Prevalence and factors associated with anaemia among pregnant women attending the Antenatal Care Clinic of UDUTH, Sokoto, Nigeria

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ABSTRACT

Background: Pregnancy-related anaemia is a significant global public health concern, especially in underdeveloped nations where it significantly increases maternal morbidity and mortality. **Aim**: This study aimed to determine the prevalence and factors associated with anaemia among pregnant women attending the Antenatal Care Clinic of UDUTH, Sokoto, Nigeria. **Materials and Methods:** A facility-based cross-sectional study was conducted among 297pregnant women selected by systematic sampling technique. A structured interviewer-administered questionnaire was used to obtain information on the research variables, while the participants' haemoglobin concentration was extracted from their case files. Data were analyzed using IBM SPSS version 25 statistical computer software package. **Results**: About two-thirds, 186 (62.6%) of the 297 pregnant women were anaemic. Of these, 116 (62.4%) had mild anaemia, while 70 (37.6%) had moderate anaemia. The factors associated with anaemia were not being employed, multiple gestations, being in the early stages of pregnancy, not using iron supplements, not having complete doses of intermittent preventive treatment for malaria, not sleeping under insecticide-treated nets consistently, and recent treatment for malaria. **Conclusion**: This study showed a high prevalence of anaemia among pregnant women attending the antenatal clinic of UDUTH Sokoto, Nigeria, and it was associated with several sociodemographic and obstetric factors. The findings of this study underscore the need for a multipronged approach to the prevention of anaemia among pregnant women, including women empowerment to facilitate access to good nutrition, iron supplementation, intermittent preventive treatment of malaria (IPTp-SP), and promotion of consistent use of insecticides treated nets (ITNs).

Keywords: Anaemia, prevalence, associated factors, pregnant women

INTRODUCTION

Pregnancy-related anaemia is a significant global public health concern, especially in underdeveloped nations, where it significantly increases maternal morbidity and mortality. Additionally, it raises the risk of miscarriage, preterm birth, stillbirth, low birth weight, and ultimately perinatal mortality.[1,2]Iron deficiency, which results from a protracted negative iron balance, accounts for 50% of anemia in women and 75% in women of reproductive age worldwide.[3] The lack of adequate dietary iron intake or absorption, the increased need for iron during pregnancy, and increased iron losses due to menstruation, worm infestation, and infections are all possible causes of the negative iron balance.[4]

Anemia in pregnant women continues to be one of the most intractable major public health issues, particularly in developing nations, because of a variety of sociocultural issues like a lack of essential nutrients like iron, folate, vitamin B12, C, and A, as well as a lack of awareness, poor dietary practices, parasitic infestations, blood loss, the Human Immunodeficiency Virus, tuberculosis, and malaria, as well as too early pregnancies, high parity, poor uptake of ITNs among others.[5-7]Increased maternal age, reduced number of antenatal care visits, residing in rural areas, intestinal parasites, malaria parasitaemia, and being a primigravida are associated with anaemia in pregnancy.[8]Around the world, 500 million women of reproductive age suffer from anaemia. In 2011, 29% of nonpregnant women and 38% of pregnant women aged 15–49 years were anaemic worldwide, but the prevalence was highest in South Asia and Central and West Africa.[5]

About 38.9% to 48.7% of pregnant women in South-East Asia, the Eastern Mediterranean, and Africa were anaemic.[3] In India, the prevalence varies from 65% to 75%,[9] while studies across Nigeria reported anaemia prevalence rates ranging from 24.5% to 76.5%.[10-12] The adverse effects of anaemia during pregnancy include general fatigue, fetal anaemia, low birth weight, preterm delivery, increased risk of postpartum haemorrhage, intrauterine growth restriction, perinatal mortality stillbirth, reduced work capacity, low infection tolerance, shortness of breath, and decreased physical and mental performance. According to estimates, anaemia causes more than 115,000 maternal fatalities annually, or 20% of all maternal deaths, and 591,000 perinatal deaths worldwide.[13-15]

