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Epidemiological and Cytological Profile of Acute Myeloid Leukemias: A Five-Year Retrospective Study at the Hematology Laboratory of Mohammed V Military Hospital, Rabat, Morocco

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Abstract:

- ***Background:***

Acute leukemias are characterized by malignant proliferation of hematopoietic precursor cells (blasts), arrested at specific differentiation stages and present in bone marrow, peripheral blood, and sometimes other tissues. Advances in diagnostic techniques over the past decades have enabled better distinction between myeloid and lymphoid acute leukemias.

- ***Objective:***

To describe the epidemiological and cytological features of acute myeloid leukemias (AML) diagnosed at the Hematology Laboratory of Mohammed V Military Hospital in Rabat over a 5-year period (2017–2022).

- ***Methods:***

We conducted a retrospective study of patients diagnosed with AML between January 1, 2017 and May 30, 2022. Patients with incomplete records were excluded. Epidemiological, clinical, and laboratory data (complete blood counts, bone marrow cytology, cytochemical staining) were collected from laboratory information systems. The diagnosis of AML was based on ≥ 20% blasts in bone marrow (WHO 2008 criteria). Cytochemical myeloperoxidase (MPO) testing was performed when myeloid morphology was unclear.

- ***Results:***

A total of 126 AML cases were included. The sex ratio (male/female) was 1.86. Two incidence peaks were observed: 10–20 years and 40–70 years. The most frequent cytological subtypes were AML-M2 (22 %) and AML-M4 (17 %). Among MPO+ AML cases: 70 % were unclassified MPO+, 9 % showed Auer bodies, 6 % had AML-M4 features, etc. Hemogram anomalies included: anemia in 91 %, thrombocytopenia in 73 %, neutropenia in 37 %, hyperleukocytosis in 14 %, pancytopenia in 27 %.

- ***Conclusion:***

AML in this Moroccan cohort display a bimodal age distribution and diverse cytological patterns dominated by MPO+ uncharacterized forms. The high prevalence of cytopenias underlines the severity of disease presentation. Further national registries and molecular studies are warranted to enhance diagnostic and therapeutic capacity.

Keywords: *Acute Myeloid Leukemia; Epidemiology; Cytology; Morocco; Hematology; MPO.*

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I. INTRODUCTION

Acute leukemias (AL) encompass malignant hematologic disorders characterized by clonal proliferation and accumulation of hematopoietic precursor blasts blocked at a given stage of differentiation in bone marrow, blood, or other tissues [1]. According to lineage, they are classified into acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) [2]. Over the past two decades, diagnostic advances (cytochemistry, flow cytometry, cytogenetics) have improved the discrimination between these entities.

ALs account for approximately 10–15 % of malignant hematopathies, with a world-standardized incidence < 6 per 100 000 per year, and an age distribution that varies by subtype [1]. In children, AML is less frequent and typically occurs before age 2 or after age 15, whereas ALL is the most common childhood cancer, comprising ~25 % of cancers in children under 15 years, and being ~5 times more prevalent than AML [2].

The aim of this study was to characterize the epidemiological and cytological profiles of AML cases diagnosed at the Hematology Laboratory of Mohammed V Military Hospital, Rabat, between 2017 and 2022.

II. METHODS

➢ *Study Design and Setting*

We performed a retrospective descriptive study at the Hematology Laboratory of Hôpital Militaire Mohammed V, Rabat, over the period from January 1, 2017 to May 30, 2022.

➢ *Inclusion and Exclusion Criteria*

All patients with a confirmed diagnosis of AML during the study period were included. Patients whose medical or laboratory records were incomplete were excluded.

➢ *Data Collection*

We extracted data from the laboratory information system (DxLab) and Laboratory Registers into Excel files. Variables included demographic data (age, sex), clinical presentation, and laboratory results (complete blood count, bone marrow cytology, cytochemistry).

➢ *Hematologic and Cytologic Methods*

Peripheral blood samples were collected in EDTA tubes and analyzed using the DxH 800 analyzer. Bone marrow aspiration was performed; smears of bone marrow and peripheral blood were stained with May–Grünwald–Giemsa (MGG). The diagnostic threshold for AML was ≥ 20 % blasts in bone marrow according to WHO 2008 criteria. When myeloid lineage was not morphologically clear, myeloperoxidase (MPO) cytochemistry (pyronin technique) was applied; a sample was considered negative if fewer than 3 % of blasts were MPO-positive.

➢ *Statistical Analysis*

Data were analyzed using descriptive statistics. Categorical variables are expressed as frequencies and percentages; continuous variables are presented as means (± standard deviation) or medians (range), as appropriate.

III. RESULTS

➢ *Demographic Characteristics*

Among 126 AML patients, the male to female sex ratio was 1.86. Two incidence peaks were noted: one in the 10–20 year age group, and another between 40 and 70 years (Figure 1).

➢ *Cytological Subtypes*

The most frequent cytological forms were AML-M2 in 22 % of cases and AML-M4 in 17 %. Table 1 shows the distribution of AML types according to MPO positivity and morphological features.

