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Prevalence of Anaemia among Antenatal Clinic Attendees at A Tertiary Hospital in South West, Nigeria

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ABSTRACT

Introduction: **Anaemia in pregnancy is a global public health problem causing both maternal and perinatal morbidities and mortalities. Prevalent rates vary from one geopolitical region to the other. Efforts have been made to reduce this condition during pregnancy through the use of haematinics and other interventions. However, despite all the efforts put in place, pregnant women still present with this condition. This study was carried out to find out its prevalence rate and the factors responsible for it.**

Materials and Methods: **It was a cross-sectional institutional based study carried out at the antenatal clinic of the University of Medical Sciences Teaching Hospital Complex, Akure, Ondo State, South West, Nigeria. The study used a systematic sampling to recruit 400 antenatal clinic patients over a period of 16weeks starting from the 16th of August to 16th of December 2022.The women were interviewed with copies of a structured questionnaire administered by trained research doctors who also helped in the collection of the blood samples. About 3mls of venous blood was collected from the antecubital vein using plastic disposable syringes into sample bottles containing ethylene diamine-tetra acetic acid (EDTA) and the bottles labelled accordingly. Packed cell volume and red cell morphology were done for the women at the time of recruitment. Data obtained were analysed using the Statistical Package for Social Sciences (SPSS Version 22). Descriptive statistics were computed for all relevant variables, Chi Square test and Multivariate logistic regression were used to test for association and possible risk factors for anaemia. The level of significance was set at $P < 0.05$.**

Results: **Most of the women were within 30years- 39years (51.2%, 205) with a mean age of 31.61years±5.37years. Most of them were married (97.3%, 389), were Christians (94.5%, 378), were Yorubas (82.8%, 331), were traders (40.3%, 161), had tertiary level of education (68.8%, 275) and lived in the urban areas of Ondo State (89.5%,358). Most had their first menses between the ages of 10 to 15 years (79.2%, 317) with a mean age of 14.24 ± 2.12 years. Majority had inter- pregnancy interval of ≤ 2 years (53.7%, 215). There was no history of bleeding in most of the women (91.5%, 366), many of them were in the third trimester of their pregnancy (64.1%, 257) with a mean gestational age of 28.83 ± 6.91 weeks. The prevalence of anaemia among the study participants was 40.0% (160/400) while 60% (240/400) were not anaemic. Among the participants who were anaemic, 77.5% (124/160) had mild anaemia, 22.5% (36/160) had moderate anaemia while none had severe anaemia. The only risk factors identified to be responsible for anaemia among the women were high parity and being in the third trimester of pregnancy.**

Conclusion: **This study showed that the prevalence of anaemia is still high among our women mostly occurring among women of high parity and in the third trimester of pregnancy. Efforts must be intensified to address this condition through the use of haematinics which can be started pre-conception and adequate counselling on the need to fully recover from the effects of one pregnancy before embarking on another.**

Keywords: Anaemia in pregnancy, prevalence, risk factors.

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I. Introduction

Anaemia in pregnancy is a major cause of morbidity and mortality among women and has both maternal and fetal consequences [1]. It is a global public health problem with greater consequence in developing countries such as Nigeria [2]. In 2008, the World Health Organization (WHO) reported that 35% to 80% of pregnant women in developing countries are anaemic with a prevalence of 60% reported in Nigeria [3]. It is estimated that anaemia causes about 115,000 maternal and 591,000 perinatal deaths globally per year [4]. According to WHO, a woman is anaemic if her haemoglobin level is less than 11g/dl or Packed cell volume of less than 33% [5]. It further classified severe anaemia as haemoglobin level of <7g/dl, moderate anaemia as haemoglobin level of between 7-9.9g/dl and mild anaemia as haemoglobin level of between 10-10.9g/dl [5].

