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Prevalence of Anaemia in Pregnancy Among Women Visiting Antenatal Clinic in Bingham University Teaching Hospital Jos, Nigeria

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Abstract: In developing countries such as Nigeria, anaemia in pregnancy is thought to be one of the most common problem affecting pregnant women accounting for a significant level of maternal morbidity and mortality. This study was carried out to determine the prevalence of anaemia in pregnancy among women visiting Antenatal Clinic (ANC) in Bingham University Teaching Hospital (BHUTH). This is a cross sectional descriptive study conducted from August to September, 2015 on two hundred and thirty seven (237) women. A semi–structured interviewer administered questionnaire was used to obtain socio-demographic, obstetrics, and nutritional information from the respondent pregnant women who consented at each antenatal clinic days (Mondays and Thursdays). Packed cell volume was used to assess the level of anaemia in accordance to WHO guide lines. The prevalence of anaemia in pregnancy was found to be 43.5%, amongst all women who were anaemic, 83%, 8.7% and 2% were found to have mild, moderate and severe anaemia respectively. However, 0.9%, 35%, 52% of these women were found to be in their first, second and third trimesters respectively. 61% were multi-parous women (para 2-4); 24.3% women had only two antenatal clinic visits, 66.2% women were within the age group of 34–39 years; 89.3% women had been taking balanced diet, while 89.3% women were on their routine drugs; 66.0% women used insecticide treated mosquito net; 66.0% women had taken anti-malarial prophylaxis. Reduced ANC visits and increasing age where significant factors associated with anaemia in pregnancy. Prevalence of anaemia amongst pregnant women in BHUTH was 43.5%. The most common type of anaemia in this study is mild anaemia. However, the prevalence of anaemia was found to predominate amongst women in their third trimester. Increased maternal age and reduced number of antenatal care visits were statistically

significant factors to be associated with anaemia in pregnancy.

Keywords: Anaemia, Pregnant Women, Antenatal Clinic, Packed Cell Volume (PCV), Gestational Age, Parity

1. Introduction

1.1. Background

Anaemia is defined as a decrease in the concentration of circulating red blood cells or in the haemoglobin concentration and con-comitant impaired capacity to transport oxygen [1]. The World Health Organization (WHO) further divides anaemia in pregnancy into mild anaemia (haemoglobin 10 – 10.9g/dL), moderate anaemia (Hb 7.0-9.0g/dL) and severe anaemia (haemoglobin <7g/dl or 10.5 g/dl). Anaemia in pregnancy is therefore defined as a haemoglobin concentration <11.0 g/dl or <10.5 g/dl in the second half of pregnancy. However in the tropics, a pregnant woman is said to be anaemic when haemoglobin is less than 10g/dl or PCV is <30% [2]. It has been estimated that the global prevalence of anaemia in pregnancy is 42% [3]. Anaemia in pregnancy is thought to be one of the commonest problems affecting pregnant women in developing countries. Among girls and women in the developing world, anaemia was ranked the eighth (8^{th}) leading cause of death by the World Bank in 1993. By WHOs' criteria, over 2000 million people are anaemic, with pregnant women most affected. In developing countries, prevalence rates in pregnant women are commonly estimated to be in the range of 40% - 60% [4, 5, 7].

Among non-pregnant women this is 20% - 40% and in school aged children and adult men the estimate is around 20% [4]. The greatest burden of anaemia is borne by Asia and Africa where it is estimated that 60% and 52% of women, respectively, are anaemic and between 1% and 5% are severely anaemic. (Hb <7g/dl) In a research by Mohammad et al, the prevalence of anaemia among pregnant women in Kano state Nigeria was found to be 24.5%, reason for this comparatively lower prevalence was attributed to good family planning and low parity among women [6, 7].

Consequence of anaemia in pregnancy include maternal complications like the cardiac failure, nfections (urinary tract infections, perpetual sepsis), post partum haemorrhage (PPH), Maternal mortality. Foetal complications include intrauterine growth restriction (IUGR), increased perinatal mortality. It is associated with significant maternal, foetal and neonatal morbidity and mortality [6, 7]. Mild forms of anaemia have been related to permanent cognitive damage by decreasing attention span and shortening memory. Children with anaemia have intelligent quotients (IQs) that are two points lower per every 10g/L, decrease in haemoglobin than other children [8]. Anaemia has devastating costs to individual and national productivity. Women with anaemia in pregnancy have decreased work capacity. They may be unable to earn their livelihood if the work involves manual labour [8, 9].

Iron deficiency anaemia has been estimated to affect as many as 200 million people in the world probably women, at least half of all anaemia cases have been attributed to iron deficiency [10]. Prevalence of iron deficiency may be 2-3 times prevalence of anaemia, ranging from about 50% in some countries to nearly 100% in parts of others according to results of earlier research [11].

