COMPARISON OF WBC- TOTAL AND DIFFERENTIAL COUNT IN DIFFERENT TRIMESTERS OF PREGNANCY

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A B S T R A C T

Background: - Pregnancy is a state characterized by changes in many physiological and haematological parameters. Most earlier studies conducted emphasized mainly on Haemoglobin and RBC parameters changes in pregnancy but there have been only a few studies on changes in WBC-total and differential count parameters in pregnancy. Leukocytosis in pregnancy is seen mainly due to neutrophilia with slight left shift along with toxic granulation associated with stress. The aim of this study was to assess the changes in total and differential leucocytes count in pregnancy in comparison with non-pregnant controls in different trimesters in pregnancy. The cross sectional study was conducted in Department of Pathology, Indore Medical College Hospital and Research Centre, Indore during October 2013 to September 2015. A total 400 blood samples from pregnant women and non-pregnant women each were collected and run on fully automated 5part differential hematology analyser Transasia Model-XS-800i. Detail parameters including WBC- total and differential count were done and compared in different trimesters of pregnancy. In our study around two third females were in age group of 21-30 years. In total 39%, 38.75% and 22.25% women were in first, second and third trimester respectively. Comparison of mean between three trimesters was done. Total WBC count, Neutrophils and Lymphocytes count showed significant difference, while Monocytes, Eosinophils and Basophiles did not show any significant correlation. Significant increase in WBC and Neutrophil count were seen in pregnant women. There was significant difference in WBC count and neutrophils between first-second and first-third trimesters.

INTRODUCTION

Pregnancy is a state characterized by changes in many physiological and haematological parameters, which may be pathological in the non-pregnant women.1 Many factors influence the pregnancy i.e. culture, environment, socioeconomic status and availability of medical care. These haematological parameters changes may also affect the pregnancy and its outcome.2 Most of the studies conducted on haematological changes have given emphasis on haemoglobin concentration and RBC parameters changes in pregnancy, however only a handful of studies have been done on changes in WBC-total and differential count in pregnancy.3,4 The white blood cells constitute about 1% of blood cells and are responsible for the immune system. There are five subsets of white blood cells, neutrophils, eosinophils, basophils, lymphocytes, and monocytes.5 Increased WBC count is major finding seen in the pregnancy mainly associated with physiologic stress and increased inflammatory response associated with pregnancy.6,7

This leucocytosis is mainly due to neutrophilia and slight neutrophilic left shift with toxic granulation. Monocytosis is also reported in pregnancy.8 Several other changes also have been reported in neutrophils during pregnancy. They include, impairment of apoptosis due to the increased inflammatory response, reduced chemotaxis and impaired respiratory burst.4,7,8,9 Lymphocytes, eosinophils and basophils decline in number with increasing gestational age in pregnancy.6,10

The aim of this study was to assess the changes in total and differential leucocytes count in pregnancy in comparison with non-pregnant controls in different trimesters in pregnancy.

MATERIAL AND METHODS

The cross sectional study was conducted in department of pathology, Index Medical College Hospital and Research Centre, Indore from October 2013 to September 2015. The total 400 blood samples from pregnant women and 400 blood samples from non-pregnant women were collected for the study. All the pregnant women of 20-40 years attending antenatal clinic with positive pregnancy test and live fetus in ultrasonography were included in the study. Pregnant women
sufferings from bleeding disorder, splenomegaly, hypertension, HIV, Hepatitis B and women on NSAID were excluded from study. After taking written consent, 2-3 ml blood from antecubital vein was collected by using dry, sterile disposable syringe and needle. Blood was immediately transferred in a tube containing anticoagulant ethylene-diamin-tetraacetic acid (EDTA). Detail history was taken. A drop of blood was placed on two slides and smears were prepared. The slides were stained with Leishman and field.

