ORIGINAL ARTICLE

Does antenatal care attendance prevent anemia in pregnancy at term?

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Abstract

Background: Anemia in pregnancy is one of the public health problems in the developed and developing world. If uncontrolled it is a major indirect cause of maternal and perinatal morbidity and mortality. This is worst in settings with poor prenatal practices. Quality prenatal interventions therefore are expected to prevent or ameliorate this disorder in pregnancy. Nigerian scientific literatures are full of data on anemia in pregnancy, but few of them are on the influence of prenatal care on maternal anemia. This study, therefore, sought to appraise the role of antenatal care (ANC) services in the prevention of anemia in pregnancy at term in Nigerian women.

Objectives: The aim was to estimate the prevalence of anemia at first antenatal visit and determine if antenatal attendance prevents anemia at term among prenatal Nigerian women. To measure the hematocrit levels at booking and at term respectively and compare the proportion anemic at booking with the proportion anemic at term.

Materials and Methods: A retrospective cross-sectional comparative study of 3442 prenatal women in a mission hospital in South-South Nigeria from 2009 to 2013. Venous blood hematocrit was estimated from each woman at booking and at term, and the prevalence of anemia for the two periods were compared.

Results: There were 1205 subjects with hematocrit of below 33% at booking, an anemia prevalence of 32.2% at booking in this population. At term or delivery at term 736 (21.4% odds ratio [OR] =2.3, $P < 0.0001$) of the 1052 subjects that fulfilled the study criteria had their anemia corrected, a 69.9% prevention, while 316 (9.2%, OR = 0.43, $P < 0.0001$) persisted despite their antenatal attendance. The subjects were similar in most of the confounding factors like parity, social class, mean age, body mass index and gestational age at delivery (P value: all > 0.05).

Conclusion: The prevalence of anemia in pregnancy is still high in our setting. Quality ANC appeared a valuable preventive intervention that should be made widely available, accessible and affordable to all pregnant women.

Key words: Antenatal care, anemia prevention, South-South Nigeria, term pregnancy

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Introduction

Anemia is the reduction of red blood cells concentration or oxygen carrying capacity of blood to meet the physiologic needs of the individual.[1] It is a disorder of great public health importance in both rich and poor countries especially in sub-Saharan Africa. Pregnant women and young children especially preschool age group are the most vulnerable with a global prevalence of 47.4% and 41.8%, respectively.[2] It is noteworthy that the normal hemoglobin concentration varies with age, sex, altitude, smoking and physiologic state like during pregnancy.[2] The burden of anemia in pregnancy is highest in Africa and South-East Asia with estimated prevalence of 57.1% and 48.2% respectively and lowest in America and Europe with prevalence of 24.1% and 25.1% respectively.[2] In Nigeria,[3] a 1993 survey as contained in

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World Health Organization (WHO) Database 2005 puts the prevalence of anemia at 66.7%.[2]

Anemia in pregnancy contributes significantly to maternal and perinatal morbidity and death mostly in poor countries. Some 20% of maternal death in Africa[4] and 11% in Nigeria[5] has been attributed to anemia. It has social and demographic implications.[2,5] Its primary cause is iron deficiency, but it presents in combination with other causes like parasitic infection, especially malaria in endemic tropical countries of Africa, nutritional deficiencies and hemoglobinopathies.[2] Appropriate prenatal interventions like iron supplementation helps in reducing the prevalence.[6-9]

There is a high level of ignorance and cultural beliefs about anemia in pregnancy, its prevention and treatment in our environment.[10] Early age at pregnancy, grandmultiparity, low socioeconomic class[11] and poor maternal education are some of the factors associated with maternal anemia in some Nigerian studies.[11,12-14]

The role of early and quality antenatal care (ANC) in preventing maternal anemia cannot be overemphasized.[4] Good nutritional awareness and practices or quality prenatal services and utilization among well motivated and highly aware women are expected to reduce the prevalence of anemia in pregnancy in any society. Nutritional and prenatal practices in Nigeria unlike in most western countries are evolving, and anemia in pregnancy is one of the eloquent reflections of the duo. This study, therefore, aimed to explore the effect of ANC on prevention of anemia in pregnancy at term.