Anaemia has multiple precipitating factors occur in isolation but more frequently co-occurred. These factors may be Physiological or Pathological haemodilution of pregnancy & increased demand for Iron and Folic acid e.g. multiple pregnancies. While pathological causes include blood loss, increased red blood cell destruction and decreased red cell production. Nutritional deficiency (Iron and Folic acid deficiency) due to reduced storage, diminished intake (under/malnutrition), abnormal absorption and abnormal utilization from Crohn's disease, ileal resection; short inter-pregnancy intervals, infections – Malaria, pyelonephritis, septicemia; acute blood loss – ectopic pregnancy, Antepartum haemorrhage; chronic blood loss resulting in deplation of iron stores from hookworm infestation and chronic gastric or duodenal ulcer, Acquired Immunodefeciency Syndrome; Haemoglobinopathies – sickle cell diseases and Thalassemias; Leukemias. The reported principal cause of anaemia in sub-saharan Africa include nutritional deficiency, malaria, parasitic infections, recent infection with HIV [1, 7, 8].

1.2. Justification for the Study

The fact that anaemia is a completely preventable significant cause of maternal morbidity and mortality in Nigeria necessitates this study to find out the common factors associated with the condition.

Knowledge of associated factors is expected to provide the required information for the intervention which should contribute to the reduction in the prevalence of anaemia in pregnancy and improve maternal health.

1.3. Aims and Objectives

i. To determine the prevalence of Anaemia in pregnancy among Women attending Antenatal Clinic (ANC) in Bingham University Teaching Hospital (BHUTH)
ii. To determine the distribution of anaemia in pregnancy by gestational age of the woman
iii. To assess the factors associated with anaemia among women visiting Antenatal Clinic in BHUTH.
iv. To describe the commonest types of anaemia among the women.

2. Literature Review

2.1. Review

Anaemia is defined as a decrease in the concentration of circulating red blood cells or in the haemoglobin

concentration and con-comitant impaired capacity to transport oxygen [1]. Anaemia in pregnancy is defined as a haemoglobin concentration < 11.0g/dl or <10.5 g/dl in the second half of pregnancy. However in the tropics, a pregnant woman is said to be anaemic when haemoglobin is less than 10g/dl or PVC is <30% [2].

2.2. Classification of Anaemia in Pregnancy

According to the World health Organization (WHO) criteria, anaemia in pregnancy is classified into mild (haemoglobin 10-10.9g/dl), moderate anaemia (haemoglobin 7.0-9.9g/dl) and severe anaemia (heamoglobin <7g/dl). Though many local studies have used the cut off haemoglobin level of <10g/dl to define anaemia based on the work of Lawson which states that there is usually no serious harm to the mother and foetus until haemoglobin level <10g/dl [7]. However, for the purpose of being to compare results for pulblished studies, internationally agreed cut-off points set by WHO are used in this study [2].

2.3. Prevalence of Anaemia in Pregnancy

Anaemia in pregnancy is thought to be one of the commonest problems affecting women in pregnancy. Anaemia is a global public health problem affecting the developed and the developing countries with major consequences for human health as well as social economic development. The most dramatic health effect of anaemia is the increased risk of maternal mortality [11, 12, 13, 14].

According to 2008 WHO report, anaemia in pregnancy has an estimated global prevalence of 42%. Globally, anaemia affects 1.62 billion people (25%), among which 56 million are pregnant women [14, 15]. Also, according to the worldwide prevalence of anaemia from 1993 – 2005, the prevalence of anaemia in pregnancy was 41.8% [2, 16]. Prevalence of anaemia can be as high as 61% in developing countries with a high incidence and severity occurring among primigravidae living in malaria endemic areas [17, 18, 19].

Developing African countries like Ethiopia, rural Tanzania, Mozambique, rural Zaire, showed prevalence rates such as 62.7%, 71.7%, 58% and 76% respectively [2, 18-21]. In pregnancy, anaemia has a significant impact on the health of the foetus as well as that of the matter, 20% of maternal deaths in Africa have been attributed to anaemia [7].

Several studies related to anaemia in pregnancy have been carried out in Nigeria. Across the six geographical zones, prevalence of anaemia ranged from 23.7%-88.7%. A cross-sectional survey conducted in 4 northern Nigerian states (Jigawa, Katsina, Zamfara and Yobe) revealed that the prevalence of anaemia among pregnant women ranged from 61.2 to 88.7%. These high prevalences have been attributed to a relatively low utilization of Iron-Folic Acid supplementation, despite high awareness and high coverage [22, 43]. A study conducted in Bida, Niger state revealed a prevalence of 67.4% [7]. Separate studies in, Abeokuta, and in Oyo revealed prevalence of 72.5%, and 58% respectively. High prevalence has been likened to low education and economic status [22, 23, 24, 25]. In a study conducted at federal Teaching Hospital, Abakaliki, Ebonyi state. South-Eastern Nigeria, prevalence among pregnant women was 58% [23]. Prevalence in south-south, according to a Hospital based reseaech in port-Hacourt was 23.2% [18]. It can be noted that prevalence rate is higher in the other parts of Nigeria compared with that in the south-south. Study shows that differences might be due to better awareness of how to stay healthy, general health consciousness and widespread use of haematinics and anti-malarial prophylactic prior to looking for antenatal care services [22, 27].