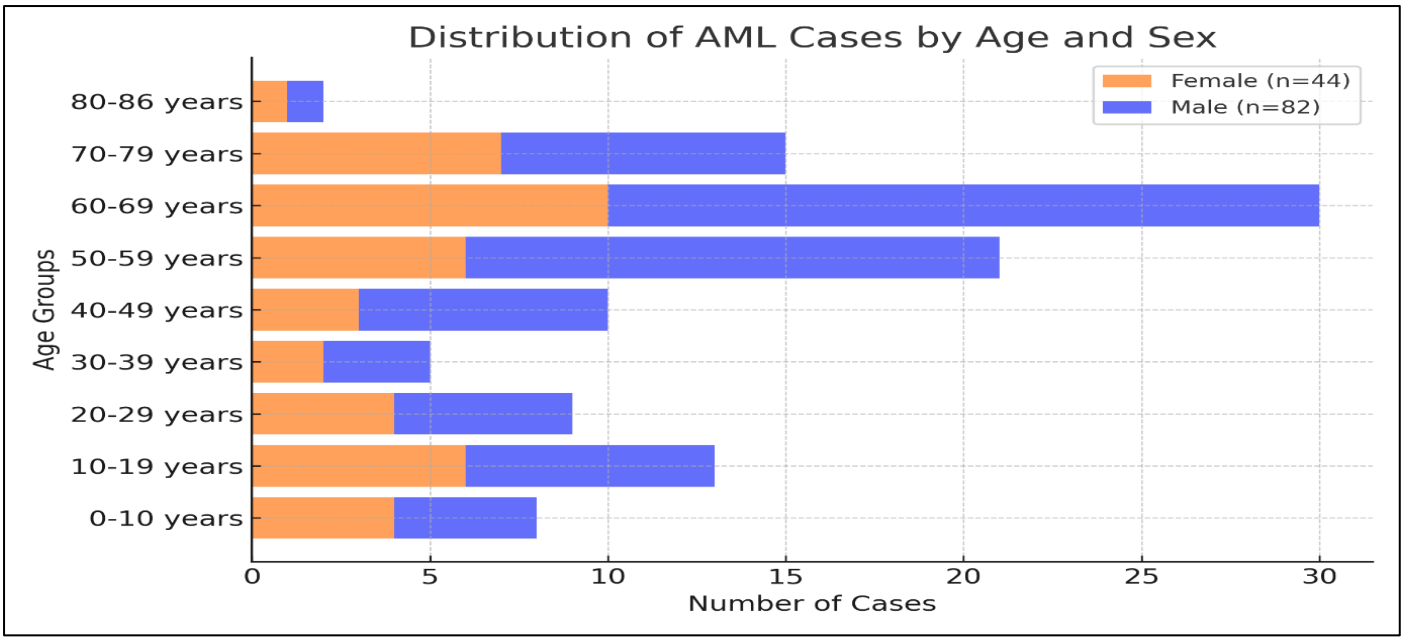

Fig 1 Distribution of AML Cases by Age and Sex

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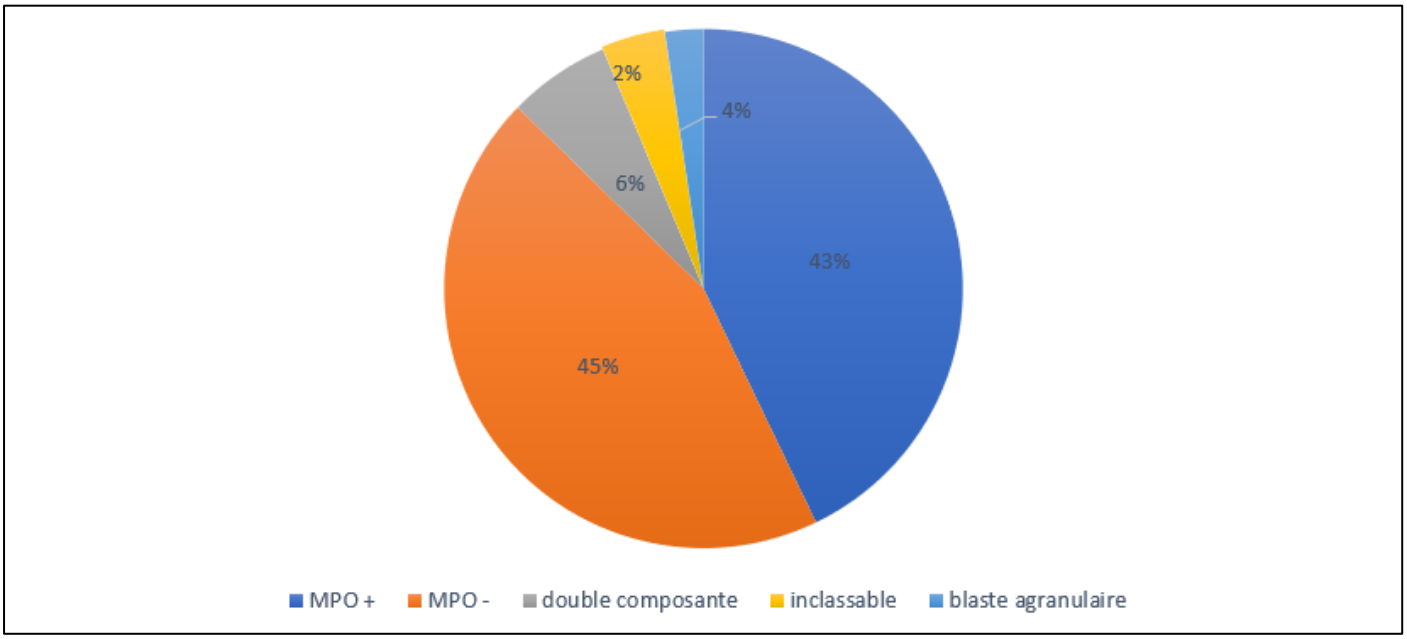