Materials and Methods

This was a retrospective cross-sectional comparative study carried out in St. Philomena Catholic Hospital (SPCH), Benin City, Edo state in South-South region; Nigeria using database generated 2009–2013. SPCH is a mission hospital with longstanding secondary level obstetric services. It is a 120 bedded facility with fairly well established and staffed maternity section and medical Record department. Its annual delivery rate was about a 1000 deliveries. The laboratory was fairly well equipped with Swelab Alfa hematological auto analyzer among other equipment and hematologist technicians among other technicians.

Analysis was limited to only 3442 women (study population) who fulfilled the inclusion criteria of registering and attending antenatal clinic to term or delivering at the facility. The unbooked cases, those with incomplete booking/term hematocrit pair records were excluded from the study. Excluded also were antepartum, preeclampsia, sickle cell disease patients and preterm deliveries.

Term is defined as gestational period of 41 completed weeks and 6 days. Anemia is defined as venous blood Hematocrit of <33%.[15,16] Booking is defined for the purpose of this study as having registered and thereafter attended antenatal clinic at least once before delivery. The gestational period is divided into trimesters: The first, second and third trimesters corresponding to the first 13 weeks, 14–27 weeks and 28 weeks to term respectively. The social classification of the women was based on the educational attainment of the women and the occupation of their husbands.[17] The husband occupation is classified into professionals, middle level and unskilled respectively scored 1, 2 and 3 while the education of the women is scored 0, 1 and 2 respectively for university, secondary and primary levels of education. The aggregate of the two scores is the social class. For the purpose of this study the social class I and II is high class, class III middle class while IV and V formed the lower class. Data were raised on each mother's sociodemographic profile, booking hematocrit among other details, hematocrit at term or at presentation in labor at term in whichever she presented first.

Interventions during antenatal course were hematocrit check of each antenatal woman at booking visit and recorded in her ANC file among other routine and optional investigations, a repeat test was carried out at least once in each trimester or more frequent as indicated and on presentation in labor. Each woman was placed on routine hematinics: 200 mg ferrous sulfate (60 mg elemental iron) and 5 mg folic acid daily for those that had hematocrit of ≥ 33%. The women who were anemic received 200 mg ferrous sulfate thrice daily with the daily folic acid till about 3 months after the anemia was corrected before returning to the routine regimen. Some of the women like those with severe anemia or anemic heart failure received blood transfusion and thereafter were maintained on the hematinics. Malaria chemoprophylaxis with intermittent preventive treatment (IPTp-SP) with sulfadoxine-pyrimethamine combination three tablets at 18 weeks or after quickening followed with one or two other doses of at least four weeks apart but not later than 36 weeks of gestation. Those who did not tolerate this received proguanil 100 mg daily. The attendees were encouraged to sleep under insecticide-treated net. Any intercurrent illness was managed accordingly and promptly. General and obstetric evaluations were carried on each expectant mother at each visit. Health education on nutrition among other relevant topics was regularly given to attendees. Standard model of ANC was practiced in the center with routine clinic visits of four weekly up to 28 weeks of gestation then fortnightly till 36 weeks and weekly thereafter till delivery.

The proportion of antenatal patients with hematocrit values <33% at booking visit and last visit at term or at presentation in labor at term were respectively estimated and compared. Also, the characteristics of women that remained anemic at term were compared with those that were corrected.

Table 1: Characteristics of women versus correction of anemia in pregnancy at term

Characteristics	Subgroups	Anemia in pregnancy (%)		Percentage correction	OR	95% CI	*P*
		Yes	No				
All participants (*n*=3442)	At booking	1052 (30.6)	2390 (69.4)		4.35	3.8-5.0	<0.001*
	At term	316 (9.2)	3126 (90.8)	70.0			
		Anemia in pregnancy at booking (*n*=1052)					
		Corrected at term (*n*=736)	Uncorrected at term (*n*=316)				
Booking trimester (weeks)	1st (*n*=106)	75 (10.2)	31 (9.8)	70.8	1.04	0.67-1.6	0.91
	2nd (*n*=659)	478 (64.9)	181 (57.3)	72.5	1.38	1.06-1.81	0.02*
	3rd (*n*=287)	183 (24.9)	104 (32.9)	63.8	0.67	0.51-0.82	0.009*
Social class	Upper (*n*=392)	281 (38.1)	111 (35.1	71.7	1.14	0.87-1.5	0.38
	Middle (*n*=553)	389 (52.9)	164 (51.9)	70.3	1.04	0.8-1.4	0.79
	Lower (*n*=107)	66 (9.0)	41 (13.0)	61.7	0.66	0.44-1.0	0.06
Parity	0 (*n*=441)	296 (40.2)	145 (45.9)	67.1	0.79	0.6-1.0	0.10
	1-4 (*n*=586)	426 (57.9)	160 (50.6)	72.7	1.34	1.03-1.75	0.03*
	≥5 (*n*=25)	14 (1.9)	11 (3.5)	56.0	0.54	0.24-1.2	0.13

