

**EVALUATING THE PREVALENCE AND TYPES OF ANEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT THE NKWEN DISTRICT HOSPITAL BAMENDA**

Dr. Lukong Hubert Shalanyuy<sup>1,2\*</sup>, Ketunze Idris Acha<sup>3</sup>, Dor Marie Claire Wiydzerla<sup>1</sup>, Chah Peter Nges<sup>1</sup>,  
Ndikaka Vannessa Emlah<sup>4</sup> and Fongum Evans Kobbi<sup>5</sup>

<sup>1</sup>National Polytechnic University Institute Bamenda, Cameroon.

<sup>2</sup>Essential Health Higher Institute – Foubot Cameroon.

<sup>3</sup>Florence Nightingale Higher Institute of Health and Biomedical Sciences.

<sup>4</sup>The University of Yaoundé I, Cameroun.

<sup>5</sup>The Catholic School of Health Sciences Shisong, Cameroon.



\*Corresponding Author: Dr. Lukong Hubert Shalanyuy

National Polytechnic University Institute Bamenda, Cameroon.

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**ABSTRACT**

**Background:** Anemia is a condition in which the number of red blood cells or the hemoglobin concentration within them is lower than normal and consequently their oxygen-carrying capacity is insufficient to meet the body's physiologic needs. Globally, the World Health Organization (WHO) report of 2011 showed that, while the prevalence of anemia among women of reproductive age was 29.9%, pregnant women are considerably more burdened, with a prevalence of 38% worldwide. This study aimed to assess the prevalence and types of anemia among pregnant women attending ANC at the Nkwén district hospital Bamenda (PMI). **Methods:** A cross-sectional study was conducted involving 76 freely consented pregnant women attending antenatal care at Nkwén district hospital Bamenda (PMI) who were sampled using a simple random sampling technique. Hemoglobin, Red blood cells and red cell indices were measured using the automated MINDRAY 280 coulter hematology analyzer, following all standard procedures. Ethical clearance was obtained from the Regional Delegation of Public Health for the North West Region. Data was analyzed using SPSS version 21, with statistical significance considered when p value was less than or equal to 0.05. **Results:** The study revealed that the majority of pregnant women were aged 18–24 years (39.5%), married (60.5%), had secondary education (52.6%), and were Christians (92.1%). The overall prevalence of anemia among participants was 39.5%. Anemia was more prevalent in younger women aged 18–24 years (30.2%) and among single women (30.2%) compared to married women (9.2%). Educational level showed a protective effect, with only 4% of university-educated women being anemic, while those with secondary education accounted for the highest anemia burden (28.9%). Occupational status also influenced anemia prevalence, with 28.9% of women in the "other" category (such as farmers and traders) being anemic, compared to just 4% among civil servants. Statistically significant associations were found between anemia and the types of anemia including iron deficiency ( $p < 0.001$ ), folic acid deficiency ( $p < 0.001$ ), and malaria infection ( $p < 0.001$ ). Additionally, gestational age showed a significant relationship with anemia ( $p = 0.002$ ), with the highest prevalence in the first trimester (22 out of 26 cases). Nutritional habits played a crucial role, as daily consumption of vegetables ( $p = 0.001$ ) and beans ( $p = 0.003$ ) were associated with reduced anemia occurrence. These findings highlight key demographic, nutritional, and clinical risk factors associated with anemia in pregnancy in the study area. **Conclusion:** Targeted interventions, including iron supplementation, dietary counseling, and malaria prevention, are crucial, particularly during the second trimester to address this public health challenge effectively.

**KEYWORDS:** Anemia, Pregnancy, Prevalence, Iron Deficiency, Gestational Age, Public Health.

**BACKGROUND**

Anemia in pregnancy remains a leading cause of maternal and neonatal mortality in low- and middle-income countries.<sup>[1]</sup> It occurs when red blood cells or hemoglobin levels are too low to meet the body's oxygen needs, resulting in symptoms such as fatigue, dizziness, and shortness of breath.<sup>[2,3]</sup>

The most common cause of anemia in pregnancy is iron deficiency, which occurs when the body lacks sufficient iron to produce adequate haemoglobin.<sup>[4]</sup> This deficiency is worsened by increased iron demands during pregnancy, which many women cannot meet through diet alone, particularly those with pre-existing deficiencies.<sup>[5,6]</sup>

