ORIGINAL ARTICLE

EVALUATION OF HAEMATOLOGICAL PARAMETERS IN PATIENTS AGED ≥85 YEARS: A RETROSPECTIVE SINGLE-CENTER STUDY FROM TURKEY

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Abstract

Introduction: We aimed to analyse complete blood count values in patients aged ≥85 and the potential differences in haematological parameters between age groups within this population.

Materials and Method: A retrospective analysis was conducted on 458 patients aged ≥85 who underwent complete blood count testing between 2 February 2005 and 11 October 2023. White blood cell count, neutrophils, lymphocytes, eosinophils, basophils, haemoglobin, platelets, mean corpuscular volume, mean platelet volume, red cell distribution width, mean corpuscular haemoglobin, and mean corpuscular haemoglobin concentration levels were recorded, and their median and mean values were calculated. Patients were stratified into three age groups: 85–89, 90–99, and ≥100 years. The impact of age and sex on complete blood count parameters was assessed. A subgroup analysis was also performed, excluding patients with a history of factors potentially affecting haematological parameters and those with abnormal mean corpuscular volume levels.

Results: Excluding patients with abnormal mean corpuscular volume and a history of factors potentially affecting haematological parameters, we found a notably high prevalence of anaemia (85% in men and 76% in women). No significant differences in haemoglobin values were observed across the age groups. The median platelet, lymphocyte, and white blood cell counts remained within the hospital's normal reference ranges.

Conclusion: The presence of anaemia in older patients aged ≥85, based on the current World Health Organization criteria, with no apparent cause after etiologic investigations, may be considered normal in some older individuals.

Keywords: Anaemia; Blood Cell Count; Geriatrics.

INTRODUCTION

There is no standardised age-specific reference level for blood count readings in older patients. The World Health Organization defines anaemia as haemoglobin levels < 12 g/dL in women and < 13 g/dL in men (1). Determining the limits of anaemia may also be decisive for developing a treatment plan. In a study conducted on patients aged ≥60 years, Hermann et al. reported that platelet levels were higher in women than in men (2). They also found that the lower platelet reference limit decreased in men with increasing age, whereas the upper reference limit remained constant (2). A German study by Röhrig et al. on patients aged ≥60 years showed that the levels of all leukocyte subtypes other than monocytes remained unaffected with advancing age (3). They also reported that platelet levels were higher in women than in men and that these values decreased with advancing age (3).

This study sought to analyse the complete blood count values of patients aged ≥85 years to establish both median and mean values for this cohort. Furthermore, we aimed to determine whether there were variations in haemogram parameters across different age subgroups within this older population. We also investigated the potential impact of advancing age on blood count values in patients aged ≥85. Additionally, our study explored whether haemogram parameters differed between men and women within this age group. The availability of age-specific standardised upper- and lower-limit blood count values for this demographic has the potential to contribute to avoiding unnecessary testing and wasting time in hospitals for certain geriatric patients.

MATERIALS AND METHOD

Research Protocol

This retrospective study analysed data from 458 patients aged ≥85 years who underwent complete blood count (CBC) testing at Süleyman Demirel University Medical Faculty Hospital (SDU Research and Teaching Hospital) between 2 February 2005 and 11 October 2023 inclusive. Patients aged < 85 years were excluded.

The patients included in the study were also divided into two groups, men and women and all analyses were performed separately.

The following CBC parameters were recorded for all patients: white blood cell (WBC) count, neutrophil count, lymphocyte count, eosinophil count, basophil count, haemoglobin concentration, platelet (plt) count, mean corpuscular volume (MCV), mean platelet volume (MPV), red blood cell distribution width (RDW), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC). Descriptive statistics, including median and mean values, were calculated for each CBC parameter in the entire cohort. These data were then stratified by sex, and separate descriptive analyses were performed for men and women the results are presented in separate tables by sex. Subsequently, sex-based differences in WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, platelet, MCV, MPV, RDW, MCH, and MCHC values were also investigated.

