ORIGINAL ARTICLE

Correlation of monocytopenia with aging in COVID-19 infected patients.

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ABSTRACT… Objectives: To observe the effect of aging on monocyte count in COVID-19 infected patients. **Study Design:** Observational study. **Setting:** Rawal Institute of Health Sciences Islamabad, Pakistan Institute of Medical Sciences Islamabad. **Period:** April 2021 till July 2021. **Material & Methods:** Adult humans of total 100 in numbers, suffering from corona virus with positive PCR test were selected. They were divided in two groups with 50 patients in group A and 50 patients in group B. Inclusion criteria was COVID-19 infected patients belonging to both genders without any blood disorder. All adults below the age of 18 years with blood disorder diseases were excluded. The age limit in group A was below 50 years and in group B was above 50 years. Monocyte count of all the patients was noted from the record in the laboratory of Rawal institute of health sciences and Pakistan institute of Medical sciences Islamabad. The age of the patients was confirmed from their CNIC. **Results:** Data was checked for normality by using Shapirowilk test of normality and comparison of monocyte count in between two groups was done by using Mann Whitney U test a significant difference was seen. Monocyte count in group A was 172/μl and in group B was 122/μl of blood. The mean age in group A was 32.3 years and in group B was 65.9 years. The p value of 0.00 shows a significant correlation of aging with monocytopenia. **Conclusion:** Corona virus infected patients with increased age (> 50) years showed more reduction in monocyte count as compared to patients with lower age (< 50) years.

Key words: Aging, Cytokines, COVID-19, Monocyte Count, Reduction.

INTRODUCTION

Corona virus disease (COVID-19) caused by SARS-CoV-2 is transmitted from person to person through respiratory droplets. The virus remain in aerosol and on the contaminated surface for several hours.[1] This virus spreads through direct contact with infected surface, feco-oral route and respiratory particles.[1] The symptoms of the disease are dry cough, fever, body aches, myalgia, difficulty in breathing leading to pneumonia.[2] One of the most important cell of innate immune system is monocyte, on exposure to inflammation in body they produce inflammatory response, causes antigen presentation and phagocytosis.[3] They also differentiate into dendritic cells and macrophages in the peripheral tissues in response to any infection.[3] With increase age there are changes in the monocyte ability to fight infection, there is disturbance in signaling pathways, metabolic activities, reduced expression of genes for mitochondrial and ribosomal proteins, there is increased consumption of glucose, more DNA damage and increased oxidative stress.[4] In COVID-19 patients the number of monocyte count is reduced, SARS –CoV-2 attacks the monocytes leading to their death. On exposure to corona virus monocytes activates inflammasomes the receptors and sensors in monocytes.[5] These inflammasomes assemble to form large complexes which activates inflammatory cytokines leading to further worsening of conditions.[5] There is production of pore forming protein causing damage to the cell membranes and death of monocytes this results in the release of more inflammatory cytokines.[5] As aging causes changes in the monocyte functional abilities and corona virus attacks and damages the cell membrane leading to death of monocytes and reduction in their number. The present study is conducted to see the effect of aging on monocyte

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counts in Corona virus infected patients and to find out the relation of increased age with monocytopenia.

MATERIAL & METHODS

After approval from the ethical committee (IRHS/ REC/062/21) the study was carried out at Rawal Institute of Health Sciences and Pakistan institute of Medical Sciences Islamabad from April 2021 till July 2021. It was observational study in which hundred patients suffering from Covid-19 infection with positive corona test were selected. Both adult male and female patients not suffering from any blood disorder diseases were selected. Their monocyte count was noted from blood records in the laboratory of Rawal Institute of Health sciences and Pakistan institute of medical sciences Islamabad. The age of each patient was verified from their computerized national identity card CNIC number.

Based on their ages we divided the patients into two groups, Group A included 50 patients infected with corona and ages less than 50 years. Group B included 50 patients with ages above 50 years and suffering from Covid-19 infection. We selected 200-800/ microliter of blood as the reference range of monocyte count. Effect of increased age of Covid-19 infected patients on the monocyte count is noted.

RESULTS

Data was entered using SPSS version 24. Data was checked for normality by using Shapirowilk test of normality. Monocyte count were compared between two groups by using Mann Whitney U test, a significant difference of 0.00 was seen as shown in Table-I.

Parameter	Group A	Group B	P-Value
Monocyte/μl	172.68±13.68 172 (160-184)	123.60±14.64 122(111-135)	0.00

Table-I. Comparison of monocyte count between groups

Groups	Group A	Group B
No of patients	50	50
Mean age in years	32.3400	65.9600

Table-II. Mean age of patients in both groups

Spearmans Correlation was used to correlate age with monocyte count which showed a significant correlation of 0.00 as shown in Table-III.

