

Prevalence of anaemia among pregnant women attending the antenatal clinic at Bor State Referral Hospital

Mark Kuoi Jongkuch Kuoi¹ and Shalini Ninan Cherian²

Author Affiliation:

1. Jonglei Health Sciences Institute, Bor, South Sudan
2. Principal of Jonglei Health Sciences Institute (2019-2024), Bor, South Sudan.

Correspondence:

Shalini Cherian
principal.jhsi@gmail.com

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ABSTRACT

Introduction: Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal, leading to insufficient oxygen being delivered to organs and tissues. It mainly affects women and children and is a public health concern affecting particularly people in low- and middle-income countries (LMICs). The most common causes of anaemia in pregnancy are iron deficiency and haemoglobinopathy. In 2019, the WHO estimated the prevalence of anaemia in pregnant women in South Sudan to be 40%. The objectives of this study were to determine the prevalence of anaemia among pregnant women attending the antenatal clinic (ANC) at Bor State Hospital and the associated risks for anaemia.

Method: A cross-sectional hospital-based study was conducted in the ANC between August 17 and September 23, 2022. The haemoglobin level of each participant was measured by the researcher using the HemoCue Hb 301 device. A structured questionnaire was used to collect demographic details, clinical characteristics, and data related to risk factors.

Results: A total of 384 pregnant women attending the ANC were enrolled. The prevalence of anaemia using the WHO definition was 45.3% (95% Confidence Interval 40.3% - 50.3%). 25% with anaemia had severe or very severe anaemia, 43% had moderate anaemia, and 33% had mild anaemia, based on the WHO/CDC classification. The clinical characteristics associated with anaemia in pregnancy were teenage pregnancy, grand-multigravidity, and being underweight (BMI). The risk factors found to be significantly associated were 'diet containing meat less than three times in one week', bleeding related to obstetric complications within the previous two years, malaria within one year, and birth interval less than three years.

Conclusion: Anaemia is a significant problem found in 45.3% of pregnant women in Bor, which is very high compared to data available from other East African countries. The study identified risk factors and patient characteristics associated with anaemia, which require validation in further research. All stakeholders should be involved in preventing, identifying, and managing anaemia in pregnancy.

Keywords: anaemia in pregnancy, iron deficiency anaemia, risk factors, predictors, prevention strategy

Introduction

The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) define anaemia differently depending on age, sex, and pregnancy status. Anaemia in pregnancy is defined as haemoglobin of less than 11g/dL throughout pregnancy.^[1] This may be further divided into mild (10-10.9g/dL), moderate (7-9.9g/dL), and severe anaemia (<7g/dL).^[2]

In 2015, the WHO estimated that globally, 36.6% (32.4 million) pregnant women were anaemic. Southeast Asia and Africa share 48.7% and 46.3% respectively, of the anaemia burden.^[3,4] A Lancet series (2013) on maternal and child undernutrition reported that 37% (32 million) of pregnant women aged 15–49 years were affected by anaemia, with sub-Saharan Africa carrying the highest burden at 56%.^[4]

Anaemia in pregnancy has serious consequences for the mother and the baby: premature births, low birth weight, foetal cognitive impairment, and death.^[5] South Sudan has one of the highest maternal mortality ratios at 1,223 per 100,000 live births.^[6] Globally, approximately 23% of maternal deaths are caused indirectly by anaemia, with the majority of deaths occurring in low and middle-income countries (LMICs).^[7] Most deaths occur during delivery and postpartum. Anaemia aggravates the sequelae of postpartum haemorrhage and predisposes to puerperal infection, both of which are leading causes of mortality in LMICs.

A contributor to anaemia in South Sudan is malaria, and the whole population of Bor is vulnerable.

Data on prevalence and determinants of anaemia during pregnancy in South Sudan are scarce. Therefore, this study aimed to address this issue.

Method

The research proposal was approved by Jonglei Health Sciences Institute, Research Ethics Board, and access to the antenatal clinic (ANC), Bor State Referral Hospital (BSRH) was granted.