Patients were further stratified into three age groups: 85–89 years, 90–99 years, and ≥100 years. We analysed the differences in haematological parameters (WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, platelet count, MCV, MPV, RDW, MCH, and MCHC) across these age groups. Subsequently, men and women were separately categorised according to the same age stratification (men: 85–89, 90–99, and ≥100 years; women: 85–89, 90–99, and ≥100 years). Within each age group, sex-based differences in haematological parameters were examined. Age-related variations in these parameters were analysed within each sex group.

Subgroup analysis was conducted on patients with normal MCV values, defined as 80–100 fL. Patients with MCV outside this range (<80 or >100

fL) were excluded from the analysis. Subgroup analysis was performed on patients with normal MCV values, because other potential untested cytopenic factors could effect the MCV values. Our study was a retrospective study and to reduce bias we prefered to make subgroup analysis on patients with normal MCV values.

For this subgroup, haematological parameters, including WBC, neutrophils, lymphocytes, eosinophils, basophils, haemoglobin, platelet count, and MPV, were recorded. The mean and median values of these parameters were calculated and are presented in separate tables. Patients with MCV values between 80–100 fL were included in this group; however, additional exclusion criteria were applied to patients with normal MCV values (Table 1). Exclusion criteria are shown in Table 1. After applying the exclusion criteria in table 1 , the remaining patients were analyzed as a subgroup.

The WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, platelet, and MPV values of all patients with MCV values of 80–100 fL were

Table 1. Exclusion criteria for subgroup analysis performed on patients with normal MCV values

Patients with known high CRP levels (above the upper reference limit of the laboratory) on the day of the haemogram	Who were found to have active infections on the day of the haemogram
Patients who were on immunosuppressive drugs, had a history of chemotherapy, had a history of inflammatory connective tissue disease, and had a known history of organ transplantation	Patients with known active malignancies (“basal cell skin cancer/ low grade lymphomas with no known bone marrow involvement/ early stage cancers that did not need treatment and were followed only with observation/ early stage cancers that achieved remission only with surgery and received no other treatment” were included)
Patients on thyroid replacement therapy	Patients known to be on routine dialysis
Patients with a known history of chronic viral hepatitis	Patients with a disease infiltrating the bone marrow
Patients with a history of aplastic anaemia, myeloproliferative disease, lysosomal storage disease, myelodysplastic syndrome (MDS) myeloid neoplasm or stem cell transplantation	Patients with premalignant clonal cytopenia, idiopathic hypereosinophilic syndrome or spleen length of ≥18 cm
Patients with a diagnosis of NSAID-derived drug use on the day of the haemogram test or in the last 2 days before the day of the haemogram test	Patients whose files showed that they were on parasitosis treatment
Patients who had systemic steroid treatment on the day of the haemogram test or in the previous five days	Patients with a history of colchicine / methotrexate / azathioprine use on the day of the haemogram test or in the previous 7 days
Patients with a history of leflunomide use on the day of the haemogram test or in the previous 30 days	Patients who were under TNF inhibitor therapy on the day of the haemogram or in the previous 90 days
Patients with a diagnosis of adrenocortical insufficiency	Patients with a diagnosis of pituitary insufficiency
Patients with a diagnosis of systemic mastocytosis	Patients with decompensated liver cirrhosis
Patients with platelet levels that were permanently decreased to <150 thousand/microliter due to immune thrombocytopenia	Patients with both liver cirrhosis and oesophageal varices
Patients receiving active treatment for immune thrombocytopenia	Patients with active autoimmune haemolytic anaemia or those receiving treatment for autoimmune haemolytic anaemia
Patients receiving active treatment for immune thrombocytopenia or microangiopathic haemolytic anaemia	Patients with DIC (disseminated intravascular coagulation), TTP(thrombotic thrombocytopenic purpura, HUS (haemolytic uraemic syndrome) or active haemolytic anaemia
Patients with a disease that infiltrated the bone marrow, those with known AIDS or those with HIV infection	Patients who had “ferritin level test result <15 ng/mL or folic acid level test result <2 ng/mL or vitamin B12 test result below the lower reference limit in our hospital’s laboratory” on the day of haemogram analysis, within the last 30 days before the day of haemogram analysis, or the first 30 days after the day of haemogram analysis