Fig 2 Distribution of 126 AML Cases According to Cytological and Cytochemical Features

Table 1 Cytological Profile of MPO-Positive Acute Leukemias (N=54)

AML Sub Type / MPO Status	n	%
MPO+ non-classified	38	70 %
Presence of Auer bodies	5	9 %
AML-M2	1	2 %
AML-M3	2	4 %
AML-M4	3	6 %
Mixed AML	1	2 %
AML post CML	2	4 %
AML by transformation of MDS	2	4 %

➢ *Hemogram Abnormalities*

Table 2 Hematologic Anomalies Among the 126 AML Cases

Hemogram Abnormality	n	%
Anemia	115	91 %
Thrombocytopenia	92	73 %
Neutropenia	47	37 %
Hyperleukocytosis	18	14 %
Pancytopenia	34	27 %
Isolated anemia	18	14 %

All patients had detectable blasts in the peripheral blood, though this alone is insufficient for diagnosis.

IV. DISCUSSION

Medical literature reports that leukemias preferentially affect individuals at the extremes of age, with a bimodal distribution of incidence and mortality. Most of the peak incidence of leukemia in young children is due to acute lymphoblastic leukemia (ALL), whereas the adult peak corresponds mainly to acute myeloid leukemia (AML) [3]. Acute leukemias in adults involve the myeloid lineage in about 80% of cases. The incidence of AML increases with age, reaching a peak in the sixth decade. Only 18% of all AML cases occur in children [4,5].

In our series, 41% of AML cases were observed between 50 and 70 years of age. However, less than 18% of AML cases occurred in children.

AMLs are characterized by varying degrees of signs reflecting both tumor infiltration and bone marrow failure. These signs may guide the clinician toward suspicion of the disease. The tumor syndrome is often revealed by hypertrophy of hematopoietic organs: lymphadenopathy (cervical, mediastinal, inguinal, submandibular), splenomegaly, and hepatomegaly. Indeed, various organs can be infiltrated by leukemic cells, which increases their size and alters their function [6]. Bone pain is also observed (Table 1), most often due to atypical localization of joint pain resistant to usual treatments [7].

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Bone marrow failure was confirmed by the presence of anemic syndrome, manifested by fatigue, mucocutaneous pallor, dyspnea, asthenia, hemorrhagic syndrome marked by ecchymosis, mucocutaneous lesions, gingival bleeding, and infectious syndrome with fever. Indeed, the precursors of white blood cells, the blasts, invade the bone marrow at the expense of other hematopoietic lineages [1].

AMLs combine, to varying degrees, signs of proliferation and bone marrow failure. The blood count showed blast cells in 100% of cases, but this alone is insufficient to establish the diagnosis [8]. The complete blood count also made it possible to assess (table 2):

- The degree of anemia: anemia was observed in 91% of cases;
- The severity of thrombocytopenia and the associated hemorrhagic risk: thrombocytopenia was noted in 73% of cases;
- Leukocytosis, which constitutes a major prognostic factor. In our series, hyperleukocytosis was observed in 14% of cases (4).

The dominance of MPO+ but morphologically unclassified AML suggests limitations in morphology-only classification and underscores the need for immunophenotyping and cytogenetic/molecular studies for precise subclassification and prognosis stratification.

Given the heavy disease burden and lack of national AML registries in Morocco, our findings highlight the urgency to strengthen diagnostic infrastructure (flow cytometry, cytogenetics, molecular genetics) and to develop population-based surveillance of hematologic malignancies.

V. CONCLUSION

This retrospective study provides a descriptive picture of AML cases in Rabat, with notable cytological diversity and a bimodal age distribution. The high frequency of cytopenias emphasizes the severe presentation of disease. To improve patient outcomes, expansion of advanced diagnostic capabilities and establishment of national AML registries are imperative.

ACKNOWLEDGMENTS

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➢ *Conflicts of Interest*

The authors declare no conflicts of interest.

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