RJNMSR
Review Journal of Neurological & Medical Sciences Review

Volume 3, Issue 4, 2025

HEMATOLOGICAL PARAMETERS OF ACUTE MYELOID LEUKEMIA PATIENTS PRESENTING TO PATHOLOGY DEPARTMENT, HAYATABAD MEDICAL COMPLEX, PESHAWAR

Dr. Faiza[*1], Dr Huma Riaz[2]

[*1](MBBS, FCPS-I) Postgraduate Trainee Department of Hematology, Hayatabad Medical Complex, Peshawar
[2](MBBS, FCPS) Associate Professor Department of Hematology, Hayatabad Medical Complex, Peshawar

[*1]faizainam32@gmail.com, [2]humariaz82@yahoo.com

Corresponding Author: *
Dr. Faiza
DOI: https://doi.org/10.5281/zenodo.18240149

Received	Accepted	Published
01 June 2025	15 August 2025	25 August 2025

ABSTRACT

Objective: *To evaluate the hematological profiles of Acute myeloid leukemia patients presented at Hayatabad Medical Complex Peshawar.*

Study Design and Setting: *This cross-sectional study was conducted from 1st July 2023 to 30th June 2024, at Pathology Department, Hayatabad Medical Complex.*

Methodology: *The study including 116 AML patients aged ≥18 years. Diagnosis was based on ≥20% blasts in peripheral smear/bone marrow and classified according to FAB subtypes. Hematological parameters including hemoglobin (Hb), leukocyte and platelet counts, anemia, leukopenia, leukocytosis, thrombocytopenia, and blast percentages were recorded. Chi-square test applied for comparisons ($p \leq 0.05$ significant).*

Results: *The mean age was 54.8±13.8 years, with male predominance (58.6%). AML-M2 was the most frequent subtype (20.7%). Anemia was present in 81.9% (mean Hb: 8.1±2.8 g/dl), leukocytosis in 52.6%, leukopenia in 17.2%, and thrombocytopenia in 87.9% (mean platelet count: 55.7±16.3×10³/µL). Blast cells>60% were found in 58.6% of patients. No significant gender differences were observed ($p>0.05$). Younger patients (≤40 years) had higher Hb compared to older patients (8.3±0.5 vs. 7.7±2.0 g/dl, $p=0.049$). Significant Hb variation was also noted across AML subtypes ($p=0.045$), but other parameters showed no difference.*

Conclusion: *Anemia and thrombocytopenia were the most prevalent hematological abnormalities in AML patients. Except for hemoglobin variation by age and subtype, no significant differences were observed. These findings highlight the diagnostic value of hematological parameters and provide baseline data for clinicians in this region.*

Keywords: *Anemia, thrombocytopenia, leukocytosis, blast cells, hematological parameters*

INTRODUCTION

Acute myeloid leukemia (AML), which is characterized by the clonal growth of immature "blast cells" in the peripheral blood and bone marrow, impairing erythropoiesis and failing the bone marrow is the prevalent type among adults. Despite improvements in treatment methods, the outlook for the older population is still very poor. [1,2] There are several factors that have been reported in literature contributing to the etiology of acute myeloid leukemia including myelodysplastic syndrome, aplastic anemia, congenital disorders like “Down syndrome” and “Bloom syndrome”, radiation exposure, tobacco smoking, exposure to benzene, exposure to chemotherapeutic agents and myelofibrosis and there are different classification systems of AML which are based not only on these etiological factors but also morphology, immune-phenotype and genetics. [3,4] Anyone with

unexplained cytopenias, such as low white blood cell, haemoglobin, or platelet counts, the detection of circulating blast cells in the peripheral blood, easily bruising or bleeding, or recurring infections, should be suspected of having AML. [5,6]

