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Evaluation Haematological Parameters among Pregnant Women Attending Antenatal Clinic in College Of Health Demonstration Clinic, Port Harcourt

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Abstract: *This research evaluated the haematological parameters of pregnant women in college of health demonstration clinic, Port Harcourt, Nigeria. The results indicated an elevation in WBC concentration of pregnant women when compared with that of apparently non pregnant women while PCV concentration of pregnant women decreased significantly when compared with that of apparently non pregnant women. This result also indicated that some of the pregnant women were anemic.*

Keywords: *Anaemia, pregnant women, PCV and WBC.*

I. Introduction

Pregnancy is a unique state where the physiology of a woman is greatly altered to accommodate the newly developing foetus (Stuart and Christopher 2011). Pregnancy occurs during ovulation, which is approximately 14th day of regular menstrual cycle and if conception occurs, the ovum is fertilized in the fallopian tube and becomes zygote, which is then carried into the uterus. The zygote divides and becomes morulla which develops a cavity known as primitive yolk sac and becomes blastocyst that implants into the uterine wall at about 5 days after fertilization. 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 (Loh *et al*., 2007). 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 to 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 (29-40 weeks) the foetal organs complete maturation (Stuart and Christopher; 2011). 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 (Ujah *et al.*, 2005) and 32.2% in Benin Republic (Jacques *et al*., 2006).

Haematological parameters are very relevant in the assessment of pregnant mothers. Haemotological parameters are those parameters or test values that are done in the haematology laboratory with the use of specimen in order to assess the component of blood in health and disease, as a result of physiological conditions. Due to the physiological changes in pregnancy, certain haemotological parameters could be greatly attained especially the packed cell volume (PCV) and total white blood cell (total WBC) count (Dacie and Lewis, 2005).

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 detect conditions associated with acute or chronic inflammation including infection (Dacie and Lewis, 2005).

The investigation is typically used on general physiology pathophysiological conditions of the mother and foetus. Therefore this current research is to know what extend pregnancy conditions could affect these haematological parameters.

AIM OF THE STUDY

The aim of the study is to evaluate haematological parameters such as packed cell volume and total white blood cell among pregnant women attending antenatal clinic in College of Health Demonstration clinic, Port Harcourt.

OBJECTIVES OF THE STUDY

- To establish haematological parameters among pregnant woman in Port Harcourt metropolis.
- To ascertain to what extent gestational age affects these haematological parameters.
- To make recommendations or possible measures of curtailing the effect of pregnancy in haematological parameters.

II. Materials And Methods

STUDY AREA

This study was conducted at the Antenatal clinic at College of Health Demonstration Clinic, Port Harcourt metropolis in Rivers State. Port Harcourt is a coastal metropolitan city situated in the South-South geographical zone of Nigeria. The residents include indigenes, non indigenes and other nationals. Occupationally, they are predominantly traders, private sector workers, pregnancy is a day to day event that occurs in the city of Port Harcourt throughout the year.

STUDY POPULATION

The subjects studied consist of Ninety (90) apparently healthy pregnant women between the ages of eighteen (18) and forty nine (49) years and thirty (30) healthy non pregnant women is used as a control.

SAMPLE COLLECTION AND PREPARATION

Two milliliters (2ml) of blood was collected from each subject by clear venipuncture technique from the antecubital vein and transferred into commercially prepared ethylene diamine tetra acetic acid (EDTA) anticoagulant bottle for study.

LABORATORY STUDIES

Laboratory analyses were carried out in the haematology unit of the Department of Medical Laboratory Science, College of Health Science and Technology, Port Harcourt, Rivers State. All reagents used where strictly adhered to.

HAEMATOLOGICAL ANALYSIS

EVALUATION OF PACKED CELL VOLUME (PCV) BY MANUAL METHOD

Manual micro haematocrit method was used to evaluate packed red cells volume.

PRINCIPLE OF PACKED CELL VOLUME

When a given volume of anticoagulated whole blood sample in capillary tube is centrifuged at a constant speed. For a specific time. The blood component tends to sediment based on the molecular weight and size. Forming layers of the component and the speed occupied by the packed cells in relation to the height of the total blood volume is been measured with haematocrit reader and the value is expressed in percentage.

III. Method

The blood was allowed to enter the capillary tube by capillary action to about two third, the unfilled dry end was sealed with clay sealant, the filled capillary tubes were placed in the haematocrit centrifuge with the sealed end against the rim gasket and the rotor lid was fitted and screwed down firmly, the time was set for 5 minutes and spun and when the rotor has automatically stopped, waited for sometimes and then the sample was removed. The tube was positioned into the slot of the microhaematocrit reader and adjusted to get proper intersection of the top of the meniscus of the plasma with 100 and adjust the knob of the reader so that middle white line intersects to top of the red cells and then read the packed red cell volume using microhaematocrit reader.

