

ORIGINAL ARTICLE

Prevalence and sociodemographic determinants of anemia among women of reproductive age in Malawi: insights from Malawi DHS 2024

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ABSTRACT

Background: Anemia remains a public health challenge among women of reproductive age in sub-Saharan Africa, including Malawi. Yet, recent data on its prevalence and determinants among women in Malawi are lacking. Identification of the risk factors of anemia is essential for developing targeted interventions to reduce its burden.

Objective: To investigate the prevalence and risk factors of anemia among Malawian women aged 15–49.

Methodology: We performed a cross-sectional study of women aged 15–49 years using data from the 2024 Malawi Demographic and Health Survey. We performed the statistical analysis with SPSS 24. We used the multivariable binary logistic regression to identify factors associated with anemia. The results were reported using adjusted odds ratios (AORs) and their corresponding 95% confidence intervals (CIs).

Results: We found that 64.2% of women were non-anemic. Meanwhile, 20.1% had mild, 14.0% moderate, and 1.6% severe anemia. On performing the regression analysis, we found that women aged 20–24 (AOR: 0.668; 95% CI: 0.463–0.964), 25–29 (AOR: 0.605; 95% CI: 0.434–0.842), and 30–34 years (AOR: 0.599; 95% CI: 0.430–0.833) had significantly lower odds of anemia compared to those aged 45–49 years. Urban residence was protective (AOR: 0.690; 95% CI: 0.549–0.866). Normal-weight women had higher odds of anemia than obese women (AOR: 1.530; 95% CI: 1.140–2.055). Nulliparous women had higher odds than multiparous women (AOR: 1.769; 95% CI: 1.049–2.983). Not using intrauterine devices was associated with lower odds of anemia (AOR: 0.420; 95% CI: 0.253–0.698).

Conclusion: Anemia affected more than one-third of Malawian women, with significant sociodemographic, nutritional, and reproductive disparities. Targeted interventions are needed to reduce the burden of anemia among Malawian women.

Keywords: Anemia, Malawi, malnutrition, women's health, DHS, sub-Saharan Africa

Introduction

Anemia is defined as a reduction in the number of red blood cells or hemoglobin (HB) below the physiological level. The World Health Organization (WHO) defines anemia as a reduction in HB levels below 12 g/dl and below 11 g/dl in pregnant women [1]. Anemia represents a major burden; it affected around 1.9 billion cases worldwide in 2021. The largest burden of anemia lies in sub-Saharan Africa; it affects around 47.4% of women in sub-Saharan Africa [2].

Moreover, the prevalence of anemia is higher for pregnant women, with malaria alone resulting in 2.41 million cases of moderate or severe anemia in

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2023 [3]. Considering the high burden of anemia, the current goal is to reduce anemia burden by 12%–22% by 2030 [4].

Anemia is associated with significant morbidity and accounts for 5.7% of years lived with disabilities [2]. Moreover, it is associated with reduced work productivity, thus resulting in significant costs [5]. Anemia during pregnancy is associated with adverse outcomes for the infant, such as low birth weight, preterm, stillbirth, and neonatal death; and the mother, such as postpartum hemorrhage and preeclampsia [6]. Anemia could be caused by nutritional deficiencies, such as iron, folate, and vitamin B12; infectious diseases such as malaria, HIV; genetic disorders; and reproductive factors such as menstruation, parity, and contraceptive use [1].

Previous studies in Malawi and other sub-Saharan African countries identified several factors associated with anemia among women of reproductive age. These include age, socioeconomic status, and place of residence [7]. Yet, the available evidence from Malawi is based on older studies, and some of them included only specific populations such as pregnant women or children [8–10]. The 2024 Malawi Demographic and Health Survey (DHS) provides nationally representative data to evaluate anemia among women of reproductive age. Given the ongoing demographic, nutritional, and healthcare changes in Malawi, previously identified risk factors may no longer explain the patterns of anemia. Thus, updated evidence is needed to identify anemia prevalence and risk factors, and support national efforts toward reducing anemia in line with global targets.

