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PREVALENCE AND MICROBIOLOGICAL EFFECTS OF ANEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT GENERAL HOSPITAL, NGURU, YOBE STATE, NIGERIA

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ABSTRACT

Anaemia in pregnancy remains a critical global public health issue, basically affecting developing nations and posing significant risks to maternal and fetal health. This research is a hospital-based cross-sectional study conducted in General Hospital Nguru, also referred to as "Asibiti Malam Baba," located in Yobe State, Nigeria. The study examines anaemia among pregnant women attending antenatal care clinic from May 2025 to October 2025. Three hundred pregnant women were enrolled in this study. Data were collected using structured interviewer-administered questionnaire that gathered information on socio-demographic of the patients, characteristics of the Pathogens associated with anaemic Patients and clinical characteristics of the pregnant women. Blood samples were collected to measure haemoglobin and packed cell volume (PCV) levels. The prevalence of 46% was obtained from this study. Data were entered and statistical analysis was performed using SPSS version 21.0 software. Association between variables were done using chi square, and statistical significance were considered at $p < 0.05$. Pregnant women were categorized based on their haematocrit levels: those with a level below 33% were classified as anaemic, while those with levels at 33% and above were considered non-anaemic. Our study revealed a high prevalence (46%) of anaemia in pregnant women and there is a need for more health intervention which including health education on the causes of anemia and its risk factors.

Keywords: Pregnant women, prevalence, anaemia, haemoglobin, fetal health.

INTRODUCTION

Anaemia poses a significant public health challenge worldwide, especially during pregnancy. It is characterised by a decrease in haemoglobin levels in the blood that are insufficient for a person's age, sex, and residency (Kassebaum *et al.*, 2014). The World Health Organization (WHO, 2021) defines anaemia in pregnancy as a haemoglobin level below 11 g/dl. The physiological demands of pregnancy, such as increased plasma volume and the nutritional needs of the fetus, raise a woman's risk of developing anaemia.

This condition is linked to higher chances of maternal mortality, preterm birth, low birth weight, and perinatal mortality (Khan *et al.*, 2020). The prevalence of anaemia among pregnant women is staggeringly high, particularly in low- and middle-income countries (LMICs), 23% and 8.3% respectively (Khan, and Sharma, 2020). According to the WHO (2021), 36.5% of pregnant women worldwide were anaemic, translating to over 32 million women. The severity is highest in Africa, with 46.3% prevalence, and Southeast Asia, at 45.7%, compared to Europe, at 25.8%, and North America, at 25% (Culpepper *et al.*, 2022). Prevalence rates are strongly correlated with poverty, lack of access to nutritious food, inadequate antenatal care, and high rates of infectious diseases. For instance, studies from specific regions report alarming rates: over 50% in India and Pakistan, 57% in Nigeria, and up to 48% in Tanzania (World Bank, 2021).

In Nigeria, the causes of anaemia are multifaceted and include nutritional deficiencies, parasitic infections such as malaria and hookworm, haemoglobinopathies like sickle cell disease, as well as HIV infection. These causes are frequently preventable; yet, societal factors, such as socioeconomic deprivation contribute significantly to the issue (Kumar *et al.*, 2019). Women's limited access to resources and authority over their health decisions often exacerbates maternal anaemia, (Onyedibe *et al.*, 2023). The relationship between infection and anaemia is intricate, with both direct and indirect links. Direct causes include parasites, such as those responsible for malaria, which can lead to anaemia through several mechanisms, including the destruction of red blood cells, impaired production of new red blood cells, and sequestration effects in the spleen (Higgins *et al.*, 2017). Malaria is notably one of the most significant infectious agents causing anaemia, especially in endemic regions (Abubakar *et al.*, 2023).

