

Effect of Aging on Blood Components Red Blood Cells, White Blood Cells, and Platelets in the Individuals of 30 to 60 Years Age Group

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Abstract

Background: Aging is a progressive deteriorative change. It occurs during the adult period of life. It increases vulnerability to challenges. With an increase in age, there is a decrease in the count of red blood cells. According to different studies, the total count of white blood cells shows no correlation with age, and platelet count decreases with age.

Aims: The present study was carried out to find the significant changes in the count of Red Blood Cells, the count of White Blood Cells, and the count of Platelets which are the blood components with advancing age both in males and females of 30 - 60 years age group.

Objectives: To study and analyze the count of Red Blood Cells, count of White Blood Cells, and count of Platelets in three different age groups of males.

To study and analyze the count of Red Blood Cells, the count of White Blood Cells, and the count of Platelets in three different age groups of females.

To study and analyze the Differential leukocyte count in three different age groups of both males and females.

To compare the count of Red Blood Cells, and the count of White Blood Cells, and count of Platelets between males and females in different age groups.

Materials and Methods: The present study was conducted in the physiology department in collaboration with the Department of Pathology and the Department of General Medicine at Government Medical College, Srikakulam, Andhra Pradesh. Both genders of the age group of 30 -60 years are chosen for this study. The Study design is a cross-sectional study which is an analytical individual based nonexperimental/ observational type of epidemiological type of study and it is done for a duration of 18 months at the Department of Physiology, Government medical College, Srikakulam with a target population of around 300.

Statistical method ANOVA was done to know whether the study was statistically significant or not, when comparing count of red blood cells, count of white blood cells and count of platelets in same gender of three different age groups and independent sample t test was used to compare count of red blood cells, white blood cells and platelets in both genders in three different age groups.

Results: Means of count of red blood cells among 300 individuals is 4.94 with standard deviation of 0.593, with means of count of white blood cells among 300 individuals is 0.759 with standard deviation of 0.192 and with total mean of total platelet counts among 300 individuals is 1.214 with standard deviation of 1.98. There is difference among males and females in count of red blood cells with decrease in count on increase in age. But platelet count also decreased with increase in age in males from age group of 31-40 years to age group of 41- 50 years and again slightly increased on increase in age from age group of 41-50 years to age group of 51-60 years, in female's platelet count increased on increase in age, when compare to males' females were presented with more platelet count. No relationship variation was seen with age in both genders in count of white blood cells.

Conclusion: Based on theoretical knowledge about bone marrow changes in different age groups, various theories on aging, hormonal correlation and menstruation effects in female age groups correlated with my study results.

Keywords: Red blood cells, white blood cells, platelet count.

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Introduction

Haemopoiesis is defined as the development process of blood cells (RBCs, WBCs and Platelets). In the first two months of gestation, it occurs in yolk sac. From the third month of gestation liver and spleen becomes the main sites. From the 20th week of gestation, it begins in bone marrow, next by the 7th or 8th month, it becomes the main site. At birth almost all of it occurs in bone marrow.

But in young children active hemopoietic tissue is in both axial skeleton and bones of extremities, during this period fatty replacement throughout long bones converting bone marrow from red to yellow. With increase in aging regenerative capacity of hematopoietic stem cells decreases. Confusion should not occur with population aging with individual's aging process. This was stated in an article of Aging: Concepts and controversies. [6]. In an article of the hallmarks of aging, it was stated that among the nine tentative hallmarks which forms the common denominators in aging, stem cell exhaustion is one among them. In recent years aging research has experienced advance with the discovery of conservative methods in genetic pathways and biochemical processes for controlling the rate of aging. [15]

Materials and Methods

The present study was conducted in physiology

department in collaboration with department of pathology and department of general medicine at government medical College, Srikakulam, Andhra Pradesh. Both genders of age group of 30 -60 years is chosen for this study.

The Study design is cross sectional study which is an analytical individual based non experimental/ observational type of epidemiological type of study and it is done for a duration of 18 months at Department of physiology, Government medical College, Srikakulam with a target population of around 300 .Source of data obtained from the people who is visited for routine health check-ups in outpatient chambers in the department of general medicine and their complete blood counts reports were noted from the central lab of Department of pathology at government medical college, Srikakulam. Horiba cell counter was the instrument used to obtain cell counts in the lab.

Horiba cell counter

On passing a cell through the aperture, then electric resistance occurs in between the two electrodes, that resistance either increase, decrease or not change with increase, decrease or not change in cell volume respectively. The total count of different types of blood cells can be noted and enumerated by the impedance.



Figure 1: Horiba cell counter

Inclusion Criteria

Study is conducted in selected healthy participants who come for routine health check- ups in the 30 - 60 years age group.