A cross-sectional study was designed to determine the prevalence of anaemia in pregnancy, using the WHO definition of <11 g/dL, among women who attended ANC. The colorimetric method to estimate haemoglobin used the HemoCue Hb 301 device (Angelholm, Sweden). HemoCue Hb 301 machine estimates haemoglobin using the hemiglobincyanide method, using two wavelengths

506 and 880 nm for spectrometric analysis. It has a sensitivity of 75%-91% and a specificity of 88%-100%.^[8]

Bor State Referral Hospital is a public hospital in Jonglei State and one of two teaching hospitals in greater Jonglei. It is the state's major referral centre, serving 11 counties and a population of over 1 million. It receives patients from neighbouring states, the Lake State, the Pibor administrative area, and a few foreigners. The hospital handles about 1,000 deliveries annually. At the ANC, on average, 30 women are seen each day, each from Monday through Friday.

The sample size for this study was determined by the available statistics in the country in 2022. Data from the World Bank estimates in 2019 found that the prevalence of anaemia among pregnant women in South Sudan was 40%.^[9] The sample size in our study was determined, with a possible 5% error and a 95% CI, as 369 (adjusted to 385 to account for possible wastage of sampling kits).

The study variables were the prevalence of anaemia (< 11 g/dL) and the assessment of risk factors and clinical characteristics for anaemia, determined by administering a structured questionnaire after a face-to-face interview with the women.

Results

A total of 384 pregnant women attending ANC between August 17 and September 23, 2022, were randomly selected. Table 1 shows the socio-demographic details.

Prevalence of anaemia

Table 2 shows that the prevalence of anaemia was 45.3% (95% Confidence Limits: 40.3% - 50.3%).

The pregnant women found with anaemia were categorized into mild (10-11 g/dL), moderate (7- 9.9 g/dL), severe (< 7 g/dL), and very severe (< 4 g/dL). (Table 3).

Clinical characteristics of pregnant women and prevalence of anaemia

The prevalence of anaemia in pregnant women with any of four clinical characteristics namely teenage pregnancy, trimester of pregnancy, multi-parity and underweight, as assessed by body mass index (BMI) of less than 18.5 were evaluated (Table 4); 52.7% of those aged 15-19 years, 59.7% of grand multigravida women and 67.5% of underweight women were anaemic. There was an association with the second trimester, as it is physiologically common at this stage.

Table 1. Demographic details of study population N=384

Variable	n (%)
Age (years)	
15-19	74 (19.3)
20-34	201 (52.3)
35-45	109 (28.4)
Parity	
Primigravida	129 (33.6)
Multigravida	178 (46.4)
Grand multigravida	77 (20.1)
Occupation	
Farmers	120 (31.3)
Hairdressers	32 (8.3)
Fish sellers	89 (23.2)
Housewives	143 (37.2)
Marital status	
Married	350 (91.2)
Widowed	34 (8.8)
Trimester at time of study	
First	178 (46.4)
Second	151 (39.3)
Third	55 (14.3)

Table 2. Prevalence of anaemia in pregnant women attending the ANC clinic

Key Variable	Anaemia	95 % Confidence Intervals	
	n (%)	LL	UL
Anaemia	174 (45.3)	40.3%	50.3%

Table 3. Severity of anaemia

Variable	n (%)
Mild anaemia (10-10.9 g/dL)	57 (33)
Moderate anaemia (7.1-9.9 g/dL)	74 (43)
Severe anaemia (4.1-7 g/dL)	38 (22)
Very severe anaemia (<4 g/dL)	5 (3)

As shown in Table 4, when the test for significance using the prevalence ratio was used, teenage pregnancy, grand multigravida, and underweight (BMI) were significantly associated with anaemia. The first trimester of pregnancy

was not significantly associated with anaemia. The second trimester of pregnancy was significantly associated with anaemia, as there are physiological changes leading to haemodilution.

Risk factors and prevalence of anaemia

Five risk factors for anaemia were considered, namely, diet (meat less than thrice weekly), excessive bleeding within the last two years, consuming iron supplements for less than 120 days, having had malaria within the year, and a birth interval of less than three years (Table 5 and bivariate analysis for significance).

There were no vegetarians; all consumed some form of meat. Two hundred (52.1%) women had a history of unusual or excessive bleeding within the last two years. Of which none had bleeding haemorrhoids but 49 (28.2%) complained of menorrhagia, 23 (13.2%) gave a history of a miscarriage and 56 (32.2%) of antepartum or postpartum haemorrhage within two years before current pregnancy; 134 (34.9%) had not had any iron supplements during the current pregnancy and 251 (65.4%) had less than 120 days of iron supplements. At least one malaria attack was experienced by 233 (60.7%) in the previous year. Out of the women who had had malaria, 27 women (11.6%) had had five or more episodes of malaria in the previous year. 129 women were pregnant for the first time (primigravida). Of the remaining 255 women, 200 (78.4%) had a birth interval of less than 3 years between the current and previous pregnancies.