AML comprise diverse subtypes with distinct hematological profiles that is important in diagnosis, prognosis, and therapeutic stratification. French-American-British (FAB) classification and cytogenetic abnormalities are still essential models to classify AML variants with each having typical hematological patterns. By way of example, AML and myelodysplasia related alterations (AML-MRC) are more likely to be of lower white blood cell counts and older age of the patient with high expression of CD34, CD41a, and CD235a, the last being highly discriminatory. [7] AML type with core binding factors, especially t(8; 21) and inv(16) display different marker expressions like CD19, CD56, CD34 and CD14. [7] Increased CD33, CD13, and CD117 expression, and lower hemoglobin, high WBC, and thrombocytopenia are characteristic of the common FAB subtype AML-M2, and a rearrangement of the RUNX1/RUNX1T1 gene that is frequently found in AML-M2 is associated with suppressed erythropoiesis, thrombopoiesis, and myelopoiesis, with a mean blast percentage of 58%. [8,9] Baseline hemoglobin, neutrophil-to-lymphocyte ratio (NLR) and red cell distribution width (RDW) are hematological indicators that are prognostically significant with higher hemoglobin being associated with remission and higher NLR or RDW with poor outcomes. [10,11] Based on this, it is essential that hematologists as well as physicians should have a strong grasp regarding the trends of various hematological parameters observed in the blood samples of acute myeloid leukemia patients especially the anemia, thrombocytopenia, leucopenia or leukocytosis and the blast cell percentage.

AML patients mostly exhibit pancytopenia, characterized by low levels of red blood cells, white blood cells, and platelets, as seen in cases of myelodysplasia-related AML. [12] A high percentage of blasts in peripheral blood and bone marrow is common, with studies reporting an average blast percentage of 58% in specific subtypes. Typical values include hemoglobin levels around 8 g/dL, platelet counts averaging 41.5×10^9/L, and total leukocyte counts of approximately 71.4×10^9/L. [9]

A study reported the frequencies of various hematological parameters in blood samples of patients who had AML including anemia (82%) with mean hemoglobin (Hb) levels of 7.4 ± 1.86g/dl, leukocytosis (52%), leukopenia (18%), mean leukocyte count (61.75 ± 15.4 x 10^3/µl), thrombocytopenia (88%) and mean platelet count (48 ± 12 x 10^3/µl). [13] Similarly, in another study frequency of various indices of hematological profile in the patients of acute myeloid leukemia were reported including anemia (45.8%), leucopenia (6.5%), leukocytosis (84.1%), thrombocytopenia (96.30%) and various blast cell (%) ranges including 20-40% (17.75%), 41-60% (23.36%), 61-80% (24.29%) and 81-100% (33.64%). [14]

AML is a heterogeneous hematological malignancy with varied clinical and laboratory presentations, where early suspicion and diagnosis are crucial for improving patient outcomes. Hematological parameters such as hemoglobin levels, total leukocyte counts, platelet counts, and blast cell percentages are often the first indicators of the disease, yet their frequency and pattern may differ across populations due to genetic, environmental, and demographic variations. Limited local data exist on the hematological trends of AML patients in Peshawar, which makes it difficult for physicians to recognize population-specific patterns that could aid in timely diagnosis. Therefore, this study aims to evaluate the hematological profiles of AML patients presenting to the Pathology Department, Hayatabad Medical Complex, Peshawar. The findings will provide baseline data for local clinicians, enhance early recognition of AML based on hematological parameters, and contribute to better clinical decision-making and patient management in our setting.

METHODOLOGY

This cross-sectional study was conducted in the Department of Pathology, Hayatabad Medical Complex, Peshawar, from 1st July 2023 to 30th June 2024 by including blood sample of 116 patients, calculated based on WHO sample size calculator based on 95% confidence level, an absolute precision of 4.5%, and an expected frequency of leukopenia in patients with AML as 6.5%. [6] All blood samples were collected under aseptic conditions at the bedside using a vacutainer. The inclusion criteria were patients of either gender, age≥18 years and diagnosed with AML. AML was

diagnosed by the presence of more than 20% blast cells and Auer rods in the peripheral blood film and bone marrow biopsy and further classified into subtypes M0–M7. Patients with pre-existing hemolytic disease, active infections, hypersplenism, or autoimmune conditions, as documented in previous medical history or physician records, were excluded.

Study variables were defined as follows: anemia as hemoglobin < 10 g/dl, leukocytosis as leukocyte count > 11.0 × 10^9/L, leukopenia as leukocyte count < 4.5 × 10^9/L, and thrombocytopenia as platelet count < 150,000/µL. Blast cell ranges were categorized as 21–40%, 41–60%, 61–80%, and 81–100%.