Nutrition, socioeconomic status, educational status, child spacing, gestational age at first antenatal prophytlactic and antihelminthics, maternal age gravity among many others are factors that have been associated with severity of anaemia in pregnancy [6].

As a result of normal physiological changes in pregnancy, plasma volume expands by 46 – 555, whereas red cell volume expands by 18-25%. The resulting haemodilution has been termed physiological anaemia of pregnancy. The haemoglobin concentration, haematocrit and red cell count fall during pregnancy because expansion of the plasma volume is greater than that of red cell mass. However, there is a rise in total circulating haemoglobin directly related to the increase in red cell mass [3].

2.4. Common Causes of Anaemia in Pregnancy

Factors associated with anaemia in pregnancy are gestational age at booking, educational status, marital status, socioeconomic class, parity, inter-pregnancy drugs as well as use of insecticide treated mosquito net [3, 4].

According to a study carried out on pregnant women in Bida, Niger state, the proportion of women found to be anaemic in the first trimester was 65.3%, 63.9% and 80.8% in the second and third trimester respectively. Prevalence was therefore highest among those who booked in the third trimester. This could be explained by late booking and late commencement of routine haematinics and lack of anti-malarial prophylaxis [7]. However, in another study carried out on pregnant women in Federal Medical Center, Abeokuta, the prevalence of anaemia in those who booked in the first trimester was 33.3%, 60.6% and 53.8%0 in the second and third trimester respectively. Therefore in this study, the prevalence of anaemia was highest in those who booked in the second trimester. The absence of symptoms of ill health was given as the major reason for the late antenatal booking in this study and hence the increased prevalence in the second trimester [24]. Another study done in Sokoto, North Western Nigeria, showed that there is higher prevalence of anaemia among women in the second trimester (56.6%), followed by third trimester (29%) and first trimester (13.7%) was the lowest. The peak of anaemia in secong trimester coincides with the period in pregnancy when haemodilution is at its zenith [27]. In general, anaemia increases with gestational age due to haemodilution, and increasing needs of Iron and other nutrients for both the

mother and the foetus [24, 27].

In a study done among pregnant women at the Aminu Kano Teaching Hospital, the prevalence of anaemia was 64.7% in those from low socioeconomic class, while the prevalence in those from the middle class and high class was 14.9% and 12.5% respectively [1]. Prevalence among women from low socio-economic class was four times more than that of those from high socioeconomic class. This is because women in low socio-economic class lacked adequate level of education or had financial constraints and may not afford or have access to good maternal health services. They are therefore, more prone to the deleterious effects of poor nutrition, malaria, diarrhea disease and chronic infections. It is these same women who may have background iron deficiency anaemia before pregnancy [1]. Also, in a community based study carried out on pregnant women in Udupi district, india, the prevalence of anaemia was 41.9% in women of high socio-economic status [29]. In another study carried out on pregnant women in Burkina Faso, the prevalence of anaemia was 71% in those of low socio-economic status, 63.6% and 58.1% in the middle and low socio-economic status respectively [29].

There was an inverse relationship between educational status and anaemia in a study conducted on pregnant women in Aminu Kano Teaching Hospital. The prevalence of anaemia in the woman who had no formal education was 29.4%, those with primary education had a prevalence of 25.0%, and those with secondary education had a prevalence of 17.6% [21]. In another institutional based cross-sectional study done in Gondar, North west Ethiopia, the prevalence of anaemia had a prevalence of 9.4%, those with secondary education had a prevalence of 19% and those with tertiary education had prevalence 9.5% [3]. Also, in another study carried out by University of Uyo Teaching Hospital, the prevalence of anaemia in pregnant women with no formal/primary education was 47.8%, those with secondary education; prevalence was 67.8% and a prevalence of 46.0% in those with tertiary education. This was ascribed to the fact that the women with no formal education had poor health seeking behavior and a poor understanding of balanced diet [30]. It was also associated with strong adherence to cultural tabbos that often led to selection of food types by pregnant women culminating in nutritional deficiency such as Iron and Vitamin B12 deficiency [31].