This study aimed to investigate the prevalence and risk factors associated with anemia among women aged 15–49 years in Malawi using the 2024 Malawi DHS database.

Methods

Data source

This study used data from the 2024 MDHS, a nationally representative survey of women aged 15–49 years [11]. The MDHS employed a stratified two-stage cluster sampling design based on the 2018 Malawi Population and Housing Census frame provided by the National Statistical Office [11]. The sampling approach was designed to produce representative estimates at the national level, as well as across urban and rural areas and 33 survey domains, including 28 districts, four major cities (Mzuzu, Lilongwe, Zomba, and Blantyre), and Dzaleka refugee camp [11]. In the first stage, clusters were selected with probability proportional to size. In the second stage, households within selected clusters were listed and systematically sampled. This sampling design ensured the representativeness of key demographic and health indicators across Malawi's population and administrative regions [11].

Data collection

Data were collected by trained DHS personnel using standardized questionnaires and objective biometric measurements. HB concentration was assessed using capillary blood samples analyzed with portable HemoCue photometers [12]. This procedure involves collecting a finger-prick blood sample into a reagent-coated microcuvette, which is then analyzed by a battery-operated portable device that directly reports HB levels in g/dL. The HemoCue system is widely recognized for its accuracy and reliability in field settings, with results comparable to conventional laboratory methods. HB values were adjusted for altitude and smoking status in accordance with WHO recommendations [12].

Anemia was classified into four categories based on WHO criteria. For non-pregnant women, no anemia was defined as HB ≥ 12.0 g/dL, mild anemia as 11.0–11.9 g/dL, moderate anemia as 8.0–10.9 g/dL, and severe anemia as < 8.0 g/dL. For pregnant women, no anemia was defined as HB ≥ 11.0 g/dL, mild anemia as 10.0–10.9 g/dL, moderate anemia as 7.0–9.9 g/dL, and severe anemia as < 7.0 g/dL [13].

Inclusion and exclusion criteria

This study included women aged 15–49 years who participated in the 2024 MDHS and had available HB measurements. Women with missing anemia data were excluded to maintain the accuracy and completeness of the analysis.

Study variables

The study included a wide range of sociodemographic, behavioral, reproductive, anthropometric, and socioeconomic variables. Sociodemographic factors comprised age (5-year age groups), place of residence (urban or rural), region, education level, religion, and ethnicity. Behavioral variables included media exposure (frequency of reading newspapers or magazines, listening to radio, watching television, and internet use) and smoking status. Anthropometric status was represented by body mass index (BMI) categories (underweight, normal weight, overweight, and obese) [14]. BMI classification used criteria appropriate to participants' characteristics, including pregnancy status and age, to ensure valid classification across the study population. Socioeconomic status was assessed using the household wealth index [15]. Additional variables included current working status, marital status, parity, breastfeeding status, pregnancy status, use of intrauterine device (IUD) at last sexual intercourse, and health insurance coverage.

Statistical analysis

Data analysis was conducted using SPSS version 24. The analysis accounted for the full DHS complex survey design by incorporating sampling weights, primary sampling units (clusters), and stratification, in accordance with DHS recommendations. The DHS



weight variable, an eight-digit number with six implied decimal places, was rescaled by dividing by 1,000,000 prior to analysis [16]. Descriptive statistics were used to summarize participant characteristics, with results presented as frequencies and percentages. Associations between anemia status and independent variables were assessed using the chi-square test. Variables that were statistically significant at the bivariate level were subsequently included in the multivariable model. A binary logistic regression model was then fitted, with anemia status categorized as no anemia versus any anemia (mild, moderate, or severe). This categorization was used to provide a clear comparison between non-anemic individuals and those affected by anemia, facilitating interpretation of associated risk factors. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, and statistical significance was defined as $p < 0.05$.

