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Determinants of Anemia in Pregnancy at Booking, at 36 Weeks and Postpartum

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ABSTRACT

Background: Anemia is very common during pregnancy, especially in West Africa where malaria is endemic, coupled with poor nutrition and intake of hematinics, and poor antenatal attendance,

Objectives: This study intends to unravel the determinants of anemia in pregnant women: at booking, at 36 weeks gestation, and after delivery. It would also determine the prevalence of anemia, and the social-demographic characteristics of the women.

Methodology and subjects: This was a retrospective analytic cross-sectional study of pregnant women who booked for antenatal care (ANC), and delivered vaginally at Niger Delta University Teaching Hospital (NDUTH), from January 2018 to December 2022. During the study period, a total of 900 eligible women were identified.

Data collected at booking was: bio-data, gestational age at booking, and PCV at booking. At 36 weeks, data collected was: PCV at 36 weeks, presence of risk factors for anemia (mostly antenatal complications).

At delivery, data collected was: gestational age at delivery, mode of vaginal delivery, and PCV within 24 – 48 hours after delivery. Data on risk factors for postpartum hemorrhage (PPH) were: presence of uterine atony, episiotomy incision, cervical laceration, perineal tear, and use of instrumental vaginal delivery. Fetal data collected was: birth weight for fetal macrosomia, fetal status and sex.

Results: The prevalence of anemia was 66.7% at booking, 79.4% at 36 weeks, and 80.0% postpartum; with overall prevalence was 75.4%. The significant determinants of anemia at booking were: teenage pregnancy, odds ratio = 0.40[0.01, 0.20], p = 0.0005, and living in a rural area, odds ratio = 0.37 [14, 0.95], p = 0.03.

At 36 weeks gestation, women who registered late for antenatal care were 3 times more likely to be diagnosed with anemia, odds ratio = 3.30[1.89, 5.75] p = 0.0001. The odds of anemia was twice higher in women with malaria, odds ratio = 2.58[0.69, 9.60], and 3 times higher in women with multiple gestation, odds ratio = 3.86[0.75, 19.94].

Regarding postpartum anemia, the chances were 3 times higher in women who were anemic before delivery, odds ratio = 3.85[0.87, 17.03], p = 0.05. Other factors were uterine atony, odds ratio = 4.05 [1.71, 9.35], p = 0.0005, cervical laceration, odds ratio = 6.00[1.15, 31.41], p = 0.01, minor degree placenta praevia (p = 0.04), and assisted vaginal breech delivery (p = 0.04).

Conclusion: The prevalence of anemia in pregnancy in NDUTH is unacceptably high; however it could be mitigated via advocacy. Especially against late booking for ANC, teenage pregnancy, and malaria prevention; by use of insecticide treated nets, insect repellants, and intermittent preventive therapy (as recommended by WHO).

INTRODUCTION

According to the world health organization (WHO), anemia in pregnancy is defined as hemoglobin concentration (Hb) of < 11 g/dl, or haematocrit level (PCV) < 33%. [1] Anemia is a very common pregnancy complication, and it is a global health challenge. However, most of the burden is in countries with poor resource setting; the World Health Organization estimated the prevalence as 53.8% to 90.2% in developing countries, and 8.3% to 23% in developed countries. [2]

Data from Indian Demographic and Health Survey (2019–2021) reported a prevalence of 50.0%. [3] However, a study in Rural Medical Center in West Bengal (in India) reported a very high rate of 90.0%, [4] In Tanzania, a study at Mkuranga District Hospital also reported a high prevalence of 80.0%. [5] In Katsina State, Nigeria, a multi center study reported a rate of 44.0%. [6]. Much lower rates were reported in some centers; at Hiwot Fana Specialized University Hospital in Ethiopia it was 25.3%, [7] and a study at Itojo Hospital, South Western Uganda had a rate of 7.4%. [8]