The IRB approval was obtain under approval no: 1272 dated: 10/5/2023. Inform consent was obtained from patients fulfilling the selection criteria. Baseline patients' characteristics including age, gender, and AML subtype were documented. Venous blood samples were obtained by the researcher in person, ensuring aseptic precautions, and analyzed through both Sysmex hematology analyzer for complete blood count and manual counts via peripheral smear. This allowed assessment of hematological parameters including hemoglobin levels, leukocyte and platelet counts, anemia, leukopenia, leukocytosis, thrombocytopenia, and blast cell ranges.

The collected data was entered and analysed through IBM statistical package for social science (SPSS) version 27. Continuous variables such as age, hemoglobin levels, leukocyte count, and platelet count were summarized as mean ± standard deviation and median(IQR) after checking data normality through Shapiro Wilk test. Categorical variables including gender, anemia, leukopenia, leukocytosis, thrombocytopenia, and blast cell range were expressed as frequencies and percentages. Stratification by age, gender, and AML subtype was performed to control for effect modifiers. Post-stratification analysis was carried out using Chi-square test, with a p-value ≤ 0.05 considered statistically significant.

RESULTS

The sample was 116 AML patients with the mean age of 54.89 13.8 years (25-89). Most of the patients were men 68 (58.6%). In the FAB classification, the commonest subtype was AML-M2 24 (20.7%), then M4 20 (17.2%) and M3 18 (15.5%). Other less frequent types were M1 15 (12.9%), M5 14 (12.1%), M0 10 (8.6%), M6 9 (7.8%), and M7 6 (5.2%).

The mean hemoglobin of AML patients was 8.1 + 2.8 g /dl with most of them 95 (81.9) having anemia (less than 10g/dl). Mean total leukocyte count was 52.3 x10 9/L and leukocytosis was found in 52.6 and leukopenia in 17.2. The mean platelet count was markedly reduced (55.7 ± 16.3 ×10^3/µL), and thrombocytopenia was highly prevalent, affecting 102 (87.9%) of patients. Regarding blast cells, nearly one-third 37 (31.9%) had blast counts in the range of 81–100%, while 30 (25.9%) had 61–80%, 27 (23.3%) had 41–60%, and 22 (19.0%) had 21–40% (table -1).

Comparison of hematological parameters between males and females showed no statistically significant differences. The mean hemoglobin level among males (n=68) was 8.2 ± 1.9 g/dl and among females (n=48) was 7.8 ± 1.6 g/dl which was not statistically significant (p=0.057). There was anemia in 55 (80.9) males and 40 (83.3) females (p= 0.74). It was found that leukocytosis and leukopenia were found in 34 (50.0%) and 27 (56.3) males and females (p=0.52 and p=0.72). Thrombocytopenia was noted in 60 (88.2%) males and 42 (87.5%) females (p=0.91). Similarly, blast cells >60% were found in 40 (58.8%) males and 27 (56.3%) females (p=0.78). No statistically significant gender differences were observed in any hematological parameter (table -2).

In age-based comparison, patients aged ≤40 years (n=47) had a mean hemoglobin level of 8.3 ± 0.5 g/dl, while those aged >40 years (n=69) had 7.7 ± 2.0 g/dl, showing a statistically significant difference (p=0.049), indicating lower hemoglobin levels in older patients. Anemia was observed in 37 (78.7%) of the younger group and 58 (84.1%) of the older group (p=0.45). Leukocytosis was present in 25 (53.2%) patients aged ≤40 years and 36 (52.2%) aged >40 years (p=0.91), while leukopenia occurred in 9 (19.1%) younger and 11 (15.9%) older patients (p=0.65). Thrombocytopenia was common in both age groups, 42 (89.4%) in ≤40 years and 60 (87.0%) in >40 years (p=0.72). Similarly, blast cells >60% were found in 28 (59.6%) of the younger and 39 (56.5%) of the older patients (p=0.74). Except for hemoglobin levels, no significant age-related differences were observed in other hematological parameters (table -3).

