Asian Hematology Research Journal

2(1): 1-7, 2019; Article no.AHRJ.49361

Prevalence of Anemia among Pregnant Women Registered at Antennal Clinic of Ondo Specialist Hospital, Ondo State, Nigeria

Funmilayo Stella Oluwafemi[1], Ayodeji Akinwande Fasoro[1*], Adebanji Modupe Akingbade[2], Charles Oluwafemi Faeji[3], Ignatius Olawale Oni[1], Toluwani Agunbiade[3], Adebanke Adeorite Agboola[3] and Emmanuel J. Akele[4]

[1]Department of Public Health, College of Medicine and Health Sciences, Afe Babalola University, P.M.B. 5454, Ado-Ekiti, Nigeria.
[2]Department of Anatomy, Ekiti State University, P.M.B. 5363, Ado-Ekiti, Nigeria.
[3]Department of Medical Microbiology and Parasitology, College of Medicine and Health Sciences, Afe Babalola University, P.M.B. 5454, Ado-Ekiti, Nigeria.
[4]Department of Medical Laboratory Science, College of Medicine and Health Sciences, Afe Babalola University, P.M.B. 5454, Ado-Ekiti, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Author FSO designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors FSO and AAF performed the statistical analysis. Authors AMA and COF managed the analyses of the study. Authors IOO, TA, AAA and EJA managed the literature searches. All authors read and approved the final manuscript.

Article Information

Editor(s):
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Complete Peer review History: http://www.sdiarticle3.com/review-history/49361

Original Research Article

Received 27 March 2019
Accepted 04 June 2019
Published 14 June 2019

ABSTRACT

Anemia remains a major risk factor for unfavorable outcome of pregnancy both for the mother and the fetus. It is the world's second leading cause of disability and one of the most serious global public health problems among children and pregnant women. Its diagnosis remains a challenge in poor and underfunded hospitals and primary health centers. This study is a hospital-based cross-

**Corresponding author: E-mail: akinfasoro@abuad.edu.ng;*

sectional study conducted in Ondo Specialist Hospital, Ondo town to assess anemia among pregnant women attending antenatal care clinic from August to October 2015. One hundred and fifty pregnant women were enrolled in this study. Data were collected using pretested questionnaire, which contains socio-demographic characteristics of the pregnant women. Blood samples were collected to measure hemoglobin and Packed Cell Volume (PCV) levels. Data were entered and statistical analysis was performed using SPSS version 20.0 software. Association between variables was done using chi square, and statistical significance was considered at $p<0.05$. The mean age of pregnant women was 28.92±4.89 years and the prevalence of anemia obtained in this study using the Tallquist, Hemoglobin cyanide methods and PCV was 36%, 36.7% and 47.3% respectively, based on the World Health Organization criterion for the diagnosis of anemia in pregnancy (hemoglobin <11.0 g/dl; PCV <33%). Our study revealed a high prevalence of anemia in pregnant women and calls for more health intervention including health education about causes of anemia and its risk factors. Antenatal care follow up should also be improved on.

Keywords: Anemia; pregnant women; antenatal care; prevalence; hemoglobin.

1. INTRODUCTION

Anemia has been described as the most common complication related to pregnancy and it affects almost half of pregnant women worldwide [1]. The World Health Organization (WHO) defines anemia as low blood hemoglobin (Hb) concentration level in the body, which decreases oxygen-carrying capacity of red blood cells to tissues [2, 3]. It is a global public health problem which affects both developed and developing countries thus resulting into maternal morbidity and mortality as well as other social and economic problems [3]. Globally, anemia affects about 1.62 billion people [4]. It was estimated that the prevalence of anemia in developed countries is about 9% while it's about 43% in developing countries [5]. Anemia in pregnancy may lead to premature births [6], low birth weight [7], fetal impairment and infant deaths [8]. Every year, anemia is estimated to be responsible for more than 115,000 maternal deaths and 591,000 prenatal deaths worldwide. An increased risk of psychiatric disorders has also been reported among children and adolescents with iron deficiency anemia [9].

In West Africa, anemia is responsible for an estimated 20% of maternal deaths and still contributes more to deaths through obstetric hemorrhage [10]. Epidemiological studies on prevalence of anemia among pregnant women in Nigeria have been carried out and reported with varying magnitude of anemia and several associated factors. Most of these studies based their classification on WHO cut-off point of the hematocrit of 33%. Some reported prevalence as low as 30% [11], 35.3% [12] and others as high as 85.5% [13] and 76.5% [14] among pregnant women. The aim of this study was to assess the anemic status of pregnant women attending the antenatal clinic of a specialist hospital using different methods of evaluation for Hemoglobin (g/dl) and packed cell volume measurement.

