Prevalence of Anaemia and its associated factors among Pregnant Women in South–West Nigeria

***Talabi, J.Y[1], Dada, I.O[1], Ajayi, K[1] and Taiwo, O.M[1]**

[1]*Department of Human Nutrition and Dietetics, College of Medicine and Health Sciences, AfeBabalola University, Ado Ekiti, Nigeria*

[2]*Institute of Agriculture, Research and Training, Moor Plantation, Ibadan, Nigeria*

Corresponding Author: justinatalabi@yahoo.com

ABSTRACT

Background: *Anaemia is a public health problem especially among the pregnant women. This study was carried out to assess the prevalence of anaemiaand associated factors among pregnant women in Ado-Ekiti South-West Nigeria.*

Methodology: *A health facility–based cross-sectional descriptive study was conducted among three hundred and seventy-eight (378) pregnant women attending antenatal clinic in Ekiti State University Teaching Hospital. A pretested interviewer-administered questionnaire was used to obtain socio-demographic characteristics, obstetric and medical history. Packed cell volume (PCV) of the respondents was analysed using full blood cell counter while serum ferritin level was analysed using human ferritin enzyme immuno-assay test kit. Data were analysed using the Statistical Package for the Social Sciences version (SPSS) 17.0. Chi-square test and logistic regression analysis were used to establish association between variables at 5% level of significance.*

Results: *The mean age of the respondent was 31.29±0.41 years. The women were in their first (16.7%) second (59.5%) and third (23.8%) trimesters. The prevalence of anaemia as judged by their PCV level was 33.4%. The prevalence of iron deficiency anaemia (serum ferritin< 12ng/ml) was 6.5%. Marital status and serum ferritin level were significant (P< 0.05) factors associated with anaemia in pregnancy. Monthly income (OR = 1.37; 95% CI) and gestational age (OR = 0.47; 95% CI) were found to be independent predictors of anaemia.*

Conclusion: *The study established presence of anaemia among pregnant women in the study area. Income and gestational age were predators of anaemia. Nutrition education for pregnant women should be intensified.*

Keywords: Anaemia, iron, serum ferritin, pregnant women

Introduction

Anaemia in pregnancy is a serious public health problem worldwide. In sub-saharan Africa, it is estimated that 52% of women are anaemic (1, 2).Recent estimates in Nigeria put the prevalence of anaemia at 58-60% in pregnancy and about 7.0% of the women are said to be severely anaemic (3).

Pregnancy related anaemia is ranked highest among the leading causes of global health burden (4) with more than half attributed to iron deficiency. Women have additional iron requirements during pregnancy. This is because the physiological changes associated with

pregnancy exert a demand for additional iron needed for transfer to the foetus (5). Iron requirements rise from approximately 0.8mg per day in the first month to approximately 10mg per day during the last six weeks of pregnancy (6, 7).

Consequences of anaemia in pregnancy include maternal complications like the cardiac failure, infections (urinary tract infections, perpetual sepsis), postpartum haemorrhage (PPH), maternal mortality, foetal complications include intra uterine growth restriction (IUGR), increased prenatal mortality, birth of preterm babies and low birth weight (8, 9). A pregnant woman with anaemia will present with any of the following: angular stomatitis, pallor, glossitis, spoon shaped nails, dizziness, fatigue and shortness of breath. Children born to anaemic mothers are more likely to be anaemic early in life. This may irreversibly affect the cognitive performance, development and physical growth of such children even in the long term (10).

Anaemia during pregnancy is diagnosed if a woman's packed cell volume(PCV) is less than 33.0% or haemoglobin (Hb) level is lower than 11.0g/dl at sea level (3). The degrees of anaemia include mild (PCV 27-32.9%), moderate (PCV 22-26.9%), and severe (PCV below 21%) (2).When anaemia is accompanied by an indicator of iron deficiency (e.g. low concentrations of serum ferritin or serum transferrin concentrations); it is referred to as iron-deficiency anaemia (11, 12).

The study therefore seeks to assess the prevalence of anaemia and identify factors associated with it among pregnant women in Ado-Ekiti, South-West Nigeria.

