Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Der Pharmacia Lettre, 2015, 7 (7):1-5
(http://scholarsresearchlibrary.com/archive.html)

Der Pharmacia Lettre
Scholars Research Library
ISSN 0975-5071
USA CODEN: DPLEB4

Comparative study of some haematological parameters of pregnant women in Akpabuyo local government area of Cross River State, Nigeria

D. C. Okpokam[1*], Z. A. Okhormhe[3], N. A. Ernest[3], K. N. Udoh[2], J. O. Akpotuzor[1] and A. O. Emeribe[1]

[1]Department of Medical Laboratory Science (Haematology Unit), University of Calabar, Calabar, Nigeria
[2]Department of Haematology. University of Uyo Teaching Hospital, Uyo, Nigeria
[3]Department of Haematology, University of Calabar Teaching Hospital, Calabar, Nigeria
[4]Department of Medical Laboratory Science (Chemical Pathology Unit), University of Calabar, Calabar, Nigeria

---

ABSTRACT

Anaemia is defined as a haemoglobin concentration lower than the established cut-off defined by the World Health Organization (WHO). This cut-off ranges from 110g l21 for pregnant women and for children 6 months–5 years of age, to 120g l21 for non-pregnant women, to 130g l21 for men.Cross-sectional prospective study involving 100 apparently healthy pregnant subjects attending antenatal clinic at two centers and 100 apparently healthy non-pregnant subjects of child bearing age (control group), both were within the age range 18 and 43 years and from Akpabuyo Local Government Area Cross River State in Nigeria. Four important haematological parameters were carried out and they include; haematocrit (Hct), haemoglobin concentration (Hb), total white blood cell count (TWBC) and differential white cell count in the subjects studied. The results obtained indicate that there was decrease haemoglobin concentration as well as slightly raised Neutrophil and Lymphocyte count that show significant difference in pregnant subjects in comparison with non-pregnant subjects. However, HCT and Hb were found to reduce significantly while TWCC and Neutrophil increase slightly as trimester increased. Parity showed not to have influence on haematological parameters of pregnant women from Akpabuyo LGA. The present study provides fundamental haematological parameters of pregnant women in rural community of Akpabuyo. This will be of help to the community and the government that a complete blood count is carried out routinely for proper management of ante-natal women, as well as creating awareness to educate pregnant and non-pregnant women on proper food to eat and vitamins to take when pregnant.

Keywords: Pregnancy, haematological parameters, gestational age

---

INTRODUCTION

A pregnancy is influenced by many factors, some of which include culture, environment, socioeconomic status, and access to medical care. The haematological indices also have an impact on pregnancy and its outcome [2].Anaemia in pregnant women is variously defined with two common parameters either as haemoglobin concentration less than 11.0 g/dL or 5th percentile of the distribution of haemoglobin concentration or haemotocrit in a healthy reference population [3]. This assessment is possible through a series of tests measuring different variables [4]. The normal human pregnancy lasts for about 280 days (40 weeks) and has a large impact on the well being of a woman without any underlying medical disorder at the same time makes the foetus vulnerable to the change in the mother's internal and external physiological status. Both mother and the foetus are major consideration in the management of pregnancy [5]. During pregnancy, great change occurs in the physiology of the mother, designed to supply the foetus nutrients required for growth and the mother additional energy that she requires for labour (before the foetal need arises). These changes happen in the first trimester (up to 13 weeks after conception). Where the foetus weighs approximately 13g and is up to 8cm long. During the second trimester (13 – 26 weeks), rapid foetal growth occurs