Several factors have been proven to be associated with anemia in pregnancy globally. A multi-center study in China and South Korea identified the risk factors as living in rural area (OR = 1.207), multiple gestation (OR = 1.478), ≥ 3 gravidity (OR = 1.195), and low educational level (OR = 1.203). [9]

In Nairobi Kenya, a study at Pumwani Maternity Hospital identified the predictors of anemia in pregnancy as: non compliant with intake of hematinics (AOR = 2.04; 95% CI = 1.14 - 3.64; P = 0.016), advanced maternal age (AOR = 2.71; 95% CI = 1.25 - 5.88; P = 0.012), and unemployment (AOR = 1.91; 95% CI = 1.03 - 3.53; P = 0.039) [10]

Another study at University of Peradeniya Teaching Hospital in Sri Lanka reported the significantly associated factors as low monthly family income, low weekly consumption of red meat (OR 8.994; 95% CI, 5.74 - 14.09, p < 0.05) and high weekly tea intake (OR 0.21795% CI 0.144 - 0.327, p < 0.05). [11]

In Sub-Saharan Africa, parasitic infections that cause anemia in pregnancy are very common; Iron deficiency anemia is frequently caused by Malaria, and hook worm infections. [[12]. Previous studies on antenatal women in Nigeria reported high rates of malaria infestation; 76.0% in Yola, [13] 53% at Enugu, [12] and 23.5% at Ahmadu Bello University, Zaria. [14]

Hookworm infestation in antenatal women is relatively common in developing countries, especially in farmers. A study on pregnant women with anemia in a rural community at Enugu in South East Nigeria reported a rate of 27%. [12] Another study (a meta-analysis) on hookworm infestation reported a global prevalence that range from 1% to 78%, and that pregnant women with hookworm infection were more likely to have anemia, odds ratio = 2.55 [2.20, 2.96], *P* < 0.001) [15]

Other common causes of anemia in West Africa are pregnancy complications such as antepatum hemorrhage, from abruptio placenta and placenta praevia. [16] Excessive bleeding after delivery (post partum hemorrhage) is even more common, especially from uterine atony, and genital tract trauma during delivery. [17, 18]

The factors associated with anemia in pregnancy has been widely studied, and there are many publications on this subject matter globally (including Nigeria), but none in this environment. Hence the need for this study, as the results is expected to enhance the management of our antenatal women.

Objectives:

This study intends to elucidate the determinants of anemia at booking, at 36 weeks and after delivery, among women who received antenatal care. It would also determine the socio-demographic characteristics of the women.

METHODOLOGY

Study site and subjects

The study was carried out at the antenatal clinic, antenatal and labour wards, in the department of obstetrics and gynaecology, NDUTH, Yenagoa, Southern Nigeria. The subjects were pregnant women who booked for ANC, and delivered vaginally in NDUTH.

Study design

This was a retrospective analytic cross-sectional study. It was carried out from January 2018 to December 2022.

Inclusion criteria

Included in this study were pregnant women who booked for ANC, and delivered vaginally during the study period.

Exclusion criteria

Excluded were unbooked patients, women who booked for ANC in NDUTH, but delivered elsewhere, and women whose hemoglobin or haematocrit levels were not well documented in their case notes.
Also excluded were women who delivered by caesarean section, and booked patients whose pregnancies terminated before the period of fetal viability, which in Nigeria is 28 weeks gestation in Nigeria. [19]

NDUTH policy on screening for anemia in pregnancy

The hospital policy is to screen all pregnant women at the booking visit, at 36 weeks, and within 24 – 48 hours after delivery. Blood samples are collected from the

patients and sent to the hospital hematology laboratory for full blood count, which includes hemoglobin (Hb), and haematocrit or packed cell volume (PCV).

Diagnosis of anemia in pregnancy

The diagnosis of anemia in pregnancy was based on the WHO criteria, as shown below. Patients with Hb < 11g/dl or PCV < 33.0% were considered anemic.

