ORIGINAL ARTICLE

TRACKING OF HAEMATOLOGICAL PARAMETERS IN FIRST AND SECOND TRIMESTER OF PREGNANCY

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

Author's Affiliation: [1]Associate Professor, Dept. of Physiology, Govt. Medical College, Surat, India
Correspondence: Dr. Snehalata J Chaudhari, E-mail: snehalatajchaudhari@gmail.com

ABSTRACT

Introduction: Normal pregnancy is characterized by profound changes in almost every organ and system to accommodate the demands of feto-placental unit. Objective of the study was to compare various haematological parameters between women in first and second trimester of pregnancy.

Method: This cross sectional study was undertaken in new civil hospital, Surat. Twenty five pregnant women each in first and second trimester were taken as study subjects. Haematological parameters and blood pressure were studied for each study subjects.

Results: Mean haemoglobin value was 12.2 ± 3.01 and 11.4 ± 3.12 respectively in first and second trimester women & the mean difference was statistically significant ($p < 0.01$). Mean RBC count was lower in second trimester compared to first trimester but the difference was not statistically significant ($p > 0.05$). Mean difference of WBC count, ESR and PCV were statistically significant. There was no statistically significant difference in means of MCV, MCH and MCHC ($p > 0.05$). Mean blood pressure levels were slightly higher in second trimester women in comparison to first trimester but the differences were statistically not significant ($p > 0.05$).

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

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

INTRODUCTION

Pregnancy is a state characterized by many physiological haematological changes, which may appear to be pathological in the non-pregnant state.[1] 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 factors 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. Objective of the study was to compare various haematological parameters between pregnant women of first and second trimester.

METHOD

the study was obtained. The study was conducted among pre pubertal girls (10-12 yrs). All girls were included in this age group except those having history of (h/o) fever last14 days, respiratory illness like symptoms in last14 days, acute or chronic respiratory diseases, history of cardiac or renal problems, anaemia like symptoms, history of any drug intake which can affect lung function, allergic history, history of deformity of bone, chest or spine and any muscular weakness, significant family history of asthma, atopy, or other chronic lung diseases.

Details regarding purpose and objective of the study were explained to parents and school authorities. Data was collected by asking, and a thorough clinical examination on each girl was done to rule out any significant problems fitting the exclusion criteria. A total of 45 girls were included in the study while remaining girls were excluded due to exclusion criteria.

Standard anthropometric measurements weight (kg), height (cm), was measured in a beam balance.

All included subjects were tested in a proper sitting position with the head straight. Before testing, the procedure was explained and demonstrated to each until full familiarity was achieved. Minimum three readings were given and best of the three was chosen for analysis, based on standardization of spirometry study based on ATS/ERS task force series [8] and various other studies.[2-5,7] Each participant was told to take a deep breath and then blow into the mouth piece as hard and fast as she could. The same spirometer was used throughout the study and the tests were performed by the same technician. Data were collected and analysis was done with appropriate statistical test.

RESULT

According to table 1, mean age of the participants was 11.36 (±0.69) years. Similarly mean height, weight, BMI and BSA was 134.8 (±8.91) cm, 28 (±5.9) kg, 15.29 (±2.02) (Kg/m^2), and 1.02 (±0.13) (m^2) respectively.

According to Table 2, mean of the various respiratory parameters like FEV1, FVC, FEV1/FVC, PEFR and MVV were 1.64 (±0.33), 1.67 (±0.41), 90.87 (±9.24), 3.29 (±0.74) and 91.23 (±15.53) respectively.

According to table 3, there were 27 (60 %) participants with BMI <18 and 18 (40%) participants with BMI >18. There was significant statistical association between BMI and FEV1 (%), FEV1/FVC (%), PEFR (%) ($P < 0.05$).

Table 1: Anthropological data of the subjects (n=45)

Variables	Mean (±SD)
Age (Yrs)	11.26 (± 0.69)
Height (cm)	134.8 (±8.91)
Weight (Kg)	28 (± 5.9)
BMI (Kg/m^2)	15.29 (± 2.02)
BSA (m^2)	1.02 (± 0.13)

Table 2: Respiratory parameters in study participants (n=45)

Parameters	Mean (±SD)
FEV1 (Obs.)	1.64 (± 0.33)
FEV1 (%)	78.02 (± 13.51)
FVC (Obs.)	1.67 (± 0.41)
FVC (%)	78.22 (± 19.40)
FEV1/FVC (Obs.)	90.87 (± 9.24)
FEV1/FVC (%)	93.15 (± 10.01)
PEFR (Obs.)	3.29 (± 0.74)
PEFR (%)	75.8 (± 13.9)
MVV (Obs.)	91.23 (± 15.53)
MVV (%)	80.95 (± 18.78)