Exclusion Criteria

Participants with suspect of any clinical diseases are excluded Investigations required:

Complete blood count, blood pressure

measurements and blood sugar estimations done if needed.

The method used for this study.

Under different types of Epidemiological studies, the present study was analytical observational cross-sectional study. Statistical method ANOVA was done to know whether the study was statistically significant or not, when comparing count of red blood cells, count of white blood cells

and count of platelets in same gender of three different age groups and independent sample t test was used to compare count of red blood cells, white blood cells and platelets in both genders in three different age groups.

Results

Mean and standard deviations of count of red blood cells are compared in 3 different age groups of same gender of 143 males in 300 subjects. With increase in age, the count of cells was decreased from 5.8 million/cu mm to 4.69 million/cu mm with P value of 0.04.

Significant result was seen when comparing fourth decade and fifth decade aged males. Mean and standard deviations of white blood cell count of same gender of 143 males out of 300 individuals for 3 age groups were compared. significance with p value of 0.034.

On increase in age, means of 3 age groups of males were increased. statistical method of ANOVA was put in for comparing the means of differential leucocyte count of subjects of male gender in different age groups among 143 subjects out of 300 subjects. In males, the means of neutrophil count increased with increase in age that is from 6.56 to 7.26. The means of lymphocyte count decreased with increase in age that is from 2.97 to 2.72. The Means of other cells in differential leucocyte count increased from 31-40 years age group to 41-50 years age group, that is from 3.01 to 3.1, again decreased from 41-50 years age group to 51-60 years age group that is from 3.1 to 2.71 with increase in age. The results shown that there occurred no relationship of variation with age in males. Means and standard deviations of platelet count of same gender of 143 males out of 300 individuals of 3 different age groups were compared. The results had shown the significance in data with p value of 0.04. When age increased from 31 to 50 years mean of platelet count decreased whereas when age increased from 41 to 60 years mean of platelet count slightly increased. Mean and standard deviations of count of RBCs of 3 different age groups of same gender of 157

females in 300 individuals were compared. Values of count of red blood cells were decreased from 5.3million/cu mm to 3.9million/cu mm with increase in age. P value is 0.02 indicating the study is significant.

Means and standard deviations of count of white blood cells of same gender of 157 females out of 300 of 3 different age groups were compared. The results obtained were significant (p value 0.015). On increase in age means of count of WBCs was increased from 2.82 thousands/cubic milli meter to 3.22 thousands/cubic milli meter.

Compare the means and standard deviations of differential leucocyte count of same gender females of 157 subjects out of 300 subjects. Overall results are shown that in females of three different age groups, the means of neutrophil count decreased from 7.0 to 6.46 with increase in age. Means of Lymphocyte count increased from 2.74 to 2.87 with increase in age. Means of other cells in differential leucocyte count, increased from 2.78 to 2.97 with increase in age. These results had shown that there is no relationship variation with age in females. On comparing differential leucocyte count in both males and females means of neutrophils, lymphocytes and other cells are more in males when compared to females.

Means and standard deviations of platelet count of same gender of 157 females out of 300 individuals of 3 different age groups were compared. The results had shown that there is no significance in data with p value of 0.09. On increase in age from 31 to 60 years in females means of platelet count increased from 2.37 lakhs/ cubic millimetre to 3.62 lakhs/ cubic milli meter. results of the independent sample t test with the comparisons of means and standard deviations between males and females of 31 –40 years age group of 100 subjects. The mean of 47 males in 31 – 40 years age group is 5.8 with standard deviation of +/-0.144. The mean of 52 females in 31 – 40years age group is 5.3 with standard deviation of +/-0.13. Finally got the P value of <0.001 on comparing both groups. This indicates the study is statistically significant.

Table 1:

Age group	Gender & no of subjects	Mean	SD+/-	P value
31-40 yrs	47 males	5.8	0.144	<0.001 on
31-40 yrs	52 females	5.3	0.13	comparing

The following table shows results of the independent sample t test with the comparisons of means and standard deviations between males and females of 41 – 50 years age group of 100 subjects. The mean of 48 males in 41 – 50 years age groups is 5.24 with standard deviation of +/-0.17. The mean of 52 females in 41 – 50 years age group is 4.74 with standard deviation of +/-0.17. Finally got the P value = < 0.01 indicating the study is statistically significant.

Table 2:

Age group	Gender & no of subjects	Mean	SD+/-	P value
41-50yrs	48 males	5.25	0.17	<0.001 on
41-50yrs	52 females	4.74	0.17	comparing

The following table shows results of the independent sample t test with the comparisons of means and standard deviations between males and females of 51 –60 years age group of 100 individuals .The mean of 48 males in 51-60 years age group is 4.69 with standard deviation of +/-0.137.The mean of 53 females in 51-60 years age group is 3.99 with standard deviation of +/-0.186.Finally got the P value of <0.001 on comparing both results. This indicates that the study is statistically significant.