Ethics approval, consent, and data use

This study involved a secondary analysis of data obtained from the DHS Program. Authorization to access and use the dataset was secured through the official DHS data-access process. The data were anonymized and de-identified prior to release to the researchers and did not contain personally identifiable information. As the study relied exclusively on previously collected data and involved no direct interaction with participants, informed consent was not required for this analysis. All data were used in accordance with the DHS Program's data-use requirements and applicable ethical guidelines.

Results

Data were collected from 10,590 Malawian women aged 15–49 years. The majority (64.2%) were not anemic, while 20.1% had mild anemia, 14.0% had moderate anemia, and 1.6% had severe anemia. Anemia prevalence was highest among adolescents aged 15–19 years, who had the greatest proportion of moderate anemia (18.3%) and the lowest proportion of non-anemic women (57.7%). Rural women had a higher burden of anemia at all levels compared to urban women, with 37.0% of rural women being anemic versus 28.8% of urban women. Regarding marital status, women who were never in union had the highest anemia prevalence (42.7%), compared to married women (33.9%). Parity also showed a notable pattern, with nulliparous women having the highest combined anemia prevalence (44.6%) compared to multiparous women (33.9%). Among BMI groups, underweight women had the highest anemia prevalence (37.1%), while obese women had the lowest (30.2%). Currently pregnant women had a higher proportion of moderate anemia (19.3%) compared to non-pregnant women (13.6%). The full distribution of baseline characteristics across anemia levels is presented in [Table 1](#).

In multivariable binary logistic regression ([Table 2](#)), using not anemic as the reference category, the following factors were significantly associated with anemia:

Age. Compared to women aged 45–49 years, those aged 20–24 (AOR: 0.668; 95% CI: 0.463–0.964; $p = 0.031$), 25–29 (AOR: 0.605; 95% CI: 0.434–0.842; $p = 0.003$), and 30–34 years (AOR: 0.599; 95% CI: 0.430–0.833; $p = 0.002$) had significantly lower odds of being anemic.

Place of residence. Urban women had significantly lower odds of anemia compared to rural women (AOR: 0.690; 95% CI: 0.549–0.866; $p = 0.001$).

BMI. Women with normal weight had significantly higher odds of anemia compared to obese women (AOR: 1.530; 95% CI: 1.140–2.055; $p = 0.005$). Underweight and overweight categories showed no significant association with anemia status.

Parity. Nulliparous women had significantly higher odds of anemia compared to multiparous women (AOR: 1.769; 95% CI: 1.049–2.983; $p = 0.033$), while primiparous women showed no significant difference.

IUD use. Women who did not use an IUD had significantly lower odds of anemia compared to IUD users (AOR: 0.420; 95% CI: 0.253–0.698; $p = 0.001$).

Ethnicity, employment status, marital status, and breastfeeding status were not significantly associated with anemia in the multivariable model.

Discussion

Summary of findings

We investigated the prevalence of anemia and its associated risk factors in Malawi using nationally representative data from the 2024 DHS database. We found that 35.8% of women aged 15–49 years in Malawi were anemic, and most of them had mild or moderate anemia. On performing multivariable analysis, we found that women aged 20–34 years and urban residents had a lower risk of anemia. Meanwhile, normal-weight, nulliparity, and IUD use were associated with higher odds of anemia.

Comparison with the literature

The overall prevalence of anemia (35.8%) highlights that anemia is a public health concern among Malawian women. According to the WHO, anemia prevalence between 20% and 39.9% represents a moderate public health problem [12]. Yet, this prevalence is comparable to other studies in sub-Saharan Africa. Correa-Agudelo et al found that anemia was prevalent among 43.3% of women in sub-Saharan Africa [17]. Adamu et al. found that anemia was prevalent among 16.2% of adults in two regions in Malawi [7]. Meanwhile, Rogerson et al. found that anemia was prevalent among 52.7% of pregnant women in Malawi [18]. This highlights the need for identification of potential risk factors and development of strategies to reduce the burden of anemia among Malawian women.