Parity is said to be associated with prevalence of anaemia in women with higher parity showing higher prevalence. Adewara et al found out that 85.3% of grand multiparous (para 1-4) and 65.5% of all primigravida women had varying degrees of anaemia, showing that there is a correlation between anaemia and parity [7, 42]. However this is contrary to studies that recorded highest rate of anaemia among primigravidae. In a study carried out on pregnant women at Uduoi district, India, the prevalence of anaemia among women of low parity (1-2) was 51.6% and for women with high parity (3 and more) was 38.4% [28]. Also in a study done on pregnant women in Abeokuta, the prevalence of anaemia in primigravida was 69.7% and that of multigravida was 59.0% [24]. This is because malaria which is a major cause of anaemia in pregnancy in endemic regions is known to be severe among primigravida [32].

In a study carried out on pregnant women in University of Uyo Teaching Hospital, the prevalence of anaemia among women of <2years inter pregnancy interval was 64% and 48.5% in women of ≥ 2 years inter pregnancy interval [30]. Hence, short interval between pregnancies, delays the mother's recovery from the effects of previous pregnancies thus increasing the risk of *maternal depletion syndrome.* Since the foetal demand is met first, the mother is left with further depleted iron stores at the end of one pregnancy takes almost two years to be replenished [33].

The causes of anaemia are multi-factoral, including and genetics, and for some of the commonest cause of anaemia there is good evidence of the effectiveness of simple interventions: for example, iron supplementation [34], long-lasting insecticide nets and intermittent preventive treatment for malaria [32, 35]. Malaria parasites, HIV and hook worm infestations are infectious most commonly related to anaemia in sub – Saharan Africa. Malaria due to plasmodium falciparum may cause severe anaemia in pregnancy depending on the geographical area and the individual's level of immunity. It is estimated that in sub – Saharan Africa, 23 million pregnant women are exposed to malarial infection annually [17]. Women in their first and second pregnancies living in an endemic area are at higher risk of acquiring malaria than non pregnant women or multi-gravid, due to reduction of an appropriate immune response to malaria parasite. Anaemia associated with malaria is caused by haemolysis of the erythrocytes. Complications include spontaneous abortion, stillbirth, pre-maturity and low birth weight especially in low transmission settings where immunity is relatively low. The WHO has recommended the use of long-lasting insecticidal nets, intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine in areas of stable malaria transmission and prompt diagnosis and effective treatment in pregnancy [3, 36].

Anaemia was less common in those women who had used anti-malarial drugs or haematinics before booking visits than those who had not used any of these medications. This corroborates the earlier findings of Fleming and Anorlu in the year 1987 and 2006 respectivly [37, 38]. Their findings support the basis of anaemia prevention in sub Saharan Africa, which is hinged on control of malaria and haematinic supplementation. However, innovative delivery systems need to be used to reach the light proportion of pregnant women who do not attend antenatal clinics. Although not statistically significant, the association of anaemia with positive history of recent febril illness in the index pregnancy could be due to the endemicity of malaria in the study area. Malaria is endemic in Nigeria and is a common cause of febrile illness among pregnant women [37, 38]. Hookworm infection has long been recognized among the major causes of anaemia in poor communities, but understanding of the benefits of the management of hookworm infection in pregnancy has lagged

behind the other major causes of malarial anaemia [39]. An epidemiological study in 1995 highlighted the paradox presented to public health workers that an estimated one-third of all pregnant women in developing countries were infected with hookworm [40].

2.5. Factors Associated with Anaemia in Pregnancy

Other causes are vitamin deficiencies, infections (bacteria, viral, parasitic) and other inflammatory conditions [41, 42]. In a study done on pregnant women in Aminu Kano Teaching Hospital, the prevalence of anaemia in pregnant women who were single was 66.7%; the prevalence among married women was 16.0% and 66.7% among divorced women. It was therefore concluded that single or divorced pregnant women had a two-fold increased risk compared to those that were married [1]. In a study carried out on pregnant women in Kakamega country in kenya, showed that the prevalence of anaemia among married women was 88.3%, while among single women was 11.7% [31]. Some studies have reported that anaemia is commoner among adolescents. However, some studies conducted in Malawi confirmed that when this increased risks are corrected for gravity and trimester at booking, this increased risk no longer exist [10].

3. Materials and Methods

3.1. Study Area

The study was conducted at Bingham University Teaching Hospital (BHUTH). BHUTH is a Faith Based Tertiary Health Institution in Plateau State with a 250 bed space. It was established 1959 by the then Sudan Interior Mission (SIM) missionaries but presently owned by Evangelical Church Winning All (ECWA). It is located along Zaria by pass, off Polo round about, in Jenta, Jos North Local Government Area of Plateau state. Since inception, it has been operating as General Hospital until the year 2010 when it became the BHUTH. The Antenatal Clinic is a service unit of the department of Obstetrics and Gynecology which provides services such as health education, nutritional counseling, immunization, screening and treatment of common diseases in pregnancy to about 60-80 pregnant women visiting on clinic days which are every Mondays and Thursdays.