and by the end of the second trimester, the foetus weighs approximately 70g and is 30cm long within which the foetal organs would have begun to nature. During the third trimester (29 – 40weeks) the foetal organs complete maturation [6].In pregnancy, plasma volume increases 25 – 80% between the sixth and twenty-fourth week of gestation [7]. However, the increase in RBC mass has been found to be approximately 30% between the twelfth and thirty-sixth week of gestation when iron and folate are supplemented [8]. In late pregnancy, plasma volume increases at a slower rate, inducing a slight rise in hematocrit level. These physiological changes during pregnancy make it difficult to define normal hematological reference intervals for pregnant women [9]. Anemia contributes to low birth weight and miscarriages and is also a primary cause of low immunity in both the mother and the child, which makes them vulnerable to several infections [10]. Malaria infection causes 3 –5% of maternal anemia and, worldwide, about 50 million women are exposed to malaria, especially in highly endemic regions like Nigeria[11,12].Previous studies have reported that pregnancy is usually accompanied by leukocytosis, but the full sequential changes of the various cell types responsible for this observed leukocytosis have not been clearly determined in all geographical locations and physiological conditions[13,14]. Among several other causes of maternal mortality haemorrhage and inflammation as a result of infection and malnutrition has been reported to be the major cause in the West African sub-region, haemorrhage and anaemia account for 34.6% in North Central Nigeria [15] and 32.2% in Benin Republic [16]. The packed cell volume (PCV) provides information about the percentage of erythrocytes. When there is decrease in PVC, it implies anaemia while the total white blood cell provides information about the immunity and also detects conditions associated with acute or chronic inflammation including infection [17].Akpabuyo though a rural area has various nutritional source of nutrient necessary for pregnant women which include clam, fish, vegetables and periwinkle etc. With adequate nutritional education during antenatal care and regular haemoglobin and pack cell volume test will go long way to prevent anaemia in pregnancy.

MATERIALS AND METHODS

Subjects: Akpabuyo Local Government Area of Cross River State is located geographically at the South-South region of Nigeria. It has a total population of about 350,000 with about 201,000 female populated in the region [17]. A total of two hundred (200) female, all residing in Akpabuyo were recruited in this study which comprises of one hundred (100) pregnant women and one hundred (100) non-pregnant women (control group). The study duration was from the month of August to November, 2010. The subjects gave their consent and biodata was obtained with the aid of a questionnaire before being allowed to participate in the study. Ethical approval was gotten from the State Ministry of Health Cross River State before collection of samples. The pregnant women were randomly selected from the cohort of women attending Clinic at Maternity hospital and Traditional Birth AttendantCenter both in Akpabuyo Local Government Area of Cross River State. Their age range from 18 – 43years and all were apparently in good health. The non-pregnant subjects (control group) age ranges between 18 – 34years and they were also drawn from the same population.

Exclusion criteria: Women who were breast-feeding, menstruating or were on any form of oral contraception at the time of the study were excluded.

Collection of Sample: Sequestrated sample i.e. 2 milliliters of blood was collected from both pregnant and non-pregnant subject into EDTA bottle in the concentration of 2mg/ml of blood and the following haematological parameters was estimated; haematocrit (HCT), haemoglobin concentration (Hb), total white cell count (TWCC) as well as differential white cell count.

Methodology: They were carried out using full automated blood cell counter (PCE-210 version 5:10 by ERMA, INC. Tokyo).

Data analysis: Significant differences were determined by independent samples student t-test and analysis of variance ANOVA (F-ratio). SPSS-16.0 statistical software was used

RESULTS

Table 1 shows the relationship between the haematological parameters of non-pregnant and pregnant women in Akpabuyo Local Government Area.

The haemoglobin concentration was 116.9± 119g/L and 100.9± 137g/Lfor non-pregnant and pregnant subjects respectively. The pregnant subjects haemoglobin concentration values were observed to be significantly reduced ($p<0.05$) when compared to the non-pregnant women. It also showed slightly increased Leucocyte count (8.3±5.94 $X10^9$/L), Neutrophil (5.3±4.08 x 10^9/L) and Lymphocyte (2.3±1.03 x 10^9/L)count than that of the non-pregnant

women. The difference was statistically increase ($p<0.05$). There was no statistically significant difference in haematocrit, Eosinophil, Monocyte and Basophil between non-pregnant and pregnant subjects.

Table 2 shows the haematological parameters of pregnant women based on trimesters
They were classified according to their approximate gestation age: 1st (1 – 3months), 2nd (4 – 6months) and 3rd (7 – 9months) trimesters, and the number of subjects for each trimester was thirty-four (34), thirty (30) and thirty-six (36) respectively. The mean haematocrit and haemoglobin concentration were observed to be slightly reduced with increasing trimester of the pregnant women. It shows decrease significant difference ($p<0.05$) between the trimesters of HCT and Hb particularly in 3rd trimester. Moreover, the mean values of total white cell count, Neutrophil and Lymphocyte was observed to rise significantly and statistically ($p<0.05$) with increasing trimester.

