum Ferritin	Low	46 (63.9)
	High	26 (36.1)
MCV	Low	40 (55.6)
Symptoms	Fatigue	50 (69.4)
	Pallor	44 (61.1)
	Dizziness	38 (52.8)

Table 3: Pharmacological & Dietary Factors

Variable	Category	Frequency (%)
Iron Supplement Use	Yes	25 (34.7)
	No	47 (65.3)
Compliance	Good	12 (16.7)
	Poor	13 (18.1)
Side Effects	Present	18 (25.0)
Tea with Meals	Yes	49 (68.1)
Iron-rich Diet	Adequate	20 (27.8)
	Inadequate	52 (72.2)

Table 4: Community-Level Determinants

Variable	Category	Frequency (%)
Housing Type	Katcha	41 (56.9)
	Pakka	31 (43.1)
Clean Water Access	Yes	28 (38.9)
	No	44 (61.1)
Sanitation	Adequate	26 (36.1)
	Inadequate	46 (63.9)
Overcrowding	Yes	50 (69.4)
Healthcare Access	Easy	22 (30.6)
	Difficult	50 (69.4)

Table 5: Factors Associated with Iron Deficiency Anemia

Variable	IDA Present n (%)	IDA Absent n (%)	p-value
Low Education	32 (69.6)	10 (38.5)	0.012
Iron Supplement Use	14 (30.4)	11 (42.3)	0.041
Poor Diet	40 (87.0)	12 (46.2)	0.001
Tea with Meals	36 (78.3)	13 (50.0)	0.018
Poor Sanitation	35 (76.1)	11 (42.3)	0.009

Table 6: Multivariate Logistic Regression Analysis

Variable	AOR	95% CI	p-value
Poor Diet	3.8	1.5–9.2	0.003
No Iron Supplement	2.6	1.1–6.5	0.028
Poor Sanitation	2.9	1.2–7.1	0.015
Low Education	1.9	0.8–4.5	0.102

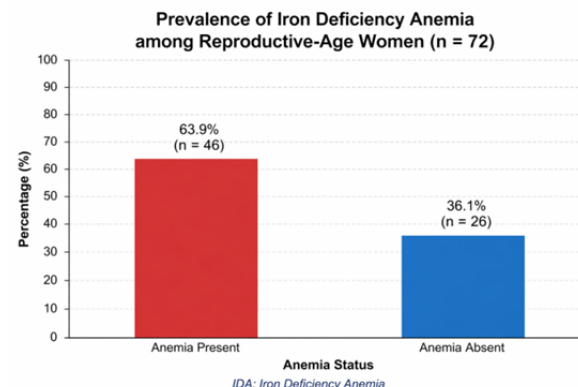


Figure 1: Prevalence of iron deficiency anemia among reproductive-age women (n = 72). The bar graph illustrates that 63.9% (n = 46) of participants were anemic, while 36.1% (n = 26) were non-anemic, indicating a high burden of anemia in the studied population residing in urban slums of Karachi.

Anemia was significantly associated with education, dietary practices, iron supplementation, and hygiene (p < 0.05).

In the multivariate analysis, poor diet, lack of supplementation, and poor sanitation were independent predictors of anemia.

DISCUSSION

This study highlights a high prevalence of iron deficiency anemia (63.9%) among reproductive-age women, reflecting a substantial public health burden in low-resource settings. The predominance of moderate anemia aligns with patterns reported in similar populations, where nutritional deficiencies and socio-economic constraints contribute significantly to disease severity. The mean hemoglobin levels observed in this study further support the chronic nature of iron deficiency in such communities^{10, 11}.

Socio-demographic factors were significant determinants of anemia. Iron deficiency anemia was more common in women with lower levels of education and household income. This could be due to a lack of understanding about balanced nutrition, dietary practices and limited access to health care. Parity was also found to be a predictor of anemia, due to the iron depletion during successive pregnancies without its replenishment¹²⁻¹⁴.

This study found that pharmaceutical factors were significant. Although anemia was prevalent, iron supplementation was rarely used (34.7%) and poorly complied. The side effects, such as abdominal discomfort, may have been a cause of non-compliance. This highlights the need for better prescribing and education of women. Underutilisation of iron therapy is a major risk factor for recurrent anemia and its effects¹⁵⁻¹⁷.

Nutritional factors were a strong predictor. Many of the study participants consumed an inadequate amount of iron-rich foods and often drank tea with meals, which hinders iron absorption. These data highlight the need for dietary advice and behaviour change in the management of anemia^{18, 19}.

There were also community-level factors. Inadequate sanitation, hygiene and overcrowding were strongly linked to anemia. These factors predispose to infections and parasitic diseases which result in iron loss and malabsorption. Inadequate access to health services also contributed to late diagnosis and treatment, further exacerbating morbidity²⁰.

Multivariate analysis revealed malnutrition, iron supplementation, and sanitation were significant predictors of iron deficiency anemia. This study underscores the complexity of anemia, with biological, behavioural and environmental determinants playing a simultaneous role. Thus, managing anemia requires a two-pronged approach of medical treatment and public health measures addressing the social determinants of health.