Out of 400 pregnant women 156 (39%), 155(38.75%) and 89 (22.25%) women were first, second and third trimester respectively. (Table No.3) Comparison of mean between three trimesters done and Total WBC count, neutrophils and lymphocytes count showed significant difference, while monocytes, eosinophils and basophils did not show any significant correlation. (Table No.4)

### Table No 3 Distribution of case group patients according to trimester

<table>
<thead>
<tr>
<th>Trimester</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trimester</td>
<td>156</td>
<td>39.00</td>
</tr>
<tr>
<td>Second trimester</td>
<td>155</td>
<td>38.75</td>
</tr>
<tr>
<td>Third trimester</td>
<td>89</td>
<td>22.25</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.00</td>
</tr>
</tbody>
</table>

### Table No 4 Comparison of Mean WBC and Differential count between the groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>First trimester (n=156)</th>
<th>Second trimester (n=155)</th>
<th>Third trimester (n=89)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>(Mean±SD)</td>
<td>(Mean±SD)</td>
<td>(Mean±SD)</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>9.41±2.31</td>
<td>10.27±2.31</td>
<td>10.13±2.79</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>23.86±6.35</td>
<td>19.47±6.81</td>
<td>21.75±7.66</td>
</tr>
<tr>
<td>Monocytes</td>
<td>3.56±1.29</td>
<td>3.20±1.28</td>
<td>3.49±1.65</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>1.90±1.30</td>
<td>1.77±1.82</td>
<td>2.29±3.21</td>
</tr>
<tr>
<td>Basophils</td>
<td>0.00±0.00</td>
<td>0.00±0.00</td>
<td>0.00±0.00</td>
</tr>
</tbody>
</table>

Comparison of Mean WBC between the groups

One –Way ANOVA test was used with F value=2.14, P value=0.119, Not significant. The F value obtained was 2.14 with a P value of > 0.05, which is statistically not significant. Thus, WBC values in all the three groups are comparable. As the ANOVA value was found to be non-significant, post-hoc Tukey test has not been applied. (Table No. 4)

Comparison of Mean Neutrophil count between the groups

One- Way ANOVA test was used with F value = 16.09, P value = 0.000, Significant.

The F value obtained was 16.09 with a P value of < 0.05, which is statistically significant.

Thus, neutrophil values in all the three groups are statistically different. (Table No.4)

Significant difference was seen between the pairs first trimester- second trimester, and second trimester- third trimester, while non-significant difference was seen between first trimester-third trimester pair. Post- hoc Tukey was applied to see the difference between the pairs. (Table No. 5)

### Table No.5 Post-hoc Tukey Test was applied to see the difference between the pairs

<table>
<thead>
<tr>
<th>Pair</th>
<th>Mean Difference</th>
<th>t’ Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trimester- Second trimester</td>
<td>4.89</td>
<td>5.61</td>
<td>0.000*</td>
</tr>
<tr>
<td>First trimester- Third trimester</td>
<td>1.65</td>
<td>1.62</td>
<td>0.238</td>
</tr>
<tr>
<td>Second trimester- Third trimester</td>
<td>3.24</td>
<td>3.17</td>
<td>0.004*</td>
</tr>
</tbody>
</table>

* Significant difference

Comparison of Mean Lymphocyte count between the groups

One-Way ANOVA test was used, F value = 14.79, P value = 0.000, Significant

The F value obtained was 14.79 with a P value of < 0.05, which is statistically significant.

Thus, lymphocyte values in all the three groups are statistically different. (Table No. 4)
Significant difference was seen between the pairs first trimester-second trimester and second trimester-third trimester, while non-significant difference was seen between first trimester-third trimester pair. Post-hoc Tukey Test was applied to see the difference between the pairs. (Table No. 6)

**Table No. 6** Post-hoc Tuskey Test was applied to see the difference between the pairs

<table>
<thead>
<tr>
<th>Pair</th>
<th>Mean Difference</th>
<th>t' Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trimester-Second trimester</td>
<td>4.21</td>
<td>5.44</td>
<td>0.000*</td>
</tr>
<tr>
<td>First trimester-Third trimester</td>
<td>1.93</td>
<td>2.12</td>
<td>0.086</td>
</tr>
<tr>
<td>Second trimester-Third trimester</td>
<td>2.29</td>
<td>2.52</td>
<td>0.032*</td>
</tr>
</tbody>
</table>

* Significant Difference

**Comparison of Mean Monocyte count between the groups**

One-Way ANOVA test was used. F value = 2.96, P value = 0.053, Not Significant.