Discussion

Prevalence of anaemia in pregnant women

This is the only reported study from South Sudan to have assessed the prevalence of anaemia in pregnancy using haemoglobin assessment. The prevalence of anaemia was high at 45.3% (95% Confidence Interval: 40.3 – 50.3). The WHO considers anaemia a severe public health problem if the prevalence is $\geq 40\%$.^[2] A study of pregnant women from South Sudan in a refugee/returnee camp in Western Ethiopia found the prevalence of anaemia to be 36%.^[10]

The WHO/World Bank estimates of anaemia in pregnancy in South Sudan in 2019 were 40 %, ^[9] which is very close to our finding. However, a recent review^[11] quotes the prevalence of anaemia in pregnancy in South Sudan at 60-61% but does not refer precisely to the population sources. The prevalence of anaemia among pregnant women in East African countries ranges from 23.36% in Rwanda to 57.10% in Tanzania.^[12]

Risk factors for anaemia in pregnancy

The study also examined predictors and risk factors that may lead to anaemia in pregnancy. The predictors and risk factors were those already known to cause anaemia. A study in Ghana found that low education level, number of pregnancies, and number of children a woman had were significant determinants of anaemia during pregnancy.^[13]

Teenage pregnancy, low BMI, and grand multiparity were found to be associated with anaemia in this study.

Since its independence in 2011, South Sudan has struggled economically, leading to food shortages among other calamities. Recent reports by the UN state that 7.7 million people face food scarcity, which is nearly 50% of the population.^[14] Reasons contributing to this are climate change and the recent war in neighbouring Sudan.^[15] Many children and women are adversely affected by this, giving rise to malnutrition and probably anaemia. This study found that low BMI and a low-iron diet predict anaemia in pregnancy.

Teenagers are generally prone to anaemia because their growth spurt increases iron requirements.^[16] Also, South Sudan has one of the highest rates of child marriage, with more than half the girls being married off at or before 18 years of age.^[17]

Excessive bleeding within the previous two years, having a diet low in iron and its enhancers (meat), attacks of malaria in the previous year, and a birth interval of less than three years were included in the study and found to be significantly associated with anaemia. All these conditions increase the demand for iron.

South Sudan has a very high burden of malaria, with the 2019 Integrated Disease Surveillance and Response report of the WHO stating that 66.8% of outpatient morbidity and 50% of mortality are due to malaria.^[18]

This study found that teenage pregnancy, multiparity, and low weight (BMI) were predictors of anaemia with low dietary iron intake, excessive bleeding within two years, malaria within one year, and a birth interval of less than three years to be significantly associated with anaemia in pregnancy.

Conclusion

The study was a preliminary investigation to estimate the prevalence of anaemia in pregnancy and identify significant risk factors. The World Health Assembly has set a goal of reducing anaemia in pregnancy by 50% between 2012 and 2025. With limited data on whether South Sudan is on track to reach this goal, this study in Bor in 2022 aimed to determine the prevalence and risk factors.

The prevalence of anaemia in pregnancy in this study of 45.3% is higher than previous estimates. In a resource-constrained environment such as South Sudan, routine haemoglobin testing is not performed in ANC clinics. The risk factors identified as statistically significant in this study should be considered predictors of anaemia. Midwives and other healthcare providers in ANCs should be aware of these predictors and provide targeted testing and treatment with iron (120-180 mg of elemental iron per day).

Table 4. Clinical characteristics associated with anaemia in pregnancy

Characteristic	Prevalence	Prevalence Ratio
Teenage pregnancy	52.7%	1.2
First trimester	44.9%	0.98
Second trimester	49.7%	1.17
Grand multi gravida	59.7%	1.43
Under weight (BMI)	67.5%	1.9

Table 5. Risk factors for anaemia in pregnancy

Risk factors	Prevalence	Prevalence ratio	95% CI		Prevalence
			LL	UL	
Dietary habit*	61.3%	1.75	1.4	2.17	<0.0001
Bleeding within two years	64%	2.56	1.96	3.36	<0.0001
No iron or less than 120 days of iron supplements	51%	1.47	1.13	1.92	0.0021
Malaria in the previous year	67.4%	5.98	3.79	9.45	<0.0001
Birth interval <3 years	51.5%	3.54	1.84	6.81	<0.0001

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