

GENDER VARIATION IN HEMATOLOGICAL PARAMETERS IN HEALTH AND DEVELOPMENT OF ATHEROSCLEROSIS IN LATER LIFE

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Abstract: Background & objectives: Complete blood cell count is a frequently used laboratory test for the diagnosis of several diseases, in health examination and preoperative evaluation. Values of haematological parameters are affected by a number of factors even in apparently healthy population. Recently it was reported that white blood cell count and platelet counts are associated with cardiovascular diseases and that the premenopausal women have a lower incidence of cardiovascular disease than men possibly due to female sex hormonal effect on platelet functions. So this study was conducted to determine any sex variation in haematological parameters in apparently healthy young adult subjects. **Methods:** 80 young adults between 17 to 20 yrs of age group participated in this study voluntarily. Blood samples of subjects were collected and haematological parameters were analysed by Sysmex KX-21 automated haematology analyzer. The haematological differences in between male and female subjects were analyzed by paired students't test.

Results: There was statistically significant difference in differential leucocyte count, haemoglobin and platelet count between males and females. **Interpretation & Conclusion:** Gender variation in haematological parameters could be based on various factors like age, sex, body build, and nutritional, environmental and social factors with ethnic backgrounds.

Key Words: Blood cells, Haemoglobin, Leucocyte, Platelet, Gender.

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Introduction:

Study of haematological parameters like complete blood cell count is a frequently used laboratory test performed to support the diagnosis of several diseases. It is also used in periodic health examination and preoperative evaluation.

The values of haematological parameters are affected by a number of factors even in apparently healthy population. These include age, sex, body build, and nutritional, environmental and social factors with ethnic backgrounds.¹ It has been shown in several studies that some of the haematological parameters exhibit considerable variation in different periods of life. At birth the total haemoglobin (Hb) level, red blood cell (RBC) count, packed cell volume (PCV) are shown to be higher than at any other period of life.^{2,3} The levels of these parameters then decrease during the next few months after birth, some more steeply than others, with cells becoming hypochromic with the development of physiological iron deficiency anemia.⁴ The Hb content and RBC count then gradually rise and approaches near to the adult levels by the age of puberty.⁵ In general the male haematological levels are higher than the adult

female levels.⁶ However, Tell et al reported that total WBC & platelet counts are significantly higher in adolescent female than adolescent male subjects of 14-16 years of age.⁷ Recently it was also reported that white blood cell count and platelet counts are associated with cardiovascular diseases. Total WBC and certain subtype counts in young adulthood are significantly associated with the presence of coronary artery calcification (CAC) 15 or 20 years later in early middle age. This suggests possible involvement of WBC in initiation or early development of atherosclerosis at later age of life.⁸ Therefore, study on WBC and other haematological parameters at an early adulthood is important. Thus, the aim of this study was to measure the various haematological values in the young adult male and female subjects and then to compare their results.

Material and Methods:

Prior approval from the Sumandeep Vidyapeeth Institutional Ethical Committee (SVIEC) was obtained for this study. 40 females average 20.75 ± 2.23 years old and 40 males average 20.83 ± 0.96 years old; a total of 80 apparently healthy people participated in this study on a voluntary basis. The

subject was excluded from the study, if he/she suffered from any haematological, endocrine, gynaecological, cardiovascular, respiratory and/or nervous disorders; evidence of any infection at the time of sampling, history of blood transfusion or blood donation in last 3 months, if subject had any kind of addiction or the subject refused to sign informed consent form.

The study was conducted from July 2012 to October 2012. The protocol was explained to the subjects properly and informed written consent was obtained. 2 ml of venous blood sample was drawn from antecubital vein under aseptic precautions into a vial containing 10% potassium EDTA. To avoid diurnal variation, all samples were collected between 9 AM to 12 noon. The sample was analysed immediately within 1-2 hrs, to avoid any variations due to storage. Haematological parameters such as red blood cell (RBC) count, haemoglobin (Hb), haematocrit value (HCT), mean corpuscular volume (MCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), erythrocyte distribution width (RDW), total leukocyte count (TLC), differential leukocyte count (DLC), platelet count (PLT), were analyzed with "Sysmex-kx-21" brand blood cell counter device in central laboratory of Dhiraj General Hospital, Piparia.

