



(RESEARCH ARTICLE)



Evaluations of haematological profile in geriatric patients in a tertiary care hospital

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International Journal of Science and Research Archive, 2023, 10(01), 904–908

Publication history: Received on 05 September 2023; revised on 14 October 2023; accepted on 17 October 2023

Article DOI: <https://doi.org/10.30574/ijrsra.2023.10.1.0833>

Abstract

Ageing is the process which has an impact on all the cells, tissues, organ systems, and organisms. Alterations or modifications in the bone marrow are observed with ageing. Increased risk of myeloproliferative disorders, anaemia, and a deteriorating adaptive immunity are signs of age-related hematologic alterations, as is a loss in bone marrow cellularity. Evaluations of haematological parameters can be used to track the disease's development. Hence, this retrospective study was designed to evaluate the haematological profile of geriatric patients and to compare the haematological parameters between males and females. The Complete Blood Count reports of 445 patients aged 60 years and above were selected for this retrospective study. The backbone computerized data of these cases were taken from central laboratory of Yenepoya Medical College Hospital. Haematological profile was studied and analyzed from selected cases. The independent sample t test was used to compare the haematological parameters of males and females. P value < 0.05 was considered as significant. The results obtained showed that there was a statistical significance in lymphocytes, Eosinophils, MCH, MCHC in Geriatrics patients. There was no statistical significance in haemoglobin, neutrophils, monocytes, platelet count, MCV, PCV, and RBC count. Major abnormalities were found in Haemoglobin and lymphocytes than other haematological parameters. Incidence of anaemia was 77.8% and lymphocytopenia 77.9%. The most frequently observed haematological abnormalities in elderly persons were anaemia and lymphocytopenia. Anaemia was seen to be higher in females than males. Lymphocytopenia was seen to be higher in males than females. Early evaluations of haematological profile will reduce morbidity and mortality among the geriatric patients.

Keywords: Geriatric; Gender; Anaemia; Red cell indices; Lymphocytopenia

1. Introduction

Geriatrics is commonly referred to the portion of life that comes after youth and middle age and is typically discussed in terms of a decline in the ability of the organs and cells to operate. There are distinct variations in physical, mental, and hematopoietic characteristics during the geriatric period of life. As a result of each person's distinct character and genetic makeup, they develop at different speeds and in different orders for different people, even those who are the same age chronologically [Azuonwu O et-al., 2017].

Ageing has minor effects on the hematopoietic system, but these effects start to stand out beyond age 65 [Esan AJ, 2016]. All blood cells are produced in a balanced manner by hematopoietic stem cells (HSCs) throughout life. HSCs eventually lose their capacity for self-renewal and regeneration as people age, but cellular derailment is more common. Both cell-intrinsic and extrinsic factors contribute to the ageing process in HSCs, which reduces the formation of blood cells and impairs immune system performance [Zhang L et-al., 2020].

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There are distinct differences in physical, mental, and haematological traits at the geriatric period of life. Age-related clonal haematopoiesis, myelodysplastic syndromes, acute myeloid leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin's lymphoma are among the myeloid and lymphoid malignancies that are more common in elderly populations [Zhang L et-al., 2020]. Haematological parameters are classifiable blood components such as leukocytes, platelets, and erythrocytes and their indices [Bain B] et-al., 2016]. Haematological testing can reveal whether an aged person has anaemia, as well as their nutritional state and immune system, providing information that can be used to track the disease's development [Anggraini D and Sjaaf F, 2019]. Hence the purpose of the study was to evaluate the haematological abnormalities in old age populations and to compare the haematological parameters between males and females.

2. Material and methods

2.1. Sample source

This retrospective Study was approved by Yenepoya Ethics Committee 2, Yenepoya deemed to be University, after the approval from scientific review board, a total of 445 geriatric patients who were aged 60 years and above were included in this study and the patients who were below the age 60 and patients who are repeating the complete blood count test during the study period were excluded. Investigation reports of hematological profile from November 2020 to November 2022 were collected from the backbone computerized software from the Central Laboratory, Yenepoya Medical College Hospital with the prior permission from authorized authority by anonymising the patient identity.