3.2. Study Population

The study population comprised of all pregnant women attending ANC at the BHUTH during the period of the study (24^{th} August to 28^{th} September, 2015) irrespective of age, gestational period, and parity that consented to participate in the study.

3.3. Study Design

The research is a descriptive cross sectional study conducted for a period of one month using a structured questionnaire to collect relevant information from the pregnant women who consented to be part of this work.

3.4. Sample Size Determination

The sample size was calculated using standard acceptable formula

$$N = Z^2 PQ/D^2$$

Where:

n = minimum sample size

Z = standard normal deviation at 95% confidence interval (a constant = 1.98)

P = proportion of the population having study of interest (obtained from previous studies)

Q = 1-p

D = level of decision (a constant = 0.05)

In a study conducted by (Mohammed et al, 2013), to determine the pattern of anaemia in northern Nigeria pregnant women, prevalence of anaemia was found to be 0.245, making the calculated minimum sample size to be 290 [6].

3.5. Sampling Technique

Bingham University Teaching Hospital (BHUTH) was purposively selected for its convenience from the list of Tertiary Health Institutions in Jos Town. In addition, no previous study had been done on the prevalence of anaemia among pregnant women antenatal clinic in the institution.

Approximately 2ml of venous blood was collected into an ethylene diaminetetraacetic acid (EDTA) bottle from cubital veins or veins at the dorsum of the hand of the subjects who consented to participate. Blood samples were analyzed using micro haematocrit centrifuge and a micro haematocrit reader to determine a Packed Cell volume (PCV) at the Bingham University teaching Hospital Haematology laboratory.

3.6. Data Collection

A semi-structured interviewer administered questionnaire was used to obtain information from pregnant women, who gave consent at each antenatal clinic day (Mondays and Thursdays) between the periods of August and September, 2015. However, at the point of data collection, majority of the women completed their questionnaires themselves, while some were assisted. The questionnaire was used to gather information on women's identification, pregnancy history, laboratory findings, as recorded in patients file based on mandatory test done at first visit (such as blood group and genotype), nutritional history, family and social history, and on perception of health.

3.7. Consent

Written and verbal informed consent were sought and obtained from each of the participants with explanations of the aims and importance of the research before administration of questionnaire. Anonymity and confidentiality of the information obtained were assured and maintained.

3.8. Ethical Clearance

Ethical clearance was obtained from the ethical views committee of BHUTH, Jos

3.9. Data Analysis

At the end of the data collection period, women who consented and completed the questionnaire had their blood samples taken for packed cell volume (PCV) measurement.

Data analysis was done using SPSS version 20 statistical software. Statistical significance was determined using chi square test. A 95% confidence level was used for the study and a *p value <0.05* was considered statistically significant in bivariate analysis.

The term "No Response (NR)" was used to represent parameters that were not properly filled by the subject who consented.

4. Results

Table 1. *Socio-demographic Distribution of Women attending ANC in BHUTH.*

Characteristics	Frequency of Women	
	No	%
Age		
≤18	1	0.4
19 – 23	4	1.7
24 – 28	62	26.2
29 – 33	79	33.3
34 – 39	56	23.6
≥40	5	2.1
No response	30	12.7
Total	237	100

Gestational Age	No	%
≤13	6	2.5
14 – 26	69	29.1
≥27	139	58.6
No response	23	9.7
Total	237	100

Parity	No	%
1	57	24.1
2	56	23.6
3	44	18.6
4	36	15.2
5	21	8.9
≥6	10	4.2
No response	13	5.5
Total	237	100

Educational Status	No	%
None formal	1	0.4
Primary	9	3.8
Secondary	64	27
Tertiary	160	67.5
No response	3	1.3
Total	237	100

Marital Status	No	%
Married	234	98.7
Single	2	0.8
No response	1	0.4
Total	237	100

Occupational Status	No	%
Unemployed	91	34.2
Business	68	28.7
Civil servant	36	15.2
Teacher	26	11
Artisan	8	3.4
Professional (s)	7	3
Services	4	1.7
Sales worker (s)	1	0.4
No response	6	2.5
Total	237	100

Shows that 33.3% of the women between the ages of 29-33 years, while only one woman was aged below 18 years; Most of the women were in the third trimester 139 (58.6%). Only 25% of the women were in the first trimester, see table 4.2 for distribution of the women by gestational age. Majority of the patients were multi-parous 167 (70.4%). Primigravida constituted 57 (24.1%), and only 10 (4.2%) were grandmultiparous. Majority 234 (98.7%), of the women were married. Many of the women had tertiary education, 160 (67.5%), only one woman had no formal education. Most of the women were unemployed 81 (34.2%), of those employed; most were business women 68 (28.7%).