recorded after applying the exclusion criteria in table 1. The means and medians of these values were calculated and the findings are shown in a separate table. Patients included in the subgroup analysis were divided into two groups: men and women. The WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, platelet, and MPV values of the men and women were recorded separately. The means and medians of these values were calculated and the findings are presented in separate tables for men and women. We also examined whether there was a difference in WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, plt, MPV values between "men and women". Patients included in the subgroup analysis were also divided into 3 different age groups in terms of age ranges (85–89, 90–99, and ≥100-year-old patients). We also investigated whether there were any differences in WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, platelet, and MPV values between the three age groups. Furthermore, "men and women" were classified separately according to these 3 age groups (men and women aged 85–89 years, 90–99 years and ≥100 years). Subsequently, we also investigated the presence of sex-based differences in WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, plt, MPV values in the same age groups were also determined in these patient groups.

Finally, to complete the analysis of the subgroup with normal MCV values, we also examined potential differences in WBC, neutrophil, lymphocyte, eosinophil, basophil, haemoglobin, plt, and MPV values between the three age groups within each sex (i.e., (85–89, 90–99, and ≥100-year-old men and women).

This study used a retrospective file-review design. No identifying information was published to ensure patient confidentiality. Data were extracted from the hospital's electronic file system and patient notes archived at the SDU Medical Faculty Hospital. Relevant data were collected and analysed according to the methodology described above.

Ethics Committee Approval

The research protocols were approved by the Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (Ethics Committee Decision dated 29 December 2023 number 289).

Statistical Analyses

Data presentation: Descriptive, categorical, and grouped data are presented using frequency (number) and percentage values, and numerical (measurement) data are presented using mean, median, standard deviation, and minimum-maximum values. Tables and graphs are used to present the data. Box and scatter plots were used for graphics.

Statistical analysis: All collected data were analysed using the SPSS 22 software package (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). In addition to descriptive statistics, the Independent Sample t-test, a parametric hypothesis test, was used to investigate whether there was a statistical difference in the haemogram values obtained between the groups. The Mann–Whitney U test and Kruskal–Wallis tests, which are nonparametric hypothesis tests, were employed to analyse the data that did not meet the parametric criteria. Pearson's correlation test was performed to compare the relationship between age and haemogram parameters.

When a statistically significant difference was detected using the Kruskal–Wallis test for the comparison of more than two groups (comparison of age groups and haemogram parameters), pairwise comparisons were performed using the Independent Sample t-test and Mann–Whitney U Test to determine which group or group this significant difference originated from. Statistical significance was set at $p < 0.05$.

As this was a retrospective study, data were obtained from the "electronic/old type file"

archive records of SDU Research and Application Hospital. With the approval of the hospital chief physician, we requested access to relevant patient information, including findings, diagnoses, patient characteristics, examination results, follow-up notes, and other pertinent patient information. Data were screened to identify eligible patients based on the inclusion and exclusion criteria. Patients with documented exclusion criteria were excluded from this study. Patients were included if their medical records did not meet any of the exclusion criteria.

RESULTS

Of the 458 patients included in the study, 53.3% (n=244) were women and 46.7% (n=214) were men. The mean age of the entire cohort was 88.9 ± 3.8 years (range: 85–109 years). The mean age of women and men was 88.9 ± 3.8 years (range: 85–109 years) and 88.8 ± 3.7 years (range: 85–108 years), respectively. The majority of patients (71.4%, n=327) were 85–89-years-old, followed by 27.3% (n=125) aged 90–99 years, and a small proportion (1.3%, n=6) aged ≥100 years. The CBC parameters of the patients are shown in Table 2.