WHO Classification of anemia in pregnancy

Anemia	Hemoglobin (Hb) level	Haematocrit (PCV) level
Normal (no anemia)	11.0 g/dl	33.0%
Mild anemia	10.0 - 10.9 g/dl	30.0 – 32.9%
Moderate anemia	7.0 – 9.9 g/dl	21.0 – 29.7%
Severe anemia	<7g/dl	<21.0%
Very severe anemia	<4.0 g/dl	<12.0%

Data collection

During the study period, a total of 900 pregnant women who booked for antenatal car, and had vaginal delivery were identified. Out of these, 595 women were diagnosed with anemia, while 305 had normal hemoglobin levels.

The case notes of these women were retrieved from the hospital records, and data collected at booking was: bio-data, gestational age at booking, and PCV at booking. At 36 weeks, data collected was: PCV at 36 weeks, and presence of antenatal complication that predispose to anemia, such as: malaria, antepartum hemorrhage, multiple gestation etc.

After delivery, data collected was: gestational age at delivery, mode of vaginal delivery, and PCV within 24 – 48 hours after delivery. Also collected was data on risk factors for postpartum hemorrhage (PPH), such as: presence of uterine atony, episiotomy incision, cervical laceration, perineal tear, and use of instrumental vaginal delivery. Fetal data collected was: birth weight for fetal macrosomia, fetal status and sex.

Data analysis

Data collected from each patient was entered into SPSS version 25 spread sheath, and EPI info version 7 software, and analyzed. Results were presented in tables as rates, proportions, and mean with standard deviation. Test of significance was by odds ratio, confidence interval was set at 95%, and statistical significance was set at p values ≤ 0.05.

Ethical Approval

Ethical approval for this study was granted by the NDUTH ethical committee, with registration number NDUTH/REC/0099/2024.

RESULTS

Table 1: Socio-demographic characteristics of the patients

Demographic factor	Frequency N = 900	Percentage N = 100%
Maternal age		
≤ 19 years	30	3.3%
20 – 24 years	140	15.6%
25 – 29 years	395	43.9%
30 – 34 years	235	26.1%
≥ 35 years	100	11.1%
Parity		
Para 0	245	27.2%
Para 1- 4	520	57.8%
≥ Para 5	135	15.0%
Religion		
Christian	820	91.1%
Muslim	80	8.9%
Ethnicity		
Ijaw	390	43.3%
Igbo	245	27.2%
Yoruba	65	7.2%
Hausa/Fulani	35	3.9%
Other tribes	165	18.3%
Address		
Urban	770	85.6%
Semi-urban	110	12.2%
Rural	20	2.2%
Educational level		
Primary Education	65	7.2%
Secondary Education	620	68.9%
Tertiary Education	215	23.9%
Patient's employment status		
Unemployed	360	40.0%
Employed	540	60.0%

The mean maternal age was 28.2 ± 5.0 years, the median parity was para 2, the mean GA at booking was 23.8 ± 6.7weeks.

