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ARE THERE ANY DIFFERENCE IN HAEMATOLOGICAL PARAMETERS IN PREGNANT AND NON-PREGNANT WOMEN?

Snehalata J Chaudhari[1], Rajeshri K Bodat[1]

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Author's Affiliation:
[1]Associate Professor, Dept. of Physiology, Govt. Medical College, Surat, India

Correspondence:
Dr. Snehalata J Chaudhari
snehalatajchaudhari@gmail.com

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ABSTRACT

Introduction: Objective of the study was to compare various haematological parameters between non-pregnant women and women in third trimester.

Method: This cross sectional study was undertaken in new civil hospital, Surat. Twenty five pregnant women in third trimester were taken as cases and another twenty five non pregnant healthy women of 18 to 32 years were taken as control group. Haematological parameters and blood pressure were studied for each study subjects.

Results: Mean haemoglobin value is significantly lower in 3rd trimester women in comparison to control group ($p < 0.001$). Mean RBC count is significantly lower ($p < 0.001$) and mean WBC count was higher in third trimester women ($p < 0.001$). Mean ESR value was seen very much elevated in third trimester compared to non-pregnant women ($p < 0.001$). Mean blood pressure levels were slightly higher in third trimester women in comparison to non-pregnant women but the differences were statistically not significant ($p > 0.05$).

Conclusion: It can be concluded that altered haematological indices are seen during third trimester of normal pregnancy in comparison to non-pregnant women.

Key words: Pregnancy, haematological changes, third trimester, haemoglobin, ESR

INTRODUCTION

Normal pregnancy is characterized by profound changes in almost every organ and system to accommodate the demands of fetoplacental unit.[1] In normal pregnancy, the physiological change in haemoglobin concentration (HGB) and platelet count during pregnancy are well known phenomena.[2] It is also one of the physiological conditions capable of causing remarkable and dramatic changes in haematological variables. 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]

The haematological indices of an individual to a large extent reflect their general health.[3] Blood is a special type of connective tissue composed of formed elements in a fluid matrix. Many of the hematological indices are influenced by many fac-

tors like sex, seasonal variation, lactation, pregnancy health, and nutritional status.[4] It is also acknowledged that for comparisons between individuals and with reference data in a clinical diagnostic situation, it is necessary to consider the normal variations due to sex, age, and breed in order to increase diagnostic precision.[5]

In normal pregnancy the haematological indices of an individual to a large extent reflect their general health[3] and many studies such as Osonuga et al.[6] and Shaw et al.[7] have identified the haematological indices of the pregnant woman as one of the factors affecting pregnancy. Anaemia (low haemoglobin) is a widely identified haematological abnormality[8] and it is also associated with adverse pregnancy outcome.[9] Anaemia in pregnant women is variously defined with two common parameters either as haemoglobin concentration less than 11.0 gm/dL or 5th percentile of the distribution of haemoglobin concentration or haemotocrit in a healthy reference population.[10] This assessment is possible through a series of tests measuring different variables.[11]

This study is of importance because systems monitored during antenatal care in an attempt to predict and/or improve pregnancy outcome are dependent on the quality and quantities of haematological indices. Pregnancy is a state characterized by many physiological haematological changes, which may appear to be pathological in the non-pregnant state. Objective of the study was to compare various haematological parameters between non-pregnant women and women in third trimester.

METHOD

This cross sectional study was undertaken in new civil hospital, Surat. Twenty five pregnant women in third trimester were taken as cases and another twenty five non pregnant healthy women of 18 to 32 years were taken as control group. All the study subjects included in the study were not suffering from any infectious disease at the time of examination. Detailed written consent was taken from all the study participant. Permission was granted from Institutional Ethical Committee (IEC).

Detailed present and past history, menstrual and obstetric history were taken and routine clinical examination was carried out to rule out any gross abnormality. From all study subjects 4 ml of venous blood was collected and transferred to Wintrobe bulb for haematological investigation. To avoid diurnal variation, the time for collection of blood was standardized between 9 AM to 11 AM. Haemoglobin estimation was carried out by Sahli's method. Total erythrocyte count/ Red blood cell (RBC) and total leucocyte count (TLC) was done using improved Neubauer's counting chamber. Erythrocyte sedimentation rate was estimated by Wintrobe's method. Reading was taken at the end of 1st hour. Packed cell volume (PCV or Haematocrit) was estimated by centrifuging the haematocrit tube filled with blood at 3000 rpm for 15 minutes. Various blood indices were derived from the above mentioned variables.

RESULTS

Table 1 shows values of mean, standard deviation and comparison of various haematological parameters in control non pregnant women and in pregnant women of third trimester.