Table 3:

Age group	Gender & no of subjects	Mean	SD+/-	P value
51-60 yrs	48 males	4.69	0.137	<0.001 on
51-60 Yrs	53 females	3.99	0.186	comparing

The results of data by independent sample t test of count of white blood cells with the comparisons of means and standard deviations between males and females of 31 – 40 years age group of 100 individuals. The mean of 47 males in 31 – 40 years age group is 0.734 with standard deviation of +/-0.126. The mean of 52 females in 31 – 40 years group is 0.63 with standard deviation of +/- 0. 221. Finally got the P value = 0.0056 on comparing both groups. This indicates that the study is statistically significant.

Results of the independent sample t test of count of white blood cells with the comparisons of means and standard deviations between males and females of 41 – 50 years age group of 100 individuals. The mean of 48 males in 41 – 50 years age group is 0.84 with standard deviation of +/-0.67.

The mean of 52 females in 41 – 50 years age group is 0.74 with standard deviation of +/-0. 245. Finally got the P value = 0.0134 on comparing both groups. This indicates that the study is statistically significant.

Results of the independent sample t test of count of white blood cells with the comparisons of means and standard deviations between males and females of 51 – 60 years age group of 100 individuals. The mean of 48 males in 51 – 60 years age group is 0.87 with standard deviation of +/-0.18. The mean of 53 females in 51 – 60 years age group is 0.77 with standard deviation of +/-0.122. Finally got the P value =0.008 on comparing both groups which is statistically significant.

Results of the independent sample t test of platelet count with the comparisons of means and standard deviations between males and females of 31 – 40 years age group of 100 individuals. The mean of 47 males in 31 –40 years age group is 3.0 with standard deviation of +/-0.66. The mean of 52 females in 31 – 40 years age group is 2.37 with standard deviation of +/- 0. 187.Finally got the P value = <0.01. This indicates that the study is statistically significant. Results of the independent

sample t test of platelet count with the comparisons of means and standard deviations between males and females of 41 – 50 years age group of 100 individuals. The mean of 48 males in 41 –50 years age group is 2.86 with standard deviation of +/-0.63. The mean of 52 females in 41 – 50 years age group is 3.56 with standard deviation of +/-0.44.

Finally got the P value =0.04. This indicates the study is statistically significant. Results of the independent sample t test of platelet count with the comparisons of means and standard deviations between males and females of 51 – 60 years age group of 100 individuals. The mean of 48 males in 51 –60 years age group is 2.95 with standard deviation of +/-0.73.

The mean of 53 females in 51 – 60 years age group is 3.62 with standard deviation of +/- 0.38. Finally got the P value = 0.0456 on comparing both groups. This indicates that the study is statistically significant.

Discussion

Molecular and biological hallmarks of ageing showed that senescent cells accumulation occurred with increase in age and there is exhaustion of haematopoietic stem cells with aging [7]. Biino et al found that decrease in platelet count is more in men. In the review of hematopoietic system ageing, it was argued that defect occurred in the stem cell protective mechanisms and accumulation of damaged HSCs is a disadvantage leading to decreased response to neoantigens. [9]. By a simplified formula $100 - \text{age (years)} = \text{bone marrow cellularity}$, explained by several authors like J Gerontol and Burkhardt R, Kettner G, Bohm W, et al. [10]. Anaemia in the elderly as its effect on quality of life. Studies stated that abnormality in the regulation of proinflammatory cytokines mostly interleukin-6 has its impact on haematopoiesis. [11] In the study of Reference ranges and age-related changes of peripheral blood lymphocyte subsets in Chinese healthy adults, it was conducted in 151 healthy adults in 19 – 86 years. There is significant

increase in natural killer cells. In other previous studies it was showed that CD4+ T CELLS increase and CD8+ T cells reduce with increase in age, while the others showed that both CD4+ T cells and CD8+ T cells either increase or reduce with age or not changed with age at all. Regression analysis and t test had shown that there is significance in difference in counts of Natural Killer cells beyond 50 years age group. [12]

The study in the aged population should be more vertical to establish the reference values in the aged individuals. [13]. In an article count of White Blood Cells in Elderly is clinically useful in predicting in middle aged and elder people and majority of parameters decreased between young and middle-aged individuals. This provided evidence for immunosenescence.[14]. Regression analysis and t test had shown that there is significance in difference in counts of Natural Killer cells beyond 50 years age group.[12] Clear evidence exists between neutrophil count associated with cardiovascular risk. It was providing clues for the connection between WBC counts and cardiovascular death. WBC count was more useful than serum cholesterol in geriatric clinical context. [8].

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