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Hematological profile of pregnant women in southwest of Nigeria

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ABSTRACT

Objective: To evaluate the values of some major hematological parameters at different trimesters of pregnancy. **Methods:** The research involved 33 healthy pregnant women as the study group and 11 non-pregnant women as control. The age range of these women was 20-40 years. Ethical approval was obtained from Olabisi Onabanjo University Teaching Hospital, Sagamu. Three milliliters of venous blood collected from the median cubital vein with minimum stasis were put into K^+EDTA bottle. The blood was properly mixed and analyzed for packed cell volume (PCV), total white cell count, differential counts and erythrocyte sedimentation rate (ESR). Hematology was done according to standard methods. **Results:** The result showed that study group exhibited statistically significant lower values of PCV, monocyte and lymphocyte while WBC, eosinophil and ESR were not significantly changed. There was no significant difference in all hematological parameters among the three trimesters. **Conclusions:** Healthy pregnancy may have effect on hematological parameters. Therefore, there is a need to monitor these parameters during pregnancy. We also find that stages of pregnancy have no influence on hematological parameters.

1. Introduction

Pregnancy outcome is influenced by many factors some of which include culture, environment, socioeconomic status and access to medical care. The hematological profile of pregnant women also has an impact on pregnancy and the outcome of the pregnancy[1-3].

The most common hematological indices are the indicators of hemoglobin concentration. Low hemoglobin in the blood (anemia) is widely identified as a hematologic abnormality and it is associated with adverse pregnancy outcome[4].

Anemia in women is variously defined with two most common being, either as a hemoglobin concentration less than 11.0 g/dL or less than the 5th percentile of the distribution, and is based on sex, age and stage of pregnancy (among pregnant women)[4].

In a cohort study conducted by Harrison on pregnant women in Southern Nigeria and those from South India in 1996, he found that mortality rate was proportional to the period of their pregnancy. Those at the late stage of pregnancy were vulnerable to complaints and consequently death might follow[5].

Anemia contributes to low birth weight and miscarriages and it is also a primary cause of low immunity of both the mother and the child, which makes them vulnerable to several infections[6].

Malaria infection especially in the first and second trimesters has been implicated in adverse pregnancy outcomes. It causes 3%-5% of maternal anemia cases. About 50 million pregnant women are exposed to malaria especially in the high endemic regions[7,8].

The hematological status in pregnant women can be analyzed by collection of blood samples during each of the three trimesters, measuring different variables such as packed cell volume (PCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular volume (MCV), red blood cell (RBC) count, white blood cell (WBC) count, hemoglobin concentration, erythrocyte sedimentation rate (ESR) and platelet count[4].

The study was aimed to determine the effect of pregnancy on hematological indices and compare the hematological

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indices at different stages of pregnancy.

2. Materials and methods

2.1. Subjects

Thirty three pregnant women (11 in first trimester, 11 in second trimesters and 11 in third trimesters) between the ages of 20-40 years were enrolled in the Antenatal Clinic of Olabisi Onabanjo University Teaching Hospital for the study. Eleven non-pregnant age-matched women were used as control subjects. Ethical approval was obtained from the Research and Ethics Committee of the Hospital.

2.2. Methodology

Three milliliters of venous blood collected from the median cubital vein with minimum stasis were put into K^+EDTA bottle. The blood was properly mixed and analyzed for PCV, total white cell count, differential counts and ESR. Hematology was done according to the standard methods[8].

2.3. Statistical analysis

All calculations were done using the SPSS-V15 statistical software package for analysis of the data. The data were presented as Mean±SD, and statistical analysis was carried out using the student's paired *t*-test and ANOVA. Differences were considered to be statistically significant at an error probability of less than 0.05 ($P \leqslant 0.05$).

3. Result

Table 1 showed the comparison of mean hematological indices between pregnant women and non pregnant women where differences in PCV, WBC, eosinophil, monocyte, lymphocyte and ESR were found to be statistically significant.

Table 2 showed the mean hematological values between the three trimesters of pregnancy. All the parameters were compared with each other between trimesters and none of the values were found to be statistically significant.

Table 1
Comparison of hematological indices in pregnant women and control (Mean±SD).