The analysis in Table 3 reveals a statistically significant difference in the mean MCH values across the three age groups (p=0.010). Pairwise comparisons using independent sample t-tests and Mann–Whitney U tests indicated that this difference was attributable to lower mean MCH values in patients aged 100 years and older than in those aged 85–89 years (p=0.005) and 90–99 years (p=0.005).

The analysis of Table 3 also shows a significant difference in the mean MCHC values across age groups (p=0.032). Pairwise comparisons (independent sample t-tests and Mann–Whitney U tests) revealed that this difference was also due to lower mean MCHC values in patients aged ≥100 years compared to those aged 85–89 years (p=0.012) and 90–99 years (p=0.008). No statistically significant differences were observed in the other CBC parameters across the three age groups (p>0.05). Table 4 presents the CBC values of the

Table 2. Results of complete blood count tests of patients

Hemogram Parameters (Unit)	N	Mean ± SD	Median	Min-Max
WBC (Leukocytes) (x10³/mm³)	458	12650.2 ± 23036.3	8750.0	200–289600
Neutrophils (x10³/mm³)	458	9041.1 ± 13343.5	6200.0	0.0–214200
Lymphocytes (x10³/mm³)	458	2367.5 ± 11696.1	1100.0	100–197000
Eosinophils (x10³/mm³)	458	122.5 ± 198.3	100.0	0.0–1800
Basophils (x10³/mm³)	458	62.9 ± 189.3	0.0	0.0–1900
Hemoglobin (g/dL)	458	10.3 ± 2.1	10.2	3.5–17.6
MCV (fl)	458	87.0 ± 8.6	87.3	55.6–126.5
MCH (pg)	458	29.1 ± 3.3	29.4	17.8–41
MCHC (g/dL)	458	33.5 ± 1.5	33.5	27.6–40.2
RDW (%)	458	18.3 ± 4.1	17.2	12.4–34.9
Platelet (x10³/mm³)	458	197751.1 ± 125128.7	188000.0	3000–941000
MPV (fl)	458	8.5 ± 1.4	8.3	0.0–15.2

WBC, white blood cell; MCV, mean corpuscular volume; MCH, mean corpuscular haemoglobin; MCHC, mean corpuscular haemoglobin concentration; RDW, red blood cell distribution width; MPV, mean platelet volume.

Table 3. Comparison of hemogram values according to age groups

Hemogram Parameters (Unit)	Age Groups						p*
	Age 85–89		Age 90–99		Age ≥100		
	N	Mean ± SD (Median Value)	N	Mean ± SD (Median Value)	N	Mean ± SD (Median Value)	
WBC (Leukocytes) (x10³/mm³)	327	12246.2 ± 18481.9 (8900)	125	13619.2 ± 32458.1 (8600)	6	14483.3 ± 8166.1 (13050)	0.207
Neutrophils (x10³/mm³)	327	8711.6 ± 8671.4 (6200)	125	9761.6 ± 21335.4 (6100)	6	11983.3 ± 7185.9 (10850)	0.213
Lymphocytes (x10³/mm³)	327	2315.0 ± 11438.0 (1200)	125	2567.2 ± 12652.4 (1000)	6	1066.7 ± 403.3 (1150)	0.576
Eosinophils (x10³/mm³)	327	124.8 ± 203.0 (100)	125	120.0 ± 190.5 (100)	6	50.0 ± 54.8 (50)	0.726
Basophils (x10³/mm³)	327	66.4 ± 198.2 (0)	125	54.4 ± 168.7 (0)	6	50.0 ± 54.8 (50)	0.597
Hemoglobin (g/dL)	327	10.2 ± 2.2 (10.2)	125	10.4 ± 2.1 (10.2)	6	11.4 ± 1.1 (11.4)	0.224
MCV (fl)	327	86.9 ± 8.6 (87)	125	87.4 ± 8.7 (88.2)	6	82.6 ± 3.5 (81.5)	0.142
MCH (pg)	327	29.1 ± 3.2 (29.3)	125	29.4 ± 3.3 (29.6)	6	26.1 ± 1.6 (26.1)	**0.010****
MCHC (g/dL)	327	33.4 ± 1.5 (33.5)	125	33.6 ± 1.5 (33.5)	6	31.6 ± 1.9 (31.4)	**0.032****
RDW (%)	327	18.4 ± 4.0 (17.2)	125	18.0 ± 4.2 (16.9)	6	21.5 ± 6.4 (19.8)	0.190
Platelet (x10³/mm³)	327	192042.8 ± 123408.5 (186000)	125	212168.0 ± 128647.7 (190000)	6	208500.0 ± 142061.6 (207000)	0.433
MPV (fl)	327	8.5 ± 1.4 (8.3)	125	8.5 ± 1.3 (8.3)	6	8.6 ± 1.4 (9.1)	0.922