Anaemia in pregnancy could be relative or absolute with relative anaemia being a normal physiological occurrence in pregnancy due to larger increase in plasma volume than the red cell mass while absolute anaemia is a true decrease in red cell mass caused by pathological conditions [6], [7]. The causes of anaemia in pregnancy have been reported to be due to repeated pregnancies and child births, parasitic infestations like hookworm and malaria, impaired production of erythrocytes or increased loss of erythrocytes from bleeding [8]. Parasitic infection like hookworm causes blood loss from the gastrointestinal tract leading to depletion of iron stores and impaired erythropoiesis, they also cause malabsorption and reduced appetite thereby worsening micronutrients deficiency and maternal anaemia [9], [10]. In Nigeria, malaria in pregnancy has been reported as the most predominant cause of anaemia in pregnancy [11]. Other risk factors for anaemia include young age, ignorance, grand multiparity, low socioeconomic status, illiteracy and short inter-pregnancy intervals [12].

In our facility the principle of prevention of anaemia in pregnancy is routine use of haematinics and prophylaxis for malaria coupled with health education on diet that could boost immunity and increase the iron content for the mother and the baby. However, despite all the efforts that have been put in place to curtail this public health issue, some women still present with anaemia during delivery which necessitated this study to find out the true prevalence of anaemia and the factors that could be contributing to the anaemia. This will help policy makers and can also enhance programming for reducing morbidities and mortalities associated with anaemia in pregnancy.

II. Materials and Methods

A. Study Design

It was a cross sectional study carried out in the antenatal clinic of the University of Medical Sciences Teaching Hospital Complex in Akure, Ondo State, South West Nigeria. This teaching hospital is part of the hospitals being used in the state for the training of undergraduate students of the University of Medical Sciences and for the training of resident doctors in different specialties. The teaching hospital provides services to the people in the state and its environs. It serves as a major referral hospital for government owned and privately owned hospitals in Ondo State and the surrounding states.

B. Sample Size

This was calculated using Kish Leslie formula for cross sectional studies [13]. Using a prevalence of anaemia reported in Nigeria as 60% [3], P=0.6, q=0.4, d which is the degree of accuracy desired was put at 5% giving a value of 0.05, Z the standard normal deviate usually set at 1.96 corresponds to the 95% confidence interval and N the required sample size. Therefore,

$N=Z^2\ Pq/d^2 = (1.96)^2 \times 0.6 \times 0.4/(0.05)^2 = 369$, this was approximated to 400.

C. Patients Recruitment

The study was conducted over 16 weeks from 16th of August 2022 to 16th of December 2022. A total of 1,600 women were anticipated to present for antenatal clinic during the study period based on the previous antenatal clinic records where average of 100 patients were seen every week with a total of 4,800 patients in the previous year. The antenatal clinic is run twice in a week because of the patients load. Using a sample size of 400, the patients were recruited by systematic sampling technique as 1,600/400=4, thereby every 4th patient was then selected from the list of the antenatal clinic attendees to give a total of 25 patients per week.

D. Inclusion Criteria

This included only the women who have been attending antenatal clinic at the facility and who consented to participate in the study.

E. Exclusion Criteria

Women who did not give consent, who have been transfused in the index pregnancy for anaemia and those presenting for booking were excluded.

F. Data Collection

Data were collected over a period of sixteen weeks (16th of August 2022 to 16th of December 2022) and during this period 400 pregnant women were recruited. The women were interviewed with copies of a structured questionnaire administered by trained research doctors who also helped in the collection of the blood samples and the following information obtained: maternal age, parity, gestational age, last child birth, last menstrual period, level of education and occupation of the women and their husbands, history of fever and treatment for malaria in the index pregnancy, presence of any chronic illnesses, history of vaginal bleeding in the present pregnancy and the nature of their diets. Packed cell volume and red cell morphology were done for the women at the time of recruitment. From each of the recruited woman, 3mls of venous blood was collected from the antecubital vein using plastic disposable syringes into sample bottles containing ethylene diamine-tetra acetic acid (EDTA) and the bottles labelled accordingly.

G. Haematocrit Estimation

Two capillary tubes labelled for each subject were filled with blood to about 2/3 of the length of each tube and one end of each of these tubes was then sealed with plasticine. This was to ensure that the average of the two values obtained was used for calculation.

H. Ethical Approval

Ethical approval for the study was obtained from the University of Medical Sciences Teaching Hospital Complex, Ondo ethics committee.