CALCULATION

$$\text{PCV} = \frac{\text{Height of Packed Cell Column}}{\text{Height of whole blood column}} \times \frac{100}{1}$$

EVALUATION OF TOTAL WHITE BLOOD CELL BY MANUAL HAEMOCYTOMETER METHOD

PRINCIPLE OF TOTAL WHITE BLOOD CELL

Whole blood is diluted appropriately using a diluent with haemolyses cells, leaving all the nucleated cells intact. The number of white cells in a known volume and known dilution are counted using a counting chamber.

METHOD

The diluting fluid (1:20) was drawn into caliberated Pasteur Pipette marked 380ul and disperse into a Kahn's test tub. Whole blood was drawn into caliberated Pasteur Pipette marked 20ul and dispensed into a Kahn's test tube, mixed gently in a like manner for 1-2 minutes to get homogenous mixture, the counting chamber and coverglass was thoroughly cleaned and the chamber was charged to show a "RAINBOW PHENOMENON", a drop of the diluted blood was placed in the counting chamber and charged for 2-3 minutes, the chamber was placed on a microscope stage and focused, the cells were counted from the four corners square of the ruled area under the microscope using 10 x objective.

To calculate white blood cell value

$$\text{Cell count} = \frac{\text{Number of cells counted x diluting factor x } 10^6}{\text{Total Area counted X Depth of Chamber}}$$

$$\text{i.e. } \frac{N \times DF \times 10^6}{A \times D}$$

Where N = Number of cells counted,
DF = Diluting factor (20)
A = Total area counted ($4mm^2$)
D = The depth of the chamber (0.1mm)

Substituting

$$\text{Cell count} = \frac{N \times 20 \times 10^6}{4.0 \times 0.1} /L$$

$$= \frac{N \times 20 \times 10^2}{0.4}$$

$$\therefore \text{ Cell count } = N \times 50 \times 10^6 / L$$

DATA REPORTING

Resulting of packed cell volume and number of white cell count were expressed in percentage and $10^9/L$ to analyze the data generated. The normal distribution was tested by the kolmogorous – Smirnov test. The sample population was grouped among apparently healthy non-pregnant women (control) and pregnant women. Student T- test was used to test for difference among these populations. A probability value (P-value) of <0.05 was considered significant.

IV. Results

DEMOGRAPHIC DETAILS OF PARTICIPANTS

A total of one hundred and twenty (120) females were recruited for this research study, thirty (30) were apparently healthy non-pregnant females while ninety (90) were confirmed pregnant women. The pregnant women were made up of twenty-eight (28) in first trimester, thirty (30) in second trimester and thirty-two (32) in third trimester and were between the ages of 18-49 years (Mean ± SD 31.0 ± 5.1 years) as shown in tables 2 and 3 respectively.

Table 1: Demographic Details Of Participants

TOTAL NO. OF SAMPLES	120	FREQUENCY (%)
NO. OF APPARENTLY HEALTHY NON-PREGNANT WOMEN	30	25
NO. OF APPARENTLY HEALTHY PREGNANT WOMEN	90	75
NO. OF PREGNANT WOMEN IN FIRST TRIMESTER	28	23
NO. OF PREGNANT WOMEN IN SECOND TRIMESTER	30	25
NO. OF PREGNANT WOMEN IN THIRD TRIMESTER	32	27
AGE RANGE	18-49	

Table 2 shows the comparison of mean ± SD of packed cell volume values between apparently non- pregnant women and pregnant women based on their trimesters. There were statistically significant ($P< 0.05$) difference when each of the trimester were compared with and also with the control samples.

TABLE 2: Comparison Of Mean ± Sd Packed Cell Volume Values Between Non-Pregnant And Pregnant Women Based On Their Trimesters.

PCV Estimated Values	Mean ± SD (%)	Range (%)	P values
Non-pregnant women (control)	36.0± 0.97 (n-30)	35.0 – 37.0	$P < 0.05$
Pregnant women			
First trimester	33.0 ± 2.4 (n=28)	32.0 – 34.0	$P < 0.05$
Second trimester	32.0 ± 3.1 (n=30)	30.0 – 33.0	$P < 0.05$
Third trimester	29.0 ± 2.4 (n=32)	28.0 – 30.0	$P < 0.05$

Table 3 shows the comparison of mean ± SD of total white blood cell count values between apparently non-pregnant women and pregnant women based on their trimesters. There were statistically significant ($P < 0.05$) difference when each of the trimesters were compared with and also with the control samples.