Table 3 shows the haematological parameters of pregnant women based on parity
The mean values of the haematological parameters used in this study shows no statistical significant ($p<0.05$) difference when parity was considered.

Table 1: Comparison of haematological parameters of Non-pregnant and pregnant subjects in Akpabuyo LGA

Parameters	Non-pregnant (n =100)	Pregnant (n = 100)
Hct (L/L)	0.35±0.0008	0.31±0.009
Hb (g/L)	116.9±119	100.9±137*
TWCC ($X10^9$/l)	6.2±2.03	8.3±5.94*
Neutrophil ($X10^9$/l)	4.1±1.51	5.3±4.08*
Lymphocyte ($X10^9$/l)	1.9±0.32	2.8±1.03*
Eosinophil ($X10^9$/l)	0.1±0.02	0.2±0.09
Monocyte ($X10^9$/l)	0.01±0.001	0.01±0.001
Basophil ($X10^9$/l)	-	-

**p<0.05 significantly difference when compared to that of the non-pregnant subjects*

Table 2: Comparison of haematological parameters of pregnant women based on trimester

Parameters	1st trimester (n=34)	2nd trimester (n = 30)	3rd trimester (n=36)
Hct (L/L)	0.31±0.00	0.31±0.001	0.29±0.001*
Hb (g/L)	104.9±160.2	100.5±135.0	97.7±97.8*
TWCC ($X10^9$/l)	7.5±3.41	8.1±3.60	9.1±9.21*
Neutrophil ($X10^9$/l)	4.7±2.80	5.1±2.41	6.0±5.94*
Lymphocyte ($X10^9$/l)	2.6±1.03	2.8±0.42	2.9±1.55
Eosinophil ($X10^9$/l)	0.2±0.05	0.2±0.07	0.2±0.14
Monocyte ($X10^9$/l)	0.01±0.001	0.02±0.002	0.01±0.001
Basophil ($X10^9$/l)	-	-	-

**p<0.05 significantly difference when compared to that of the non-pregnant subjects*

Table 3:Comparison of haematological parameters of pregnant women according to parity

Parameters	0 – 2 (n=65)	3 – 5 (n=35)
Hct (L/L)	0.31±0.001	0.31±0.007
Hb (g/L)	101.3±163.2	100.3±89.8
TWCC ($X10^9$/l)	8.2±6.86	8.4±4.34
Neutrophil ($X10^9$/l)	5.3±4.52	5.2±3.40
Lymphocyte ($X10^9$/l)	2.7±1.02	2.9±1.02
Eosinophil ($X10^9$/l)	0.17±0.06	0.24±0.13
Monocyte ($X10^9$/l)	0.01±0.001	0.01±0.002
Basophil ($X10^9$/l)	-	-

$p>0.05$ significantly difference when compared to that of the non-pregnant subjects

DISCUSSION

The Haemoglobin concentration value of pregnant subjects in Akpabuyo was observed to be significantly lower than that of the non-pregnant subjects when comparing the two groups. The low haemoglobin values in pregnant women may be due to haemodilution which could be attributable to the fact that some of these pregnant women may not be taking their iron supplement, eating food containing iron and not attending antenatal clinic regularly. The result is in agreement with study carried by Ichipi-Ifukor *et al.*, [18] and Akinsegun *et al.*, [19] who reported significant lower haemoglobin values for pregnant women in Port Harcourt and Lagos respectively also in Nigeria. Neutrophil and Lymphocyte count was slightly raised in pregnant women when compared to non-pregnant women. The increase in Neutrophil may be as a result of alteration in immune system due to bacterial infection. The study is also similar