Table 2. *Packed Cell Volume (PCV) of Women attending ANC in BHUTH.*

Characteristics	Frequency of women	
	No	%
PCV		
≤ 21	2	0.8
22 – 26.9	9	3.8
27 – 32.9	92	38.8
≥ 33	133	56.1
No response	1	0.4
Total	237	100

	Age**							
PCV	≤18	19–23	24–28	29–33	34–39	≥40	NR	Total
≤21	0	0	0	0	0	0	2	2
22–26.9	0	0	1	1	5	1	1	9
27–32.9	0	3	26	23	25	1	14	92
≥ 33	1	1	34	55	26	3	13	133
NR	0	0	1	0	0	0	0	1
Total	1	4	62	79	56	5	30	237

PCV	Gestational age in weeks			NR	Total
	≤13	14 -26	≥27		
≤21	0	0	0	2	2
22–26.9	1	3	5	0	9
27–32.9	0	34	49	9	92
≥33	5	32	85	11	133
NR	0	0	0	1	1
Total	6	69	139	23	237

PCV	Parity			NR	Total
	1	2 – 4	≥5		
≤21	1	1	0	0	2
22–26.9	1	7	0	1	9
27–32.9	17	55	17	3	92
≥33	37	74	14	8	133
NR	0	0	0	1	1
Total	56	137	31	13	237

**Significant *(p<0.01)* in bivariate analysis.

One hundred and three of the women were anaemic giving a prevalence of 43.5%. 38.8% had mild anaemia and only 2 (0.8%) of the women were severely anaemic, *see table 2* for the distribution of PCV among the women studied. Women within the age group 34-39 had the highest prevalence of anaemia, 30 (29.1%). Women within the age group 29-33 had the highest prevalence of normal PCV, 55 (41.4%). Women within the age group 24-28 had the highest prevalence of mild anaemia, 26 (28.3%). Women in their third trimester had the highest prevalence of anaemia 54 (54.2%) and the highest prevalence of mild anaemia 49 (53.3%). They also had the highest prevalence of normal PCV 85 (63.9%). Women who were multiparous (para 2-4) had the highest prevalence on anaemia 63 (61.2%) and the highest prevalence of mild anaemia 55 (59.8%), while 43.5% of all the women had anaemia. The prevalence of severe anaemia was equally distributed between primigravida and multiparous (para 2-4) women; 1 (50%) and 1 (50%) respectively; Multiparous (para 2-4) women had the highest prevalence of normal PCV 74 (55.6%). While, 133 (56.1%) of all the women had normal PCV. 7.2% of grand multiparous all women were anaemic at booking, while 26.6% of multiparous, and 8.0% of all primigravida women varying degrees of anaemia.

Table 3. *Antenatal Care Visit of Women in relation to Packed Cell Volume (PCV).*

Characteristics								
PCV	Antenatal Care Visit (s)							
	1	2	3	4	5	≥6	NR	Total
≤21	2	0	0	0	0	0	0	2
22 -26.9	2	2	1	1	2	1	0	9
27 – 32.9	13	23	19	9	8	17	3	92
≥33	23	26	13	12	20	36	3	133
No response	0	0	0	0	0	0	1	1
Total	40	51	33	22	30	54	7	237

Gestational	Antenatal Care Visit (s)							
age	1	2	3	4	5	≥6	NR	Total
≤13	3	2	0	0	0	1	0	6
14 – 26	20	29	11	4	3	2	0	69
≥27	13	16	21	15	23	48	3	139
No response	4	4	1	3	4	3	4	23
Total	40	51	33	22	30	54	7	237

PCV	Diet (s)			
	Balanced	Unbalanced	NR	Total
≤21	1	0	1	2
22 -26.9	7	2	0	9
27 – 32.9	84	6	2	92
≥33	123	7	3	133
No response	0	0	1	1
Total	215	15	7	237

PCV	Routine Drug (s) Intake			
	Yes	No	NR	Total
≤21	0	2	0	2
22 -26.9	9	0	0	9
27 – 32.9	83	8	1	92
≥33	121	12	0	133
No response	0	0	1	1
Total	213	22	2	237

PCV	Anti-Malaria Prophylaxis			
	Yes	No	NR	Total
≤21	0	2	0	2
22 -26.9	5	4	0	9
27 – 32.9	58	29	5	92
≥33	84	39	10	133
No response	0	0	1	1
Total	147	74	16	237

PCV	Use of Insecticide Treated Mosquito Net (s)			
	Yes	No	NR	Total
≤21	0	2	0	2
22 -26.9	6	3	0	9
27 – 32.9	62	30	0	92
≥33	97	35	1	133
No response 0	0	1	1	
Total	165	70	2	237