According to World Health Organization (WHO) criteria, pregnant women are considered anemic when hemoglobin levels fall below 11g/dL.<sup>[4]</sup> If untreated, iron deficiency anemia can lead to serious consequences, including low birth weight, stillbirth, preterm delivery, neonatal death, developmental delays, and early undernutrition.<sup>[7-9]</sup> It may also increase maternal risks such as premature labor, cesarean delivery, and pregnancy-induced hypertensive disorders.<sup>[7,10,11]</sup>

Globally, anemia affects 38% of pregnant women, with higher prevalence in developing regions.<sup>[12,13]</sup> South and Southeast Asia report a prevalence of 52%<sup>[6]</sup>, Sub-Saharan Africa 45.8%<sup>[14]</sup>, and Tanzania up to 57%, with Dar es Salaam reaching 68%.<sup>[15,16]</sup> Risk factors include poor iron intake, inadequate protein and green vegetable consumption, poverty<sup>[17,18]</sup>, and pica behavior during pregnancy.<sup>[19-21]</sup>

Anemia is more common in rural than urban areas.<sup>[22]</sup> Infections can suppress appetite and impair dietary intake during pregnancy, further exacerbating anemia.<sup>[23]</sup> Additional risk factors include young maternal age, lack of education, large family size, food insecurity, and infrequent ANC attendance.<sup>[15]</sup> These determinants vary by region due to differences in socio-economic and cultural contexts.<sup>[15,24,25]</sup>

The types of anemia in pregnancy include iron deficiency, folate deficiency, vitamin B12 deficiency, sickle cell anemia, thalassemia, and anemia of chronic inflammation. Each has distinct causes and poses specific risks. For example, folate and B12 deficiencies are linked with neural tube defects and macrocytic anemia, while hemoglobinopathies like sickle cell anemia and thalassemia can lead to severe complications such as intrauterine growth restriction, preeclampsia, and maternal mortality.<sup>[4,7,10,11,26-28]</sup>

In Cameroon, national surveys estimate anemia prevalence in pregnant women to be 50–60%, though figures vary across regions.<sup>[31,32]</sup> Micronutrient deficiencies and genetic disorders are common, especially in rural areas. In Tanzania, despite policies promoting iron and folic acid supplementation, malaria prevention, and anemia screening, community-based data remains limited, and anemia prevalence remains high among women not attending ANC services.<sup>[26-30]</sup>

Anemia during pregnancy is a critical public health issue globally and in Cameroon, with high national prevalence rates.<sup>[31,32]</sup> However, there is limited data specific to the Nkwen District Hospital, a major health facility, on the prevalence and types of anemia affecting pregnant women attending ANC.

This lack of localized information hinders the design of targeted interventions suited to the needs of pregnant women in this setting. Without such data, planning effective maternal health strategies becomes difficult,

resulting in suboptimal maternal and child health outcomes.

While the Cameroon Ministry of Public Health promotes routine iron and folic acid supplementation, malaria prevention, and nutrition education, these efforts are often compromised by low ANC attendance, poor adherence, persistent infections, and limited healthcare resources.<sup>[31]</sup>

Identifying the specific types of anemia is essential for appropriate management, as each type requires a different therapeutic approach. Misdiagnosis or generalized treatment may result in continued maternal and fetal complications such as preterm birth, low birth weight, and maternal mortality.<sup>[4,26-28]</sup> Despite national guidelines, there remains a gap in understanding the burden and types of anemia among pregnant women at the Nkwen District Hospital. Without community-specific data, health providers cannot identify high-risk groups or offer tailored care. This study, therefore, aims to evaluate the prevalence and types of anemia among pregnant women attending ANC at Nkwen District Hospital, Bamenda, to provide evidence for the development of specific, effective, and localized interventions.

## METHODS

This institutional-based cross-sectional study was conducted in April 2025 at Nkwen District Hospital Bamenda, located in Bamenda III Subdivision of the Northwest Region of Cameroon. The study aimed to determine the prevalence and types of anemia among 70 freely consented pregnant women attending antenatal care (ANC), selected through convenience sampling. The exclusion criteria included those who were acutely ill, declined participation, or had known hematological disorders. Data was collected using a pre-tested structured questionnaire for socio-demographic information. 3mls of venous blood samples was collected in K<sub>3</sub>-EDTA tubes for laboratory analysis. Blood samples were analyzed using the Mindray 280 coulter hematological analyzer based on electrical impedance and flow cytometry for red blood cells, hemoglobin and red cell indices (MCH, MCV and MCHC). Data was coded and analyzed using SPSS version 23.0, with descriptive and inferential statistics including Chi-square tests applied, considering a p-value  $\leq 0.05$  as statistically significant. Ethical approval was obtained from the Florence Nightingale Higher Institute of Health and Biomedical Sciences (FLENHIHBS), and administrative clearance was secured from the Regional Delegation of Public Health and the Director of Nkwen District Hospital. Participation was voluntary, data confidentiality was ensured, and informed consent was obtained from all participants.