CONCLUSION

Iron deficiency anemia is highly prevalent among reproductive-age women, driven by a combination of poor dietary practices, inadequate pharmacological intervention, and unfavorable community conditions. The study underscores the need for integrated strategies, including improved access to iron supplementation, enhanced nutritional education, and better sanitation and healthcare services. Targeted interventions at both individual and community levels are essential to effectively reduce the burden of anemia and improve women's health outcomes.

REFERENCES

- Owais A, Merritt C, Lee C, Bhutta ZAJN. Anemia among women of reproductive age: an overview of global burden, trends, determinants, and drivers of progress in low-and middle-income countries. 2021;13(8):2745.
- Ali SA, Khan US, Feroz AS. Prevalence and determinants of anemia among women of reproductive age in developing countries. 2020.
- Ghosh P, Dasgupta A, Paul B, Roy S, Biswas A, Yadav AJJoFM, et al. A cross-sectional study on prevalence and determinants of anemia among women of reproductive age in a rural community of West Bengal. 2020;9(11):5547-53.
- Correa-Agudelo E, Kim H-Y, Musuka GN, Mukandavire Z, Miller FD, Tanser F, et al. The epidemiological landscape of anemia in women of reproductive age in sub-Saharan Africa. 2021;11(1):11955.
- Ali SA, Abbasi Z, Shahid B, Moin G, Hambidge KM, Krebs NF, et al. Prevalence and determinants of anemia among women of reproductive age in Thatta Pakistan: Findings from a cross-sectional study. 2020;15(9):e0239320.
- Sunuwar DR, Singh DR, Adhikari B, Shrestha S, Pradhan PMSJBo. Factors affecting anaemia among women of reproductive age in Nepal: a multilevel and spatial analysis. 2021;11(3):e041982.
- Kinyoki D, Osgood-Zimmerman AE, Bhattacharjee NV, Kassebaum NJ, Hay SIJNm. Anemia prevalence in women of reproductive age in low-and middle-income countries between 2000 and 2018. 2021;27(10):1761-82.
- Assefa EJSOM. Multilevel analysis of anemia levels among reproductive age groups of women in Ethiopia. 2021;9:2050312120987375.
- Gona PN, Gona CM, Chikwasha V, Haruzivishe C, Mapoma CC, Rao SRJBPH. Intersection of HIV and Anemia in women of reproductive age: a 10-year analysis of three Zimbabwe demographic health surveys, 2005-2015. 2021;21(1):41.
- Siffir Argawu A, Gobebo Mekebo G, Bedane K, Kanth Makarla R, Kefale B, Senbeto T, et al. Prevalence and determinants of anaemia among reproductive-aged women in Ethiopia: a Nationally Representative Cross-sectional Study. 2021.
- OKUNROTIFA OS. FACTORS ASSOCIATED WITH HEMATINICS UTILIZATION DURING PREGNANCY AMONG MOTHERS OF UNDER TWO YEARS IN IBADAN NORTH EAST LOCAL GOVERNMENT AREA, OYO STATE 2021.
- Islam R, Akter KM, Rahman A, Khanam NN, Al Azad S, Islam MR, et al. The serological basis of the correlation between iron deficiency anemia and thyroid disorders in women: a community based study. 2021;33(19A):69-81.
- Yamamoto K, Wang N, Takita M, Maeda Y, Tanimoto T, Crump A, et al. Iron deficiency anaemia: its prevalence among women of reproductive age in Shanghai and Tokyo and links to body mass index. 2020;12(7).
- Tirore LL, Mulugeta A, Belachew AB, Gebrehaweria M, Sahilemichael A, Erkalo D, et al. Factors associated with anaemia among women of reproductive age in Ethiopia: Multilevel ordinal logistic regression analysis. 2021;17(1):e13063.
- AGES RAITR. PHARMACEUTICAL SCIENCES.
- Rakanita Y, Sinuraya RK, Suradji EW, Suwantika AA, Syamsunarno MRA, Abdulah RJSRiP. The Challenges in Eradication of Iron Deficiency Anemia in Developing Countries. 2020;11(5).
- Athman MA. Factors Influencing Uptake of Iron and Folic Acid Supplements among Women of Child Bearing Age in Mombasa County: JKUAT-COHES; 2020.
- Tiwari M, Dubey V, Srivastava IJJoP. Comparative study of Different Oral Iron Preparations in females of Reproductive Age Group. 2021;33(28B):93-100.
- Habyarimana F, Zewotir T, Ramroop SJAJoRHLRAISR. Prevalence and risk factors associated with anemia among women of childbearing age in Rwanda. 2020;24(2):141-51.
- Mansour D, Hofmann A, Gemzell-Danielsson KJAit. A review of clinical guidelines on the management of iron deficiency and iron-deficiency anemia in women with heavy menstrual bleeding. 2021;38(1):201-25.

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