Across different AML subtypes, the mean hemoglobin level was 8.2 ± 1.5 g/dl in M0–M2, 7.9

± 1.8 g/dl in M3–M5, and 7.6 ± 1.3 g/dl in M6–M7, showing a statistically significant difference (p=0.045), with lower hemoglobin levels in the M6–M7 group. Anemia was present in 41 (83.7%) of M0–M2, 42 (80.8%) of M3–M5, and 12 (80.0%) of M6–M7 cases (p=0.89). Leukocytosis was observed in 26 (53.1%), 27 (51.9%), and 8 (53.3%) of these subgroups respectively (p=0.99), while leukopenia occurred in 8 (16.3%), 9 (17.3%), and 3 (20.0%) (p=0.91). Thrombocytopenia was highly prevalent across all subtypes, 44 (89.8%) in M0–M2, 45 (86.5%) in M3–M5, and 13 (86.7%) in M6–M7 (p=0.85). Similarly, blast cells >60% were noted in 30 (61.2%), 29 (55.8%), and 8 (53.3%) respectively (p=0.79). Except for hemoglobin, no significant differences were found in other hematological parameters among AML subtypes (table -4).

DISCUSSION

This study has compared the hematology parameters of AML patients reported to the Pathology Department of Hayatabad Medical Complex, Peshawar. The results indicated that anemia, thrombocytopenia, leukocytosis, leukopenia and high percentages of blast cells were prevalent in the cohort.

The most notable hematological derangements in the patients of AML were anemia and thrombocytopenia. Eighty-one point nine percent of the cases had anemia with a mean hemoglobin of 8.1 g/dL, which is equal to international outcomes as anemia is documented in more than 95% of the patients with an average hemoglobin value of approximately 7.5 g/dL. [15] Thrombocytopenia was also more common, 87.9% of the patients had a significantly low mean platelet of 55.7 × 10'L, which was in line with the literature who had frequencies of up to 95%. [16] These anomalies are characteristic traits of AML and have a great clinical implication. The chronic anemia indicates widespread bone marrow failure and the severe thrombocytopenia is closely correlated with bleeding complications and worse outcomes, especially in case of the delay of platelets recovery after chemotherapy. [17] All these findings in combination highlight the need to ensure close caution in monitoring, supportive transfusion, and early intervention to reduce morbidity and enhance survival in AML patients.

Abnormalities in leukocytes were also noticeable in the course of this study. Fifty-two point six percent of patients had leukocytosis and 17.2 percent leukopenia. Such results are consistent with the previous reports that further indicate that AML can occur either with or without leukocytosis or leukopenia with respect to the disease stage and subtype. According to Díaz (2024) [18] leukocytosis (or hyperleukocytosis) is presented in up to 20 percent of cases and is linked with severe complications, including leukostasis. In the same vein, Cicconi et al. (2024) [19] reported high leukocytosis rates in the induction therapy, particularly in acute promyelocytic leukemia (APL). Conversely, leukopenia indicates the suppression of marrow and has been more prevalent in AML than in acute lymphoblastic leukemia. [20] Our study distribution represents the heterogeneous biology of AML and it claims the importance of individualized supportive care by the presenting leukocyte profile.

In the case of blast cells, almost 1/3 of our patients contained blast counts over 80, and over 50 contained blast counts over 60. This observation agrees with the past research where hyperleukocytosis and high percentages of blast were often seen. [20] The genetic and molecular abnormalities that have been identified as the cause of the accumulation of blasts include mutations in the DNMT3A, TET2, and FLT3 that disrupt hematopoietic differentiation and facilitate clonal proliferation. [21,22] Moreover, anti-apoptotic processes, such as the overexpression of Bcl-xL are another aspect that leads to persistence of blasts. [23] Our data are in line with these pathophysiology processes because most of our patients had blast percentages way much higher than the diagnostic threshold of 20%.

There were no statistically significant differences when the hematological parameters were stratified based on gender. This is contrary to the reports that males can have higher hemoglobin levels and more adverse cytogenetic abnormalities than females. [24,25]

The stratification of ages showed that the mean hemoglobin level in younger patients (less than 40 years) was much higher in comparison to the older patients, but there was no significant difference in the prevalence of cytopenias and high blast counts. It is somewhat in line with the results of Untama et al. (2024) and Fareed et al. (2025) who have found younger AML patients to have a better clinical outcome and a more positive hematological profile. [26,27] We can propose that the severity of anemia is partly age-related, but other

hematological abnormalities exist in all age groups, which means that the heterogeneity of hematological profiles cannot be explained by only age.