Materials and Methods

Study location

The study was conducted at Ekiti State University Teaching Hospital (EKSUTH). EKSUTH is a tertiary health institution in Ekiti State and is situated in the South-West geopolitical zone of Nigeria. It is located along Iworoko Road, Ado-Ekiti in Ado-Ekiti local government area of EkitiState. Ado-Ekiti is a big town in Nigeria, with population of about 313,690 and situated between the coordinates of 7.66124^0N and 5.2371^0E. It is inhabited by Yoruba-speaking people who are majorly Christians.

Study design

The research was a descriptive cross sectional study conducted for a period of three months using a pretest interviewer-administered questionnaire to collect relevant information from the pregnant women who consented to be part of this work.

Study population and sample size determination

The study population comprised of all pregnant women attending ante-natal clinic (ANC) at the EKSUTH during the period of the study (20th February to 20th May, 2018)that consented to participate in the study. Eligible participants were the pregnant women at their first antenatal visits while pregnant women at their follow-up antenatal visits; those who had received blood transfusions or were already receiving treatment for anaemia in pregnancy; women on iron tablets and those with chronic illness before antenatal registration were excluded.

The sample size was determined by using sample size formula described below:

$N = Z^2pq/d^2$

Where N is the minimum sample size

Z is the standard normal deviate usually set at 1.96, which corresponds to the 95% confidence interval.

P is the proportion of pregnant women with anaemia, which is 32.5% (0.325). This was prevalence from a previous study carried out in Southwest Nigeria (13).

q is complementary proportion equivalent to 1- P

d is the degree of accuracy desired (absolute precision), which is 5.0% (0.05).

The calculated sample size was 337.However, all participants booking for antenatal care during the study period who met the inclusion criteria were recruited after informed consent. In total, 378 participants were sampled in order to account for drop out or poorly filled questionnaires.

Sampling Technique

Ekiti State University Teaching Hospital (EKSUTH) was purposively selected for this study. The attendance list of the women at each booking clinic served as the sampling frame. The attendance number of each woman at every booking clinic was written on separate slips of paper. These were then thoroughly mixed in a container from where the first woman was picked randomly by balloting. If the woman did not meet the inclusion criteria, a new number was drawn until one met the criteria.

Data collection

A pretested structured questionnaire was interviewer administered to the pregnant women with the help of trained research assistants. The questionnaire was made up of three sections:

Section A was on socio-demographic characteristics of respondents; Section B gathered information on obstetric and medical history; Section C collected data on laboratory findings.Registered phlebotomists collected blood samples from the patients according to standard procedures for biochemical analysis.The laboratory investigations were carried out both at the haematology laboratory of the Ekiti State Teaching Hospital (EKSUTH) and Department of Medical Laboratory Science of AfeBabalola University, Ado Ekiti.

From each of the recruited woman, 2 mls of venous blood was collected from the antecubital vein using plastic disposable syringes into sample bottles containing ethylene diamine-tetra acetic acid (EDTA).Packed Cell volume (PCV) level was carried out using full automated blood cell counter, PCE-210 version 5.10 by ERMA INC. Tokyo at the haematology laboratory of the Ekiti State Teaching Hospital (EKSUTH).

Serum ferritin level estimation of a sub sample of 150 respondents (40%) was carried out at the haematology laboratory of Medical Laboratory Science of AfeBabalola University, Ado Ekiti using human ferritin enzyme immunoassay test kit by Diagnostic Automation, Inc. Calabasas USA. About 2mls of venous blood was obtained in a plain (anti-coagulant free) bottle. The serum was separated immediately and was refrigerated at 2-8^{0}C prior analysis.

Ethical approval of the study

Ethical approval was obtained from the Ethics and Research Committee of the Ekiti State University Teaching Hospital Ado-Ekiti, Nigeria with reference number EKSUTH/A67/2018/02/002 before the commencement of the study. Informed consent letter was signed by all the women that participated in this study.

STATISTICAL ANALYSIS

Statistical Package for Social Sciences (SPSS) version 17.0 (SPSS Inc., Chicago, USA) was used to analyse the data. Descriptive statistics of relevant variables were presented and cross-tabulation of socio-demographic variables against anaemia was done. Multivariate analysis was done to establish association between variables using Chi-square test and logistic regression at 5% level of significant. Chi-square test was used to evaluate the effect of these variables on anaemia in pregnancy at booking.