Table 3 Comparison Of Mean ± Sd Total White Blood Cell Count Values Between Non-Pregnant And Pregnant Women Based On Their Trimesters

Total WBC Estimated Values	Mean ± SD (10^9/L)	Range (10^9/L)	P values
Non-pregnant women (control)	6.42 ± 0.72	6.14 – 6.68	$P < 0.05$
Pregnant women			
First trimester	6.59 ± 0.68	6.32 – 6.85	$P < 0.05$
Second trimester	7.59 ± 0.48	7.41 – 7.77	$P < 0.05$
Third trimester	9.34 ± 0.61	9.11 – 9.57	$P < 0.05$

Table 4: Frequency Distribution Of The Pregnant Women According To Anaemic Status

Pregnant women (subjects)	Frequency (%)
Non-anaemic	53 (58.89%) (PCV ≥ 30%)
Anaemic	37 (41. 11%) (PCV < 29%)
TOTAL	**90 (100%)**

TABLE 5: Frequency Distribution Of The Pregnant Women According To Total White Blood Cell Count

Pregnant women (subjects)	Frequency (%)	Total WBC (10^9/L)
Normal leukocyte	83 (92.22%)	Total wbc ≥ 4.50 (10^9/L)
Leucopenia	7 (7.78%)	Total wbc < 4.00(10^9/L)
Leukocytosis	-	-
TOTAL	**90(100%)**	

V. Discussion

Pregnancy is a unique state where the physiology of a woman is greatly altered to accommodate the newly developing foetus. Due to the physiological changes, certain haematological parameters could be altered especially the packed cell volume (PCV) and total white blood cell count (total wbc). The decreased in PCV could be due to globulin and fibrinogen content of plasma as a result of protein synthesis by liver hepatocytes to meet up the need for the mother and foetus development during pregnancy (Poole et al 2011). Increase in total white blood cell count is as a result of physiological changes such as microtears infection and even the needs of the developing baby, placenta and the uterus (Kumar 2007). This study found a mean ± SD PCV of 33. 0 ± 2.4% for the first trimester and when compared with the apparently healthy non-pregnant women (control) value of 36.0 ± 0.97% ($P < 0.05$), there was a significant decrease in the pregnant women. But there was a slight decrease in PCV, in the third trimester in relation to the mean value of pregnant women (29.0 ± 2.4% versus 36.0 ± 0.97%), PVC was found to be the highest subject in the third trimester of pregnancy. This agrees with Poole et al (2011), who also reported a significant decrease value of PCV in pregnancy and stated that it was due to globulin and fibrinogen content of plasma. The decrease fibrinogen concentrate observed for the mother and

foetus development during pregnancy which could have made liver produce less fibrinogen. The decrease might be due to depressed fibrinolytic system during pregnancy which make PCV to fall from 39-16% which agree with my work. In the work of Chukwubelu and Obi (2005), Idowu *et al*., (2005) worked on pregnant women using PCV as a criterion for establishing anaemic and further classified anaemia into three major groups with their ranges in 27-30% is mildly anaemic, 21-26% is moderately anaemic and (less than) < 21% is severely anaemic in all the trimester. This implies that anaemia is often common in pregnant women and this agrees with this work where 37 persons were anaemic. WHO (2011), 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 (2008), also recorded a decrease in PCV 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*., (2008) also stated that stages of pregnancy affect PCV which also agrees with this finding.

Also, mean± SD of total wbc count of 6.59 x 10^9/L for the first trimester and when compared with the apparently healthy non-pregnant women (control) value of 6.42 ± 0.72 x 10^9/L, there was no significant change in the first trimester of pregnant women. But there was a slight increase in third trimester in respect to the mean value of pregnant women (9.34 ± 0.61 x 10^9/L versus 6.42 ± 0.72 x10^9/L). Total wbc count was found to be highest subjects in the third trimester of pregnant women. Kumar (2007) 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 total wbc upto 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 (2005) also recorded that there will be an increased in total wbc upto 12.0 x 10^9/L but during infection such as HIV, the total wbc 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 (2011) also stated that immune response triggered the elevation of total wbc which agree with finding.

VI. Conclusion And Recommendation

The present study provides additional baseline data for PCV and total WBC count in apparently healthy pregnant women in Port Harcourt metropolis. This would be of immense benefit especially in the antenatal assessment of pregnant women in Nigeria.

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