ORIGINAL ARTICLE

# LEUCOCYTE CHANGES IN NORMAL PREGNANCY IN MAIDUGURI NORTH EASTERN NIGERIA

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## ABSTRACT

**Background:** Medline search revealed paucity of data with respect to the leucocyte changes in normal pregnancy in Maiduguri.

**Objectives:** To determine the normal range of leucocyte count in pregnancy and the effect of parity on leucocyte counts.

**Methods:** A cross-sectional study carried out at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri between April-October 2005. The subjects were pregnant women at different gestational age recruited from the ante natal clinic at booking. The control groups were women from the family planning clinic who had weaned their babies, and not on hormonal contraceptives. Blood samples were collected from the 200 normal pregnant women (cases) and 150 non-pregnant controls for white blood cell count and differential.

**Results:** The mean count for the white blood cell (WBC) was higher in pregnancy. The values for total leucocyte count (TLC) were 7.9±2.05, 8.33±1.74, 8.74±1.87 in the 1st, 2nd and 3rd trimesters respectively. The means differential leucocyte counts in the 1st, 2nd and 3rd trimesters were; neutrophils 2.98, 2.98 and 3.09, lymphocyte 2.95, 3.66 and 3.86, eosinophils 0.72, 0.84 and 0.92, and monocytes 0.72, 0.84 and 0.88 respectively.

The values for the non-pregnant controls were TLC 7.82±1.11, neutrophils 1.95, lymphocytes 4.2, eosinophils 0.78 and monocytes 0.78. There were no statistically significant differences between parity and TLC.

**Conclusion:** There is a significant rise in total leucocyte count with increasing gestational age, but parity has no effect on leucocyte count.


***KEYWORDS: Leucocytes changes, Normal pregnancy, Parity, Maiduguri.***

## INTRODUCTION

During normal pregnancy, leucocyte count has been shown to increase progressively throughout the period of gestation. Leucocyte count ranges of 5,000/μL to 12,000/μL have been reported. [1-4] In labour and early puerperium, the elevation is even more marked, reaching levels of 25,000/μL or more. The cause for this is not known but the same response occurs during and after strenuous exercise. [5] Early changes are due, in part, to the metabolic demands brought on by the fetus, placenta and uterus and, in part, to the increasing levels of pregnancy hormones, particularly those of progesterone and oestrogen.[1]

The increase in leucocyte count in pregnancy has been attributed largely to neutrophilia. In addition, recent studies showed significantly increased proportion of granulocytes and CD8-T lymphocytes and a concomitant reduction in the proportion of CD4-T lymphocytes and monocytes .[6] The alterations in leucocyte count and differentials has to do with suppression of some functions of both cellular and humoral immunity in order to accommodate the foreign semiallogenic fetal graft.

Medline search revealed no data with respect to the leucocyte changes in normal pregnancy. The aim of this study is to determine the normal range of leucocyte count in normal pregnancy in Maiduguri and the effect of parity on leucocyte count in Maiduguri.

## MATERIALS AND METHODS

A cross sectional study was carried out between April-October 2005 at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri. Maiduguri is the capital of Borno state in north eastern Nigeria, with a population of about 4.2 million.[7]

The cases were pregnant women at different gestational ages recruited from the antenatal clinic (ANC) of the UMTH Maiduguri during booking. Those included were normal individuals without previous history of any disease especially hypertension, diabetes mellitus or sickle cell anemia carrying a singleton pregnancy confirmed by ultrasound scan (USS). The controls were selected from normal, non-pregnant individuals attending Family Planning Clinic. They had no history of hypertension,

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diabetes or sickle cell anemia and were not on hormonal contraceptives.

Blood samples were drawn from the 350 subjects, 200 healthy pregnant women (cases) and 150 healthy non-pregnant women (controls). Five milliliters of venous blood sample was aseptically obtained using plastic syringes and needles into plastic sequestrene bottles containing tripotassium ethylene diamine tetracetic acid ($K_3$- EDTA) anticoagulant. Care was taken to avoid undue stasis and frothing during withdrawal of the blood as was recommended.[8] The Specimens were transported to Human Physiology Laboratory in the University of Maiduguri where blood films were made and stained with Leishmans stain. Two hundred cells were counted for white blood cell differential. A questionnaire was used to obtain the gestational ages of the cases and biodata, medical history and parity of both the cases and controls. Ethical clearance was obtained from the UMTH ethical committee.

The data were collated into a computer for statistical analysis with Statistical Package for Social sciences (SPSS) version 11 for windows (SPSS, Chicago, Ill, USA). The various blood parameters were analyzed by descriptive statistics and student t-test was used in analyzing the results obtained from the different groups in the study to find whether there were any significant difference in the blood parameters between cases and control groups. The results were presented as tables. P value of less than 0.05 is considered significant.

## RESULTS

The results are shown in tables 1 and 2. The mean, standard deviation (SD) and significant t-test for 150 non-pregnant healthy women were compared with that of 200 healthy pregnant women, 8 in the first trimester, 119 in the second trimester and 73 in the third trimester.