*Significant. OR=Odds ratio; CI=Confidence interval

Developed by centres for disease control and prevention (CDC) in Atlanta Georgia, USA. Released 13th Aug 2008 were used for statistical analysis. Chi-square or Fisher's exact test were used for statistical tests as appropriate. Paired sample, *t*-test was used for the paired means comparison after the normality test with Kolmogorov–Smirnov test. Statistical significance was set at 95% confidence interval (CI).

Results

A total of 3740 women had ANC in the center within the study period, 1205 (eligible and noneligible at booking) had hematocrit of below 33% at booking which gave an anemia prevalence of 32.2% in this population. Among all the antenatal attendees, a total of 3442 women satisfied the inclusion criteria (study population) and subsequent analyses were limited to them. The mean hematocrit of all the study population was 33.7 ± 3.5% and 34.9 ± 4.3% at booking and term respectively. The observed difference was statistically significant ($t = 12.34$, $P < 0.001$).

As shown in Table 1, 1052 (30.6%) among the 3442 eligible subjects had hematocrit of <33% at booking visit (booking anemia study group).

At term 316 (9.2%) mothers persisted with anemia while 736 (21.4%) had their anemia corrected, a reduction of 69.9%. When the proportion with hematocrit <33% at booking and at term were compared, they were statistically significant different (odds ratio [OR] =4.35, 95% CI: 3.8–5.0, $P < 0.001$) The anemic women who commenced prenatal care as early as the second trimester of their gestation significantly recovered from their anemia (OR: 1.38, 95% CI: 1.06–1.81) contrary to those who commenced later in the third trimester (OR: 0.67, 95% CI: 0.51–0.82).

Table 2: Characteristics of anemic women at booking by their correction status at term

Characteristics	Anemia group at term		*T*-test	*P*
	Corrected anemia (*n*=736)	Uncorrected anemia (*n*=316)		
Mean age (years)	29.3±4.5	29.1±4.9	0.64	0.52
Mean bookinggestational age (weeks)	21.3±6.6	22.3±7.1	2.20	0.028*
Mean gestationalage at delivery (weeks)	39.4±1.8	39.3±2.2	0.77	0.44
Mean height (cm)	162.1±8.0	162.3±7.5	0.38	0.71
Mean booking weight (kg)	71.9±13.7	71.6±14.2	0.32	0.75
Mean last antenatal weight at term before delivery	78.8±13.7	77.3±13.6	1.63	0.10
BMI (kg/m) at booking	27.0±4.9	27.03±5.0	0.09	0.93
Last antenatal BMI (kg/m) at term	29.8±5.0	29.4±4.6	1.22	0.22

BMI=Body mass index

There was 20–40% likelihood of persistent anemia to term among the nulliparous and grade multiparous women though this was not to a statistical significant level [Table 1]. The para 1–4 women made statistically significant recovery at term (OR: 1.3, 95% CI: 1.03–1.75). This however, lacked statistical significant linear trend ($\chi^2 = 1.290$, $P = 0.25$) There was increased correction of anemia at term among antenatal attendees from the upper socioeconomic class (OR = 1.14, $P = 0.38$), but it was not statistically significant. Women in the lower social class had reduced recovery from anemia in pregnancy at term that also was not statistically significant (OR = 0.66, $P = 0.06$).