2.2. Sampling method and data collection

For the evaluation of Complete Blood Counts, 3 mL of venous blood sample was collected in EDTA tubes and haematological parameters such as Hb, TLC, RBC, Neutrophils, Basophils, Eosinophils, Monocytes, Lymphocytes, MCV, MCH, MCHC, PCV and Platelet count were analyzed by fully automated 6 part sysmex XN1000 haematological analyzer.

2.3. Statistical analysis

Haematological parameters were calculated using mean and standard deviation for continuous data, frequency and percentage for categorical data. The independent sample t test was used to compare the haematological parameters of males and females. P value < 0.05 was considered as significant.

3. Results

3.1. Gender distribution among the geriatric patients

The patient data (n=445) were collected from the central laboratory of Yenepoya Medical College Hospital and analyzed by using mean, standard deviation, independent t test. The gender distributions of the geriatric patients are given in table 1. In our study, out of 445 cases, 222 were females and 223 were males with the percentage 49.9% and 50.1% respectively.

Table 1 Gender distribution of geriatric patients

	Gender	Frequency	Percentage
1.	Female	222	49.9%
2.	Male	223	50.1%

3.2. Incidence of anemia among geriatric patients

The overall incidence of anaemia was 77.8%. In males, 169 were anaemic and 54 were normal. In females, 177 were anaemic and 45 were normal. Therefore the incidence of anaemia in females (79.8%) was found to be larger when compared to males (75.8%). The incidence of anemia among geriatric patients is given in table 2.

Table 2 Incidence of anemia among geriatric patients

Category	Male		Female		Total	
	Count	% within Sex	Count	% within Sex	Count	% within Sex
Normal	54	24.2%	45	20.2%	99	22.2%
Anaemic	169	75.8%	177	79.8%	346	77.8%
Total	223	100 %	222	100 %	445	100 %

3.3. Comparison of haematological parameters in males and females among geriatric patients

Table 3 Comparison of haematological parameters in males and females among geriatric patients

	Gender	Mean	Standard Deviation	t value	p value	95% Confidence Interval	
						Lower	Upper
Haemoglobin	Males	11.11	2.38	0.540	0.589	-0.7438	1.3076
	Females	10.82	7.41				
TLC	Males	12.71	8.99	0.641	0.522	-1.5505	3.0518
	Females	11.96	14.98				
Neutrophils	Males	71.98	16.82	0.310	0.757	-2.3869	3.2807
	Females	71.53	13.38				
Lymphocyte	Males	16.00	10.78	-2.565	0.011	-4.6701	-0.6183
	Females	18.65	10.95				
Eosinophils	Males	2.60	3.74	2.018	0.044	0.0157	1.1986
	Females	2.00	2.46				
Monocyte	Males	7.68	4.67	0.156	0.876	-0.8429	0.9881
	Females	7.61	5.13				
Basophils	Males	0.39	0.38	-0.165	0.869	-0.1074	0.0907
	Females	0.40	0.64				
PLT	Males	249.04	127.59	-1.105	0.270	-35.8451	10.0500
	Females	261.94	118.52				
RBC	Males	3.916	0.87	-1.021	0.308	-0.6941	0.2195
	Females	4.153	3.35				
PCV	Males	33.59	6.98	1.833	0.068	-0.0899	2.5735
	Females	32.34	7.30				
MCV	Males	85.01	10.80	1.602	0.110	-0.3459	3.3944
	Females	83.49	9.20				
MCH	Males	28.47	2.70	5.124	<0.001	0.8605	1.9316
	Females	27.08	3.03				
MCHC	Males	33.24	4.18	3.299	0.001	0.4439	1.7521
	Females	32.15	2.66				