Table 2: Obstetrics factors, fetal characteristics, and prevalence of anemia

Factor	Frequency N = 900	Percentage N = 100%	Anemia in pregnancy	Prevalence of anemia
GA at Booking				
< 12 weeks (early booking)	175	19.5%		
≥ 12 weeks (late booking)	725	80.5%		
PCV at booking			120	66.7%
≥ 33.0% (no anemia)	305	33.9%		
30.0 - 32.7 % (mild anemia)	480	53.3%		
21.0 – 29.7% (moderate anemia)	90	10.0%		
< 21.0% (severe anemia)	25	2.8%		
PCV at 36 weeks			143	79.4%
≥ 33.0% (no anemia)	185	20.6%		
30.0 - 32.7 % (mild anemia)	490	54.4%		
21.0 – 29.7% (moderate anemia)	220	24.4%		
< 21.0% (severe anemia)	5	0.6%		
PCV postpartum			144	80.0%
≥ 33.0% (no anemia)	180	20.0%		
30.0 - 32.7 % (mild anemia	575	63.9%		
21.0 – 29.7% (moderate anemia)	135	15.0%		
< 21.0% (severe anemia)	10	1.1%		
Gestational age at delivery (GA)				
Preterm (28 – 36 weeks)	15	1.7%		
Term (37 – 42 weeks)	880	71.1%		
Post term (> 42 weeks)	5	0.6%		
Birth weight				
Very low birth weight (<1500 grams)	0	0.0%		
Low birth weight (1500 – 2500 grams)	60	6.7%		
Normal birth weight (2501 – 3999 grams)	600	71.1%		
Fetal macrosomia (≥ 4000 grams)	200	22.2%		
Fetal sex				
male	425	47.2%		
female	95475	52.8%		
Fetal status				
Fresh still birth	70	7.8%		
Baby alive	830	92.2%		

The prevalence of anemia was 66.7% at booking, 79.4% at 36 weeks, and 80.0% postpartum; with overall prevalence was 75.4%.

Most of the women (71.1%) booked for ANC late at GA ≥ 12 weeks. The mean PCV at booking was 31.7 ± 1.8%, at 36 weeks it was 30.8 ± 2.1%, and at postpartum it was 30.5 ± 1.6%. The mean GA at delivery was 38.8 ± 1.6 weeks, and the mean birth weight was 3.47 ± 0.60 kg.

Table 3: Determinants of PCV at booking

Variable	**PCV at booking**			**Odds ratio**	**Confidence interval**	**P value**
Maternal age	**Anemia N = 595**	**No anemia N = 305**	**Total N = 900**			
≤ 19 years	15(1.7%)	15(1.7%)	30(3.3%)	0.40	[0.01, 0.20]	0.0005*
20 – 24 years	90(10%)	50(5.6%)	140(15.6%)	0.77	[0.23, 2.64]	0.67
25 – 29 years	260(17.5%)	135(15.0%)	395(43.9%)			
30 – 34 years	160(14.8%)	75(8.3%)	235(26.1%)			
≥ 35 years	70(7.8%)	30(3.3%)	100(11.1%)			
Parity						
Para 0	145(16.1%)	100(11.1%)	245(27.2%)			
Para 1- 4	355(39.4)	165(18.3%)	520(57.8%)			
≥ Para 5	95(10.6%)	40(4.4%)	135(15.0%)	0.33	[0.22, 1.67]	0.33
Religion						
Christian	550(61.1%)	270(30.0%)	820(91.1%)			
Muslim	45(5.0%)	35(3.9%)	80(8.9%)			
Ethnicity						
Ijaws	270(30.0%)	120(13.3%)	390(43.3%)	1.31	[0.61, 2.78]	0.48
Igbo	155(17.2%)	90(10.0%)	245(27.2%)			
Yoruba	45(5.0%)	20(2.2%)	65(7.2%)			
Hausa/Fulani	25(2.8%)	10(1.1%)	35(3.9%)			
Other tribes	100(11.1%)	65(7.2%)	165(18.3%)			
Address						
Urban	505(56.1%)	265(29.4%)	770(85.6%)			
Rural	90(10.0%)	40(4.4%)	130(14.4%)	0.37	[14, 0.95]	0.03*
Educational level						
Primary	50(5.5%)	15(1.7%)	65(7.2%)	0.31	[0.04, 2.75]	0.27
Secondary	428(47.6%)	205(22.8%)	620(68.9%)	1.05	[0.45, 2.46]	0.90
Tertiary	130(14.4%)	85(9.4%)	215(23.9%)			
Employment status						
Unemployed	255(28.3%)	105(11.7%)	360(40.0%)	1.05	[0.75, 3.23]	0.22
Employed	340(37.8%)	40(4.4%)	540(60.0%)			

Anemia at booking was more common among teenagers, odds ratio = 0.40[0.01, 0.20], p = 0.0005, and among rural dwellers, p = 0.03, and rural dwellers, p = 0.03.