*Kruskal–Wallis Test

**Mann–Whitney U Test, Independent Sample t-test

WBC, white blood cell; MCV, mean corpuscular volume; MCH, mean corpuscular haemoglobin; MCHC, mean corpuscular haemoglobin concentration; RDW, red blood cell distribution width; MPV, mean platelet volume.

115 patients with normal MCV values (80–100 fL) that remained after exclusion.

To assess the influence of sex on CBC parameters, we compared the haemogram values of 115 patients with normal MCV values after applying the exclusion criteria. The comparisons are presented in Table 5.

When the haemogram values of the 115 patients with normal MCV values were compared according to sex, no statistically significant differences were

Table 4. Hemogram values in eligible patients with normal MCV

Hemogram Parameters (Unit)	N	Mean ± SD	Median	Min-Max
WBC (Leukocytes) (x10³/mm³)	115	9016.5 ± 2969.9	8600	1600–16400
Neutrophils (x10³/mm³)	115	6577.4 ± 2736.5	6100	1100–14800
Lymphocytes (x10³/mm³)	115	1521.7 ± 1204.7	1200	200–8300
Eosinophils (x10³/mm³)	115	139.1 ± 149.1	100	0.0–600
Basophils (x10³/mm³)	115	41.7 ± 104.3	0.0	0.0–900
Hemoglobin (g/dL)	115	11.0 ± 1.7	10.8	8.0–15.4
Platelet (x10³/mm³)	115	247191.3 ± 102984.7	219000	108000–544000
MPV (fl)	115	8.4 ± 1.3	8.1	6.2–12.9

WBC: white blood cell, MPV: mean platelet volume

Table 5. Comparison of hemogram values by sex in eligible patients with normal MCV

Hemogram Parameters (Unit)	Sex				p*
	Men		Women		
	N	Mean ± SD (Median)	N	Mean ± SD (Median)	
WBC (Leukocytes) (x10³/mm³)	48	9360.4 ± 2645.1 (9050)	67	8770.1 ± 3178.9 (8200)	0.295
Neutrophils (x10³/mm³)	48	6993.8 ± 2529.9 (6200)	67	6279.1 ± 2856.7 (5800)	0.168
Lymphocytes (x10³/mm³)	48	1391.7 ± 976.7 (1100)	67	1614.9 ± 1343.9 (1200)	0.329
Eosinophils (x10³/mm³)	48	133.3 ± 156.2 (100)	67	143.3 ± 144.8 (100)	0.726
Basophils (x10³/mm³)	48	64.6 ± 148.0 (0)	67	25.4 ± 50.3 (0)	0.083
Hemoglobin (g/dL)	48	11.0 ± 1.8 (10.7)	67	11.0 ± 1.6 (10.9)	0.973
Platelet (x10³/mm³)	48	260375.0 ± 113858.2 (229500)	67	237746.3 ± 94183.5 (218000)	0.247
MPV (fl)	48	8.2 ± 1.0 (8.0)	67	8.6 ± 1.5 (8.2)	0.116

*Independent Sample t-test

WBC: white blood cell; MPV: mean platelet volume

found (p>0.05). Table 6 presents the comparison of haemogram parameters across the three age groups (85–89 years, 90–99 years, and ≥100 years) in these 115 patients.