## RESULTS

### Socio-demographic data

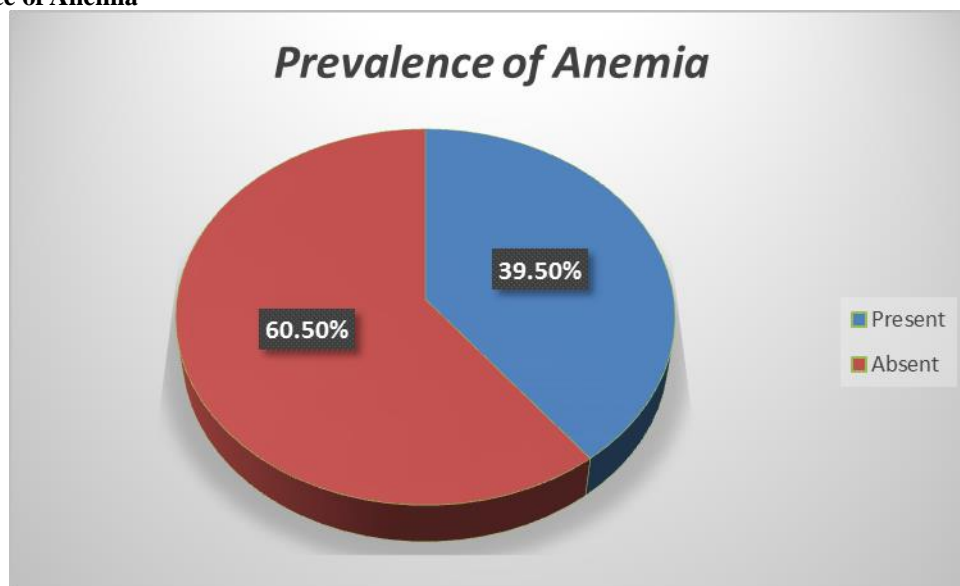
From the information gotten 39.5% (n=30) of participants were in between the ages of 18-24, many of the participants 60.5% (n=46), were married and most

participants, 52.6% (n=40) had a secondary education, while 39.5% (n=30) and 7.9% (6) had a university and primary education respectively. Majority 92.1% (n=70) of the participants were Christians and only 7.9% (n=6) were Muslims (table 1)

**Table 1: Socio-demographic characteristics.**

Variable	Characteristic	Frequency	Percentage (%)
Age	18-24	30	39.5
	25-29	21	27.6
	30-34	15	19.7
	35-40	10	13.2
	<b>Total</b>	<b>76</b>	<b>100</b>
Marital status	Single	30	39.5
	Married	46	60.5
	<b>Total</b>	<b>76</b>	<b>100</b>
Level of Education	Primary	6	7.9
	Secondary	40	52.6
	University	30	39.5
	<b>Total</b>	<b>76</b>	<b>100</b>
Occupations	Housewife	20	26.3
	Civil servant	30	39.5
	Others	26	34.2
	<b>Total</b>	<b>76</b>	<b>100</b>
Religion	Christian	70	92.1
	Muslim	6	7.9
	<b>Total</b>	<b>76</b>	<b>100</b>

### 4.2 Prevalence of Anemia



**Figure 1: prevalence of anemia.**

The prevalence of anemia among pregnant women in Nkwen District hospital was found to be 39.5% (n=30), which is lower than the national average of 50% (Figure 1). The table illustrates the prevalence of anemia among the study population with respect to some of the demographic characteristics, the prevalence was highest in pregnant women aged 18-24 with anemia present in 30.2% (n=23) of them, single pregnant women had a higher prevalence 30.2% (n=23) compared to married

women who only had a prevalence of anemia of 9.2% (n=7), the prevalence was notably lower 4% (n=3) in women who had a university education (Table 2)

Table 2: Distribution of respondents based on demographic data.