I. Consent

Consent was taken from each patient recruited into the study. Those who gave consent and participated in the study had the opportunity of getting their results and those who had low packed cell volume were treated accordingly.

J. Data Analysis

Data obtained were analysed using the Statistical Package for Social Sciences (SPSS Version 22). Descriptive statistics were computed for all relevant variables and the association between anaemia and the possible risk factors for anaemia among the women was tested using the chi square test and multivariate logistic regression. The level of significance was set at $P < 0.05$.

III. Results

The socio-demographic characteristics of the study participants showed that most of the participants were in the age range of 30 years- 39 years (51.2%, 205) with a mean age of 31.61 years±5.37 years. Most of the women were married (97.3%, 389), were Christians (94.5%, 378), were Yorubas (82.8%, 331), were traders (40.3%, 161), had tertiary level of education (68.8%, 275) and lived in the urban areas of Ondo State (89.5%,358). This is as shown in Table I.

TABLE I: Socio-demographic Characteristics of the Study Participants

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
<20	3	0.8
20-29	136	34.0
30-39	205	51.2
40-49	56	14.0
Marital status		
Married	389	97.3
Single	10	2.5
Separated	1	0.2
Religion		
Christianity	378	94.5
Islam	22	5.5
Tribe		
Yoruba	331	82.8
Hausa	13	3.3
Igbo	41	10.2
Others	15	3.7
Occupation		
Unemployed	36	9.0
Civil servant	118	29.5
Traders	161	40.3
Artisans	68	17.0
Others	17	4.2
Education		
No formal	4	1.0
Primary	8	2.0
Secondary	113	28.2
Tertiary	275	68.8
Residence		
Urban	358	89.5
Semi-urban	35	8.8
Rural	7	1.7

Table II showed the obstetric characteristics of the study participants with most of the participants being nulliparous (35.5%, 142). Most had their first menses between the ages of 10 to 15 years (79.2%, 317) with a mean age of 14.24 ± 2.12 years. Majority had inter-pregnancy interval of less than or equal to 2 years (53.7%, 215). There was no history of bleeding in most of the women (91.5%, 366), many of them were in the third trimester of their pregnancy (64.1%, 257) with a mean gestational age of 28.83 ± 6.91weeks.

TABLE II: Obstetrics Characteristics of the Study Participants

Characteristics	Frequency (n)	Percentage (%)
Parity		
Nulliparous (no previous delivery)	142	35.5
Primiparous (has had one delivery)	117	29.3
Multiparous (has had 2-5 deliveris)	140	35.0
Grand multiparous (had >5 deliveries)	1	0.2
Age at first menses in years		
<10	3	0.8
10-15	317	79.2
16-20	77	19.2
21-25	3	0.8
Pregnancy interval		
Not stated	131	32.7
≤2 years	215	53.7
≥2 years	54	13.6
Tribe		
Yoruba	331	82.8
Hausa	13	3.3
Igbo	41	10.2
Others	15	3.7
History of bleeding		
Yes	366	91.5
No	34	8.5
Gestational ages		
First trimester (≤13 weeks)	9	2.4
Second trimester (14-26 weeks)	134	33.5
Third trimester (≥27 weeks)	257	64.1

TABLE III: Medical Conditions Present in The Study Participants

Medical conditions	Frequency (n)	Percentage (%)
None	336	84
HIV	7	1.7
Hepatitis B	2	0.5
Sickle cell disease	1	0.3
Diabetes mellitus	1	0.3
Malaria infection	49	12.2
Urinary tract infection	4	1.0

TABLE III: Classification of Anaemia and Their Severity among The Study Participants

Anaemic status	Frequency (n)	Percentage (%)
Anaemic	160	40
Not anaemic	240	60
Severity of anaemia		
Mild	124	77.5
Moderate	36	22.5
severe	0	0.0

Many of the study participants did not have any underlying medical condition (84.0%, 336) but about 12.2% (49) had malaria infection in this pregnancy. This is shown in Table III.