In the subgroup of 115 patients with normal MCV values, no statistically significant differences in haemogram parameters were observed across the three age groups (85–89 years, 90–99 years, and ≥100 years) (p>0.05).

Similarly, within each age group, no statistically significant differences in haemogram parameters were found between men and women (p>0.05). However, a comparison of haemogram parameters by sex in the ≥100 years age group was not performed due to the small sample size (only one men).

No statistically significant difference was found between the haemogram parameters in men with MCV within the normal range after the exclusion criteria were applied when compared according to the age groups of the patients (p>0.05).

No statistically significant differences were observed in haemogram parameters across age groups among women with normal MCV values who met the inclusion criteria (p>0.05).

Table 6. Comparison of hemogram values by age groups in eligible patients with normal MCV

Hemogram Parameters (Unit)	Age Groups						p*
	Age 85–89		Age 90–99		Age ≥100		
	N	Mean ± SD (Median Value)	N	Mean ± SD (Median Value)	N	Mean ± SD (Median Value)	
WBC (Leukocytes) (x10³/mm³)	81	8971.6 ± 2784.9 (8500)	33	9039.4 ± 3430.5 (8700)	1	11900.0 ± -(11900)	0.519
Neutrophils (x10³/mm³)	81	6523.5 ± 2645.3 (6100)	33	6618.2 ± 2981.6 (6000)	1	9600.0 ± -(9600)	0.501
Lymphocytes (x10³/mm³)	81	1540.7 ± 1265.4 (1200)	33	1487.9 ± 1076.7 (1100)	1	1100.0 ± -(1100)	0.933
Eosinophils (x10³/mm³)	81	150.6 ± 155.0 (100)	33	112.1 ± 134.1 (100)	1	100.0 ± -(100)	0.436
Basophils (x10³/mm³)	81	28.4 ± 61.7 (0)	33	75.8 ± 165.9 (0)	1	0.0 ± -(0)	0.117
Hemoglobin (g/dL)	81	10.9 ± 1.7 (10.7)	33	10.9 ± 1.7 (10.9)	1	12.9 ± -(12.9)	0.483
Platelet (x10³/mm³)	81	240765.4 ± 92263.8 (219000)	33	256818.2 ± 122541.4 (218000)	1	450000.0 ± -450000)	0.335
MPV (fl)	81	8.5 ± 1.3 (8.1)	33	8.3 ± 1.2 (8.1)	1	8.6 ± -(8.6)	0.775

*Kruskal–Wallis Test

WBC: white blood cell, MPV: mean platelet volume

DISCUSSION

Previous studies by Tettamanti et al. (4), Guralnik et al. (5), Artz et al. (6), Artz et and Thirman MJ (7), Price et al. (8), and McLennan et al. (9) reported that the prevalence of unexplained anaemia in older populations was 26.4%–45%. In our study, after excluding patients with an abnormal MCV and those meeting the other exclusion criteria, the prevalence of anaemia was notably higher (85% in men and 76% in women). This high prevalence raises critical questions about the applicability of current anaemia criteria, specifically the WHO definition (1), to individuals aged 85 years and older.

In an Italian study, Inelmen EM et al. (10), reported that the mean hemoglobin value in the group over 85 years of age was 13.83 ± 1.13 in men and 13.34 ± 1.61 in women. Besides, Zauber NP and Zauber AG (11) evaluated 110 patients who were at least 84 years old and found the mean Hb to be 14.8 +/- 1.1 g/dL in men and 13.6 +/- 1.0 g/dL in women. On the other hand, in our study, we found mean hemoglobine level 11.0±1.8 g/dL in men and 11.0±1.6 g/dL in women in the subgroup over 85 years old. The differences between these studies and our study might be attributed to the different ethnicities.