Variable	Category	Lab results		Total
		Present	Absent	
Age	18-24	23(30.2)	7 (9.2)	30(39.5)
	25-29	4(5.2)	17(22.3)	21(27.7)
	30-34	2(2.6)	13(17.1)	15(19.8)
	35-40	1(1.5)	9(11.9)	10(13)
	<b>Total</b>	<b>30(39.5)</b>	<b>46(60.5)</b>	<b>76(100)</b>
Marital status	Single	23(30.2)	7(9.3)	30(39.5)
	Married	7(9.3)	39(51.3)	46(60.5)
	<b>Total</b>	<b>30(30.5)</b>	<b>46(60.5)</b>	<b>76(100)</b>
Level of education	Primary	5(6.6)	1(1.3)	6(7.8)
	Secondary	22(28.9)	18(23.7)	40(52.7)
	University	3(4)	27(35.5)	30(39.5)
	<b>Total</b>	<b>30(39.5)</b>	<b>46(60.5)</b>	<b>76(100)</b>
Occupation	Housewife	5(6.6)	15(19.8)	20(19.5)
	Civil servant	3(4)	27(35.5)	30(39.5)
	Others	22(28.9)	4(5.2)	26(41)
	<b>Total</b>	<b>30(39.5)</b>	<b>46(60.5)</b>	<b>76(100)</b>
Religion	Christian	25(32.9)	45(59.2)	70(92.1)
	Muslim	5(6.6)	1(1.5)	6(7.9)
	<b>Total</b>	<b>30(39.5)</b>	<b>46(60.5)</b>	<b>76(100)</b>

#### 4.3 Predominant types of anemia

The Chi square analysis at 95% confidence level showed that iron deficiency anemia, folate/Vit B<sub>12</sub> deficiency

anemia and malaria induced anemia are all statistically significant among pregnant women in Nkwen district with P-values <0.001 (Table 3)

Table 3: Distribution of types of Anemia.

Variable	Category	Present	Absent	Total	Chi square(x <sup>2</sup> )	P-value
Iron deficiency	Less than 1 month	13	3	16	20.221	<0.001*
	1-3 months	14	20	34		
	3+ months	3	23	26		
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>		
Folic acid and Vitamin B <sub>12</sub> deficiency	Absent	4	36	40	30.076	<0.001*
	Mild	21	9	30		
	Severe	5	1	6		
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>		
Malaria test	Positive	13	3	16	14.804	<0.001*
	Negative	17	43	60		
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>		

\*-Statistically significant at 0.05, type of anemia gotten from classification from red cell indices provided by MCH, MCV and MCHC values from the FBC results.

#### Distribution of prevalence in pregnant women attending ANC based on gestational age

Out of 76 participants, 22 participants who had gestational age 1-12 weeks where anemic, all the 76 women had done a blood test for anemia and 30 of them

were anemic. Consumption of vegetables and beans apparently played a vital role in preventing anemia as evidenced by reduced number of anemic women in those who consumed it daily (Table 4)

Table 4: Distribution of prevalence based on gestational age and other factors.

Variable	Category	Lab Results		Total
		Present	Absent	
Gestational age(weeks)	1-12	22	4	26
	13-27	6	24	30
	28-40	2	18	20
	<b>Total</b>	<b>28</b>	<b>48</b>	<b>76</b>
Done blood test for anemia	Yes	30	46	76

	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>
Red meat consumption (per week)	Never	18	3	21
	1-3 times	9	16	25
	4-6 times	3	27	30
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>
Vegetable consumption (per week)	1-3 times	19	3	22
	4-6 times	7	7	14
	Daily	4	36	40
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>
Beans consumption (per week)	1-3 times	27	13	40
	4-6 times	1	15	16
	Daily	2	18	20
	<b>Total</b>	<b>30</b>	<b>46</b>	<b>76</b>

## DISCUSSION

Our study revealed a significant prevalence of anemia (39.5%) among pregnant women attending antenatal clinics at Nkwen District Hospital Bamenda. This finding highlights the persistent burden of anemia in this vulnerable population and underscores the need for sustained and strengthened public health interventions. This prevalence aligns with findings from several sub-Saharan African countries. Taye N.<sup>[33]</sup> reported a prevalence of 41.2% in a rural Ethiopian community, suggesting similar underlying challenges in healthcare access and nutrition. Similarly, Olamide F.<sup>[34]</sup> found a prevalence of 37.8% among pregnant women in Nigeria, reinforcing the widespread regional burden. The World Health Organization (WHO) classifies anemia prevalence of 40% or more in pregnant women as a severe public health problem.<sup>[35]</sup> However, anemia prevalence varies by region and setting. For instance, Mbatha N.<sup>[36]</sup> reported a significantly lower prevalence of 25% in urban South Africa, which may be attributed to better access to health services, more diverse diets, and reduced malaria exposure. These differences underscore the localized nature of anemia and the necessity for context-specific interventions to effectively reduce the burden.