The prevalence of anaemia among the study participants was 40.0% (160/400) while 60% (240/400) were not anaemic using WHO classification of anaemia. Among the participants who were anaemic, 77.5% (124/160) had mild anaemia, 22.5% (36/160) had moderate anaemia while none

had severe anaemia. This is as shown in Table IV.

To find out if there is any association between the sociodemographic characteristics of the study participants with the presence of anaemia using a chi square test, none of the variables showed any significant relationship (Table V).

TABLE V: ASSOCIATION BETWEEN THE SOCIODEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS WITH ANAEMIA

Characteristics	Participants anaemic status		X^2	P value
	Anaemic	Non anaemic		
Age (years)				
<20	1 (33.3%)	2 (66.7%)	18.1	0.870
20-29	57 (41.9%)	79 (58.1%)		
30-39	70 (34.1%)	135 (65.9%)		
40-49	52 (52.1%)	24 (48.9%)		
Marital status				
Married	155 (39.8%)	234 (60.2%)	1.09	0.581
Single	5 (50%)	5 (50%)		
Separated	0 (0%)	1 (100%)		
Religion				
Christianity	152 (40.2%)	226 (59.8%)	0.13	0.720
Islam	8 (36.4%)	14 (63.6%)		
Tribe				
Yoruba	132 (39.9%)	199 (60.1%)	2.09	0.554
Hausa	3 (23.1%)	20 (76.9%)		
Igbo	28 (43.9%)	23 (56.1%)		
Others	7 (46.7%)	8 (53.3%)		
Occupation				
Unemployed	13 (36.1%)	23 (63.9%)	2.59	0.628
Civil servant	47 (39.8%)	71 (60.2%)		
Traders	71 (44.1%)	90 (55.9%)		
Artisans	23 (33.8%)	45 (66.2%)		
Others	6 (35.3%)	11 (64.7%)		
Education				
None	1 (25%)	3 (75%)	0.75	0.862
Primary	3 (37.5%)	5 (62.5%)		
Secondary	48 (42.5%)	65 (57.5%)		
Tertiary	108 (39.3%)	167 (60.7%)		
Residence				
Urban	148 (41.3%)	210 (58.7%)	3.33	0.343
Semi-urban	9 (25.7%)	26 (74.3%)		
Rural	3 (42.9%)	4 (57.1%)		

To find out other possible risk factors for anaemia among the study participants using their obstetric and medical conditions, a multivariable logistic regression model was used. This showed that those who were multiparous had higher odds of being anaemic (OR =4.91, 95%CI [2.96-8.17], p=0.000) than their counterparts with lower parity. Also, those who were in their third trimester of pregnancy had higher odds of being anaemic than those in the first and the second trimesters of pregnancy (OR=3.37, 95% CI [1.31-8.65], p=0.000). While age at first menses, pregnancy interval, history of bleeding and none of the medical conditions showed any statistical significance (Table VI).

TABLE VI: MULTIVARIABLE REGRESSION MODEL TO DETERMINE RISK FACTORS FOR ANAEMIA AMONG THE STUDY PARTICIPANTS USING THEIR OBSTETRIC CHARACTERISTICS AND THEIR MEDICAL CONDITIONS

Variables	Odds ratio (n)	95% CI	P value
Parity			
Nulliparous/primiparous	3.28	1.77-4.10	0.996
Multiparous	4.91	2.96-8.17	0.000*
Age at first menses in years			
≤15 years	1.64	1.51-2.42	0.997
≥15 years	3.04	1.76-4.78	0.683
Pregnancy interval			
≤2 years	0.562	0.11-2.96	0.496
≥2 years	0.467	0.34-1.43	0.567
History of bleeding			
No	0.822	1.99-0.34	0.664
Yes	1.241	1.12-1.56	1.000
Trimester of pregnancy			
First/second trimesters	3.23	1.25-8.37	0.060
Third trimester	3.37	1.31-8.65	0.000*
Medical conditions			
HIV	1.12	1.11-1.12	0.198
Hepatitis B infection	0.96	2.90-3.15	0.995
Sickle cell disease	1.01	1.19-3.21	0.999
Diabetes mellitus	0.96	2.49-3.67	0.464
Malaria infection	0.83	0.72-0.85	0.112
Urinary tract infection	1.11	1.01-9.76	0.265