Prevalence and sociodemographic determinants of anemia

Table 1. Baseline characteristics of the participants.

Variables	Anemia level				-value
	Severe	Moderate	Mild	Not anemic	
	N (%)	N (%)	N (%)	N (%)	
Age in 5-year groups					<0.001
15–19	40 (2.1%)	352 (18.3%)	421 (21.9%)	1109 (57.7%)	
20–24	25 (1.3%)	257 (13.3%)	377 (19.5%)	1275 (65.9%)	
25–29	24 (1.6%)	158 (10.7%)	283 (19.1%)	1012 (68.5%)	
30–34	11 (0.8%)	144 (11.1%)	219 (16.8%)	925 (71.2%)	
35–39	14 (1.3%)	159 (14.2%)	231 (20.6%)	716 (64.0%)	
40–44	21 (2.1%)	149 (14.9%)	221 (22.2%)	606 (60.8%)	
45–49	18 (2.4%)	110 (14.6%)	163 (21.5%)	467 (61.5%)	
Type of place of residence					<0.001
Urban	22 (1.4%)	165 (10.8%)	253 (16.6%)	1088 (71.2%)	
Rural	131 (1.6%)	1165 (14.6%)	1661 (20.8%)	5021 (62.9%)	
Region Group					0.210
Northern		27 (2.1%)	212(16.3%)	272(21.0%)	
Central		68 (1.7%)	547(13.6%)	814(20.2%)	
Southern		58 (1.4%)	572(13.6%)	828(19.8%)	
Highest educational level					0.093
No education	9 (1.4%)	83 (12.4%)	155 (23.1%)	423 (63.1%)	
Primary	91 (1.5%)	924 (14.8%)	1249 (20.0%)	3986 (63.8%)	
Secondary	47 (2.0%)	287 (12.2%)	476 (20.2%)	1551 (65.7%)	
Higher	5 (2.2%)	36 (16.0%)	35 (15.4%)	150 (66.4%)	
Religion					0.957
Catholic	21 (1.5%)	191 (13.5%)	269 (19.1%)	932 (65.9%)	
CCAP	22 (1.6%)	183 (13.4%)	268 (19.6%)	897 (65.5%)	
Anglican	3 (1.7%)	28 (15.0%)	41 (22.3%)	113 (61.1%)	
Seven days/Baptist	10 (1.2%)	110 (14.3%)	158 (20.6%)	493 (63.9%)	
Pentecostal	17 (1.6%)	153 (13.8%)	236 (21.2%)	705 (63.4%)	
Other christian	46 (1.4%)	446 (13.8%)	656 (20.3%)	2087 (64.5%)	
Muslim	34 (2.5%)	210 (15.4%)	273 (20.0%)	846 (62.0%)	
No religion	0 (–)	9 (16.6%)	13 (23.5%)	34 (59.9%)	
Ethnicity					0.006
Chewa	59.552 (1.8%)	470.300 (14.3%)	681.843 (20.7%)	2087.020 (63.3%)	
Tumbuka	24.851 (2.6%)	163.942 (17.2%)	180.887 (19.0%)	584.662 (61.3%)	
Lomwe	14.847 (0.8%)	220.439 (11.6%)	381.399 (20.1%)	1276.219 (67.4%)	
Tonga	4.490 (2.8%)	37.457 (23.0%)	37.184 (22.8%)	83.673 (51.4%)	
Yao	30.626 (2.4%)	167.808 (13.3%)	247.867 (19.6%)	816.906 (64.7%)	
Sena	3.977 (1.3%)	56.864 (18.8%)	57.800 (19.2%)	183.155 (60.7%)	
Nkhonde	0.399 (0.4%)	19.910 (17.9%)	26.712 (24.0%)	64.363 (57.8%)	
Ngoni	10.112 (1.0%)	114.615 (11.8%)	188.669 (19.4%)	659.094 (67.8%)	