The World Health Organization (WHO) advises daily iron and folic acid supplementation for pregnant women as part of antenatal care to prevent anaemia in pregnancy and intermittent iron and folic acid supplementation for menstruating women living in areas where the prevalence of anaemia is 20% or higher. It is believed that iron supplementation, routine deworming, consistent use of insecticide-treated bed nets, nutritional counselling, food fortification, iron and folic acid supplements, raising awareness of anaemia among pregnant women during their antenatal visits, raising awareness of the underlying causes and complications, and treating anaemia are vital to preventing anaemia and its complications.[16,17] In 2012, the World Health Assembly announced the second global nutrition objective, which included a goal of reducing anaemia among women of reproductive age by 50% by 2025.[18] It is believed that understanding the severity of anaemia and its contributing factors can help prevent harmful fetal and mother consequences. This study aimed to determine the prevalence and factors associated with anaemia among pregnant women attending the Antenatal Care Clinic of UDUTH, Sokoto, Nigeria.

MATERIALS AND METHODS
Study Design, Population and Area
A facility-based cross-sectional study was conducted among pregnant women attending the Antenatal Care Clinic of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria, in June and July 2021. The hospital has a bed capacity of 650 and serves the inhabitants of Sokoto state, neighbouring Kebbi and Zamfara states, and people from the neighbouring Niger Republic. All apparently healthy pregnant women attending the hospital's antenatal care clinic who fulfilled the inclusion criteria and gave consent to participate in the study were considered eligible and enrolled in the study. Those who were known sickle cell disease patients, and those with bleeding disorders were excluded from the study.

Sample Size Estimation and Sampling Technique
The sample size was estimated at 297 using the formula for calculating the sample size for proportion in cross-sectional studies,[19] a 75.7% prevalence of anaemia in pregnancy from a previous study,[20] a 5% margin of error, and an anticipated 95% response rate. The eligible participants were selected by systematic sampling technique; One of five patients presenting consecutively at the clinic was enrolled on the study over an eight clinic-day period until the required sample size was obtained.

Data Collection
A structured interviewer-administered questionnaire was used to obtain information on the sociodemographic characteristics of the study participants and the factors associated with anaemia among them. The questionnaire was adapted from the instrument used in previous studies,[2,5,8,11,20] and it was pretested on 30 pregnant women attending ANC in another tertiary health facility in Sokoto metropolis. The necessary adjustments were made based on the observations made during the pretesting. Information on the participants' haemoglobin concentration was extracted from their case files.

Operational definition of terms
Anaemia in pregnancy was defined based on the World Health Organizations' criteria as haemoglobin levels less than 11 grams per deciliter. It was categorized into mild anaemia (haemoglobin levels between 9 and 10.9 g/dl), moderate anaemia (haemoglobin levels between 7-8.9 g/dl), and severe anaemia (haemoglobin levels between 7 and 4.5 g/dl).[21]

Data Analysis
Data were analyzed using IBM SPSS version 25 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies

and percentages. Frequency distribution tables were constructed, and cross-tabulations were done to examine the relationship between categorical variables. Chi-square analysis was used to determine the factors that were associated with anaemia. All levels of significance were set at $p < 0.05$.

Ethical Consideration
Institutional ethical clearance was obtained from the Ethical Committee of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria. Permission to administer the questionnaires was obtained from the Head of Obstetrics and Gynecology Department, and informed consent was obtained from the participants before commencing questionnaire administration.

RESULTS
Sociodemographic characteristics of respondents
All the 297 questionnaires administered were filled, returned and analyzed, giving a response rate of 100%. The respondents' ages ranged from 18 to 42 years (mean = 27.76 ±4.89). A larger proportion of the respondents (34.3%) were aged 25-29 years. Almost all 294 (99.0%) of the 297 respondents were married, and most of them (82.2%) were in a monogamous marriage. The majority of the respondents practised Islam as a religion (77.8%), belonged to the Hausa ethnic group (57.2%), and had tertiary education (64.0%). A larger proportion of the respondents (47.8%) were full-time housewives, most of them (96.0%) reside in urban areas, and two-thirds of respondents reported a monthly family income ≥ ₦100,000 (Table 1).