Reference category was non anaemic
*Significant at p<0.05

IV. DISCUSSION

Anaemia in pregnancy remains a major cause of maternal and perinatal morbidity and mortality in sub-Saharan Africa [1], [2] and a global health problem. This study was carried out to find out its prevalence and the factors responsible for it. We discovered that the study participants were within the reproductive age group with a mean age of 31.61 years ± 5.37 years, were married (97.3%, 389), had tertiary level of education (68.8%, 275), were gainfully employed (40.3%, 161) and most of them lived in the urban areas of Ondo State, South West, Nigeria (89.5%, 358). This showed that the women who participated in the study were probably knowledgeable about this condition and the dangers it may pose to them and their babies. It was therefore not surprising that the prevalence of anaemia reported was 40% which was lower than what was reported in the northern part of Nigeria by [6]. However, the prevalence of 40% reported in this study though in keeping with the study by Dim & Onah in Enugu, South East Nigeria where a prevalence of 40.4% was reported [14], this still showed that many of our women are anaemic using WHO classification of anaemia [5] and it is still in keeping with a global estimate of 40-60% by WHO [15] even after 30years. A similar study carried out in the South West of Nigeria reported a prevalence rate of 35.3% [13] while another study carried out in East Africa reported 41.8% [16]. However, this is not comparable to the cross-sectional survey conducted in four Nigerian States (Jigawa, Katsina, Yobe, Zamfara) where the prevalence rate of anaemia was estimated to be between 61.2%-88.7% [17]. Similar higher rates have been reported in other countries [18]-[21]. Such geographical variations in the prevalence of anaemia across the countries may be attributable to the difference in food preferences and cultural beliefs about dietary consumption during pregnancy,

the occurrence of communicable diseases, the difference in the availability of healthcare facilities, the socioeconomic status of the women and possibly their level of education [22], [23].

Among the women who were anaemic, mild anaemia accounted for the commonest type of anaemia seen in the women (77.5%, 124) followed by moderate anaemia (22.5%, 36) while none of them developed severe anaemia (0, 0%) this is in keeping with the study of Dim and Onah in Enugu, South East Nigeria, where mild anaemia was reported to account for 90.7%, moderate anaemia accounted for 9.8% and severe anaemia was 0% [14]. Similar reports were also recorded in the same geopolitical zone and Ibadan, South West Nigeria by similar studies [24,25,26]. This was however lower than the 2.1% reported for severe anaemia by [6]. The rate of severe anaemia was also higher in the reports from [27] working in Jos which showed that 2% of pregnant women had severe anaemia and the reports from Bida, Niger state, Nigeria which showed severe anaemia among the women [28], [29]. Though mild to moderate anaemia may be generally well-tolerated, but it clearly adversely affects the sense of well-being of the woman, resulting in fatigue and a decrease in work capacity causing economic consequences on the family in particular and on the society at large [27].

The sociodemographic characteristics of the study participants did not show any association with anaemia, this is in contrast to other studies which have reported that women who are well educated and gainfully employed are more knowledgeable about the condition and its dangers making them to take more of iron enriching diets [31], [32]. The multivariable logistic regression model showed that there was a higher odd of having anaemia among the multiparous women (OR =4.91, 95% CI [2.68-8.17] p=0000) which has been reported in other studies [32,33]. This could be due to the fact that they were yet to fully recover from the effect of the previous pregnancies before they conceived again. Also, there was a higher odd of developing anaemia in the third trimester of pregnancy than in the first and the second trimesters of pregnancy (OR=3.37, 95% CI[1.31-8.65] p=0.000). The reason for this could also be due to the fact that there is a higher demand for iron as pregnancy advances. Other obstetric factors like first onset of menses, previous history of bleeding, short inter-pregnancy intervals and underlying medical conditions had no association with anaemia in this study unlike what has been reported in a similar study [12], this is probably because of the quality of care they receive during the antenatal visits at our facility.