On an indirect level, infections like helminths can lead to chronic blood loss; for instance, *Ascaris lumbricoides* competes for vital nutrients such as vitamin A and protein, which are essential for haemoglobin synthesis (Ndyabakira *et al.*, 2021). Additionally, Bacterial Vaginosis (BV) has been connected to an increased risk of obstetric complications like preterm birth and chorioamnionitis. These complications often elevate maternal inflammation and can worsen pre-existing anaemia (Mendola and Liao, 2022). Chronic urinary tract infections (UTIs) can lead to ongoing inflammation, which may elevate

hepcidin levels and result in what is known as "anemia of inflammation" (Ponnusamy and Dutta, 2023). Additionally, Human Immunodeficiency Virus (HIV) affects anaemia through various mechanisms, including the chronic activation of the immune system, direct suppression of bone marrow function, and negative effects from certain antiretroviral medications like zidovudine (Smit and Goetghebuer, 2023). This complex relationship between infections and anaemia underscores the necessity for a comprehensive understanding and effective management strategies. This study seeks to investigate the prevalence and microbiological impact of anaemia among pregnant women attending the antenatal clinic at the general hospital in Nguru, Yobe State, Nigeria.

MATERIALS AND METHODS

Study area

The research was conducted at General Hospital Nguru, also referred to as "Asibiti Malam Baba," located in Yobe State, Nigeria. This hospital serves a wide region, providing care to patients from all ten geopolitical wards within Nguru local government, as well as those from neighboring areas, including Machina and Karasuwa.

Study design

A cross-sectional descriptive study was conducted from May 2025 to October 2025.

Study population

The study population is pregnant women attending the antenatal clinic at General Hospital Nguru, Yobe State, Nigeria

Sampling method

A research study aimed to collect samples from 300 pregnant women attending antenatal care at the general hospital in Nguru, from May 2025 to October 2025. Participants were included consecutively until the target sample size was reached. The collected samples were then transported to the Federal Medical Centre Nguru for haematological and microbiological analyses. Pregnant women who required emergency medical care such as those with pre-eclampsia, eclampsia, HIV, sickle cell disease, multiple gestation, or who had received a blood transfusion in the past four months—were excluded from the study.

Data collection

Participants were assessed using a structured interviewer-administered questionnaire that gathered information on their socio-demographic and clinical characteristics, as well as their use of iron and folic acid supplements, dietary habits, and knowledge about measures to prevent anaemia. Additionally, blood samples were tested, and any samples showing a haemoglobin level below 33% prompted the collection of urine, stool, and vaginal swab samples for microbiological analysis.

Haematological Analysis

The estimation of hemoglobin was performed using the packed cell volume (PCV) method. To collect data for this laboratory test, whole blood was obtained from venipuncture and placed in a sample bottle containing the anticoagulant EDTA. Capillary tubes were filled with the blood via capillary action, with a minimum of two tubes used to ensure balance during centrifugation. After sealing the tubes, they were centrifuged for five minutes. During this process, a distinct column of packed erythrocytes formed at one end of the capillary tube, followed by a small turbid layer known as the buffy coat, and a clear column of

plasma. To estimate haematocrit, the ratio of the packed erythrocytes column to the total length of the sample in the capillary tube was calculated using a graphic reading device. Pregnant women were categorized based on their haematocrit levels: those with a level below 33% were classified as anaemic, while those with levels at 33% and above were considered non-anaemic.

Microbiological Analysis

A midstream urine sample was collected in a sterile container, ensuring proper hygiene to minimize contamination. If the sample was not analyzed immediately, it was preserved by refrigerating it at 4°C for up to 24 hours. Subsequently, 10-25 mL of the sample was transferred to a sterile centrifuge tube and spun at approximately 3000 rpm for 10-15 minutes. After centrifugation, the supernatant was carefully decanted without disturbing the sediment. The remaining sediment was re-suspended, and a smear was prepared for microscopic examination.

RESULTS

Sociodemographic characteristics of the women

Table 1 shows the sociodemographic characteristics of the pregnant women, a total of 300 pregnant women were enrolled in this study and 138 were anaemic as presented in Table 1. The mean age of the respondents was 29.4 years with 5.3 years of S.D. The majority of the mothers 63 (21.0%), had secondary education, 26 (8.7%) had primary education, 27 (9.0 %) were unable to read and write and 22(7.3%) acquired tertiary education, 36(12.0 %) were employed while 102 (34.0 %) were not employed.