with the findings by Ichipi-Ifukor *et al.,* [18] who reported that granulocyte and platelets showed significant decrease with Lymphocyte increasing significantly. Moreover, in their study TWBC showed no significant difference but the level was increased compared to non-pregnant subjects. Although in this study, TWBC was increase in pregnant subjects when compared to the non-pregnant subjects. This could be due to the location being a rural area where the study is carried out and platelet count was not included in the parameters checked.As pregnancy progresses, it was observed that haematocrit and haemoglobin values of pregnant women progressively dropped slightly in the second and third trimester when compared with the values of first trimester. The low HCT and Hb values in the second and third trimesters of pregnant women in Akpabuyo Local Government Area a rural community could be precisely to poor nutritional intake of proteins and vitamins. In the face of such poor nutritional status, there will be little/reduced or no intake vitamins as well as other essential vitamins for pregnant women which thereby influence haemoglobin formation.Additionally, the decrease in Hb level and HCT as pregnancy advances in the gestational age groups could also be due to increase demand for iron as it progresses as well as haemodilution accompanying pregnancy. Dapper *et al*, [20] reported significant difference in PCV amongst three gestational age groups that was highest amongst subjects in the first trimester and lowest amongst subjects in the second trimesters. World Health Organization[21]also reported that PCV of pregnant women tend to fall from 35 – 21% due to increased volume and decreased resistance, cardiac output rises. Decrease PCV is seen in a lowering of the blood pressure, especially in the third trimester which sometimes causes dizziness or feeling faint in women as they rise to stand during the third trimester. Vanden-Broek and Letsky [22] also recorded a drop in PCV ranging from 36 – 20% in all the trimesters due to systemic vascular resistance (SVR) level of hormones. The decreasing SVR is an expected result of the increasing progesterone and prostaglandin levels, which relax smooth muscle producing vasodilation and also Huisman *et al*., [23] also stated that stages of pregnancy affect PCV which also agrees with this finding.Increase was also observed in total white cell count (TWCC), Neutrophil and Lymphocyte as trimester rises in pregnant women in Akpabuyo. The reason for a rise in Lymphocyte could be as a result of Lymphocyte suppression by infections mostly by bacteria (which causes the white blood cell to increase, especially Neutrophil). These findings corroborate those of a similar and recent work carried out inJos, Port Harcourt, Ibadan and Lagos, Nigeria by Onwukeme and Uguru [24]; Dapper *et al*,[20]; Adegbola *et al*, [25] and Akinsegun *et al*.,[19] respectively which reported similar trend in TWBC as in this study. A recent work by Elemchukwu *et al*,[26] reported a slight increase in third trimester in respect to the mean value of pregnant women of $9.34 \pm 0.61 \times 10^9$/L versus $6.42 \pm 0.72 \times 10^9$/L. They observed TWBC count to be highest subjects in the third trimester of pregnant women. Kumar [27] also documented that pregnancy lead to increase in white blood cell count from 4.5 – 13.5 x 10^9/L base on their respective trimester but during active labor there is also an increased in TWBC up to 16.0 – 22.0 x 10^9/L and the stated that pregnancy lead to increase in white blood cell count due to physiological changes such as microtears, infection and even the needs of the developing baby, placenta and the uterus which agree with my work. In the work of Scrimshaw and San Giovanni [28] also recorded that there will be an increased in TWBC up to 12.0 x 10^9/L but during infection such as HIV, the TWBC will fall to 3.5 x 10^9/L even lowered than that as a result of immune breakdown which is affected by the fluid intake of the baby resulting to death of the baby and mother during pregnancy and also Oke and Ugwu [29] also stated that immune response triggered the elevation of TWBC which agree with our result.

CONCLUSION

This study assess the comparison of some haematological parameters of pregnant subjects attending the Maternal Hospital as well as the Traditional Birth Attendant Center and non-pregnant subjects both residing in Akpabuyo Local Government Area in Cross River State, Nigeria.There was a significant reduction in Hb, while Neutrophil and Lymphocyte were also slightly elevated when pregnant subjects were compared with non-pregnant subjects. In this study, gestation had significant influence on Hct and Hb with reduction in their values. Meanwhile, TWCC, Neutrophil and Lymphocyte count was increased significantly as trimester increases.Akpabuyo, a rural area with low-social economic status affects the ability of pregnant women to procure foods rich in iron and micro nutrients and drugs leading to complications in pregnancy and maternal mortality. We therefore recommend that a complete blood count be carried out routinely by qualified laboratory personnel for proper management of ante-natal women. Awareness should also be created in the community to educate pregnant as well as non-pregnant women on proper food to eat and vitamins to take when pregnant.