V. Conclusion

This study has shown that despite the level of education of the women there is still a high prevalence of anaemia among pregnant women accessing antenatal care at our facility. With majority of them presenting with mild and moderate anaemia which has less adverse effects compared to severe anaemia. Higher parity and being in the third trimester of pregnancy were found to be possible risk factors. Efforts must still be intensified to address this condition through the use of haematinics which can be started pre-conception and adequate counselling on the need to fully recover from the effects of one pregnancy before embarking on another. This study may be replicated on a large scale possibly at the community level to further ascertain the true prevalence and its consequences.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

References

[1] Akhtar M, Hassan I. Severe anaemia during late pregnancy. *Case Report Obstet Gynecol*. 2012; 2012: 3.
[2] Hassan A, Mamman AI, Adaji S, Musa B, Kene S. Anaemia and iron deficiency in pregnant women in Zaria, Nigeria. *Sub-Saharan African Journal of Medicine*. 2014; 1: 36-39.
[3] World Health Organization (WHO). *Worldwide Prevalence of Anaemia 1993-2005. WHO Global Database on Anaemia*. Geneva, Switzerland: WHO Press. 2008: 7-8.
[4] Salhan S, Tripathi V, Singh R, Gaikwad HS. Evaluation of haematological parameters in partial exchange and packed cell transfusion in treatment of severe anemia in pregnancy. *Anemia Journal.* 2012; 2012: 608-658.
[5] World Health Organization (WHO), Centre for Disease Control and Prevention. Assessing the iron status of populations. 2007.
[6] Bukar M, Audu BM, Sadauki HM, Elnafaty AU, Mairiga AG. Prevalence of iron deficiency and megaloblastic anaemia at booking in a secondary Health facilty in North Eastern Nigeria. *Nigerian Journal of Medicine*. 2009; 50(2): 33-37.
[7] Geelhoed D, Agadzi F, Visser L. Severe anaemia in pregnancy in rural Ghana: a case-control study of causes and management. *Acta Obstetricia et Gynecologica Scandinavica*. 2006; 85(10): 1165-1171.
[8] World Health Organization (WHO). *The World Health Report*. Geneva,Switzerland: WHO Press. 2005.
[9] Orish VN, Onyeabor OS, Boampong JN, Acquah S, Sanyaolu AO, Iriemenam NC. The effects of malaria and HIV co-infection on hemoglobin levels among pregnant women in Sekondi-Takoradi, Ghana. *Int J Gynecol Obstet.* 2013; 120(3): 236-9.
[10] Olatunbosun OA, Abasiattai AM, Bassey EA, James RS, Ibanga G, and Morgan A. Prevalence of anaemia among pregnant women at booking in the university of uyo teaching hospital, uyo, Nigeria. *BioMed Research International*. 2014.
[11] Lee AI, Okam MM. Anaemia in pregnancy. *Hematol Oncol Clin North Am.* 2001; 25: 241-259.
[12] Adinma JIB, Ikechebelu JI, Onyejimbe UN, Amilo G, Adinma E. Influence of antenatal care on the haematocrit Value of pregnant Nigerian Igbo Women. *Tropical Journal of Obstetrics and Gynaecology*. 2002; 19(2): 68-70.
[13] Anorlu RI, Oluwole AA, Abudu OO. Sociodemographic factors in anaemia in pregnancy at booking in Lagos, Nigeria. *Journal of Obstetrics and Gynaecology*. 2006; 26(8): 773-776.
[14] Dim CC, Onah HE. The prevalence of anaemia among pregnant women at booking in Enugu, South Eastern Nigeria. *Medscape General Medicine*. 2007; 9(3): 11.
[15] World Health Organization (WHO). The Prevalence of Anaemia in Women: A Tabulation of Available Information. Geneva, Switzerland: WHO Press. 1992.
[16] Liyew AM, Tesema GA, Alamneh TS, Worku MG, Teshale AB, Alem AZ, et al. Prevalence and determinants of anaemia among pregnant women in East Africa; A multi-levelanalysis of recent Demographic and Health Surveys. *PLoS ONE*. 2021; 16(4): e0250560.
[17] Oladipo AR, Falana AO, Adegoke O, Sambo A, Kungu J. Prevalence of anaemia among pregnant women and its determinants in Northern Nigeria. *Gynecol Obstet Res Open J.* 2005; 132-139.
[18] Ayoya MA. Determinants of anaemia among pregnant women in Mali. *Food and Nutrition Bulletin*. 2006; 27(1): 3-11.
[19] Rajamouli J. Study on Prevalence of Anaemia among Pregnant Women attending Antenatal Clinic at Rural Health Training Centre (RHTC) and Chalmeda Anand Rao Institute of Medical Sciences Teaching Hospital, Karimnagar, Telangana, India. *International Journal of Contemporary Medical Research*. 2016; 3(8): 43-50.
[20] Adam I, Ibrahim Y, Elhardello O. Prevalence, types and determinants of anaemia among pregnant women in Sudan: a systematic review and meta-analysis. *BMC Hematology*. 2018; 18(1): 1-8.