Obstetric and maternal characteristics of respondents
Most of the respondents (91.6%) were aged 18-34 years when they had their first pregnancy, and majority of them (58.6%) were multigravida. Most of the respondents were in the second and third trimesters (86.5%), had single gestation (90.9%) and used iron supplements in the current pregnancy (91.9%). Only about a third of respondents (39.4%) had two or more doses of IPTp-SP (i.e., Intermittent Preventive Treatment for malaria using sulphadoxine+pyrimethamine), while about a quarter of them used insecticides treated nets (ITNs) very often or always (27.3%), and slept under it the night before the survey (26.9%).

The majority of respondents (58.3%) were treated for malaria in the last 1-3 months (Table 2).

Table 1: Sociodemographic characteristics of respondents

Variables	Frequency (%) n = 297
Age group (years)	
≤ 24	82 (27.6)
25-29	102 (34.3)
30-34	84 (28.3)
≥ 35	29 (9.8)
Marital status	
Single	3 (1.0)
Married	294 (99.0)
Type of marriage	
Monogamous	244 (82.2)
Polygamous	53 (17.8)
Religion	
Islam	231 (77.8)
Christianity	66 (22.2)
Tribe	
Hausa	170 (57.2)
Fulani	33 (11.1)
Yoruba	29 (9.8)
Igbo	35 (11.8)
Others (e.g., Egbira)	30 (10.1)
Education level	
Quranic	16 (5.4)
Primary	9 (3.0)
Secondary	82 (27.6)
Tertiary	190 (64.0)
Occupation	
Full time housewife	142 (47.8)
Student	43 (14.5)
Petty trader	40 (13.5)
Office worker	16 (5.4)
Civil servant	40 (13.5)
Professional	9 (3.0)
Artisan	7 (2.4)
Place of residence	
Urban	285 (96.0)
Rural	12 (4.0)
Family income per month	
₦15,000-30,000	7 (2.4)
₦ 31,000-99,000	93 (3.1)
≥ ₦ 100,000	197 (66.5)

Prevalence, pattern and factors associated with anaemia among respondents
About two-thirds, 186 (62.6%) of the 297 pregnant women were anaemic. Of these, 116 (62.4%) had mild anaemia, while 70 (37.6%) had moderate anaemia (Table 3). The proportion of respondents with anaemia was significantly higher ($p < 0.05$) among unemployed respondents (68.8%) as compared to those who were employed (51.4%); and among those with multiple gestations (88.9%) as compared to those with single gestation (60.0%). It reduced significantly ($p < 0.05$)

from 75.0% to 67.4% and 53.9% among those in the 1st, 2nd and 3rd trimesters respectively. It was significantly higher among those who did not use iron supplements (87.5%) as compared to those who used them (60.3%).

Table 2: Obstetric and maternal characteristics of respondents

Variables	Frequency (%) n = 297
Age at first pregnancy (years)	
15-17	23 (7.7)
18-34	272 (91.6)
≥ 35	2 (0.7)
Parity	
Primigravida	97 (32.7)
Multigravida	174 (58.6)
Grandmultipara	26 (8.8)
Duration of current pregnancy	
First trimester	40 (13.5)
Second trimester	129 (43.4)
Third trimester	128 (43.1)
Pregnancy type	
Single gestation	270 (90.9)
Multiple gestation	27 (9.1)
Used Iron Supplement in the current pregnancy	
Yes	273 (91.9)
No	24 (9.1)
Dose(s) of IPTp-SP used in the current pregnancy	
None	67 (22.6)
One dose	113 (38.0)
Two doses	73 (24.6)
≥ 3 doses	44 (14.8)
Use of ITN in the current pregnancy	
Never	106 (35.7)
Occasionally	95 (32.0)
Often	15 (5.1)
Very often	14 (4.7)
Always	67 (22.6)
Slept under ITN last night	
Yes	80 (26.9)
No	217 (73.1)
When last treated for malaria	
Last 1 year	59 (19.9)
Last 6 months	65 (21.9)
Last 3 months	38 (12.8)
Last 2 months	37 (12.5)
Last 1 month	98 (33.0)
History of bleeding in the current pregnancy	
Yes	10 (3.4)
No	287 (96.6)

It was significantly higher among those who took only one or no dose of IPT (72.2%) as compared to those who took two or more doses (47.9%); and among those who never, occasionally or often used ITN (66.7%) as compared to those who used it very often or always (51.9%).