** Significant *(p<0.05)* in bivariate analysis

The prevalence of anaemia was highest in women who had attended two antenatal care clinics 25 (24.3%). The prevalence of anaemia was lowest in women who had attended 4 or 5 ANC clinics 10 (9.7%). The prevalence of anaemia was 16.5% (17) amongst women who were visiting for the first time. The prevalence of anaemia amongst all was 43.5%. Women who had attended >5 ANC clinics had the highest prevalence of normal PCV (27.1%) 36. The prevalence of normal amongst all the women is 56.1%. Women who had been taking balanced diet had the highest prevalence of anaemia 92 (89.3%) and the highest prevalence of mild anaemia 84 (91.3%). They also had highest prevalence of normal PCV 123 (92.5%). Women who had been regular with their drug intake had the highest prevalence of anaemia 92 (89.3%) and the highest prevalence of severe anaemia 83 (90.2%). Women that had not been regular with their routine drug intake had the highest prevalence of severe anaemia 2 (100%). The prevalence of anaemia amongst all the women was 43.5%. Women that had been regular with their routine drug intake had the highest prevalence of normal PCV, 12 (91%). The highest prevalence of anaemia 68 (66.0%), was observed amongst women using insecticide treated net. They also had the highest prevalence of mild anaemia 62 (67.4%) and the highest prevalence of normal PCV, 97 (72.7%). Women who had taken anti – malarial prophylaxis had the highest prevalence of anaemia, 63 (61.2%) and the highest incidence of mild anaemia 58 (63.0%); Women who had not taken anti – malaria prophylaxis had the highest prevalence of severe anaemia, 2

(100%). The prevalence of anaemia amongst all the women is 43.5%. Women who had taken anti-malaria prophylaxis had the highest prevalence of normal PCV, 84 (63.2%). However, most women seen had taking anti-malaria prohpylaxis with 62.0% (147/237). The prevalence of normal PCV amongst all the women is 56.1%. While most of the women used insecticide treated mosquito nets (ITN), 165 (69.6%).

Table 4. *Frequency Distribution of Women attending ANC in BHUTH by their Husbands Level of Education and Occupation.*

Characteristics	Frequency	
	No	%
Husband's Level of Education		
None formal	1	0.4
Primary	8	3.4
Secondary	61	25.7
Tertiary	164	69.2
NR	3	1.3
Total	237	100
Husband's Level of Occupation	No	%
Business	94	39.7
Civil Servant (s)	60	25.3
Professional (s)	24	10.1
Artisan (s)	13	5.5
Teacher (s)	11	4.6
Armed forces	11	4.6
Clergy (ies)	7	3
Unemployed	3	1.3
Sales worker (s)	2	0.8
Service (s)	2	0.8
No response	10	4.2
Total	237	100

Most of the husbands had tertiary education, 164 (69.2%). Husbands with no formal education had the least frequency 1 (0.4%). Most of their husbands were business men 94 (39.7%). About 3 (1.3%) of them were unemployed 24 (0.1%) of their husbands were professional.

5. Discussion, Recommendation and Conclusion

5.1. Discussion

The prevalence of anaemia in this study was 43.5% (*see table 2*). The finding in our study correlates with the estimated global prevalence rate of anaemia in pregnancy is in the range of 40-60% [4]. 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 61.2 - 88.7% [22]. The significant difference in the prevalence rate may be attributed to relatively higher utilization of iron-folic acid supplementation amongst the women in this study, (see table 3) as compared to the women in the above named study [22]. The commonest type of anaemia in our study was mild anaemia (83.9%); 8.7% of the anaemic women had moderate anaemia while 2% had severe anaemia (*see table 2*), which are comparable with those from Bida, Niger state Nigeria, where mild, moderate and severe anaemia were found to be 91.4%, 6.6% and 2.0% respectively among all women with anaemia [6, 7, 25].

Prevalence and severity of anaemia at gestational age increased at first trimester (0.9%), second trimester (35.9%), and third trimester 54 (52.4%) respectively. This correlates with a study done in Bida, Niger state, where the proportion of women found to be anaemic with 65.3%; 63.9% and 80.8% in the first trimester, second trimester and third trimesters respectively. Prevalence was therefore high among those who booked in the third trimester [6, 7]. However, the study done in Abeokuta differs from this study in that the highest prevalence was seen in the second trimester (60.6%). While that in the first and third trimesters were 33.3% and 53.8% respectively [24]. This could be explained by fact that most of the women in our study were in their third trimester. Also, quite a number of them booked late for antenatal care.