2. MATERIALS AND METHODS

2.1 Study Area

The study location was Ondo town, the second largest city located in the central senatorial district of Ondo State with a population of about 287,911 and located at latitude 75'60,000N and longitude 449'59,988E with an altitude of 264m. The state has four specialist hospitals which serve as referral centers to the general hospitals and primary health care centers. The study was conducted in antenatal clinic of the State Specialist Hospital, Ondo, Nigeria.

2.2 Study Design and Population

This was a cross-sectional and hospital-based study among 150 pregnant women attending the antenatal clinic which were recruited consecutively for the study. Pregnant women who were ill or admitted to the hospital were excluded for the study.

2.3 Data and Sample Collection

The age (years), education, occupation, religion and stage of pregnancy of every participant were documented and about 5 mls of blood sample was collected aseptically using a sterile needle and syringe into EDTA bottle, and was stored at 4±2°C before analysis.

2.4 Data and Sample Analysis

Anemia was assessed by measuring the blood hemoglobin level with two different methods (Tallquist method and hemoglobin cyanide method) and packed cell volume (PCV). The WHO criterion for the diagnosis of anemia in pregnancy (hemoglobin <11.0 g/dl; PCV <33%) was used. The validity of the two different methods used for hemoglobin measurement was also checked. Data were analyzed using the SPSS software version 20.0.

3. RESULT

Samples were collected from all recruited participants and assessed for anemia giving a 100% response rate. Table 1 shows that the mean age of respondents was 28.92±4.89 years with majority of respondents (68.0%) in 25-34 years age group. More than half of the respondents had tertiary education (65.3%), were Christians (54.7%), while 46% of respondents had government/private occupation.

The anemic status of the pregnant women was diagnosed using different methods of evaluation for Hemoglobin (g/dl) and packed cell volume measurement. Table 2 shows that 47.3% of the pregnant women were anemic using the PCV result while 36.0% and 36.7% of the pregnant women were anemic using their hemoglobin (g/dl) levels as determined through the Tallquist and hemoglobin cyanide method respectively.

About half of the pregnant women 74 (49.3%) were in their second trimester of pregnancy (Table 1). Majority of the anemic pregnant women belong to age group 25 -24 years (Table 3) and in their second trimester of the pregnancy (Table 4). There was a significant difference between the mean hemoglobin levels using the two different methods at $P < 0.001$ (Table 5).

4. DISCUSSION

The prevalence of anemia obtained in this study using the Tallquist, hemoglobin cyanide methods and PCV was 36%, 36.7% and 47.3% respectively, based on the World Health Organization criterion for the diagnosis of anemia in pregnancy (hemoglobin <11.0 g/dl; PCV <33%) [15]. The overall prevalence of anemia obtained in this study was higher than 27.9% reported among pregnant women in Southeast Ethiopia where the mean Hb value was 11.4 ± 2.3 g/dl [16], 19.7% (mean Hb value is 11.7 ± 2.32 g/dl) among pregnant women in Mekelle town, Ethiopia [17], 21.6% in Gondar [18], 23.2% in Nigeria [19] and 27.1% in Turkey [20]. The differences observed in these studies may be due to the different socioeconomic conditions, culture, health-seeking behavior and availability of maternal health services.

The prevalence in our is study is similar to 36.6% reported by Niguse and colleagues [21] in Shalla Woreda and 33% reported by Jufar and Zewde [22] in Addis Ababa, Ethiopia. However, our findings are lower than 53.9% reported among pregnant women in Gilgel Gibe dam area in Southwest Ethiopia [23], 62.6% in Eastern Sudan [24], 54.5% reported in Uyo, Nigeria [25], 64.1% in Enugu, Nigeria [26], 56.1% in Lagos, Nigeria [12] and 72% in north-eastern Nigeria [27]. The varying difference in these studies could be as a result of prevalent malaria infection in these study populations. *Plasmodium falciparum,* one of the *Plasmodium* species that causes malaria have long been identified to contribute to anemia throughout life and specifically during pregnancy in endemic countries [28].

The highest prevalence of anemia in our study was observed among those aged 25 – 34 years. This is in contrast to the prevalence of anemia which was higher in pregnant women in the age group of 18-26 years [16] but similar to the highest prevalence of anemia among women aged 25–29years [25].

In our study, the highest prevalence (57.8%, 46.3% and 50.9% using the PCV, Tallquist and Hb cyanide methods respectively) was observed among those in their second trimester. This is similar to what was reported in Uyo where anemia was prevalent (55.1%) among pregnant women in their second trimester [25]. Many studies conducted reported highest prevalence of anemia in the third trimester [16, 17, 23, 29]. The findings from our study call for a serious attention to pregnant women's anemic status. If these women could be anemic in their second trimester, it could pose a great threat to them and their unborn children. Further studies need to be carried out to determine what are the causes/risk factors associated with women in this study population being anemic in their second trimester.