Statistical analysis: SPSS (Statistical Package for the Social Sciences) version 21 was used in analysis of data. Results were decided on basis of Mean (M) and Standard Deviation (SD). Students' t test was applied in independent groups to compare them; $p < 0.05$ value was accepted as significant.

Results:

Table 1: Erythrocyte Parameters of Male (n=40) and Females (n=40)

Test	Male	Female	P-value
RBC	4.76±0.38	4.59±0.29	0.075
Hb (g/dl)	13.58±1.05	12.67±1.10	0.005*
HCT (%)	41.96±4.51	39.92±2.70	0.064
MCH(pg)	28.67±1.90	27.60±1.61	0.041*
MCHC(g/dl)	32.79±2.24	31.70±0.93	0.033*
RDW (fl)	46.31±4.55	44.04±2.67	0.036*

*statistically significant

Table 2: Leukocyte & Platelet count of Male (n=40) and Females (n=40)

Test	Male	Female	P-value
TLC (X 10 ³)	7.48± 1.85	7.02 ± 2.00	0.418
Differential Neutrophil count (%)	65.33± 7.83	56.70 ± 13.59	0.010*
Differential Lymphocyte count (%)	29.90± 9.72	35.80 ± 9.74	0.041*
Differential Monocyte count (%)	5.85± 2.16	7.49± 1.10	0.002*
Total Platelet count (X 10 ³)	218.79 ±29.96	252.54± 37.84	0.001*

*statistically significant

Discussion:

In our study Erythrocyte parameters like Haemoglobin, MCH, MCHC and RDW were found to be higher in males; total WBC count with neutrophil count was also higher in male subjects. Whereas lymphocyte count, monocyte count and platelet count were higher in female subjects.

EL-Hazmi and Warsy studied Saudi children with ages ranging from 1-15 years. The RBC Count did not show significant changes in the 1 to 13 year old but rose slightly beyond this age. No Significant differences were observed in red cell count in the male and female children. White blood cell gradually decreased 2 years onwards, while haemoglobin and haematocrit levels increased significantly from 2 to 15 years. The same author reported WBC count $10.9 \pm 3.8 \times 10^9/L$, $6.9 \pm 3.1 \times 10^9/L$ in 9-11 years & 12-15 years age group respectively.⁹

Ghafouri et al reported that total Level of haemoglobin was 13.7 ± 1.0 g/dl and 13.5 ± 1.0 g/dl, respectively in male & female children, with ages ranging from 12-15 years. Haemoglobin level was lowest in the two-year olds, and then gradually increased up to 15 years of age in both boys & girls. The differences of boys & girls level was significant after 14 years of age, the male values were higher than the female values.¹⁰

Usman k et al studied 302 healthy volunteers, both male and female, ages range between 20-45 years. They found, in males, the mean Hb concentration of 13.04 g/dl was significantly higher than females value of 11.63 g/dl. The RBC Count of $5.3 \times 10^{12}/L$ in males was significantly higher than the corresponding values of $4 \times 10^{12}/L$ in females. On the other hand the mean WBC Count of $8.25 \times 10^9/L$ in males was lower than the mean values of $8.42 \times 10^9/L$ in females. Similarly the values for platelet count of $255 \times 10^9/L$ in males were also significantly lower than corresponding values of $279 \times 10^9/L$ in females.¹¹

Khanduri et al reported platelet counts in 25 males & 25 females normal adult Indians, the range being 111-338 ($\times 10^9/L$) and 137-337 ($\times 10^9/L$) respectively.¹² Earlier Bain reported the mean platelet counts which were 288 and $262 \times 10^9/L$ in Caucasian females and males respectively.¹³

Casimir et al reported that gender influences clinical presentation and markers in inflammatory diseases, in many chronic conditions frequency of complications is greater in females with the increase production of inflammatory markers like CRP (c-reactive protein), neutrophil count and ESR.¹⁴ Although numerous studies have been undertaken to examine the effects of gender and various factors on differential blood counts but results have often been inconclusive and contradictory (Makinoda et al)¹⁵

Conclusion: Although blood cells of both groups are within the reference range, their being low or high in numbers is based on various factor like age, sex, body build, and nutritional, environmental and social factors with ethnic backgrounds. For clarity similar type of studies with multi subject and multi repetition are needed.

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