It was also significantly higher among respondents who were treated for malaria 1 to 3 months ago (69.9%) as compared to those who were treated for malaria six months to 1 year ago (52.4%) [Table 4].

Table 3: Prevalence and pattern of anaemia among respondents

Variables	Frequency(%)
Haemoglobin concentration status (n = 297)	
Anaemic	186 (62.6)
Normal	111 (37.4)
Pattern of anaemia (n = 186)	
Mild anaemia	116 (62.4)
Moderate anaemia	70 (37.6)

DISCUSSION

The study assessed the prevalence and factors associated with anaemia among pregnant women attending the Antenatal Care Clinic of UDUTH, Sokoto, Nigeria. The high prevalence of anemia among the respondents in this study (62.6%) could be because most of them were multigravida and grandmultipara and were in the second and third trimesters of pregnancy. The iron requirements in pregnancy are known to increase by 2-3 folds, while the folate requirement increases by 10-20 folds. These physiological demands for iron and folate rise from the second trimester and reach their peak in the third trimester.[22]

The finding of this study provides additional evidence in support of the submissions in the literature on the high burden of anaemia in pregnancy across Nigeria and the other sub-Saharan African countries, in addition to further exposing the wide variation in the prevalence of anaemia across these places with some studies reporting similarly high prevalence rates, while others reported substantially higher or lower prevalence rates. Whereas similarly high anaemia prevalence rates were reported in studies conducted in Ilesha, Nigeria (62.6%)[23] and Niger Delta, Nigeria (69.6%),[24] much higher rates were reported in studies conducted in Bunza, Nigeria (75.7%)[20] and Abeokuta, Nigeria (76.5%),[12] while much lower rates were reported in studies conducted in Port Harcourt, Nigeria (23.2%),[25] Lagos, Nigeria (35.3%),[26] and Warri, Nigeria (37.6%).[27]

Table 4: Factors associated with anaemia among the respondents

Variables	Haemoglobin concentration status		Test of significance
	Anemic Frequency (%)	Normal Frequency (%)	
Age (years)			
≤ 29	123 (66.8)	61 (33.2)	χ^2= 3.682,
≥ 30	63 (55.8)	50 (44.2)	p = 0.055
Marital status			
Single	2 (66.7)	1 (33.3)	χ^2= 0.021,
Married	184 (62.6)	110 (37.4)	p = 0.884,
Type of marriage			
Monogamous	147 (60.2)	97 (39.8)	χ^2= 3.310,
Polygamous	39 (73.6)	14 (26.4)	p < 0.069
Religion			
Islam	150 (64.9)	81 (35.1)	χ^2= 2.367,
Christianity	36 (54.5)	30 (45.5)	p < 0.124
Tribe			
Hausa and Fulani	131 (64.5)	72 (35.5)	χ^2= 0.995,
Other tribes	55 (58.5)	39 (41.5)	p < 0.318
Educational level			
Primary and below	14 (87.5)	2 (12.5)	χ^2= 2.251,
Formal	63 (69.2)	28 (30.8)	p = 0.134
Occupation			
Unemployed	132 (68.8)	60 (31.3)	χ^2= 8.701,
Employed	54 (51.4)	51 (48.6)	p = 0.003*
Place of residence			
Urban	177 (62.1)	108 (37.9)	χ^2= 0.818,
Rural	9 (75.0)	3 (25.0)	p = 0.366
Family income per month			
N99,000 and below	66 (66.0)	34 (34.0)	χ^2= 0.733,
N100,000 and above	120 (60.9)	77 (39.1)	p = 0.392
Pregnancy type			
Single gestation	161 (60.0)	108 (40.0)	χ^2= 8.752,
Multiple gestation	24 (88.9)	3 (11.1)	p < 0.003*
Duration of pregnancy			
1st trimester	30 (75.0)	10 (25.0)	χ^2= 8.053,
2nd trimester	87 (67.4)	42 (32.6)	p < 0.018*
3rd trimester	69 (53.9)	59 (46.1)	
Use Iron supplement			
Yes	169 (60.3)	108 (39.7)	χ^2= 6.965,
No	21 (87.5)	3 (12.5)	p < 0.014*
Dose(s) of IPT used			
None or one	130 (72.2)	50 (27.8)	χ^2= 17.976,
Two or more	56 (47.9)	61 (52.1)	p < 0.001*
Use of ITN			
Never, occasionally or often	144 (66.7)	72 (33.3)	χ^2= 5.524,
Very often or always	42 (51.9)	39 (48.1)	p < 0.019*
Last treatment for malaria			
6 months to 1 year ago	65 (52.4)	59 (47.6)	χ^2= 9.475,
1 to 3 months ago	121 (69.9)	52 (30.1)	p < 0.002*