Our investigation into the etiological classification of anemia revealed that iron deficiency anemia (IDA) was the predominant form, accounting for 18% of cases. This is in line with global evidence that identifies IDA as the most common cause of anemia in pregnancy due to increased iron requirements, poor dietary intake, and chronic blood loss.<sup>[37,38]</sup> Studies have consistently shown that iron supplementation is essential during pregnancy to reduce the risk of maternal anemia and adverse birth outcomes.<sup>[39]</sup> In addition, 8% of the cases were attributed to Vitamin B12 deficiency, a finding supported by earlier studies in West and Central Africa.<sup>[40]</sup> This may be linked to poor dietary intake of animal-source foods, common in low-income communities. A smaller proportion of anemia cases were due to folate deficiency and anemia of chronic disease (ACD), both of which may be associated with persistent infections such as malaria, HIV, and chronic inflammatory states.<sup>[41,42]</sup> These findings point to the need for broader nutritional screening and the

inclusion of multiple micronutrient supplements, particularly in high-risk populations.

Our findings also indicated significant variation in anemia prevalence by gestational trimester, with the highest rates observed in the second trimester. This pattern corresponds to the physiological hemodilution phase, characterized by rapid plasma volume expansion and increased fetal iron demands.<sup>[43]</sup> Previous studies have noted that hemoglobin concentrations tend to decline in the second trimester due to these physiological changes, making this a critical period for screening and intervention.<sup>[44]</sup> The observed decline in anemia prevalence in the third trimester may be attributed to increased adherence to iron and folic acid supplementation as well as improved antenatal care follow-up in later pregnancy stages.<sup>[45]</sup> Conversely, the relatively lower prevalence in the first trimester might reflect delayed ANC enrollment or lower iron demands early in gestation. These gestational trends emphasize the importance of trimester-specific strategies in anemia prevention and management.

These findings have multiple implications for public health programming. First, they highlight the urgent need for comprehensive strategies to prevent and manage anemia in pregnancy, particularly during the second trimester. Second, they emphasize the importance of addressing the underlying determinants of anemia, such as nutritional deficiencies, parasitic infections, and chronic illnesses. Third, the results point to the importance of improving early antenatal care attendance and compliance with supplementation protocols. Fourth, they support WHO recommendations on universal iron and folic acid supplementation for pregnant women.<sup>[46]</sup> Lastly, further operational research is needed to identify effective community-level strategies to enhance maternal nutrition, improve supplementation adherence, and integrate anemia prevention into routine ANC services.

## CONCLUSION

In summary, this study revealed a significant prevalence of anemia among pregnant women, with 39.5% affected. This finding underscores the ongoing public health challenge and highlights the need for continued efforts in prevention, diagnosis, and management.



Furthermore, we identified a diverse range of anemia types contributing to this overall prevalence 18% of anemia cases was attributed to iron deficiency anemia (IDA), consistent with its status as the most common cause globally. 8% was classified as, vitamin B12 deficiency, reflecting the impact of chronic inflammation or underlying medical conditions. 4% was Folate Deficiency, emphasizing the importance of considering various etiologies in the diagnostic workup.

Finally, this study demonstrated that anemia prevalence varies across gestational age. We observed the highest rates during the Second Trimester which likely reflects the increased physiological demands of pregnancy and the challenges of meeting iron requirements at this critical stage of fetal development.

#### Author's contribution

LHS, Study conception and design, writing of the manuscript; KIA, Data collection and critical revision of the manuscript; LHS/KIA, Study design, supervision of data collection and critical revision of manuscript; LHS/KIA, Data analysis and critical revision of manuscript; DMCW/CPN/NVE, Study design, acquisition and interpretation of data, critical revision of manuscript; NVE/FEK, Study conception and design, supervision of data collection and critical revision of manuscript. All authors gave their consent for publication. All authors read and approved the final manuscript.

#### Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### Competing interests

The authors declare that they have no competing interests.

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