Parameters	Pregnant women	Control
Age (years)	35.17±3.40	31.14±6.10
PCV (%)	31.72±4.30*	38.75±3.70
WBC ($\times 10^9$/L)	7.29±3.00*	4.93±0.90
Neutrophil (%)	52.91±13.90	44.63±13.4
Eosinophil (%)	10.35±4.30*	6.32±3.40
Monocyte (%)	1.41±0.80*	4.16±1.90
Basophil (%)	1.00±0.00	1.30±0.52
Lymphocyte (%)	35.68±14.50*	44.86±12.50
ESR (mm/hr)	31.46±8.90*	11.07±4.70

*$P \leqslant 0.05$ comparing with the control group.

Table 2
Hematological values over the three trimesters in pregnant women (Mean±SD).

Parameters	Trimester 1	Trimester 2	Trimester 3	*P*-value		
				1st & 2nd	1st & 3rd	2nd & 3rd
Age (years)	28.18±6.72	29.45±5.42	30.18±5.44	0.603 0	0.432 0	0.765 0
PCV (%)	30.88±2.61	32.45±4.38	31.70±5.52	0.364 0	0.647 0	0.664 0
WBC($\times 10^9$/L)	6.22±1.79	7.52±2.74	8.11±4.13	0.233 0	0.098 0	0.583 0
Neutrophil (%)	55.17±9.24	48.97±17.96	55.32±12.17	0.277 0	0.980 0	0.266 0
Eosinophil (%)	10.53±5.21	9.72±3.10	10.90±4.91	0.639 0	0.835 0	0.494 0
Monocyte (%)	1.82±0.67	0.85±0.43	1.37±0.77	0.318 0	0.601 0	0.591 0
Basophil (%)	1.00±0.00	–	–	–	–	–
Lymphocyte (%)	33.09±6.44	41.05±19.37	31.94±12.57	0.165 0	0.845 0	0.113 8
ESR (mm/hr)	35.64±23.94	31.38±14.75	27.36±18.36	0.528 0	0.241 0	0.551 0

4. Discussion

The aim of this study was to evaluate the hematological profile of pregnant women at different trimesters and to compare hematological parameters of pregnant and non pregnant women.

There is a statistical difference in the PCV of pregnant women (31.72±4.30)% compared with the control (38.75±3.70)%. This correlates with findings in other studies[4,6,9]. The decrease in PCV may be due to increase in plasma

volume during pregnancy causing hemo-dilution, infections, *e.g.* malaria, hormonal changes that increase fluid retention and iron deficiency[4,10,11].

There is no statistically significant difference in the value of PCV throughout the whole process of pregnancy, although there was variation in actual numeric values. Quality health care available to the pregnant woman, adequate management of their blood profiles with dietary supplementation may be the reasons for this. A study showed marked decrease in PCV in the third trimester. This was attributed to maternal diabetes[9].

White blood cells are responsible for body defense. During pregnancy, WBC is reported to be elevated[12]. In this study, the leucocytes count was significant higher compared to that of the controls. This agrees with previous work by Roy *et al* that reported a total leukocyte count rising in early pregnancy which remained elevated through pregnancy. This may be as a result of the body building the immunity of the fetus and it is achieved by a state of selective immune tolerance, immunosuppression and immunomodulation in the presence of a strong anti-microbial immunity. There is also down-regulation of potentially dangerous T-cell-mediated immune responses, while activating certain components of the innate immune system, such as neutrophils. This unique dysregulation between different components of the immune system plays a central role in the maternal adaptation to pregnancy[13].

The elevation of total WBC is accounted for neutrophil[12]. There is no statistical difference between the value of neutrophil in both the study and control groups, but the value is higher in the studied group than the control group. Lymphocyte and monocyte counts were lower while eosinophil count was significantly higher in studied group than in control. Similar observations have been made in previous studies[12,13]. Lurie *et al* reported no significant increase in eosinophil count[14].

The erythrocyte sedimentation rate is one of the measurements of acute phase response. It is helpful in detecting the presence of inflammation and its response to treatment. In the studied group, the value of ESR is significantly increased compared with control group. It is said that ESR can increase to as much as 2 - 3 times normal values during pregnancy[10,15]. This may be as a result of anemic state of the studied group due to plasma expansion and decrease in packed cell volume in healthy pregnancy: it may also be due to marked increase in circulating fibrinogen in pregnancy[16]. There is no significant difference in the value of all the parameters analyzed when compared at different stages of the pregnancy. This disagrees with the report that there is significant difference across the trimesters in the value of WBC and PCV as reported by James *et al*[4].

Conflict of interest statement

We declare that we have no conflict of interest.

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