29.1% of all the women were in their second trimester and 50% of these women were attending antenatal care clinic for the first time (*see table 1*). From table 2 above, it was indicated that 53.6% of the women in their second trimester had anaemia. The fact that these women made up 50% of those attending antenatal care for the first time, explains their relatively high prevalence of anaemia.

58.6% of all women were in their third trimester, which constituted 88.9% of the women who had attended antenatal care clinic >5 times. This explains that they have the highest proportion of normal PCV (63.9%) rate because in the course of their vision, they are usually educated on how to avoid anaemia. They also were examined and treated of any underlying febrile illnesses. However, the fact that they had the highest prevalence of anaemia (52.4%), this attributed to them forming the bulk of our study.

The occupation of the women's husbands, also contributed to this study. It was observed that those husbands whose jobs were business men (i.e. middle socioeconomic status) had the highest prevalence rate of anaemia (38.8%) and the highest prevalence of mild anaemia amongst pregnant women who had low socioeconomic status, were 54.3% [28]. This disparity may be explained by the fact that those whose husbands were business men formed the bulk of the women. Also, this group of women had the highest prevalence of normal PCV (39.8%). The fact that women whose husbands were professionals had a higher prevalence of normal *PCV* (11.3%) than anaemia of 7.7%, corresponds with the above named study wherein with high socio-economic status had the least prevalence of 41.9% [28].

The highest prevalence of anaemia (89.3%), mild anaemia (80.6%) and normal PCV (91%), was seen amongst pregnant women who were regular with their Routine drugs (See table 3). This prevalence of anaemia does no correlate with the previous study conducted by Arnolu *et al,* 2006 who commented that anaemia in pregnancy was less common in women who had been on haematinics than in women who had not been taking haematinics [38]. However, our study tends to agree with the Nigeria Demographic and Health survey 2013 giving 52.6% iron drug intake for Plateau State [43]. The

dissimilarities between the two studies could be explained by the fact that this study was carried out in the antenatal clinic. Hence, most of the women were on regular intake of haematinics, which can explain why they also had the highest prevalence of normal packed cell values. However, their high prevalence of anaemia may be attributed to other causes of anaemia. Though, it is important to note that the haematinics may have contributed to the anaemia being less severe.

Women who were using insecticide treated nets as well as women, who had taken anti - malarial prophylaxis, had the highest prevalence of anaemia of 66% and 61.2%, respectively. *Table 3* also had the highest prevalence of mild anaemia, 60.2% and 56.3%, respectively. This does not support the previous study which states that the use of long lasting insecticide treated nets and intermittent preventive treatment for malaria is effective in preventing anaemia by the fact that it may not be the same group of women that used insecticide treated nets that also took anti-malarial prophylaxis. However, prevalence of anaemia may be attributed to other causes of anaemia in pregnancy other than malaria. It is also important to note that these women also had the highest prevalence of normal PCV rate of 72.7% and 56.1% respectively. Hence, the use of insecticide mosquito treated nets and anti malarial prophylaxis may have contributed to the fact that the anaemia they presented with was less severe.

Women who were multiparous (para 2-4) had the highest prevalence of anaemia 61.2%. This finding is in contrast with that of Mohammed *et al*, 2013 which found out that the prevalence of anaemia was higher among grand multiparous women (85.3%), while only 66.5% of multiparous (para 2-4) and 65.5% of all primigravida women had varying degrees of anaemia, showing that there is a correlation between anaemia and parity [6].

There was a statistically significant association between increasing maternal age and prevalence of anaemia. Women within the age group 34-39 had the highest prevalence of anaemia, 30 (29.1%) (*see table 2).* This finding is however at variance with some other studies that suggested the highest rate of anaemia in teenagers and adolescent.

There was a statistical significant difference association between decreased prevalence of anaemia and number of antenatal visits ($P < 0.5$). The prevalence of anaemia was low in women who had attended two antenatal care clinics 24.3%; low in women who had attended 4 or 5 ANC clinics 9.7% and 16.5% amongst women who were visiting for the first time. Women who had attended >5 ANC clinics had the highest prevalence of anaemia with PCV of 27.1% (*Table 3*). This finding correlates with findings from Ethiopia [3].

5.2. Conclusion

Prevalence of anaemia amongst pregnant women in BHUTH is 43.5%. Commonest form of anaemia in this study is mild anaemia. Prevalence and severity of anaemia was found to be more in the second trimester. Age and reduced number of antenatal care visits were statistically significant factors found to be associated with the presentation of anaemia in pregnancy.

5.3. Recommendation

This study recommends early registration for antenatal care by all pregnant women irrespective of their parity. In addition, pregnant women attending ANC should be exposed to audiovisual aids with routine haematinics during health talks, taking balanced diet, sleeping under insecticide treated mosquito nets and taking anti-malaria prophylaxis to protect their fetuses.

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