In our cohort of patients aged ≥85 years, after applying the exclusion criteria, the median haemoglobin level was 10.7 g/dL in men and 10.9 g/dL in women. Furthermore, we did not observe any significant differences in haemoglobin values between age groups within this population. These findings suggest that the lower limit of the Hb reference range for defining anaemia in this age group may need to be revised downward. While our study provides valuable insights, the small sample size of centenarians (≥100 years old) limits the generalisability of our findings to this specific age group. Future studies with larger cohorts of centenarians are required to establish more accurate reference ranges for this population. Based on our findings, we propose that the lower reference limit for haemoglobin in older patients aged 85–100 years may be as low as 10.7 g/dL in men and 10.9 g/dL in women. To validate this proposal, we recommend conducting multicentre studies with large populations to reassess and potentially update the Hb reference ranges for defining anaemia in this age group. This could lead to revisions in the WHO and other guidelines, ensuring a more accurate diagnosis and management of anaemia in older individuals.

Nagel et al. (12) observed a slight decrease in total lymphocyte count with advancing age, whereas Ferguson et al. (13) reported a negative correlation between age and total lymphocyte levels. In our study of patients with normal MCV values, mean lymphocyte counts were 1540.7 ± 1265.4 in the 85–89 age group and 1487.9 ± 1076.7 in the 90–99 age group. Sex analysis revealed median lymphocyte counts of 1100 in men and 1200 in women over 85 years. All median lymphocyte counts remained within the normal reference ranges, according to the available follow-up data.

Hermann et al. (2) reported sex-specific differences in age-related platelet counts. In their study, women showed no significant differences across age groups (60–69, 70–79, and ≥80 years), while men demonstrated significant differences between these age groups (p=0.02) with a significant negative trend (p=0.006). In our study of patients aged > 85 years with normal MCV values who met the inclusion criteria, the median platelet count was 229,500 in men and 218,000 in women. Both values were within the normal reference range according to the current clinical follow-up data. Unlike previous findings, our analysis of patients ≥85 years showed no statistically significant differences in platelet counts when compared across sex or age groups.

Timiras and Brownstein (14) stated that MCV does not change with age in either sex. In our study, we found the median MCV as 87.3 fL in all patients. We also found no significant differences

in the MCV across age groups. Salive et al. (15) reported no age-related changes in the WBC count, platelet count, and MCV. In our study, the median WBC level was 9050 in men and 8200 in women, respectively. The median WBC count was within the normal range according to the current clinical patient follow-up. Furthermore, we did not detect a statistically significant difference between the groups in terms of WBC value among the older age groups in patients aged ≥85 years with normal MCV and remaining after applying the exclusion criteria.)

In our study, among the median values of WBC, neutrophil, platelet, lymphocyte, eosinophil, basophil, haemoglobin, and MPV in patients with normal MCV, only the median haemoglobin values (for both men and women) fell within the ranges considered low in current clinical practice. The other median values (WBC, neutrophils, platelets, lymphocytes, eosinophils, basophils, and MPV) were within the normal ranges. Further studies, such as those exploring the levels of hormones and cytokines involved in erythropoiesis, assessing bone marrow reserve and activity, and conducting comparative studies with younger individuals, may yield more definitive data on the aetiology of low median haemoglobin levels observed in individuals aged ≥85 years.

Limitations of our study were the patient number and retrospective design. This was a unicenter study. And the number of the elder population applicable to the study criteria was limited. Besides , because of the retrospective design of the study , there might be selective bias in the study. The advantages of our study were the high specificity of the exclusion criteria. Our exclusion criteria were much selective and this would decrease the bias by helping to increase the accuracy of the findings.

In conclusion, our findings suggest that the current WHO definition of anaemia may not be entirely appropriate for individuals aged ≥85 years. Lowering the reference limit for haemoglobin in this population, as suggested by our data, could prevent unnecessary diagnoses of anaemia and reduce the burden of further investigations. When clinicians encounter mild anaemia in patients aged ≥85 years that cannot be explained after thorough etiologic investigations, it is important to recognise that such a condition may be a normal variant in some older individuals.

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Author Contributions: Alparslan Merdin: Study design, conceptualisation, methodology, supervision, writing, review, and editing. Kağan Dündar: Data collection, writing the original draft, formal analysis, investigation, literature search.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

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