Clinical Characteristics of the Patients

Table 2 present the results of clinical characteristics of the patients, there were 72 (24.0%) pregnant women without miscarriage that were anaemic, 28 (9.3%) had one miscarriage, 10 (3.3%) had two miscarriage and 5 (1.7%) had more than three miscarriage. There were 34 (11.3%) women in first trimester, 49 (16.3%) women in second trimester and 55 (18.3%) in third trimester that were anaemic. There were 79 (26.3%) women that had previous cesarean section and 59 (19.7%) women had no previous cesarean sections that were anaemic.

Characteristics of Pathogens of the Patients Associated with anaemia

Table 3 present the results of Pathogens associated with Patients with anaemia, there were 138 (46.0%) pregnant women with malaria parasite that were anaemic and 162(54.0%) that are non-anaemic. Urine microscopy that were anaemic showed 35(11.7%) having pus cells, 26(8.6%) have epithelia cells, 25(8.3%) had erythrocyte, 15(5.0%) having crystals and pregnant women having cysts were 37(12.3%). For stool microscopy that were anaemic; 36(12.0%) having cyst/eggs, 25(8.3%) have erythrocyte, 56(18.7%) had protozoa and 53(17.7%) having helminthes.

Table 1: Sociodemographic characteristics of the pregnant women

Variables		Total (%)	Anaemic (%)	Non-Anaemic (%)	X ²	P-value
Age	<20	5 (1.7)	3 (1.0)	2 (0.7)	46.4741	0.00001
	20-25	56 (18.7)	38 (12.7)	18 (6.0)		
	26-30	103(34.3)	27 (9.0)	76 (25.3)		
	31-35	85 (28.3)	32 (10.7)	53 (17.6)		
	>35	51 (17.0)	38 (12.7)	13 (4.3)		
Level of Education	None	68 (22.7)	27 (9.0)	41 (13.7)	16.0624	0.0011
	Primary	49 (16.3)	26 (8.7)	23 (7.6)		
	Secondary	109 (36.3)	63 (21.0)	46 (15.3)		
	Tertiary	74 (24.7)	22(7.3)	52 (17.4)		
Employment Status	Employed	98 (32.7)	36 (12.0)	62 (20.7)	5.03	0.0249
	Unemployed	202 (67.3)	102(34.0)	100 (33.3)		

Table 2: Clinical Characteristics of the Patients

Variables		Total (%)	Anaemic (%)	Non-Anaemic (%)	X ²	P-value
Parity	0	98 (32.7)	42 (14.0)	56 (18.7)	15.113	0.00447
	1	83 (27.7)	36 (12.0)	47 (15.7)		
	2	58(19.3)	20 (6.7)	38 (12.6)		
	3	42 (14.0)	25 (8.3)	17 (5.7)		
	>4	19 (6.3)	15 (5.0)	4 (1.3)		
Miscarriage	0	196 (65.3)	72 (24.0)	124 (41.3)	3.4941	0.32153
	1	72 (24.1)	28 (9.3)	44 (14.8)		
	2	25 (8.3)	10 (3.3)	15 (5.0)		

	>3	7 (2.3)	5 (1.7)	2 (0.6)		
Gestational Trimester	First	42 (14.0)	34 (11.3)	8 (2.7)	25.4037	0.00001
	Second	110 (36.7)	49(16.3)	61 (20.4)		
	Third	148 (49.3)	55(18.3)	93 (31.0)		
Previous cesarean Section	Yes	102 (34.0)	79 (26.3)	23 (7.7)	61.5422	0.00001
	No	198 (66.0)	59 (19.7)	139 (46.3)		

Table 3: Characteristics of Pathogens of the Patients Associated with anaemia

Variables		Total (%)	Anaemic (%)	Non-Anaemic (%)	X ²	P-value
Malaria Parasite	<i>Plasmodium spp</i>	300 (100)	138 (46.0)	162 (54.0)		
Urine Microscopy	Pus cells	47 (15.7)	35 (11.7)	12(12.0)	5.3455	0.25365
	Epithelia cells	46 (15.3)	26 (8.6)	20(6.6)		
	Erythrocyte	55 (18.3)	25 (8.3)	30(10.0)		
	Crystals	45 (15.0)	15 (5.0)	30(10.0)		
	Parasite/ cysts	107 (35.6)	37 (12.3)	70(23.3)		
Stool Microscopy	Cysts/Eggs	85 (28.3)	36 (12.0)	49(16.3)	104.1938	0.00001
	Erythrocyte	35(11.7)	25(8.3)	10(3.3)		
	Protozoa	109 (36.3)	56 (18.7)	53(17.7)		
	Helminthes	71 (23.7)	21 (7.0)	53(17.7)		

