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Hematological Abnormalities In The Elderly: A Study Of 300 Cases And A Review Of The Literature

ZINEB Mostafi, Hassane Mamad, Sara Hatimi, Mohamed Ifleh, Souad Benkirane, Azlarab Masrar
(Central Hematology Laboratory, Ibn Sina Hospital, Rabat)
(Faculty Of Medicine And Pharmacy, Rabat, Morocco)

Abstract:
Background: *Hematological abnormalities are common in older adults due to age-related vulnerability, making the hemogram an essential diagnostic tool. The aim of this study was to describe hematological abnormalities in adults aged 65 years and older*
Materials and Methods*: A retrospective study of 300 complete blood counts (CBCs) collected over a 60-day period at the Central Hematology Laboratory of Ibn Sina University Hospital, Rabat. The CBCs were performed using the Beckman Coulter DxH 900 analyzer, and blood smears were carried out in selected cases.*
Results: *Median age was 76 years, with a sex ratio of 1.007. Most patients were from the emergency department (37%). Normal hemograms were found in 18%. Anemia was present in 41% (32% normocytic normochromic, 9% microcytic hypochromic), neutrophilia in 25%, lymphopenia in 12%, lymphocytosis in 4%, thrombocytosis in 11%, and thrombocytopenia in 7.7%. Blood smears confirmed hemogram abnormalities.*
Conclusion: *Hematological abnormalities, especially anemia, neutrophilia, and lymphopenia, are frequent in older adults. Routine hemogram evaluation is important in this population.*
Key Word**:** *Elderly subjects; Hemogram abnormalities; Complete blood count; Blood smear;*

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I. Introduction

In most developed and developing countries, life expectancy declined in 2020 and 2021 due to the COVID-19 pandemic but returned to pre-pandemic levels by 2023 [1]. Global life expectancy is projected to reach 78 years by 2050, with older adults representing about 20% of the population [2]. The world is undergoing a major epidemiological transition, with non-communicable diseases (NCDs) now accounting for the largest share of morbidity and mortality among older adults. The most prevalent NCDs include cardiovascular diseases, neurological disorders (such as stroke and dementia), diabetes, cancers, chronic respiratory diseases, and mental disorders, particularly depression. Meanwhile, the burden of communicable diseases—including malaria, tuberculosis, and HIV—has declined, although some regions in sub-Saharan Africa continue to face a double burden of persistent infectious diseases and emerging NCDs [3].The hemogram is a first-line laboratory test used to assess the quantitative and qualitative status of erythrocytes, leukocytes, and platelets, as well as the morphology of blood cells. It is the most frequently prescribed laboratory test in clinical practice [4]. An institutional study reported an average of 1,800 hemograms ordered daily, highlighting its central role in medical care [5]. In geriatrics, the hemogram is an essential diagnostic and monitoring tool. It enables early detection of conditions such as anemia, identification of hematological abnormalities suggestive of underlying diseases, monitoring of chronic disorders, and guidance for therapeutic decisions [6].This retrospective study, conducted at the Hematology Laboratory of Ibn Sina University Hospital in Rabat, aims to describe hematological abnormalities found in the hemograms of 300 elderly patients. The objective is to assess their prevalence, underlying causes, and clinical impact, based on collected data and a literature review.

II. Material And Methods

This is a retrospective study conducted over a 60-day period (June and July 2024) at the Central Hematology Laboratory of Ibn Sina University Hospital in Rabat. It included all samples received from patients aged 65 years and older, whether hospitalized or seen as outpatients. Complete blood counts (CBCs) were performed using the Beckman Coulter DxH 900 analyzer, and blood smears were prepared on the Beckman Coulter SMS automated slide maker with MCDh Ral staining. The analyzed parameters included age, sex, requesting departments, and CBC results. Data were extracted from the Elabs laboratory information system. A CBC was considered pathological if at least one abnormality (increase or decrease) in the blood cell elements was

observed compared with reference values adapted to older adults. In the absence of Moroccan studies on the geriatric population using Beckman Coulter technology, the reference values from the Canadian study by Khosrow Adeli et al. (2015) were used as the comparative standard [7].