The F value obtained was 2.96 with a P value of > 0.05, which is statistically not significant.

Thus, monocytes values in all the three groups were comparable. As the ANOVA value was found to be non-significant, Post-hoc Tukey test has not been applied. (Table No. 4)

**Comparison of Mean Eosinophils between the groups**

One-Way ANOVA test was used. F value = 1.87, P value = 0.155, Not Significant.

The F value obtained was 1.87 with a P value of > 0.05, which is statistically not significant.

Thus, eosinophils in all the three groups are comparable. As the ANOVA value was found to be non-significant, Post-hoc Tukey test has not been applied. (Table No. 4)

**Comparison of Mean Basophils between the groups**

For Basophils One-Way ANOVA test could not be applied.

**DISCUSSION**

Our study shows increases in total WBC count in pregnant women as compared to the control group and this is similar to the finding of study conducted by the Kuhnert et al., Osonuga et al., Luppi et al., Osoagabaka et al., James et al., Cunningham et al., Chandra et al., Das et al. and Elgari et al. The increase in total WBC in pregnant women is result of 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 antimicrobial 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. However Ichipi-Ikufor et al did not report significant changes in total WBC count in pregnant in comparison of non-pregnant control group women.

Our study does not show relation between increased total WBC count and increase in gestation age. This is probably because our study is cross sectional study with varying number of subjects at different gestational age. These finding are similar to the Pughikumo et al., Osonuga et al.

Increased TWBC with increased gestation age was however seen by pervious workers like Crocker et al., Osoagabaka OU et al., Lurie et al. Our study shows neutrophilia which is similar to the study by Fleming AF et al and Gatti L et al. This is due to impaired neutrophilic apoptosis during pregnancy. The neutrophils shows toxic granulation and left shift with increase in immature cells like myelocytes and metameylocytes in the peripheral smears. The Neutrophil count rises with gestation age and may remain elevated throughout the pregnancy. Significant difference was seen between pairs first trimester-second trimester and second trimester-third trimester, while non-significant difference was seen between first trimester-third trimester pair. Our study show increased neutrophil count with gestation age.

The lymphocyte count decreases with increased gestational age as reported by the various studies is also comparable with our study. Few studies also reported increase in lymphocyte count in pregnant women. However no significant difference was observed in different trimesters. Purohit et al reported that lymphocytes count decreases significantly during first and second trimesters and but increase during the third trimester.

There is an absolute monocytosis during pregnancy especially in the first trimester but it decreases with advance in gestation. Monocytes help in preventing foetal alloraft by infiltrating the decidual tissue (7th-20th week of gestation) possibly, through PGE2 mediated immunosuppression. Study by Pitkin RM et al also show Monocytosis but our study does not shows any significant changes in monocyte count.

Basophils and eosinophils decreases in pregnant women in comparison with control cases. Our study does not shows any significant changes in Basophils and Eosinophils similar to the study of Edlestam G et al. However Das S et al reported increased in Eosinophilic count in their study.

We can conclude that our study showed increase in total WBC and neutrophil count in pregnant women. Neutrophils and lymphocytes count shows significant changes in between first-second and second-third trimesters.

**CONCLUSION**

There was a significant increase of total WBC count and Neutrophil in pregnant women than non-pregnant women. There was significant difference in neutrophils and lymphocytes between first-second and second-third trimesters. Monocytes, Eosinophil and Basophil do not show any significant changes in pregnant women.

**References**

Comparison of Wbc- Total and Differential Count in Different Trimesters of Pregnancy


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