*Statistically significant (p < 0.05)

Similar to the findings in studies conducted in Nigeria, studies conducted across sub-Saharan Africa and other places also reported wide variations in the prevalence of anaemia, with similarly high anaemia prevalence rates reported in studies conducted in Eastern Ethiopia(56.8%),[28] and Kiboga, Uganda (63.1)[29]; with much higher rates reported in studies conducted in Northern Ghana (70.0%)[30] and West Bengal, India (70.1%)[31]; and with much lower rates reported in studies conducted in South West Ethiopia (23.5%)[32] and Mpigi, Uganda (32.5%).[33] The differences in the prevalence of anemia in pregnancy in the different population groups in Nigeria and other places could be due to differences in socioeconomic circumstances, cultural practices, dietary

patterns, and preventive health practices. The pattern of anaemia among the respondents in this study in which majority of them (62.6%) had mild anaemia, while the remaining ones (37.6%) had moderate anaemia, but none of them had severe anaemia is in concordance with the findings in studies conducted in Enugu, South Eastern Nigeria in which most (90.7%) of the women had mild anaemia, a few of them (9.3%) had moderate anaemia, but none of them had severe anaemia.[11] Other studies across Nigeria generally reported similar results, with most respondents having mild anaemia, while a few had moderate anaemia, and very few or none of the respondents had severe anaemia.[12,20,23]

The sociodemographic and obstetrics factors that were associated with anaemia among the respondents in this study (including not being employed, multiple gestations, being in the early stages of pregnancy, no use of iron supplement, not having complete doses of IPT, not sleeping under ITNs consistently, and recent treatment for malaria) have also been documented in medical and allied literature. The prevalence of anaemia was significantly higher (p < 0.05) among unemployed respondents (68.8%) as compared to those who were employed (51.4%) in this study is in agreement with the finding in studies done by Idowu et al.[12] and Omote at al.[27] which reported that anaemia was more prevalent among those who were unemployed. The possible reason could be that unemployed people may not be able to afford to book early enough for antenatal care; they may also be unable to afford iron-rich and nourishing foods that are required to facilitate erythropoiesis and boost their immune status to protect them against infections. Evidence from literature shows that anaemia has multifactorial causes involving a complex interaction between nutrition, infectious diseases, and other factors, and it is disproportionately concentrated in low socioeconomic groups.[7] Also, malnourished women are more at risk of developing iron deficiency anaemia (IDA) which is usually associated with poor wealth status, and IDA accounts for 75% of anaemia cases during pregnancy.[21,34]

The prevalence of anaemia was significantly higher (p < 0.05) among respondents with multiple gestations (88.9%) as compared to those with single gestation (60.0%) in this study. This finding is in agreement with the results of a national survey among Chinese pregnant women, which reported a higher prevalence of anaemia in women with multiple gestations (28.7%) as compared with those with single gestation (19.6%),[35]and this is believed to be because the iron requirement in multiple gestations is 1.8 times twice that of single gestation, while anaemia is 2.4-4 times more frequent in pregnant women with multiple gestations as compared to those with single gestation.[36]

Because the physiological demand for iron and folate increases from the second trimester and reaches its peak in the third trimester, thus increasing the risk of iron deficiency anaemia as pregnancy progresses,[22] the significantly higher prevalence of anaemia among respondents in the 1st (75.0%) and 2nd (67.4%) trimester of pregnancy as compared to those in the 3rd trimester (53.9%) in this study is surprising. It is in contrast to the findings in studies conducted in Abeokuta, Southwestern Nigeria,[12] Northern Ghana,[37] Eastern Ethiopia[28] and Southeastern Nepal[38] which reported higher anaemia prevalence rates among pregnant women in the second and third trimesters as compared to those in the first trimester. The lower prevalence of anaemia among respondents in the 3rd trimester in this study could be because majority of them had tertiary education (60.4%) and were multigravida (58.6%), and as such, could have had several health education sessions on the prevention of anaemia in pregnancy (including iron supplementation, use of insecticides treated nets, etc.) during their previous ANC clinic sessions both in their previous pregnancies and the current pregnancy. This assertion is supported by the high uptake of iron supplementation (91.9%) among the respondents in this study.