RESULTS

Socio-demographic characteristics of respondents

A total of 378 pregnant women were recruited for the study. Table 1shows the socio-demographic characteristics of the respondents. Their ages ranged from 20 to 50 years with a mean of 31.29 ±0.41 years. More than half (57.1%) of the women were between the ages of 30-39 years. Majority were Christians (93.7%) and Yoruba (88.9%); 98.4% of the respondents were married but only 1.6% were single. Overall, 14.3% had secondary education, 85.7%had tertiary education. Overall, 84.1% of the women were employed, with 32.5% as business women, 25.1% as artisans while 11.1% and 1.6% were unemployed and students respectively. The monthly income of 42.8% of the women was between N11, 000 and N20,000 and 18.3% earned at least N51,000.

Obstetric and medical history of respondents

Table 2 shows the obstetric and medical history of the pregnant women. Women with previous history of pregnancy were 64.3% and 20.6% having history of miscarriage or ectopic pregnancy. Among these women, 23.0% had birth interval of less than two years and 39.7% had birth interval of at least two years. Majority (59.5%) of the respondents booked for antenatal care in the second trimester, while 16.7% booked in their first trimester. The average time of booking was 21.67±4.45 weeks' gestation. Some (34.9%) of the women were multiparous, while 40.5% were nulliparous. 18.3% of the women had history of vaginal bleeding in the previous pregnancy while 4% had history of vaginal bleeding on the current pregnancy; 62.7% had their last births in health facilities while 2.4% had their last births in mission houses.

PREVALENCE OF ANAEMIA, IRON-DEFICIENCY ANAEMIA

Overall, about one-third (33.4%) of the women were anaemic (PCV value<33%) (Figure 1) out of which 30.2% were mild (PCV value 27-32.9%) and 3.2% were moderately anaemic (PCV value 22-26.9%). The anaemia rate increased from 2.4% in the first trimester to 21.4% in the second trimester but drastically reduced to 9.5% in the third trimester (Figure 2).

Ferritin test was done on the sub-sample and iron deficiency anaemia (serum ferritin < 12ng/ml) was found among 6.5% of the sub-sample **(**Figure 3**).** None of the respondent had iron deficiency anaemia in first trimester, however in second and third trimesters, iron deficiency anaemia (IDA) was 4.3% and 2.2% respectively

Table 1: Socio-demographic characteristics of the women at booking (n=378)

Characteristics	Frequency (N)	Percentage (%)	Mean ±S.E
Age			
20-29	138	36.5	
30-39	216	57.2	31.29±0.41
≥40	24	6.3	
Ethnicity			
Yoruba	336	88.9	
Ibo	24	6.3	N/A
Others	18	4.8	
Religion			
Christianity	354	93.7	
Islam	24	6.3	N/A
Marital Status			
Single	6	1.6	
Married	372	98.4	N/A
Educational Level			
Secondary	54	14.3	
Tertiary	261	69.0	N/A
Postgraduate	63	16.7	

Mean ± Standard Error; N/A: Not Applicable

Table 1: (continued)

Characteristics	Frequency (N)	Percentage (%)	Mean ±S.E
Occupation			
Business	123	32.5	
Artisan	57	15.1	
Civil Servant	48	12.7	
Professional	90	23.8	N/A
Student	6	1.6	
Unemployed	42	11.1	
No response	12	3.2	
Monthly income			
<11,000	39	10.3	
11,000-30,000	183	48.4	
30,000-50,000	48	12.7	N/A
51,000-above	69	18.3	
None	36	9.5	

Mean ± Standard Error; N/A: not applicable

Table 2: **Obstetric and medical history of the women at booking (n=378)**

Characteristics	Frequency (N)	Percentage (%)
History of previous pregnancy		
Yes	243	64.3
No	135	35.7
History of miscarriage/ectopic		
Yes	78	20.6
No	300	79.4
Inter-pregnancy interval		
<2 years	87	23.0
≥2 years	150	39.7
Not Applicable	141	37.3
Parity		
None	153	40.5
1	93	24.6
2-4	132	34.9
≥5	0	0.0
Gestational age (weeks)		
≤13 (first trimester)	63	16.7
14-26 (second trimester)	225	59.5
≥27 (third trimester)	90	23.8
Vaginal bleeding during previous pregnancy		
Yes	69	18.3
No	23161.1	
Not Applicable	78	20.6