Prevalence and sociodemographic determinants of anemia

Variables	Anemia level				p-value
	Severe	Moderate	Mild	Not anemic	
	N (%)	N (%)	N (%)	N (%)	
Mang'anja	1.907 (0.5%)	53.593 (14.8%)	74.637 (20.6%)	232.798 (64.1%)	
Lambia	0.735 (1.5%)	8.136 (16.2%)	9.875 (19.6%)	31.572 (62.7%)	
Ndali	1.135 (1.9%)	7.772 (12.7%)	8.799 (14.4%)	43.558 (71.1%)	
Other Malawian	0.000 (0.0%)	6.793 (13.1%)	13.235 (25.6%)	31.726 (61.3%)	
BMI Group					<0.001
Underweight	14.725 (2.5%)	89.621 (15.2%)	114.039 (19.4%)	369.705 (62.9%)	
Normal weight	122.473 (1.9%)	961.800 (14.7%)	1353.093 (20.7%)	4097.517 (62.7%)	
Overweight	8.363 (0.5%)	206.363 (11.9%)	330.913 (19.1%)	1189.160 (68.5%)	
Obese	7.071 (1.1%)	72.508 (11.2%)	116.503 (18.0%)	452.674 (69.8%)	
Frequency of reading newspapers or magazine					0.695
Not at all	120 (1.5%)	1113 (14.0%)	1610 (20.3%)	5098 (64.2%)	
Less than once a week	20 (2.2%)	142 (15.1%)	184 (19.6%)	592 (63.1%)	
At least once a week	12 (1.9%)	75 (12.0%)	120 (19.2%)	419 (66.8%)	
Frequency of listening to radio					0.428
Not at all	84 (1.5%)	780 (13.7%)	1180 (20.7%)	3660 (64.2%)	
Less than once a week	22 (1.5%)	221 (14.9%)	305 (20.5%)	939 (63.2%)	
At least once a week	47 (2.0%)	330 (14.2%)	430 (18.5%)	1510 (65.2%)	
Frequency of watching television					0.317
Not at all	125 (1.6%)	1065 (13.7%)	1584 (20.3%)	5023 (64.4%)	
Less than once a week	7 (1.1%)	115 (17.4%)	121 (18.3%)	417 (63.2%)	
At least once a week	21 (2.0%)	150 (14.3%)	209 (19.9%)	669 (63.8%)	
Frequency of using internet last month					0.962
Not at all	128 (1.5%)	1155 (14.0%)	1683 (20.4%)	5302 (64.1%)	
Less than once a week	1 (1.6%)	12 (13.6%)	18 (20.0%)	58 (64.8%)	
At least once a week	6 (1.9%)	43 (14.1%)	60 (19.8%)	196 (64.3%)	
Almost every day	18 (2.1%)	120 (14.2%)	154 (18.2%)	552 (65.5%)	
Wealth index					0.407
Poorest	26 (1.4%)	260 (13.6%)	402 (21.1%)	1218 (63.9%)	
Poorer	38 (2.1%)	258 (14.6%)	361 (20.4%)	1112 (62.8%)	
Middle	20 (1.1%)	268 (14.3%)	393 (20.9%)	1197 (63.7%)	
Richer	30 (1.6%)	271 (14.6%)	377 (20.4%)	1175 (63.4%)	
Richest	38 (1.8%)	273 (13.0%)	381 (18.1%)	1408 (67.0%)	
Frequency of smoking cigarettes					0.465
Does not smoke	152 (1.6%)	1324 (14.0%)	1901 (20.1%)	6076 (64.3%)	
Every day	0 (–)	3 (23.6%)	4 (40.6%)	4 (35.8%)	
Some days	1 (1.5%)	4 (8.2%)	9 (21.5%)	30 (68.9%)	
Respondent currently working					0.039
No	70 (1.5%)	685 (15.2%)	933 (20.7%)	2826 (62.6%)	
Yes	83 (1.7%)	645 (12.9%)	981 (19.7%)	3283 (65.8%)	