The elevated reduction in hemoglobin levels of older AML patients in the current study is potentially explained by the effects of age on bone marrow reserve and hematopoietic stem cell (HSC) functions. Old age is implicated in the depletion of senescent HSCs, telomere shortening, and DNA damage, which all lead to hematopoiesis deficiency, and thus anemia among the elderly. Also, age-related inflammation of the bone marrow microenvironment enhances clonal heterogeneity and decreases regenerative potential. The modifications of the proteostasis pathways, including the activation of Hsf1, could contribute to the maintenance of HSC survival and, at the same time, increase the threat of clonal hematopoiesis and leukemogenesis. [28] Although males were reported to have higher incidences of AML, our research did not find any major difference in hematological parameters based on gender which could be due to sex-biased gene-regulatory networks and epigenetic alterations that could control disease susceptibility and progression. Genetic differences, such as those associated with myelodysplasia with cytogenetic abnormalities seem more common in males, but they may not be apparent in peripheral blood counts. Moreover, hormonal contributions to the process of aging and leukemogenesis in HSC are still not clearly defined, but may be modulatory. [29] Together, these results imply that in spite of the negative impact of aging on hematopoiesis and hemoglobin production, the data can be adjusted through hormonal and genetic factors to encourage sex differences in AML hematological patterns.

AML subtypes analysis revealed that the mean hemoglobin levels varied significantly with the highest levels being recorded in M0 M2 patients as compared to the other subtypes. But, there was no significant difference as far as leukocyte and platelet abnormalities and the percentage of blast cells were concerned among subgroups. It is shown by previous literature that subtypes, like FAB-M2 M3, frequently show different hematological characteristics. [19] In our study, there were no clear differences on the subtype basis, which might be due to sample size distribution, whereby it had fewer cases in the M67 groups with less statistical power.

Study Limitations and Future Implications

The limitation of this study is its cross-sectional design and single center samples of Peshawar that can restrain the application of the particular hematological parameter frequencies to the overall population or other areas and the absence of correlation with clinical outcomes and genetics. The proposed directions to future studies are to conduct multi-center, prospective research involving larger cohorts to confirm these differences in the local jurisdiction, using both molecular and cytogenetic studies to determine the biological basis of the observed differences in hematologic parameters, and determining the prognostic value of these parameters in the local setting. The consequences of the findings are that they would offer critical baseline local data on AML hematological profiles to the clinicians at Peshawar, therefore, improving timely and population-specific identification of the disease to inform supportive care approaches (particularly with regards to common anemia and thrombocytopenia), and eventually, foster superior and localized clinical decision-making and patient management.

CONCLUSION

This study concluded that anemia and thrombocytopenia are the most prevalent hematological abnormalities among AML patients in our setting, followed by leukocytosis and elevated blast cell percentages, reflecting the profound bone marrow failure characteristic of the disease. While no significant gender-based differences were observed, older patients demonstrated significantly lower hemoglobin levels, suggesting age-related hematopoietic decline. Similarly, variation in hemoglobin levels among AML subtypes indicates underlying biological heterogeneity, though other hematological parameters remained largely comparable across subgroups. These findings emphasize the diagnostic and clinical relevance of routine hematological evaluation in AML, as early recognition of characteristic patterns—particularly anemia, thrombocytopenia, and elevated blasts, can aid in prompt diagnosis, risk assessment, and treatment planning. The study provides valuable baseline data for clinicians in Peshawar, supporting

more accurate local diagnostic interpretation and management of AML patients. Future large-scale, multicenter studies incorporating molecular and cytogenetic analyses are recommended to further elucidate the biological and prognostic significance of these hematological variations.