DISCUSSION

Anaemia among women during pregnancy is a major public health concern, so the diagnosis of anaemia during booking among pregnant women is of paramount important so as to avoid complicaton of anaemia

which leads to high maternal and perinatal morbidity and mortality (Sabina *et al.*, 2015). Data obtained from the literature in developing countries showed prevalence of anaemia in pregnancy ranging from 35.0% to 75.0% (Omigbodun, 2004). The prevalence of anaemia in this study was 46% which is lower when compared to findings from other studies in Nigeria (Olujimi *et al.*, 2014).

The high prevalence of anaemia in this study may be probably related to the low socioeconomic status of the pregnant women, which may have direct impact on their nutritional status and health Bukar *et al.* (2009). The prevalence of anaemia in this study is slightly lower than the 56.0% quoted by WHO for prevalence of anaemia in Africa based on the available 1988 record (Komolafe *et al.*, 2005) implying that even after 27 years, the situation was slightly improved. Also, the prevalence of anemia observed in this study was not in agreement with studies done in Gilgel gibie dam area (53.9%) and Shalla wereda (36.6%) (Obse *et al.*, 2013). This difference might result from the sociodemographic difference of the study populations and difference in time of studies. The mean PCV in this study was below 33%, by WHO standard, this signifies anaemia.

It is on record that anaemia in pregnancy increases with rising parity, probably due to repeated drain on iron stores (Adinma *et al.*, 2002). However, this study like those of other researchers (Aimakhu and Olayemi, 2003; Buseri *et al.*, 2008; Olujimi *et al.*, 2014) has revealed an inverse relationship between parity and anaemia as the percentage of anaemic pregnant women decreased as parity increased. The possible reasons for this observation may be due to increased awareness of the value of drugs and good diet with increasing parity as well as increased interaction with other pregnant women at the clinic (Aimakhu and Olayemi, 2003; Buseri *et al.*, 2008). The effect of these to some extent may neutralize those of rising parity. Another possible reason is that women of higher parity registered for ante natal care earlier in gestation, when iron requirements are still low compared to women of lower parity who booked later in pregnancy when iron requirements are much higher, thus predisposing them to anaemia.

The percentage of anaemia was lowest among women that registered for antenatal care in the first trimester. This finding agrees with findings of Komolafe *et al.* (2005) in Ilesha and Bukar *et al.* (2009) in Gombe. This may be due to the fact that, majority of pregnant women registered in the second and third trimester of pregnancy.

High level of anaemia recorded among women with secondary education may be due to the fact that majority of the women were unemployed and low socioeconomic status of the women may have a significant impact on their nutritional status and health. Women with low socioeconomic status may consume diets that are low in micronutrients, animal protein, and vitamins but high in carbohydrate and phytates which interfere with intestinal uptake of iron and other trace minerals such as zinc and calcium (VanderJagt *et al.*, 2007). This indicates that economic empowerment of women would play a very important role in reducing the prevalence of anaemia in our surrounding.

CONCLUSION

This study revealed that anaemia in pregnancy is still highly prevalent in our society (46%). The study has also revealed that the most important risk factors for anaemia in pregnancy in this study area are socioeconomic status of women, clinical characteristics of the patients and characteristics of pathogens of anaemic patients of the pregnant women. Hence, there is a need for public health campaigns to create awareness about the importance of early register for antenatal care; this will provide opportunity for early detection and treatment of anaemia before complication that may leads to death.

Recommendation

The socioeconomic situation of the women should be improved by economically empowering them through provision of salary paying jobs by government since majority of these women are educated. Also efforts should be made towards malaria prevention and treatment by the government.

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