Table 4: Determinants of PCV at 36 weeks

Obstetrics factor	**PCV at 36 weeks**			**Odds ratio**	**Confidence interval**	**P value**
	Anemia N = 715	**No anemia N = 185**	**Total N = 900**			
PCV at booking						
≥ 33% (no anemia)	460(51.1%)	135(15.0%)	595(66.1%)	0.67	[0.30, 1.49]	0.32
< 33% (anemia)	255(28.3%)	50(5.6%)	305(34.0%)			
GA at Booking						
Early booking	160(17.8%)	15(1.7%)	175(19.4%)			
Late booking	555(61.7%)	170(18.9%)	725(80.6%)	3.30	[1.89, 5.75]	0.0001*
Complaint with intake of hematinics						
Poor complaint	250(27.8%)	100(11.1%)	350(38.9%)	0.06	[0.03, 0.16]	0.0001*
Compliant	465(51.7%)	85(9.4%)	550(61.1%)			
Anaemia related ANC complication						
Placenta praevia	10(1.1%)	25(2.8%)	35(3.9%)	1.55	[0.29, 8.29]	0.62
Malaria in pregnancy	15(1.7%)	30(3.3%)	45(4.0%)	2.58	[0.69, 9.60]	0.14
Hyperemesis gravidarum	5(0.6%)	15(1.7%)	20(2.2%)	1.29	[0.13, 12.35]	0.82
HIV	10(1.1%)	30(3.3%)	40(4.4%)	1.29	[0.25, 6.65]	0.76
Multiple pregnancy	15(1.7%)	15(1.7%)	30(3.3%)	3.86	[0.75, 19.94]	0.08
UTI	5(0.6%)	10(1.1%)	15(1.7%)	1.93	[0.17, 21.90]	0.58

The rate of anemia at 36 weeks gestation was significantly higher in women who registered late for antenatal care, odds ratio = 3.30[1.89, 5.75] p = 0.0001, and women who did not comply with intake of antenatal hematinics, p = 0.0001.

Regarding pregnancy complications that predispose to anemia, the chances of having anemia in pregnancy was twice higher in women with malaria in pregnancy, odds ratio = 2.58[0.69, 9.60], and 3 times higher in women with multiple gestation, odds ratio = 3.86[0.75, 19.94].

Table 5: Determinants of Postpartum PCV

Variable	Postpartum PCV		Total	Odds ratio	Confidence interval	P value
	Anemia N = 760	No anemia N = 140	Total N = 900			
PCV at 36 weeks						
≥ 33% (no anemia)	260(28.9%)	45(5.0%)	305(33.8%)			
< 33% (anemia)	500(55.6%)	95(10.6%)	595(66.1%)	3.85	[0.87, 17.03]	0.05*
GA at Delivery						
Preterm(28-36 weeks)	10(1.1%)	5(0.6%)	15(1.7%)			
Term (37 – 42 weeks)	745(82.8%)	135(15.0%)	880(97.8%)			
Postterm (> 42 weeks)	5(0.6%)	0(0.0%)	5(0.6%)			
Antepartum hemorrhage (APH)						
No APH	710(78.9%)	120(13.3%)	830(92.2%)			
Placenta praevia	35(3.9%)	10(1.1%)	45(5.0%)	1.78	[0.35, 9.08]	0.04*
Abruption placenta	15(1.7%)	10(1.1%)	25(2.8%)	4.14	[0.66, 26.17]	0.10
Birth weight						
< 4000 grams	595(66.1%)	105(11.7%)	700(77.8%)			
≥ 4000 grams	165(18.3%)	35(38.9%)	200(22.2%)	1.27	[0.50, 3.27]	0.61
Uterine atomy						
Absent	550(61.1%)	55(6.1%)	60567.2%)			
Present	210(23.3%)	85(9.4%)	295(32.8%)	4.05	[1.71, 9.35]	0.0006*
Episiotomy						
Done	70(7.8%)	15(1.7%)	85(9.4%)	0.87	[0.22, 3.02]	0.74
Not done	690(76.7%)	125(13.9%)	815(90.6%)			
Perineal tear						
Absent	605(67.2%)	125(13.9%)	730(81.1%)			
Present	155(17.2%)	15(1.7%)	170(18.9%)	0.47	[0.13, 1.65]	0.22
Cervical laceration						
Absent	745(82.8%)	125(13.9%)	870(96.7%)			
Present	15(1.7%)	15(1.7%)	30(3.3%)	6.00	[1.15, 31.41]	0.01*
Mode of delivery						
Spontaneous vaginal delivery (SVD)	750(83.3%)	115(12.8%)	865(96.1%)			
Assisted breech delivery	10(1.1%)	15(1.7%)	15(1.7%)	4.27	[0.90, 20.35]	0.04*
Vacuum delivery	0	10(1.1%)	10(1.1%)			