Table 2: (continued)

Characteristics	Frequency (N)	Percentage (%)
Vaginal bleeding in current pregnancy		
Yes	15	4.0
No	363	96.0
Place of delivery of previous pregnancy		
Health facility	239	62.7
Mission house	9	2.4
Not Applicable	132	34.9

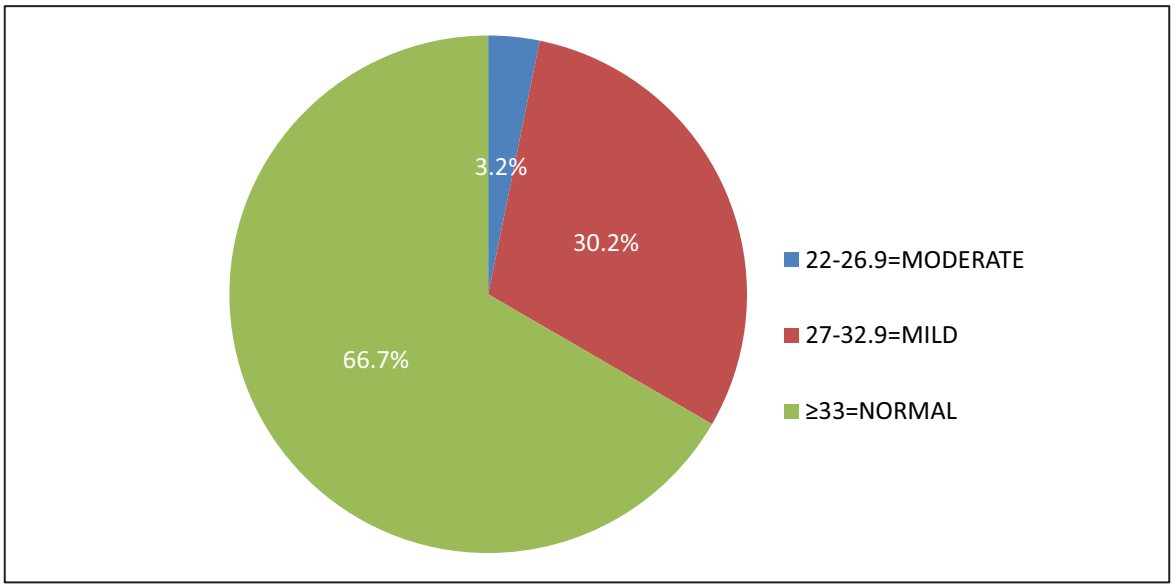

Fig 1: Prevalence of anaemia among the respondents

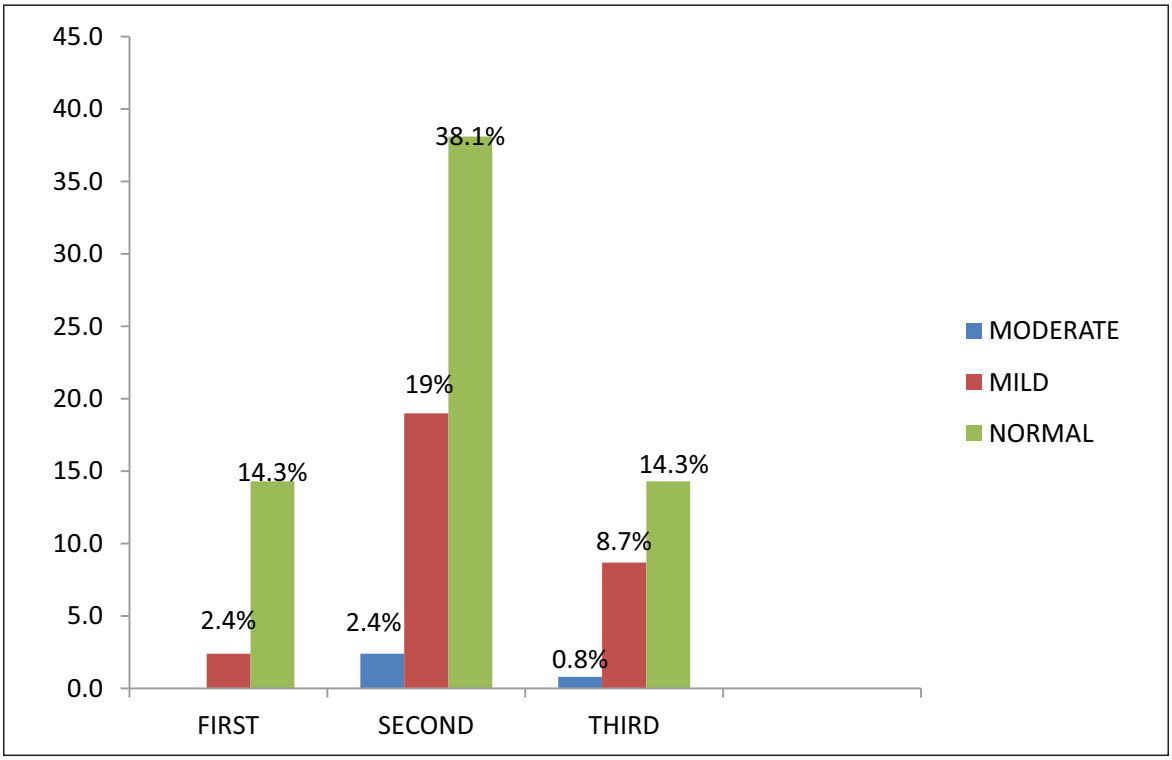

Fig 2:Prevalence of anaemia according to gestational age

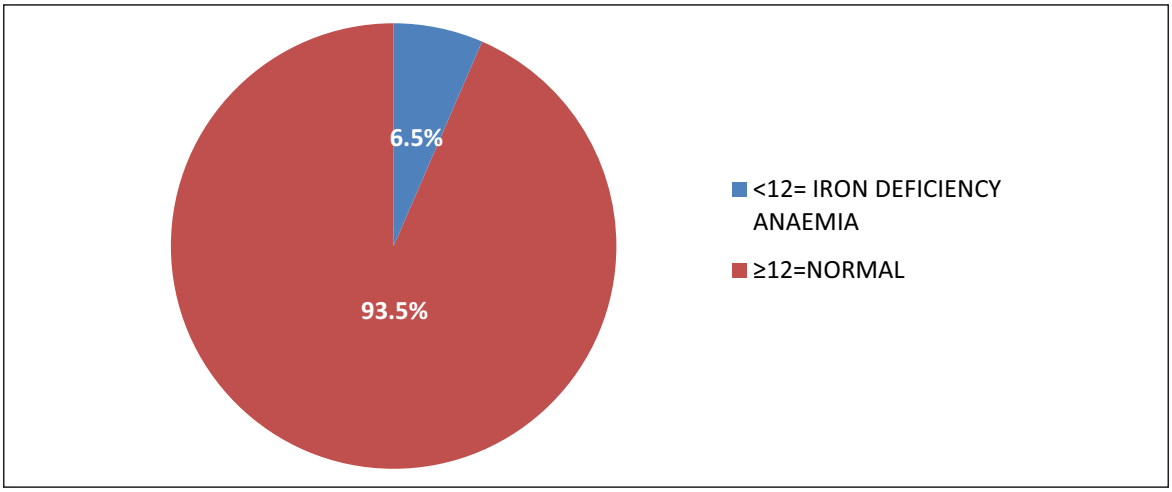

Fig 3: Prevalence of iron deficiency anaemia

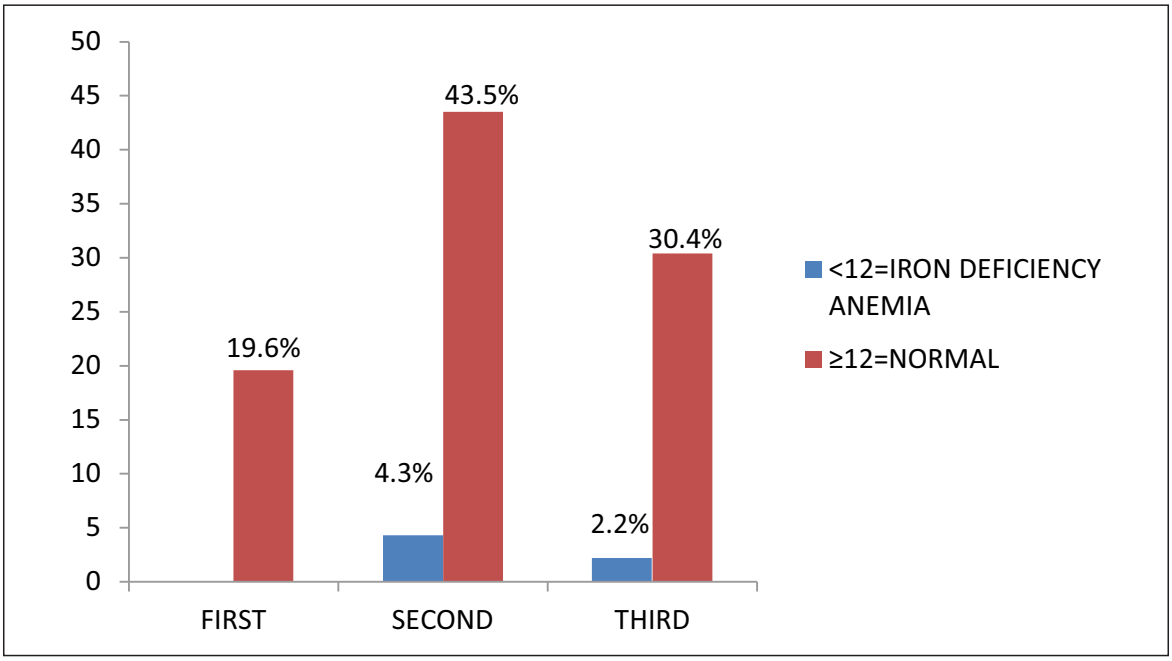

Fig 4: Prevalence of iron deficiency anaemia according to gestational age

Table 3 shows the association of socio-demographic factors and clinical parameters with anaemia. With the exception of marital status, all other socio-demographic factors were not significantly associated ($p>0.05$) with anaemia. Serum ferritin level had statistically significant ($p<0.05$) association with anaemia while other clinical parameters did not have.

Predictors of anaemia among respondents using logistic regression