Prevalence and sociodemographic determinants of anemia

Variables	Anemia level				p-value
	Severe	Moderate	Mild	Not anemic	
	N (%)	N (%)	N (%)	N (%)	
Current marital status					<0.001
Never in union	40 (2.1%)	367 (19.0%)	416 (21.6%)	1104 (57.3%)	
Married	77 (1.5%)	644 (12.5%)	1023 (19.9%)	3399 (66.1%)	
Living with partner	6 (0.9%)	76 (11.1%)	137 (20.0%)	466 (67.9%)	
Widowed	5 (2.1%)	37 (16.4%)	55 (24.0%)	130 (57.4%)	
Divorced	16 (2.0%)	88 (11.5%)	157 (20.5%)	506 (66.0%)	
No longer living together/ separated	10 (1.3%)	118 (15.9%)	121 (16.2%)	496 (66.6%)	
Nullified	0 (–)	0 (–)	6 (40.5%)	9 (59.5%)	
Parity					<0.001
Nulliparous	50 (2.6%)	376 (19.6%)	429 (22.4%)	1064 (55.4%)	
Primiparous	17 (1.0%)	219 (12.1%)	351 (19.3%)	1230 (67.7%)	
Multiparous	85 (1.5%)	735 (12.7%)	1135 (19.7%)	3814 (66.1%)	
Currently breastfeeding					<0.001
No	135 (1.8%)	1090 (14.7%)	1508 (20.3%)	4696 (63.2%)	
Yes	18 (0.8%)	240 (11.6%)	407 (19.6%)	1413 (68.0%)	
Currently pregnant					0.036
No/don't know	144 (1.6%)	1218 (13.6%)	1796 (20.1%)	5767 (64.6%)	
Yes	9 (1.5%)	112 (19.3%)	119 (20.4%)	342 (58.8%)	
IUD use					0.005
No	56 (1.2%)	507 (10.6%)	900 (18.9%)	3304 (69.3%)	
Yes	1 (0.9%)	16 (21.6%)	20 (26.5%)	38 (51.0%)	
Covered by health insurance					0.248
No	149 (1.6%)	1321 (14.0%)	1905 (20.2%)	6056 (64.2%)	
Yes	3 (4.3%)	10 (12.7%)	10 (12.7%)	53 (70.4%)	

Data are presented as N (%). N represents weighted population estimates (thousands). Anemia levels follow WHO classification (new WHO criteria). p-values from complex-samples Rao-Scott adjusted chi-square tests. IUD = intrauterine device.

Across sub-Saharan Africa, the type of contraceptive used was a modifiable risk factor of 53.1% of moderate to severe anemia cases [4]. While use of the copper IUD is associated with a decrease in HB levels, levonorgestrel is associated with an increase [19]. KIVIJÄRVI et al. found that using a copper IUD was associated with anemia and thus recommended HB and iron stores assessment before using the device [20]. Consistent with their findings, we found that IUD use was significantly associated with anemia. A possible explanation is that the copper IUD, which is commonly used increases menstrual blood loss, which may in turn increase the risk of anemia.

Previous studies found that anemia was associated with low BMI [21]. Similarly, we found that women

with normal weight had significantly higher odds of anemia compared to obese women. Meanwhile, being underweight and overweight had no significant association with anemia status. This relationship may reflect greater caloric intake and higher socioeconomic status among women with higher BMI. Nevertheless, obesity should not be interpreted as protective since it is associated with chronic inflammation which might impact hematopoiesis [22].