The chances of having postpartum anemia was 3 times higher in women who were anemic at 36 weeks gestation, odds ratio = 3.85[0.87, 17.03], p = 0.05.

It is also 4 times higher in women who had uterine atony immediately after delivery, odds ratio = 4.05 [1.71, 9.35], p = 0.0005, and 6 times higher when delivery is complicated with cervical laceration, odds ratio = 6.00[1.15, 31.41], p = 0.01.

Other significant factor are placenta praevia p = 0.04, and assisted vaginal breech delivery p = 0.04.

DISCUSSION

Anemia in pregnancy is one of the most common pregnancy complications experienced globally,[1] and its impact is more pronounced in poor resource settings,

especially in sub- Saharan Africa, where nutrition is poor, [20] malaria is endemic, [14] and there is poor utilization of obstetrics services.

It is therefore not suppressing that the 75.4% rate of anemia we got in this study was quite high. However, it did not deviate widely from what was obtained in other developing countries; 90% from a study in India, [4] 80.0% in Tanzania, [21] 62.5% in Bangladesh, [22] and 65.2% in Obudu in Nigeria. [23]

Fortunately, the high rates in developing countries stated above are not absolute; very low rates have actually been recorded in some centers in the developing world, some of which are comparable to the 8.3% to 23.0% reported for developed countries by WHO. [2] 7.4% was reported in South West Uganda, [8] 8.19% at Peradeniya in Sri Lanka, [11] 18.0% at Kilimanjaro Christian Medical Centre in Tanzania, [24] and 24.5% in Kano, Nigeria. [25]

Regarding the severity of anemia, the high rate of anemia (we got in this study) does not seem to pose many problems, as majority of the cases in NDUTH were mild. This is further supported by the fact that our rate of severe anemia was extremely low; 2.8% at booking, 0.6% at 36 weeks, and 1.1% post partum.

However, in many centers globally, moderate anemia was more common. At West Bengal in India, majority (60.5%) of the women has moderate anemia. [4] Similar results were reported from studies in Bangladesh, [22], and Eswatini. [26] On the contrary, a very formidable pattern was reported at Harari region in Ethiopia, were severe anemia was more common (11.8%), followed by moderate anemia (8.13%), and mild was least (6.10%). [7] The reason why moderate to severe anemia were more common was not clear. However, it could be due to late booking for ANC, poor intake of hematinics, and living in a malaria endemic region.