Table 4 shows the logistic regression that was conducted to assess if selected socio-demographic and obstetric factors like age, income, inter pregnancy interval, parity, gestational age were predictors of anaemia in the respondents. Low average monthly income of the family (Odds Ratio (OR) = 1.37; 95% CI); gestational age at booking (OR = 0.47; 95% CI) were found to be independent predictors of anaemia in pregnancy among the respondents

Discussion

In this study, it was found out that the majority of the women were within the active reproductive age (14).Majority of the women were Yoruba and Christians who reflect the attribute of the study setting.

It was observed that most of respondents had formal education to tertiary level, thus it was most likely that these women would have had good knowledge about their health and nutritional needs. Majority of the women were married. This suggests that the women would receive support from their spouses inthe form of companionship, empathy, and assistance with chores and logistics.

It was observed that monthly income levels were low among the pregnant women. Income is an important household resource. With such low incomes, it is likely that many of the respondents lacked the financial resources to purchase adequate amounts of nutritious food. Advocacy for free antenatal health services along with social welfare package for women once pregnancy is confirmed is advisable.

The mean gestational age at booking (age of pregnancy at the time a women first attended ante natal care) reported in this study is comparable to 23 weeks reported in a previous study (15). The percentage of women with anaemia was lowest among those that booked for antenatal care in the first trimester. This finding is in agreement with finding of (16) in Ilesha.

Antenatal booking was found to be late among these pregnant women as only 16.7% booked for

ante-natal clinic in the first trimester of pregnancy, this may have contributed to the high prevalence of anaemia recorded in this study since early antenatal care results in better monitoring and early detection of anaemia and its correction by appropriate supplementation (17). Most pregnant women book for antenatal care from the second trimester when correction of anaemia to prevent suboptimal neural development and functioning in the child may be late. This could also lead to late commencement of routine haematinics and lack of antimalarial prophylaxis (18).