Contribution

F: Manuscript writing, data collection and responsible for research integrity
HR: Concept and design of study

Conflict of interest: Nothing to declare
Funding disclosure: Nothing to declare

REFERENCES

Medeiros BC, Chan SM, Daver NG, Jonas BA, Pollyea DA. Optimizing survival outcomes with post-remission therapy in acute myeloid leukemia. *Am J Hematol.* 2019;94(7):803–11. doi:10.1002/ajh.25484

Bain BJ, Béné MC. Morphological and immunophenotypic clues to the WHO categories of acute myeloid leukaemia. *Acta Haematol.* 2019;141(4):232–44. doi:10.1159/000496097

Boddu PC, Zeidan AM. Myeloid disorders after autoimmune disease. *Best Pract Res Clin Haematol.* 2019;32(1):74–88. doi:10.1016/j.beha.2019.02.002

Hartmann L, Metzeler KH. Clonal hematopoiesis and preleukemia: genetics, biology, and clinical implications. *Genes Chromosomes Cancer.* 2019;58(12):828–38. doi:10.1002/gcc.22756

Liu XJ, Huang XJ, Xu LP, Liu KY, Zhang XH, Yan CH, et al. Effects of pre-transplant course on prognosis of allogeneic hematopoietic stem cell transplantation in patients with acute myeloid leukemia. *Zhonghua Xue Ye Xue Za Zhi.* 2019;40(3):182–6. doi:10.3760/cma.j.issn.0253-2727.2019.03.003

Schmid C, Labopin M, Schaap N, Veelken H, Schleuning M, Stadler M, et al.; EBMT Acute Leukaemia Working Party. Prophylactic donor lymphocyte infusion after allogeneic stem cell transplantation in acute leukaemia: a matched pair analysis by the Acute Leukaemia Working Party of EBMT. *Br J Haematol.* 2019;184(5):782–7. doi:10.1111/bjh.15691

Promsuwicha O, Owattanapanich W, Kankhaw S, Ruchutrakool T, Kungwankiattichai S. Can flow cytometry immunophenotyping predict cytogenetic abnormalities in acute myeloid leukemia? A focus on myelodysplasia-related cytogenetic abnormalities. *Int J Lab Hematol.* 2025 Aug 26. doi:10.1111/ijlh.14546

Maktoof SA, Al-Ammar NS, Al-Kashwan TA, Jumaa AK, Bader P, Kreyenberg H. The expressions of myeloid differentiation and non-lineage specific differentiation antigens among FAB subtypes of acute myeloid leukemia in Iraqi patients. *Rom Med J.* 2024;71(4). doi:10.37897/RMJ.2024.4.2

Maqbool S, Maqbool I, Yousaf M, Farooqi B, Sikandar MZ, Zainab R, et al. Characterization of acute myeloid leukemia with RUNX1/RUNX1T1 gene rearrangement: clinical, hematological, and morphological features. *Cureus.* 2024 Nov 29;16(11). doi:10.7759/cureus.74760

Çınar OE, Malkan ÜY, Aladağ E, Demiroğlu H, Büyükaşık Y, Göker H, et al. Anemia in patients with acute myeloid leukemia revisited: prognostic importance of anemia on treatment-naïve patients. *Acta Medica.* 2025 Jun 20;56(2):116–21. https://orcid.org/0000-0003-1226-5797

Stefaniuk P, Muzyka-Kasietczuk J, Koczkodaj D, Hus M, Podhorecka M. Reading between the lines: complete blood count-derived parameters as prognostic factors in patients with newly diagnosed acute myeloid leukemia. *Clin Med Insights Oncol.* 2025 Mar;19:11795549251321360.

Li WB, Yang L, Cheng SJ, Chen Y, Jiang Y. Clinical and laboratory characteristics of acute myeloid leukemia, myelodysplasia-related. *Zhongguo Shi Yan Xue Ye Xue Za Zhi.* 2025 Jun;33(3):666–71. doi:10.19746/j.cnki.issn.1009-2137.2025.03.007

Dong XY, Li YL, Jiang L, Wu CY, Shang BJ, Zhang L, et al. Correlation between myeloperoxidase expression and gene alterations and prognosis in acute myeloid leukemia. *Zhonghua Xue Ye Xue Za Zhi.* 2019;40(1):40–5. doi:10.3760/cma.j.issn.0253-2727.2019.01.008

Munir AH, Khan MI. Pattern of basic hematological parameters in acute and chronic leukemias. *J Med Sci.* 2019;27(2):125–9.