III. Result

A total of 300 CBCs were collected. The sex ratio of 1.007 reflects an almost equal distribution between males and females, with a median age of 76 years. Most patients were from the emergency department (n = 111; 37%), followed by oncology (n = 33; 11%), cardiology (n = 12; 4%), surgery (n = 12; 4%), dermatology (n = 12; 4%), pulmonology (n = 6; 2%), neurology (n = 6; 2%), and other departments (n = 15; 5%), while 93 patients (31%) were outpatients. A normal CBC was found in 54 patients (18%). Anemia was observed in 123 patients (41%), including 96 cases of normocytic normochromic anemia (32%) and 27 cases of microcytic hypochromic anemia (9%). Neutrophilic leukocytosis was identified in 75 patients (25%), sometimes associated with mild monocytosis. Lymphopenia was found in 36 patients (12%), whereas lymphocytosis was noted in 12 cases (4%). One case of isolated monocytosis was also observed (0.4%). Thrombocytosis was present in 33 patients (11%), while thrombocytopenia was observed in 23 cases (7.7%). Among the 300 CBCs analyzed, nine blood smears were performed. Indications for performing a blood smear included one case of isolated monocytosis at 1.800/mm³ [8], one case of severe thrombocytopenia at 40.000/mm³, two cases of anemia with hemoglobin levels below 7 g/dL [9], and one case of leukocytosis at 24.000/mm³ [10]. In these cases, the blood smear confirmed the abnormalities detected by the CBC. In addition, anisopoikilocytosis of red blood cells was observed in the two anemic patients. Four other blood smears were requested by the prescribing departments without specific indications based on CBC results.

IV. Discussion

Aging profoundly affects hematopoietic stem cells (HSCs), both in number and function. Although their number increases, their self-renewal and differentiation capacities decline, with the accumulation of DNA damage, epigenetic dysregulation, and a production bias toward myeloid lineages (granulocytes, monocytes, platelets) at the expense of lymphoid lineages. This imbalance promotes lymphopenia, increased susceptibility to infections, and the emergence of abnormal clones, which may evolve into myelodysplastic syndromes (MDS) or myeloid leukemias [11]. Aging also induces changes in the bone marrow microenvironment that regulates the quiescence/self-renewal balance of HSCs. Increased secretion of proteins—such as proteases and pro-inflammatory or pro-apoptotic cytokines—by senescent cells in the aging marrow can disrupt the interaction between HSCs and their niche, further favoring myeloid differentiation over lymphopoiesis [12–13]. In addition, a decline in trophic factors (SCF, CXCL12, TPO) and an inadequate response to erythropoietin make the environment less conducive to erythropoiesis [14]. A chronic low-grade inflammation that develops with aging—referred to as "inflammaging"—induces the production of cytokines (IL-6, TNF-α) that inhibit erythropoietin and stimulate hepcidin, leading to functional iron deficiency typical of anemia of inflammation [15]. Variations in normal hemogram values in older adults are generally less pronounced than in younger patients. A study of 283 individuals over 65 years old showed a moderate decrease in hemoglobin levels, along with an increase in neutrophils, eosinophils, and monocytes, mainly in men. Variations in basophil counts were not significant. A decrease in lymphocyte counts and an increase in platelet counts were also observed in both sexes [16]. Moreover, other studies, including that of Khosrow Adeli et al., suggest that there are few sex-related differences in most hematological parameters, which tend to stabilize with age—even in older adults [17–18]—except for monocytes, which remain higher in men [7]. According to the French National Agency for Accreditation and Health Evaluation (ANAES), some of these variations may be statistically significant without having real clinical relevance in all cases [16]. According to our study, hemogram abnormalities are common in older adults. Anemia was the most frequent finding, followed by neutrophilic leukocytosis, lymphopenia, and platelet abnormalities, particularly thrombocytosis and thrombocytopenia. Anemia affects 10–20% of individuals aged 65 years and older [19]. It is often underdiagnosed because its symptoms (fatigue, dyspnea, confusion) are frequently attributed to aging. Furthermore, 40–50% of hospitalized patients in this age group are anemic [20]. Data from the U.S. National Health and Nutrition Examination Survey III (NHANES III) show that anemia in older adults is often related to nutritional deficiencies, particularly iron, folate, and vitamin B12 deficiency. Anemia of inflammation is associated with chronic kidney disease, while other cases remain of undetermined etiology, including hematologic malignancies and mixed-origin anemias [19]. Neutrophilia is frequently observed during bacterial infections, inflammatory diseases [15], myeloproliferative syndromes [20], trauma, and after surgery [21]. In older adults, bacterial infections are a major cause of morbidity and mortality, although clinical signs are not always present or may be atypical. Neutrophilic leukocytosis can serve as a diagnostic and prognostic marker in this population. However, for certain bacterial infections such as endocarditis, neutrophilia may be absent, and its absence should not rule out a bacterial etiology [22–23]. Lymphopenia is also very common in older adults. One study reported a prevalence of 39% and identified it as a predictor of medium- and long-term mortality [24].

Regarding the platelet lineage, thrombocytosis is the most frequently observed abnormality. This may be explained by age-related changes in the vascular system and blood components that favor the development of a procoagulant state [25].

V. Conclusion

Blood count abnormalities are common in older adults and often have multiple causes, reflecting both the physiological aging of the bone marrow and the presence of associated diseases. This supports the routine use of blood counts in the medical follow-up of this population to enable early detection and better management.

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