Table 2 shows that the mean age of those women with corrected hematocrit at term was 29.3 ± 4.5 years while that of those with uncorrected anemia was 29.1 ± 4.9 years ($t = 0.64$ $P = 0.52$). The observed difference was not

statistically significant. The women in both arms were similar in height ($t = 0.36$, $P = 0.71$), weight at booking and at term (P values: 0.75, 0.10 respectively). They registered for ANC at statistically significant different gestational age ($t = 2.2$, $P = 0.03$) and delivered their newborns at similar gestational age ($t = 0.77$, $P = 0.44$).

Discussion

This study revealed a booking anemia prevalence of 32.2% in this setting that compares favorably with previous findings in other southern Nigerian sub regions.[5,18] This is at variance to the findings in other centers with relatively higher prevalence[4,12,19,20] and industrialized economies with lower prevalence.[2] At least two out of every three subjects had their anemia corrected at term or delivery at term in this study that compares fairly favorable with a previous Nigerian study.[18] It is evident from this study therefore that quality prenatal care can modify some maternal morbid states. Anemia in pregnancy is one of such, a serious public health concern in most of the developing parts of the world especially sub-Saharan Africa. This behooves an increased campaign for quality prenatal services and adequate women empowerment to utilize the services.

In most of the settings mothers for multifaceted reasons ranging from maternal age, education, parity, cultural belief, ignorance, poverty, or over confidence fail to access the facilities for prenatal care.[21-24] Even the few that try to avail this, poorly comply with the prenatal interventional measures in place. That over two-thirds of mothers in this study had their anemic state corrected at term suggests that quality care and good compliance improve maternal health. Early commencement of prenatal care as suggested from this study is one of the invaluable aspects for quality prenatal service delivery as it positively influenced the anemia recovery at term. WHO recommended commencement of ANC as early as the first trimester of pregnancy for optimal benefits of the prenatal services.[25]

Our results suggest that the women whose anemia persisted to term possibly did not comply with the prenatal care intervention which is common in this setting especially when most of the subjects remain asymptomatic in mild to moderate anemic states. A prospective study will confirm this. The subjects were fairly similar in most of the confounders suggesting poor utilization of prenatal interventions as one of the possible explanations for their persistent anemic state to term. The same care was given to all the attendees, but their individual compliance thereafter back home has great implications on the subsequent response to the interventions given. Exclusion measures in this study have taken care of hemoglobinopathy a cause of persistent low hematocrit in this environment. Malaria chemoprophylaxis for endemic malaria-induced anemia is one of the most important prenatal interventions widely given to prenatal attendees in Nigeria. It is evident that hematinics combined with malaria chemoprophylaxis offers a better prenatal preventive intervention for anemia in pregnancy.[5,26,27]

Improved women education, Health education, empowerment and home visiting those women defaulting antenatal clinic attendance are recommended to improve on their utilization of prenatal interventions. This is expected to make them appreciate better the need for early commencement and compliance with prenatal care. It seemed from our results that relative to other parities, nulliparity and grandmultiparity are associated with increased risk of persistent anemia in pregnancy to term as corroborated by previous study.[28] The notorious overconfidence of grandmultiparous and inexperience of nulliparous mothers with the attendant high prevalence of persistent anemia to term as seen in this study especially when combined with low socioeconomic state will be ameliorated with the above measures. Nulliparity and late commencement of ANC are major risk factors in this study similar to previous studies.[4,13,28] Involvement of the husbands in prenatal care to help in ensuring compliance and adherent to interventions is suggested.[29]

The role of good nutrition and balanced dieting in the prenatal period will help in ameliorating anemia in pregnancy. According to WHO iron deficiency anemia accounts for some 50% of anemia generally[15] therefore proposed increased iron supplementation, especially to vulnerable groups like the pregnant women, especially through food-based approaches such as food fortification and dietary diversification.[2]

This work though drew its strength on the sample size, it was an hospital based study, lacked randomization and multicenter spread therefore the findings may not be generalized to the rest of Nigeria but will add to the pool of the findings from other centers to give the Nigerian anemia in pregnancy situation. We recognize physiological hemodilution in pregnancy capable of leading to false hematocrit results as a potential limiting factor in anemia in pregnancy studies. A well-designed prospective study will be more appropriate.

Conclusion

Although anemia in pregnancy is still a public health concern in Nigeria, it appeared amenable to quality prenatal interventions. Early commencement of ANC for early detection and control of anemia in pregnancy is proffered.

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