Mean haemoglobin value was 12.7 ± 0.94 and 11.14 ± 3.01 respectively in control group and third trimester women. Mean haemoglobin value is significantly lower in third trimester women in comparison to control group ($p < 0.001$).

Table 1: Comparison of various haematological parameters in pregnant and non-pregnant women

Haematological Parameter	Non- pregnant	3rd trimester	P value
Haemoglobin (gm%)	12.7 ± 0.94	11.14 ±3.01	< 0.001
RBC (million/cu mm)	4.48 ± 1.20	3.5 ± 0.61	< 0.001
WBC (thousand/ cu mm)	6220 ± 1181.0	7249.2 ± 1469.3	< 0.001
ESR (mm/hr)	12.68 ± 2.92	51.80 ± 4.16	< 0.001
PCV (%)	43.2 ± 2.06	35.36 ± 3.26	< 0.001
MCV (fl)	96.44 ± 6.02	110.85 ± 14.99	< 0.001
MCH (pg/cell)	28.39 ± 4.28	32. 38 ± 4.89	0.003
MCHC (g/dl)	29.43 ± 3.05	31.61 ± 3.80	0.029
Colour index	1.01 ± 0.12	1.39 ± 0.18	< 0.001

RBC- Red Blood Cell, WBC- White Blood Cell, ESR- Erythrocyte Sedimentation Rate, PCV- Packed Cell Volume, MCV- Mean Corpuscular Volume, MCH- Mean Corpuscular Haemoglobin, MCHC- Mean Corpuscular Haemoglobin Concentration

Mean RBC count is significantly lower ($p < 0.001$) and Mean WBC count was higher in third trimester women in comparison to non-pregnant women ($p < 0.001$). Mean ESR value was seen very much elevated in third trimester compared to non-pregnant women ($p < 0.001$).

Table 2 shows variation in systolic and diastolic blood pressures due to pregnancy. Mean blood pressure levels were slightly higher in third trimester women in comparison to non-pregnant women but the differences were statistically not significant ($p > 0.05$).

Table 2: Comparison of blood pressure in pregnant and non-pregnant women

Haematological Parameter	Non- pregnant	3rd trimester	P value
Systolic BP (mmHg)	116.0 ± 3.5	119.4 ± 4.1	0.199
Systolic BP (mmHg)	76.92 ± 4.9	78.8 ± 3.1	0.114

DISCUSSION

The aim of the present study was to evaluate the haematological changes/variation that occurs during normal pregnancy. The result of the blood haemoglobin showed a significant difference ($P < 0.001$) between the non-pregnant and the third trimester women group. This findings is also supported by studies done by Good et al[12] and Good W[13]. Actually during pregnancy haemoglobin, cell volume and plasma volume all increase. Decreasing levels of haemoglobin throughout the pregnancy might be explained on the basis of a generalized great increase in the plasma volume as compared to haemoglobin and cell volume.

During the third trimester of pregnancy a highly significant decrease in RBC count from non-pregnant state was observed. This result is also supported by Benson et al[14] and Jain et al.[15] Increased level of white blood cell count (WBC) was seen in third trimester women group compared to the control non-pregnant women group. The difference was statistically significant in our study which was comparable to the findings of Osonuga et al.[6]. White blood cells are responsible for body defense during pregnancy, WBC was reported to be elevated in this study. This agrees with previous work by Luppi[16], who asserted that a total WBC count rising in early pregnancy will remain 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 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.

A significant ($p < 0.001$) rise in ESR during third trimester of pregnancy from non-pregnant state. The increased ESR is due to increased plasma proteins especially fibrinogen in the blood which is noted during pregnancy. From our study, it was discovered that there was a significant difference ($P < 0.01$) in the PCV of the third trimester group when compared to the non-pregnant group. This finding is in line with those of James et al.[5]. The decrease in PCV may be due to increase in plasma volume during pregnancy which causes haemodilution, and increased rate of infection especially malaria, hormonal changes, and conditions that promote fluid retention and iron deficiency.

During third trimester of pregnancy the mean MCV rises significantly from that in non-pregnant women which was comparable to study done by Good et al.[12] During pregnancy no significant alterations were noted in both blood pressure levels throughout pregnancy. P N Nobis studied 350 normal pregnancy cases and after careful analysis recorded the average pre-pregnancy blood pressure of 116.86/96.28 mm of Hg and observed that blood pressure level in pregnant state remains more or less unchanged.[17]

CONCLUSION

It can be concluded that altered haematological indices such as haemoglobin, red blood cell (RBC) count, white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), packed cell volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) are seen during third trimester normal pregnancy in comparison to non-pregnant women.

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