Regarding maternal age and anemia, our study has established the fact that teenage pregnancy is strongly associated with anemia in pregnancy. Nigeria is one of the countries globally with the highest number of teenage mothers, especially in Northern Nigeria, where early marriage is a cultural and religious practice. [27, 28] According to the Nigerian National Demographic Health Survey (2008 – 2018), the prevalence of teenage motherhood increased from 50.9% in 2008 to 55.2% in 2018. [28]

Teenage pregnancy as a risk factor for anemia has also been verified from studies in other parts of the world; a study at Rural Medical College-Hospital in India reported that 68.4% of pregnant teenagers were anemic. [29] A study at Ashanti Region in Ghana (on pregnant teenagers) revealed that 57.1% of the patients had anemia. [30] In Northwestern Malaysia, the prevalence was 53.1%. [31]

The reason why pregnant teenagers are vulnerable to anemia is because of inexperience, and lack of knowledge on pregnancy and antenatal care. In addition, they are not competent to take decisions on issues related to their health. As a result, they are likely to book late for ANC, and they are also unlikely to take hematinics as prescribed. [28, 29] In Malaysia, it was reported that teenagers who booked late for ANC were 16 times more likely to develop anemia, (AOR 16.33; 95% CI: 6.51, 40.99). [31]

In this study, we observed that rural dwellers were more prone to malaria in pregnancy. In Nigeria, there is significant rural urban drift, because our rural areas are underdeveloped, with very low living standards, and absence of jobs. Majority of our rural dwellers depend on small scale crude farming and fishing for survival. It is therefore not surprising that they significantly had more anemia than the urban dwellers. This is most probably from poor nutrition, and hookworm infestation.

The relationship between rural dwelling and anemia in pregnancy was also established in other centers. At West Bengal in India, a very high rate of 90.0% was reported, [4] A multi-center study in China and South Korea reported that pregnant women living in rural area significantly has more anemia than those living in urban areas, (OR = 1.207). In contrary, a study at Eswatini (in southern part of Africa) reported that anemia in pregnancy was more common in urban dwellers, odds ratio = 1.8 [1.19–2.72]. [26] The reason for this disparity is not very clear. However, it's very possible that their rural area where the study was done is developed.

With respect to pregnancy complications that predispose to anemia, prominent among our significant findings (in NDUTH) were: malaria, and multiple gestation. Malaria causes anemia because the malaria parasite (especially plasmodium falciparum) causes hemolysis, and destruction of the red blood cells. [32]

Nigeria is in the heart of the malaria belt in Africa, according to WHO, this region carries 94% of all malaria cases and 95% of deaths. [33] Four African countries accounted for more than half of all malaria deaths globally: Nigeria (26.8%), the Democratic Republic of the Congo (12.3%), Uganda (5.1%) and Mozambique (4.2%). [34] As a result, WHO recommended that pregnant women living in this region should use insecticide treated nets, insect repellants, and intermittent preventive therapy for malaria prevention. [1]

Malaria as a cause of anemia in pregnancy in Nigeria has been proven by various studies; a study in Yola reported that as much as 76.0% of ANC women diagnosed with anemia in pregnancy had malaria. [13] Another study at Ikot Ekpene reported that the prevalence of malaria among ANC women diagnosed with anemia was over 50%. [35]

A very common cause of anemia in pregnancy (vindicated by our study) is multiple gestation. Similar results have also been published in other centers; a study in a tertiary hospital in China reported the prevalence of anemia among women with twin as 42.6%. [36] At Ohio State University (Wexner Medical Center) in the US, the prevalence was 21%. [37] The cause of anemia in women with multiple gestation is increased demand for iron by the growing fetuses; Iron is a very important precursor for hemoglobin biosynthesis. [38]

Regarding postpartum anemia, the significant factors obtained in this study, such as placenta praevia and genital tract lacerations are obvious causes of blood loss, [17, 39] and requires little explanation.

CONCLUSION

The prevalence of anemia in pregnancy in NDUTH is unacceptably high; however it could be mitigated via advocacy. Especially against late booking for ANC, teenage pregnancy, and malaria prevention; by use of insecticide treated nets, insect repellants, and intermittent preventive therapy (as recommended by WHO).

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