Table 3: Association between BMI (kg/m^2) and respiratory parameters (n=45)

Parameters	BMI (<18) (n=27) Mean±SD	BMI (>18) (n= 18) Mean±SD	P value
FEV1 (%)	83.02±13.31	74.12±12.52	0.029*
FVC (%)	83.22 ±17.3	76.22±18.32	0.200
FEV1/FVC (%)	96.99±10.92	89.25±11.02	0.025*
PEFR (%)	79.7±11.9	70.80±12.91	0.022*
MVV (%)	83.95±17.98	77.95±17.77	0.276

* P value <0.05 statistically significant

DISCUSSION

This study was conducted to know reference values for lung function from healthy pre pubertal girls of Vadodara. Variables, measured commonly in various studies were age and one or more indices like BSA and BMI. Number of variables in the reference equation depends on the various indices. For example, it is more for primary indices such as FEV1 and FVC to which both body size and age contribute than to their ratio FEV1%. The lung function reported from India and other parts of south Asia exhibit consider-

Jain et al.[15] Overall increased level of white blood cell count (WBC) was seen in both first and second trimester women group. 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 second trimester of pregnancy in comparison to first trimester. 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 ($P < 0.05$) in the PCV of the second trimester group when compared to first trimester. 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.

No statistically significant difference was observed in MCV, MCH and MCHC between women of first and second trimester. 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

From our study we can conclude that significant changes in haematological indices such as haemoglobin and erythrocyte sedimentation rate (ESR) were seen during first and second trimester of pregnancy. Differences were found in red blood cell (RBC) count, white blood cell (WBC) count, packed cell volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) but they were statistically non-significant.

REFERENCES

1. K. A. Harrison. Blood volume changes in normal pregnant Nigerian women. The Journal of obstetrics and gynaecology of the British Commonwealth, 1966; 73 (5): 717–23.
2. R. Yip. Significance of an abnormally low or high hemoglobin concentration during pregnancy: special consideration of iron nutrition. The American Journal of Clinical Nutrition 2000; 72 (1): 272–9.
3. WHO. Prevention and treatment of malaria during pregnancy. 2004, Available at : http://pdf.usaid.gov/pdf_docs/Pnada621.pdf.
4. G. F. Smith. An investigation into some of the effects of the state of nutrition of the mother during pregnancy and labour on the condition of the child at birth and for first few days of life. Nutrition, 1993; 9 (4): 388–92.
5. T. R. James, H. L. Reid, and A. M. Mullings. Are published standards for haematological indices in pregnancy applicable across populations: an evaluation in healthy pregnant Jamaican women? BMC Pregnancy and Childbirth, 2008; 8, article 8.
6. O. Osonuga, O. A. Osonuga, A. A. Onadeko, A. Osonuga, and A. A. Osonug. Hematological profile of pregnant women in southwest of Nigeria. Asian Pacific Journal of Tropical Disease 2011; 1(3): 232–4.
7. J. L. V. Shaw, S. K. Dey, H. O. D. Critchley, and A. W. Horne. Current knowledge of the aetiology of human tubal ectopic pregnancy. Human Reproduction Update 2010; 16(4): 432–44.
8. Centre for Disease Control And Prevention CDC. Use of supplements containing folic acid among women child beareu age. United states. 2005.
9. S. M. Garn, M. T. Keating, and F. Falkner. Hematological status and pregnancy outcomes. The American Journal of Clinical Nutrition. 1981; 34 (1): 115–7.
10. T. S. Imam and A. Yahaya. Packed cell volume of pregnant women attending Dawakin Kudu General Hospital, Kano State, Nigeria. Int Jor P App Scs, 2008; 2(2): 46–50.
11. F. Wahed, S. Latif, M. Uddin, and M. Mahmud. Fact of low hemoglobin and packed cell volume in pregnant women are at a stand still. Mymensingh Medical Journal 2008; 17(1): 4–7.
12. Good W and Macdonald. Haematological changes in pregnancy following ovulation induction therapy. Brit Jr of Obst and Gyna; 80; 1973: p 481-5.
13. Good W Hancock. Haematological changes during pregnancy. Brit Jr of Obst and Gyna; 80; 1976: p 463.
14. Lewis D et a. Changings in corpuscle mean red cell volume in pregnancy. Br Jr of Haematology 1982; 50(3).
15. Jain and Saxena. Haematological changes in pregnancy. Indian Jr Obst & Gynaec 1985: 674.
16. P. Luppi. How immune mechanisms are affected by pregnancy. Vaccine 2003; 21(24): 3352–7.
17. P N Nobis. Blood pressure changes in pregnancy. Indian Jr Obst & Gynaec 1986: 625.