REFERENCES

[1] World Health Organization/United Nations University/UNICEF. Geneva: WHO; **2001**.
[2] R. Yip.*The American Journal of Clinical Nutrition*, **2000**:72(1);272–279.
[3] F. Wahed, S. Latif, M. Uddin, M. Mahmud, *Mymensingh Medical Journal*, **2008**;17(1);4–7.
[4] F. H. Loh, S. Arulkumaran, S. Montan, S. S. Ratnam. *Asia Oceania Journal of Obstetrics and Gyneacology.* **2007**: 20:301-315.

[5] C. Stuart, L. Christopher. Obstetrics by Ten Teachers. (20th Edition). **2011**; Pp. 40-62.
[6] C. J. Lund, J. C. Donovan. *Am J Obstet Gynecol*. **1967**;98(3):394–403.
[7] D. J. Taylor, T. Lind. *Br J Obstet Gynaecol*. **1979**;86(5):364–370.
[8] C. Shen, Y. M. Jiang, H. Shi. *J Obstet Gynaecol*. **2010**;30(4):357–361.
[9] T. S. Imam, A. Yahaya.*Int Jor P App Scs.***2008**;2(2):46–50.
[10] World Health Organization (WHO) Accessed October 21, **2012**
[11] S. J. Rogerson, L. Hviid, P. E. Duffy, F. G. Leke, D. W. Taylor. *Lancet Infect Dis*. **2007**;7(2):105–117.
[12] K. E. Onwukeme, V. E. Uguru. *W Afr J Med*. **1990**;9(2):70–75.
[13] G. W. Mitchell, A. A. Jacobs, V. Haddad, B. B. Paul, R. R. Strauss, A. J. Sbarra. *Am J Obstet Gynecol.* **1970**; 108(5):805–813.
[14] I. A. O. Ujah, O. A. Aisien, I. T. Mutihir, D. J. Van Dergat, R. H. Glew, V. E. Uguru.*African Journal Reproductive Health*. **2005**;98:27-45.
[15] S. Jacques, O. Edgard-Marins, O. Bruno. *African Journal of Reproductive Health*. **2006**;10:28-50.
[16] J. V. Dacie,S. M. Lewis In: Practical Haematology. Edinburgh; Church hill Living Stone Publishing Oxford, **2005**. Pp 01-623.
[17] Census (Nigeria), **2006**.
[18] P. C. Ichipi-Ifukor, J. Jacob, N. Ichipi-Ifukor, O. L. Ewrhe.*Physiology Journal*, **2013**. ID 283814
[19] A. A. Akinsegun, O. A. Sarah, A. R. Kabiru, A. A. Adeniyi, O. D. Adedoyin, A. Adewumi, O. O. Vincent, I. O. Bodunrin, A. I.Kamal.*Int J Womens Health*. **2013**; 5: 227–232.
[20] D. V. Dapper, C. J. Ibe, C. A. Nwauche. *Nigeria Journal of Medicine.* **2006** 15(3): 237-40.
[21] WHO (**2011** WHO/ NHD/O1.
[22] N. R. Vanden-Broek, E. A. Letsky.*British Journal of Obstetrics and Gynaecology*. **2008**;79:39-60.
[23] A. Huisman, J. G. Aaronondse, M. Krans, H. J. Huisjes, V. Fidler, W. G. Zijlstra. *British Journal of Haematology*. 147:576 – 587.
[24] K. E. Onwukeme, V. E. Uguru. *W Afr J Med*. **1990**;9(2):70–75.
[25] T. S. Akingbola, I. F. Adewole,O. A. Adesina. *J Obstet Gynaecol*. **2006**;26(8):763–769.
[26] Q. Elemchukwu,E. I. Obeagu, K. C. Ochei.*IOSR Journal of Dental and Medical Sciences,* **2014**: 13(19): PP 122-129.
[27] S. Kumar, Sir Ganga Ram Hospital, New Delhi (Unpublished).
[28] N. S. Scrimshaw, J. P. San Giovanni. *American Journal of Clinical Nutrition*,**2005**;66:4645 – 4779.
[29] H. C. Oke, C. A. Ugwu.*Physiological Science*. **2011**;3:45-52.