The parous women in this study had an inter-pregnancy interval of greater than 2 years. The high level of education of the women may contribute to this trend. This finding is similar to the report (19). Pregnant women having birth interval less than two years were at higher risk of becoming anaemic as compared to those with birth interval more than two years. This might be related with decreased iron store of women due to occurrence of pregnancy in quick succession between subsequent pregnancies (20).
In this study, it was observed that anaemia was significantly higher in the nulliparous/primigravidae, Generally, anaemia is more common in the primigravidae than in the multigravidaein sub-Saharan Africa (21). Although one might expect that anaemia in pregnancy would tend to increase with rising parity owing to repeated drain on iron stores (22), various workers have observed a progressive decline in iron stores but increasing mean Hb levels with increasing parity and attributed these differences to a greater risk of malaria in the primigravida(23, 24).

The mean packed cell volume in this study was 33.76% ± 0.30 and the prevalence of anaemia in pregnancy (AIP) at first ante-natal visit was 33.4%. WHO defines anaemia in pregnancy as packed cell level less than 33% (3) and iron deficiency anaemia in pregnancy has been defined by the National Academy of Sciences panel on nutrition and pregnancy as ferritin level lower than12 µg/l (25).

The 33.4% prevalence of anaemia reported in this study agrees with the findings of 32.4% reported (26) and 30% reported (27) working in the same south west region but lower than the values of 53.1% reported by (13) working in the same city and the rate of 54.9% reported (8) working in the south east region and 76.5% reported (17) working in Abeokuta. However, the prevalence of anaemia in this study was found to be higher as compared to the value of 24.5% reported (28) working in Kano. In addition, the current prevalence of anemia is also higher than the national anemia prevalence of 58% according to WHO (3). This discrepancy could be resulting from geographical variations across different areas. In developing countries, prevalence rates in pregnant women are commonly estimated to be in the range of 35-75% (27).

Most cases of anaemia in this study were either mild or moderate. The absence of severe anaemia is consistent with assertions from other research findings (13, 29).Mild to moderate anaemia, although generally well-tolerated, clearly adversely affects the sense of well-being, resulting in fatigue and a decrease in work capacity. Women in sub- Saharan Africa are the "hewers of wood and the drawers of water," therefore the decreased work capacity as a result of the anaemia will have economic consequences on the family in particular and on society at large (30).
In this study, it was observed that the iron deficiency anaemia was higher among primigravidae and pregnant women in their second trimester. This is consistent with previous findings (11) working in Calabar. Iron deficiency is the cause of 75% of anaemia cases worldwide. Serum ferritin estimation is a clinical, non-invasive and sensitive means of detecting iron deficiency. Ferritin is an iron storage protein in the body (31). The physiologic importance of storage iron is that it provides a rapidly available supply in the event of blood loss. The development of iron deficiency anaemia is associated with increased risk of preterm births low birth-weight infants, maternal morbidity and mortality. It is also associated with high prenatal mortality rates (11).Low levels of serum ferritin are indicative of iron deficiency while high levels means that the body stores too much iron which can lead to liver diseases among others.
The peak of anaemia and iron deficiency anaemia recorded in this study (2nd trimester) coincides with the period when haemodilution is at its peak. This may have contributed to the high prevalence recorded in the 2nd trimester, indicating that anaemia is further aggravated by haemodilution. This result conforms to the findings (17,13) and is at variance with the report of (19) in which anaemia is said to be significantly higher in the 3rd trimester of pregnancy than the first two trimesters.
Marital status of the women appeared to be the only socio-demographic factor that is statistically associated with the occurrence of AIP. Majority of the married respondents were not anaemic. This suggests that the women would receive support

from their spouses in the form of companionship, empathy, logistics and assistance with household chores such as food preparation, feeding of older children at home. Pregnancy is typically considered a vulnerable period for women and one important risk factor affecting maternal well–being is a lack of partner support (15). Low partner support in pregnancy is associated with poor dietary practices which eventually lead to poor pregnancy outcomes such as low birth weight and preterm labour.

Serum ferritin level of the women appeared to be the only clinical parameter that is statistically associated with the occurrence of AIP. This finding is consistent with previous findings Okafor, (31, 11). Low level of serum ferrritin is an indicative of iron deficiency anaemia (IDA). Among all anaemias, IDA is the most prevalent anaemia worldwide (32). Women have additional iron requirements during pregnancy. This is because the physiological changes associated with pregnancy exert a demand for additional iron needed for transfer to the foetus (5). Iron requirements are reduced in the first trimester due to the absence of menstruation however during the second half of the pregnancy there is a notable increase of iron requirements due to the expansion of the red blood cell mass.