We found that urban residence was associated with a lower risk of anemia compared to rural. This is consistent with the findings of previous studies [7]. Broek et al. found that anemia was prevalent among 58.1% of women in Malawi living in rural areas [23]. Adamu et al. found that anemia prevalence was higher in rural compared to



Prevalence and sociodemographic determinants of anemia

Table 2. Regression analysis of factors associated with anemia among Malawian women aged 15–49 years.

Parameter Estimates							
		B	SE	AOR	95% CI for AOR		p-value
					Lower	Upper	
Anemic	Age in 5-year groups						
	15–19	–0.473	0.245	0.623	0.385	1.008	0.054
	20–24	–0.403	0.187	0.668	0.463	0.964	0.031
	25–29	–0.503	0.169	0.605	0.434	0.842	0.003
	30–34	–0.513	0.168	0.599	0.430	0.833	0.002
	35–39	–0.164	0.170	0.849	0.608	1.184	0.334
	40–44	0.026	0.160	1.027	0.750	1.407	0.869
	45–49	Reference		1.000			
	Type of place of residence						
	Urban	–0.371	0.116	0.690	0.549	0.866	0.001
	Rural	Reference		1.000			
	Ethnicity						
	Chewa	–0.008	0.379	0.992	0.472	2.086	0.982
	Tumbuka	0.119	0.403	1.126	0.511	2.483	0.769
	Lomwe	–0.185	0.383	0.831	0.392	1.762	0.629
	Tonga	0.420	0.410	1.521	0.681	3.401	0.306
	Yao	–0.103	0.393	0.902	0.417	1.951	0.794
	Sena	0.252	0.440	1.286	0.542	3.053	0.568
	Nkhonde	0.247	0.435	1.280	0.545	3.008	0.571
	Ngoni	–0.179	0.406	0.836	0.377	1.856	0.660
	Mang'anja	–0.003	0.386	0.997	0.468	2.124	0.993
	Lambia	–0.059	0.539	0.943	0.327	2.716	0.913
	Ndali	–0.577	0.476	0.561	0.221	1.429	0.225
	Other malawian	Reference		1.000			
	BMI						
	Underweight	0.185	0.224	1.204	0.776	1.867	0.408
	Normal weight	0.425	0.150	1.530	1.140	2.055	0.005
	Overweight	0.275	0.167	1.317	0.949	1.827	0.100
	Obese	Reference		1.000			
	Respondent currently working						
	No	0.052	0.076	1.054	0.907	1.224	0.491
	Yes	Reference		1.000			
	Current marital status						
	Never in union	–0.618	0.945	0.539	0.084	3.448	0.513
	Married	–0.789	0.921	0.454	0.074	2.771	0.392
	Living with partner	–0.879	0.918	0.415	0.068	2.519	0.339
	Widowed	–0.599	0.970	0.550	0.082	3.694	0.538
	Divorced	–0.830	0.929	0.436	0.070	2.700	0.372



Parameter Estimates							
		B	SE	AOR	95% CI for AOR		p-value
					Lower	Upper	
	No longer living together/ separated	−0.990	0.929	0.372	0.060	2.305	0.287
	Nullified	Reference		1.000			
	Parity						
	Nulliparous	0.570	0.266	1.769	1.049	2.983	0.033
	Primiparous	−0.059	0.129	0.942	0.732	1.213	0.645
	Multiparous	Reference		1.000			
	Currently breastfeeding						
	No	0.065	0.094	1.067	0.887	1.284	0.492
	Yes	Reference		1.000			
	IUD use						
	No	−0.868	0.259	0.420	0.253	0.698	0.001
	Yes	Reference		1.000			

AOR: Adjusted Odds Ratio; CI: Confidence Interval; SE: Standard Error. Reference category = Not anemic.

urban areas among Malawian adults [7]. This could be explained as rural areas have poorer sanitation, limited access to healthcare services, and poorer compliance with iron supplementations [24].