The validity of the two methods used in measuring the hemoglobin level of respondents was compared. The validity indices for Tallquist

were sensitivity of 89.2%, specificity of 98.1%, positive predictive value of 99.2% and negative predictive value of 80.0% and overall accuracy of 92.0%. While the validity indices for Hemoglobin cyanide method were sensitivity of 96.6%, specificity of 87.4%, positive predictive value of 86% and negative predictive value of 97.0% and overall accuracy of 91.5%. The Tallquist method still has the potential of detecting and assessing anemia with reasonable and acceptable sensitivity, specificity and overall accuracy. It is inexpensive, rapid, and simple unlike the Hemoglobin cyanide method and thus mostly appropriate tool used in remote/rural communities where there is no laboratory or where laboratories and hospitals are faced with serious problems of health financing and unequipped facilities. The cross-sectional study design used in this study is a limitation to the results of this study. This is because it cannot be established whether anemia preceded the predisposing factors or vice versa. The study design could not also identify causes of anemia in pregnant women during their second trimester. Pregnant women who were ill or admitted to the hospital who were excluded from the study could have lowered the prevalence of anemia in this study sample.

Table 1. Demographic information of the pregnant women

Demographic information	f (n=150)	%
Age		
15 – 24 years	28	(18.7)
25 – 34 years	102	(68.0)
35 – 44 years	20	(13.3)
Occupation		
Government/Private work	69	(46.0)
Business Woman/Trader	35	(23.3)
Artisan/hard skilled work	38	(25.4)
Farmers	0	(0.0)
Not working	8	(5.3)
Religion		
Christianity	82	(54.7)
Islamic	61	(40.7)
Traditional	7	(4.6)
Others	0	(0.0)
Education		
Primary education	12	(8.0)
Secondary education	39	(26.0)
Tertiary education	98	(65.3)
No formal education	1	(0.7)
Trimester		
First	30	(20.0)
Second	74	(49.3)
Third	46	(30.7)
Mean age: 28.92±4.89 years		

Table 2. Anemic status of the pregnant women as assessed with different diagnostic methods

Anemic status	Hemoglobin (g/dl)		Packed cell volume (PCV) n (%)
	Tallquist method n (%)	Hemoglobin cyanide method n (%)	
Anemic (<11g/dl)	54 (36.0)	55 (36.7)	71 (47.3)
Non anemic (≥11g/dl)	96 (64.0)	95 (63.3)	79 (52.7)
Total	150 (100.0)	150 (100.0)	150 (100.0)
Mean±S.D	11.15 ± 1.47g/dl	11.20 ± 1.53 g/dl	32.79±4.53%

Table 3. Age frequency distribution of anemic pregnant women

Age frequency and percentage distribution	Hemoglobin (g/dl)		Packed cell volumen (%)
	Tallquist method n (%)	Hemoglobin cyanide method n (%)	
15 – 24 years	8 (14.8)	9 (16.4)	15 (21.1)
25 – 34 years	40 (74.1)	40 (72.7)	49 (69.0)
35 – 44 years	6 (11.1)	6 (10.9)	7 (9.9)
Total	54 (100.0)	55 (100.0)	71 (100.0)

Table 4. Stage of pregnancy of anemic pregnant women

Pregnant women with anemia	Trimester/Stage of pregnancy			
	First trimester	Second trimester	Third trimester	Total
PCV result	9 (12.8%)	41 (57.8%)	21 (29.6%)	71 (47.3%)
Tallquist Method	3 (5.6%)	25 (46.3%)	16 (29.6%)	54 (36.0%)
Hemoglobin cyanide Method	3 (5.5%)	28 (50.9%)	16 (29.1%)	55 (36.7%)

Table 5. Comparison of mean of hemoglobin level by Tallquist and hemoglobin cyanide method

Method of estimation of Hb	No of samples	Hemoglobin (g/dl) Mean±S.D	Significance
Tallquist Method	150	11.15 ± 1.47	P < 0.001
Hemoglobin Cyanide Method	150	11.20 ± 1.53	

5. CONCLUSION

The overall prevalence of anemia in this study was 36.0% from Tallquit method, 36.7% from the hemoglobin cyanide method and 47.3% from the hematocrit PCV. The overall accuracy of the Tallquist method was 92.0% and that of the Hemoglobin cyanide method was 91.5%. The Tallquist method is a suitable option of assessing anaemia where there is no laboratory or equipped hospital in rural settings. We recommend that an awareness campaign on the consequences of anemia during pregnancy be given to women of child bearing age and pregnant women in particular. Nutritional counseling on consumption of iron-rich foods and iron/foliate supplementation are highly recommended. Routine screening and deworming of pregnant women infected with intestinal parasites is also recommended.

CONSENT

An informed written consent was also obtained from all participants after being given information on the study before the questionnaires were administered.

ETHICAL APPROVAL

The Ondo State Ethics Board and State Specialist Hospital gave ethical approval before the study was commenced.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/49361