Parameter	P-Value
Age	0.00
Monocyte/μl	

Table-III. Correlation of age with monocyte count

The normal reference range for monocyte count is 200-800/ μl of blood. As it is seen in Table-I in group A the monocyte count is 172.68±13.68 / μl with mean of 172/ μl and in group B the monocyte count is 123.60±14.64/ μl with mean of 122/ μl of blood. The difference between two results on considering the means is 50/ μl which is a great difference. Table-II indicates the mean age in group A is 32.3 years and in group B it is 65.9 years Table-III indicates p value of 0.00 this shows significant correlation between age and monocyte count. From the above result we can say there is more monocytopenia with increased age.
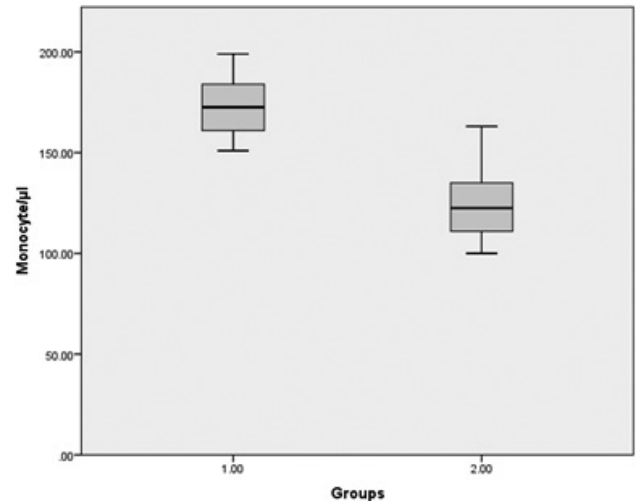

Figure-1. Box plot showing monocyte count in two groups of the study

From the above figure in group 1(A) the number of monocyte count is 172/ μl and in group 2(B) the number of monocyte count is 122/ μl. The age in group A is < 50 years and in group B is > 50 years. This indicates as the age increases in corona virus infected patients there is reduction in monocyte count which shows a significant correlation of age with monocyte count.

DISCUSSION

The present study is conducted to find out the

relation of monocyte count with increased age in patients suffering from corona virus. The normal reference range for monocyte count in percentage is 2% to 8 % of blood, our result shows the total number of monocyte in group A is 1.7 % and in group B is 1.2 %. The reduction in monocyte count in group A is 28 / μl and in group B it is 78/ μl of blood indicating more reduction in group B compared to group A. The mean age of patients of group A is 32.3 years and that of patients of group B is 65.9 years. From the above results it is clear that as the age of Corona virus infected patient increases there is more reduction in monocyte count. Quin C et. al 2020 in one of his study said that there is reduction in the percentage of monocytes in corona virus infected patients.[6] Cizmecioglu A. et al 2022 in his research concluded that there is reduction in all subsets of monocytes in COVID-19 infected patients and there is also less expression of monocyte HLA indicating the signs of immune suppression.[7]

One of the marker of cell death is pyroptosis, Zheng Z et.al 2020 said that a kind of programmed cell death is pyroptosis, there is swelling of cells leading to rupture and break down with release of proinflammatory molecules, worsening the disease. He also said that pyroptosis occurs specifically on immune cells like monocytes.[8] Ferreira AC. et. al 2021 in one of his research found high levels of pyroptosis marker indicating SARS-Cov-2 caused death of monocytes by engaging inflammasome and stimulating programmed cell death.[9] Junqueira C.et.al 2022 while studying inflammation of monocytes by SARS-CoV-2 found that corona virus enters the monocytes by antibody –opsonized Fcγ receptors and starts replicating causing damage to inflamed monocytes.[10] Epigenetic is Modification of gene expression without alteration of genetic code. Godoy-Tena, G. et al. 2022 while conducting study on epigenetics and corona virus said that after performing deoxyribonucleic acid (DNA) methylation analysis on monocytes of the (COVID-19) patients there is epigenetics in DNA of monocytes and they induced cytokine storms.[11]

Older people show poor response to recovery from corona virus infection and conditions gets worse. Crook H.et.al 2021 said in SARS-Cov-2 infected patients there is involvement of multiple organs causing respiratory and cardiovascular disorders, musculoskeletal, neurodegenerative and endocrine diseases.[12] Victoria M.et.al 2022 said elderly patients are more at risk of developing persistent symptoms, there is aggravation of all the chronic conditions including cardiovascular, respiratory and neurodegenerative diseases.[13] In elderly COVID-19 infected patients the changes in blood monocyte count are more as compared to young patients. Snodgrass RG.et.al 2022 concluded that in older patients there is reduced number of circulating monocytes and increased level of glucose, cholesterol, triglycerides and IL-6 as compared to young patients.[14] Pence BD. 2020 said that with aging there is chronic low grade inflammation in monocytes known as infammaging. There is reduced and disorder function of mitochondria, reduced HLA-DR expression, phagocytosis is impaired and there is a shift of monocytes from pro-inflammatory to dysfunctional form.[15] From the above discussion we can say that corona virus and aging both cause changes in the structural and functional capabilities of monocytes leading to their damage and reduction in their count.

CONCLUSION

We can say in COVID-19 infected patients as age increases there is more reduction in monocyte count. Corona virus causes inflammation of monocytes leading to swelling, rupture and death with increased production of cytokines, there is also modification in DNA of monocytes. With increased age in monocytes there is reduced mitochondrial function, more production of IL-6, inflammation and impaired phagocytosis All these lead to damaged monocytes causing monocytopenia in blood.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Zunnera Rashid	Design of work, Interpretation of data, Final approval of version to be publisehd, critical evaluation.	
3	Erum Rashid	Intrepretation of data, analysis of design of work.	
4	Sabeen Shakir	Design, analysis and drafting the work.	
5	Aenza Asif	Design of work, Data collection.	
6	Faiza Rasheed	Design adn drafting the work.	