High parity is usually associated with anemia due to depletion of iron stores [25]. Yet, in our study, we found that nulliparous women had significantly higher odds of anemia. Similar to these findings, Adamu et al. found that moderate to severe anemia was higher among nulliparous women, while multiparity was associated with mild anemia [7]. A possible explanation is that many nulliparous women in the present study were adolescents or younger women who may be subject to iron deficiency because of growth demands and menstrual blood loss. Adu et al. found that 41.7% of nulliparous women were anemic in Ghana [26]. Additionally, multiparous women may benefit from antenatal care services, including iron and folic acid supplementation [27].

In this study, we found that the prevalence of anemia was the highest among women aged 15–19. Indeed, adolescents have increased iron requirements related to growth and the onset of menstruation, making them susceptible to iron deficiency [28]. In the multivariate regression, however, women aged 20–34 years had significantly lower risks of anemia than those aged 45–49 years. These findings are consistent with previous studies. Adamu et al. found that women aged 35–54 had a significantly higher risk of developing moderate to severe anemia compared to younger women aged 18–24 years [7]. This could be explained as older women are more likely affected by chronic conditions,

inflammation, hormonal changes, and long-term nutritional deficiencies [29].

Strengths and limitations

Our study has several strengths. First, we used nationally representative data from the DHS database to identify determinants of anemia in Malawian women; the DHS data collection tool is standardized and validated, thus reducing the potential for bias. Second, we used data from DHS 2024, which represents updated evidence, and we included a large sample of 10,590 participants. Third, anemia was determined based on objective measurement of HB concentrations rather than self-reported data, thus reducing misclassification bias. Moreover, we investigated various determinants of anemia, including marital status, breastfeeding, parity, and the use of IUD.

Our study has some limitations. First, the cross-sectional design limits causal inference. Thus, the observed associations between anemia and the observed risk factors need further confirmation in cohort studies. Second, data on important variables that are potential confounders were missing, such as malaria infection, HIV status, dietary iron intake, inflammatory markers, genetic HB disorders, and adherence to iron. Thus, these factors need further investigation in Malawi. Third, we only included women aged 15–49 years; thus, further studies should investigate the risk factors of anemia among older women. Moreover, the DHS contraceptive variable does not distinguish between copper and hormonal IUDs. Therefore, our finding relates to IUD use in general, and we could not assess whether the association differs by IUD type. Also, IUD use was self-



reported and might be subject to recall bias. Moreover, the small number of participants with severe anemia limited our ability to assess the risk factors for each severity grade.

Clinical implications

Our study provided evidence on the prevalence of anemia and risk factors among women aged 15–49 years in Malawi. We found that older age, being nulliparous, and living in rural areas were associated with anemia. Thus, anemia screening and prevention programs in Malawi should prioritize women in rural areas, nulliparous, and older women (≥ 45 years). The higher burden in rural areas highlights the need to strengthen community-based nutrition and malaria control programs. Since normal-weight women had higher odds of anemia, screening should not be restricted to underweight women. Since we found that IUD use was associated with anemia, healthcare providers should counsel women considering IUD use about the potential for increased menstrual bleeding and the risk of developing anemia. Also, baseline and follow-up HB testing should be performed when using an IUD. Other contraceptive methods could be used, such as injectable, implant, or hormonal IUD, since they could be protective against anemia.

Conclusion

Anemia represents a public health challenge in Malawi, affecting more than one-third of women of reproductive age. We found that older age, rural residence, parity, and IUD use were independently associated with anemia. Thus, targeted interventions are needed for these high-risk groups. Further studies should assess the impact of malaria and HIV infections on anemia and investigate anemia prevalence and risk factors in older age women.

List of Abbreviations

AORs	Adjusted odds ratios
BMI	Body mass index
IUD	Intrauterine device
WHO	World Health Organization

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent for participation

Written consent was obtained from all the participants/subjects/patients.

Ethical approval

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