Both geriatric males and females exhibited statistically significant results in various haematological parameters such as Lymphocyte, Eosinophil, Mean Corpuscular Haemoglobin, Mean Corpuscular Haemoglobin Concentration for geriatric male and females exhibited evidence of statistical significant. No statistical significance was seen in Hemoglobin levels, total leukocyte count, packed cell volume, mean corpuscular volume, platelet counts, neutrophils, basophils, monocyte, red blood cells. The mean value of haematological parameters such as Lymphocyte, Basophils, Platelet counts and Red blood cells were found to be higher in females than males. However, Hemoglobin, TLC, Neutrophils, Eosinophils, Monocyte, PCV, MCV, MCH and MCHC were found to be higher in males than females. The detailed values haematological parameters in males and females among geriatric patients is given in Table 3

4. Discussion

In our study the haematological parameters such as neutrophils, eosinophils and monocytes showed an increase in mean values for males than females. Increase in the Lymphocytes and basophils count was observed in females. In the haematological parameters TLC, neutrophils, monocytes and basophils did not exhibit any statistical significance (p value 0.522; 0.757; 0.876; 0.869) respectively. Eosinophils and lymphocytes showed statistical significant values [p value <0.05]. However in a study reported by Onuigwe *et al.*, and Mwafya *et al.*, there was statistical significance in the mean values of white blood cells, neutrophil, and no statistical significance in monocyte and basophils. The mean value of lymphocytes and eosinophils showed statistical significance. Males showed slightly higher eosinophil counts than females [Onuigwe et-al.,2021, Mwafya et-al., 2020].

The haematological parameters such as MCH and MCHC showed statistical significance [p value =<0.001, 0.001 respectively]. The mean MCH found in males was 28.47 and females were 27.08. The mean MCHC found in males and females were 33.24 and 32.15 respectively. Males showed both MCH, MCHC slightly higher than females. In a similar study reported by Onuigwe *et al.*, Okpokam and Ndemateh, there was lower MCH and MCHC values [Onuigwe et al.,2021, Okpokam and Ndemateh, 2019]. The study done by Azuonwu *et al.*, showed no statistical significance in the white blood cells. This finding is similar to a study done by Odunukwe NN *et al.*, [Azuonwu et-al., 2017, Odunukwe et al., 2004].

Both humoral and cellular immunity are impacted by immune senescence, which is caused by age-related lymphopoiesis abnormalities. By early middle age, the thymus reduces in functions and adults rely on T lymphocyte response in the secondary tissue. Older people have fewer naive T cells, which makes them more reliant on memory T cells. Due to diminished co-stimulator CD28 expression, T cells of the elderly have lower reactivity to mitogens and antigens. T cell contact is necessary for B lymphocyte function. The capacity to produce an antibody response may be diminished when T cell deficiencies take place.

5. Conclusion

In conclusion, the most frequently observed haematological abnormalities in elderly persons were anaemia (77.8%). Males had a lower anaemia rate than females. Low haemoglobin levels in the elderly are a result of diseases or typical aging-related changes. The majority of older people have their blood counts normal, and those with low haemoglobin levels have an underlying medical condition. A loss in bone marrow function, a decrease in physical activity, cardiovascular illness, and chronic inflammatory disorders are the factors that cause anaemia. Reduced numbers of bone marrow erythroid and myeloid progenitors were more pronounced in elderly populations which may help to explain the ageing process effect on haemoglobin level. Improved knowledge of the factors that contribute to unexplained anaemia and the ageing haemoglobin curve would be a significant step towards developing effective anaemia control techniques. By being well-aware of the underlying reasons, adopting the right treatment options and focusing an emphasis on preventive measures can enhance the quality of life for elderly people.

Compliance with ethical standards

Acknowledgments

We would like to thank Yenepoya (Deemed to be University) for the support.

Disclosure of conflict of interest

There are no conflicts of interest between the authors.

Statement of ethical approval

The ethical approval (YEC2/1170) to conduct the study was obtained from Yenepoya Ethics Committee-2, Yenepoya Deemed to be University.

Statement of informed consent

Since it is a retrospective study, waiver of consent was obtained from Yenepoya Ethics Committee-2, Yenepoya Deemed to be University.

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