[21] Baig-Ansari N. Anaemia prevalence and risk factors in pregnant women in an urban area of Pakistan. *Food and Nutrition Bulletin.* 2008; 29(2): 132-139.
[22] Chakona G, Shackleton C. Food Taboos and Cultural Beliefs Influence Food Choice and Dietary Preferences among Pregnant Women in the Eastern Cape, South Africa. *Nutrients*. 2019; 11(11): 2668.
[23] Oni T, Unwin N. Why the communicable/non-communicable disease dichotomy is problematic for public health control strategies: implications of multimorbidity for health systems in an era of health transition. *International Health*. 2015; 7(6): 390-399.
[24] Aluka C, Amadi AN, Kamanu CI, Feyi-Waboso PA. Anaemia in pregnancy in Abia State University Teaching Hospital, Aba. *Journal of Medical Investigation Practition (JOMIP).* 2001; 2: 58-61.
[25] Adinma JIB, Ikechebelu JI, Onyejimbe UN, Amilo G, Adinma E. Influence of antenatal care on the haematocrit value of pregnant Nigerian Igbo women. *Trop J Obstet Gynaecol*. 2002; 19: 68-70.
[26] Aimakhu CO, Olayemi O. Maternal haematocrit and pregnancy outcome in Nigerian women. *West Afr J Med*. 2003; 22: 18-21.
[27] Bassi AP, Idoko L, Dibigbo-Ibeaji NM, Godwin AO, Seljul RMC, Olugbenga OT, et al. Prevalence of anaemia in pregnancy among women visiting antenatal clinic in bingham University Teaching Hospital Jos, Nigeria. *Clinical Medicine Research*. 2016; 5: 52-62.
[28] Mohammed YG, Emmanue AU. The pattern of anaemia in Northern Nigerian pregnant women. *Journal of Medicine and Medical Sciences.* 2013; 4: 319-323.
[29] Owolabi MO, Owolabi AO, OlaOlorun DA. Sociodemographic factors in anaemia in pregnancy in south-western Nigeria. *S Afri Fam Pract*. 2012; 54: 222-227.
[30] Nonterah EA, Adomolga E, Yidana A, Alhassan M, Kagura J, Yidana A, et al. Descriptive epidemiology of anaemia among pregnant women initiating antenatal care in rural Northern Ghana. *African Journal ofPrimary Health Care & Family Medicine*. 2019; 11(1): 1-7.
[31] Al-Farsi YM, Brooks DR, Werher MM, Cabral AJ, Al-Shafei MA, Wallenburg HC. Effects of high parity on occurrence of anaemia in pregnancy: a cohort study. *BMC Pregnancy Childbirth*. 2011; 11(1): 7.
[32] Chowdhury HA, Ahmed KR, Jebumessa F, Aker J, Hossain S, Shahjahan M. Factors associated with maternal anaemia among pregnant women in Dhaka city. *BMC Women's Health*. 2015; 15: 77.
[33] Stephen G, Mgongo M, Hashim TH, Katanga J, Stray- Pedersen B, Msuya SE. Anaemia in pregnancy: prevalence, risk factors, and adverse perinatal outcomes in Northern Tanzania. *Anaemia*. 2018.