The significantly higher prevalence of anaemia among respondents who did not use iron supplement (87.5%) as compared to those who used it (60.3%) in this study is in agreement with the findings in studies conducted by Ononge et al.,[33] and Abd-Rahman et al.,[39] and it could be due to development of iron deficiencies during pregnancy because of the increased iron requirements for the expanding blood volume of the mother and the rapidly growing fetus and placenta.[4] A review of data on iron-folic acid supplementation trials by Sanghvi et al.,[40]shows data iron-folic acid supplementation of pregnant women increases haemoglobin by 1.17g/dl in developed countries and 1.13 g/dl in developing countries; and that the intervention could reduce the prevalence of maternal anaemia by one-third to one-half over a decade with

focused implementation on a large scale in the populations concerned.

The significantly higher prevalence of anaemia among respondents who took only one or no dose of IPT (72.2%) as compared to those who took two or more doses (47.9%) in this study is consistent with the findings in a survey conducted by Agyeman et al.,[41]which reported a significantly (p < 0.05) lower prevalence of anemia (54.1%) among pregnant women who took three or more doses of IPTp-SP as compared to those who took one or two doses (66.6%). Also, the significantly higher prevalence of anaemia among those who never, occasionally or often used ITN (66.7%) as compared to those who used it very often or always (51.9%) in this study is consistent with the findings in a survey conducted by Hakizimana et al.,[34]which found sleeping under insecticides treated nets to be associated with lower odds of anaemia among pregnant women. Intermittent preventive treatment of malaria in pregnancy sulphadoxine-pyrimethamine (IPTp-SP) under directly observed therapy (DOT) starting as early as possible in the second trimester, with doses given at least one month apart until the time of delivery, and consistently sleeping under insecticides bed nets (ITN) are among the interventions that are effective in preventing malaria and its complications among pregnant women.[16,17]

The significantly higher prevalence of anaemia among respondents who were treated for malaria 1 to 3 months ago (69.9%) as compared to those who were treated for malaria six months to 1 year ago (52.4%) in this study is consistent with the findings in studies conducted by Adam et al.,[4], Zekarias et al.,[32]and Ononge et al.,[33]which reported a higher risk of anaemia among pregnant women who had malaria infection than those who did not have malaria infection. Pregnant women are more susceptible to malaria due to the sequestration of malaria parasites in the placenta, which avoids splenic clearance.[42]Also, malaria causes anaemia and low birth weight in pregnant women and fetuses, respectively, through immune destruction of parasitized red cells, excess removal of non-parasitized erythrocytes, and impaired erythropoiesis as a result of bone marrow dysfunction.[42]

The findings of this study provide additional evidence in support of the need for government, healthcare providers, and other stakeholders involved in the care of women to collaborate and implement a multipronged approach to the prevention of anaemia in pregnancy, including women empowerment to facilitate access to good nutrition, iron supplementation, intermittent preventive treatment of malaria (IPTp-SP), and promotion of consistent use of insecticides treated nets (ITNs).

CONCLUSION
This study showed a high prevalence of anaemia among pregnant women attending the antenatal clinic of UDUTH Sokoto, Nigeria. The associated factors were not being employed, multiple gestations, being in the early stages of pregnancy, not using iron supplements, not having complete doses of IPT, not sleeping under ITNs consistently, and recent treatment for malaria. The findings of this study underscore the need for a multipronged approach to the prevention of anaemia among pregnant women, including women empowerment to facilitate access to good nutrition, iron supplementation, intermittent preventive treatment of malaria (IPTp-SP), and promotion of consistent use of insecticides treated nets (ITNs).

Conflict of interest
None declared.

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