In multivariate logistic regression, monthly income and gestational age at booking of the respondents was found to be independent predictors of anaemia in pregnancy. From this study, pregnant women who had low monthly income were four times more likely to be anaemic as compared to those with high monthly income. This is consistent with the findings (13) who reported a decreasing trend in AIP with high per capital income among women. Direct immediate access to income drastically reduces a woman's dependency and this strengthens her ability to realize her own preferences within the family. Women's nutritional status is related to their economic status. When food is not enough, mothers usually gave up their share for their children thereby skipping meals which affects their dietary intake and nutritional status and also contributes to anaemia. Economic empowerment of women would play a very important role in reducing the prevalence of anaemia in our environment.

Gestational age at booking is also an independent predictor of anaemia. Most pregnant women registered for antenatal care during the second trimester when correction of anaemia to prevent sub-optimal neural development and functioning in the child may be late. This result conforms to the findings (17, 19, 11). Anaemia in pregnancy is further aggravated by haemodilution. Majority of the women came for booking at a time when physiologic haemodilution is most profound.

Conclusion

Anaemia was found to be amoderate public health problem in the study area and the commonest form of anaemia was mild anaemia. Prevalence of anaemia was found to be more in the second trimester. Marital status and serum ferritin levels were statistically significant factors found to be associated with the presentation of anaemia in pregnancy. Monthly income and gestational age of the women were the independent predictors of anaemia using multivariate logistic regression. Nutrition education should be intensified.

Recommendations

Based on the findings, the study recommends that early registration for antenatal care by all pregnant women. Government should assist in subsidizing the money for assessing ante natal clinic if not free. Economic empowerment of women would play a very important role in reducing the prevalence of anaemia.

Acknowledgements

We wish to thank all pregnant women who participated in the study.

Table 3: Association between socio-demographic factors and clinical parameters with Anaemia

Variable	Anaemic<33	Normal≥33	X^2	P-value
Age				
20-39	114(30.4)	237(63.2)	0.146	p>0.005
≥40	9(2.4)	15(4.0)		
Religion				
Christianity	120(32.0)	77(61.6)	0.206	p>0.005
Islam	3(0.8)	21(5.6)		
Marital Status				
Single	6(1.6)	0(0.0)	0.041	p<0.005
Married	117(31.2)	252(67.2)		
Educational level				
Secondary	27(7.2)	27(7.2)		
Tertiary	96(25.6)	225(60.0)		p>0.005
Occupation			0.121	
Business woman/Artisan	63(16.8)	114(30.4)		
Civil servant/Professional	18(8.0)	60(28.8)		p>0.005
Student	6(1.6)	0(0.0)		
Unemployed	21(5.6)	21(5.6)	0.172	
No response	3(0.8)	9(2.4)		
Income				
<11,000	15(4.0)	21(5.6)		
11,000-30,000	69(21.0)	114(30.7)		
31,000-50,000	15(4.0)	33(8.8)	0.094	p>0.005
51,000 and above	6(1.6)	63(16.9)		
No response	18(4.8)	18(4.8)		
Inter-pregnancy Interval				
<2	36(9.6)	51(13.6)		
≥2	39(10.4)	111(29.6)	0.350	p>0.005
Not applicable	48(12.8)	90(24.0)		
Parity				
None	45(12.0)	105(28.0)		
1	36(9.6)	57(15.2)	0.709	p>0.005
2-4	42(11.2)	90(24.0)		
Serum ferritin				
<12	9(6.7)	0(0.0)	0.011	p>0.005
≥12	36(26.7)	90(66.7)		

Table 4: Predictors of Anaemia among Respondents Using Logistic regression

Variable	Odd ratio (OR)	Pvalue	95% Lower	Upper
Age	2.29	0.080	0.90	5.84
Income	1.37	0.039*	1.02	1.84
Interpregnancy interval	0.77	0.539	0.33	1.77
Parity	0.64	0.282	0.29	1.44
Gestational age	0.47	0.048*	0.22	0.99

**Significant at (p<0.05)*

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