Leucocytes count of subjects was compared to that

**Table1. Leucocyte counts in pregnant and non- pregnant women in Maiduguri.**

| | **Non- Pregnant (n=150)** | | **Pregnant (n=200)** | | | | |
|---|---|---|---|---|---|---|---|
| | **Mean absolute WBC values x109\L** | **Percentage of total WBC ±SD** | **Mean absolute WBC values x 109\L** | | | | |
| | | | **1st T** | **2nd T** | **3rd T** | **Percentage of Absolute means for Pregnant** | **P value** |
| WBC | 7.82±1.11 | 100 | 7.90±2.05 | 8.33±1.74 | 8.74±1.87 | 8.32±1.89 | 0.001 |
| Neutrophils | 1.95 | 25.0± 1.11 | 2.98 | 2.98 | 3.09 | 3.02 | 0.001 |
| Lymphocytes | 4.2 | 53.7± 2.66 | 2.95 | 3.66 | 3.86 | 3.49 | 0.120 |
| Eosinophils | 0.86 | 11.0±1.22 | 0.72 | 0.84 | 0.92 | 0.83 | 0.655 |
| Monocytes | 0.80 | 10.3±1.32 | 0.72 | 0.84 | 0.88 | 0.81 | 0.663 |

*Key: n=number, T=trimester*

**Table 2: Effect of Parity on Leucocyte Counts in Maiduguri**

| PARAMETER | PARITY | NO IN GROUP | ABSOLUTE MEAN | SD | P-Value |
|---|---|---|---|---|---|
| Total WBC (x109)/L | 0 | 47 | 8.68 | 1.91 | 0.40 |
| | 1-4 | 112 | 8.22 | 1.78 | 0.50 |
| | ≥5 | 31 | 8.36 | 1.87 | 0.60 |
| Neutrophils (x109)/L | 0 | 47 | 3.07 | 0.38 | 0.50 |
| | 1-4 | 112 | 2.92 | 0.41 | 0.40 |
| | ≥5 | 31 | 3.09 | 0.54 | 0.50 |
| Lymphocytes (x109)/L | 0 | 47 | 3.79 | 0.43 | 0.50 |
| | 1-4 | 112 | 3.59 | 0.41 | 0.20 |
| | ≥5 | 31 | 3.58 | 0.54 | 0.50 |
| Eosinophils (x109)/L | 0 | 47 | 0.88 | 0.17 | 0.40 |
| | 1-4 | 112 | 0.83 | 0.21 | 0.20 |
| | ≥5 | 31 | 0.86 | 0.28 | 0.50 |
| Monocytes (x109)/L | 0 | 47 | 0.88 | 0.17 | 0.20 |
| | 1-4 | 112 | 0.82 | 0.13 | 0.10 |
| | ≥5 | 31 | 0.84 | 0.14 | 0.50 |

of controls in table 1. Mean counts for the WBC was higher in pregnancy. There was a progressive increase in the leucocyte count through the trimesters. This was statistically significant ($p \geq 0.001$). The differential leucocyte counts also showed that the neutrophils ($P \geq 0.001$), monocytes ($P \geq 0.663$) and eosinophils ($P \geq 0.655$) increased with increasing gestation although only the increase in neutrophils is statistically significant.

Table 2 shows the effect of parity on leucocyte counts. Parity had no effect on total leucocyte or its differentials.

**DISCUSSION**

Pregnancy induced leucocytosis has been appreciated for more than a century.[9] The total leucocyte count in this study has been observed to increase with increasing gestational age. The value obtained is significantly higher than in the non-pregnant women ($P \geq 0.001$). This is in keeping with report of other workers.[2,9-13]

Two mechanisms may explain the gestational alterations in leucocyte count. Pregnancy is known to involve an increase in plasma-free cortisol levels and certain other states characterized by elevation of corticosteroid levels like strenuous exersice[5] had been shown to be associated with leucocytosis. Another factor that might be responsible is the increase estrogen level during pregnancy.[14]

The cell type responsible for the leucocytosis of pregnancy clearly is the segmented neutrophils whose absolute count was found to be approximately doubled during gestation.[9] In this study, the absolute neutrophils counts were found to almost double the non-pregnant control value. This finding is in keeping with previous reports of neutrophilia in pregnancy.[2,9-11] The non-pregnant control showed relative neutropenia in this study which is in keeping with findings of other workers.[15]

Lymphocytes have been noted to be lower in pregnant than in non-pregnant women.[9,10,16] In this study it was found that the absolute lymphocyte counts is lower in pregnancy than the non-pregnant control (Table 1). However, a study [16] reported that lymphocyte count is not affected by pregnancy, but that lymphocytes are functionally suppressed. This could partly explain the predisposition of pregnant women to some infections e.g. Viral.[17]

Absolute eosinophils counts have been shown to slightly increase in pregnancy.[12] Absolute eosinophils counts in this study showed no significant increase ($P \geq 0.655$) in pregnancy from the non-pregnant control but the absolute monocyte counts showed an insignificant increase ($P > 0.05$) in pregnancy from the non-pregnant control. This finding is similar to the findings of previous work,[9,18] but contrary to a report that monocyte counts remain unchanged during pregnancy.[4] The visual technique of leucocyte estimation used could also explained some of the variations with some other workers as Pitkin observed that manual methods might be prone to errors. Also the study design is cross-sectional not longitudinal.

When the effect of parity on leucocyte count was determined, it was observed that there was no significant difference between different parities in respect to the parameters.

In conclusion, there was significant rise in WBC with increasing gestational age, but parity had no effect on leucocyte count in Maiduguri.

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