Chang F, Shamsi TS, Waryah AM. Clinical and hematological profile of acute myeloid leukemia (AML) patients of Sindh. *J Hematol Thrombo Dis.* 2016;4(2):239.

Abdulgayoom M, Shawayli H, Soliman DS, Abdalla E, Mudawi D, Abbas F, et al. Serious bleeding manifestations in patients with newly diagnosed acute myeloid leukemia: a single center experience. *Blood.* 2024 Nov 5;144:5976. doi:10.1182/blood-2024-205585

Parekh D, Batayneh O, Bassir A, Olojakpoke E, Sandhu M, Zerdan MB, et al. A retrospective study to determine if early platelet recovery correlates with improved prognosis in acute myeloid leukemia. *Blood.* 2024 Nov 5;144:6092. doi:10.1182/blood-2024-201028

Diaz MA. Clinical challenges and management of hyperleukocytosis and leukostasis in hematologic cancers.

Cicconi L, Bisegna M, Gurnari C, Fanciullo D, Piciocchi A, Marsili G, et al. Leucocytosis during induction therapy with all-trans-retinoic acid and arsenic trioxide in acute promyelocytic leukaemia predicts differentiation syndrome and treatment-related complications. *Br J Haematol.* 2024 Nov;205(5):1727–33. doi:10.1111/bjh.19759

Chen W, Wang H, Hu J. Incidence of myelosuppression in AML is higher compared with that in ALL. *Mol Clin Oncol.* 2024 Oct 18;21(6):95.

Rahman M, Ahmed M, Hasan MK. Hyperleucocytosis and leucostasis in acute myeloid leukaemia: a challenging clinical situation. *Haematol J Bangladesh.* 2024 Feb 20;8(1):39–46. doi:10.37545/haematoljbd2024127

Koko T, Pietka G, Howell L, McCormick A, Thornton T, Garimberti E, et al. Bone marrow failure in AML: residual neutrophils and erythroblasts are derived by differentiation from the AML. *Blood.* 2024 Nov 5;144:1535. doi:10.1182/blood-2024-205536

Lyu G, Lyu W. Complete elimination of hyperleukocytosis risk in AML through early high-quality disease remission. *Front Oncol.* 2024 Jun 13;14:1412583. doi:10.3389/fonc.2024.1412583

Puspitasari F, Notopuro PB. Association of Bcl-xL expression with blast count, CD34 and CD7 expression in adult acute myeloid leukemia patients. *Pharmacogn J.* 2024;16(2). doi:10.5530/pj.2024.16.73

Li Z, Yu L, Hu LJ, Zhao T, Duan W, Wang J, et al. Sex differences in disease characteristics and outcome in adults with acute myeloid leukemia from China. *Blood.* 2024 Nov 5;144:6121. doi:10.1182/blood-2024-211874

Untama JL, David L, Salas I, Navarro-Cabrera JR. Outcomes of 418 newly diagnosed AML patients since 2017 to 2023 in a single institution of Perú: real-world data. *Blood.* 2024 Nov 5;144:7916. doi:10.1182/blood-2024-212214

Fareed S, Al-Mashdali AF, Shwaylia H, Mulikandathil Y, Alshurafa A, Aldali S, et al. Clinical characteristics and treatment outcomes of acute myeloid leukemia in adolescent and young adult versus adult patients: a single-center experience in Qatar. *Clin Hematol Int.* 2025 Jun 23;7(2):55. doi:10.46989/001c.140933

Zhou FJ, Wang HC, Le MK, Yang W, Sunshine MJ, Magee JA, Signer R. Age-related changes in hematopoietic stem cell proteostasis promote the emergence of clonal hematopoiesis and leukemia in older adults. *Blood.* 2024 Nov 5;144:4047. doi:10.1182/blood-2024-202652

Zhang C, Hao T, Bortoluzzi A, Chen MH, Wu X, Wang J, et al. Sex-dependent differences in hematopoietic stem cell aging and leukemogenic potential. *Oncogene.* 2025 Jan 29;44(2):64–78. doi:10.1038/s41388-024-03197-9