

Access this article online

Quick Response Code:



Website:

www.ijhonline.org

DOI:

10.4103/ijh.ijh_55_22

Presentations of acute leukemia among patients at National Health Laboratory, Asmara, Eritrea: A descriptive cross-sectional study

Amin AtaAlmannan Alamin

Abstract:

BACKGROUND: Acute leukemias are a group of potentially fatal hematological malignancies. The purpose of this study was to evaluate the clinical presentation of acute leukemia and estimate the frequency of its signs and symptoms in Asmara, Eritrea.

PATIENTS AND METHODS: A retrospective cross-sectional study was conducted consecutively included all of the patients with the diagnosis of acute leukemia at the National Health Laboratory, Asmara, Eritrea, from December 2015 to July 2017. The laboratory and medical data of the patients were obtained using a structured questionnaire based on age, gender, presenting complaints, and clinical findings.

RESULTS: Twenty cases who were reviewed acute lymphoblastic leukemia constituted (60%), while acute myeloid leukemia (AML) accounted for 40% of the cases studied. The female patients were more than males (55% vs. 45%). Acute leukemia mainly affected those aged 1–10 years (45%), while the least affected were those aged over 40 years (5%). Acute lymphoid leukemia mainly affects those aged 1–10 years (58.3%), while those aged 20–30 years and over 40 years are unaffected (0%). AML mainly affects those aged 1–10 years and 21–40 years (25%), while those aged 11–20 years and over 40 years being the least affected (12.5%). The most familiar presenting complaint for acute leukemia was fever (70%), followed by fatigue (40%). Splenomegaly (70%), hepatomegaly (40%), and lymphadenopathy (40%) were the most typical physical examination findings.

CONCLUSIONS: Acute lymphoblastic leukemia is the most typical kind of acute leukemia affecting the people of Asmara, Eritrea. The young population suffers the most, and fever, fatigue, and pallor are the primary presenting complaints. Splenomegaly, hepatomegaly, and lymphadenopathy are the main physical examination findings among patients with acute leukemia.

Keywords:

Acute leukemia, clinical presentation, criteria

Department of Pathology,
College of Medicine,
Taif University, Taif,
Saudi Arabia

Address for correspondence:

Dr. Amin AtaAlmannan
Alamin,

Department of Pathology,
College of Medicine,
Taif University, P.O.
Box 11099, Taif 21944,
Saudi Arabia.
E-mail: amakki@tu.edu.sa

Submission: 10-12-2022

Revised: 08-01-2023

Accepted: 12-01-2023

Published: 31-03-2023

Introduction

Cancer is a group of disorders with uncontrolled cell growth and differentiation.^[1] Eritrea is among the sub-Saharan African developing states with a high annual incidence of cancers,

20.3/100,000, according to National Health Laboratory and hospital data.^[2]

Leukemia accounted for approximately 3.4% of all new cancer cases and 3.8% of all cancer-related deaths worldwide in 2020.^[3] Leukemia incidence has not changed significantly globally, but there are variations in certain regions due to factors such as ethnicity, environmental conditions, and lifestyle.^[4-6] Belai *et al.* found that acute

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Alamin AA. Presentations of acute leukemia among patients at National Health Laboratory, Asmara, Eritrea: A descriptive cross-sectional study. *Iraqi J Hematol* 2023;12:33-7.

leukemia was the most common type of hematologic cancer in the Eritrean National Health Laboratory, accounting for 34.6% of cases.^[7]

Leukemia is a blood cancer that primarily affects the bone marrow, mainly responsible for blood cell production. Furthermore, leukemia classification depends on the onset and the type of hematopoietic stem cell affected. Acute leukemia includes acute lymphocytic leukemia (ALL) and acute myeloid leukemia (AML). The most frequent hematological malignancy was acute leukemia,^[8] which has a rapid onset and causes acute clinical features in people suffering from the disease. Thus, ALL is a common malignant disease in children and young adults, linked to hepatosplenomegaly, hyperleukocytosis, fatigue, frequent infections, pain, and easy bruising.^[9]

Acute lymphocytic leukemia affects lymphoid hematopoietic stem cells. The causes of ALL are unclear, but it is linked to exposure to radiation, chemicals, smoking, and infections.^[10]

AML is a malignant disease with rapid progress affecting hematopoietic stem cells, resulting in the accumulation of poorly differentiated myeloid cells in the bone marrow. Moreover, AML is the most common that affects adults, with a high incidence among one age group.^[11,12] People suffering from AML exhibit multiple clinical features as the disease affects all blood cells. These symptoms include paleness, shortness of breath, easy fatigability, bleeding resulting from easy bruising, and a high risk of infection.^[13]

The fatality rate of this disease is high if prompt treatment is not initiated at an early stage. Effective treatment of acute leukemia depends on proper clarification. AML can be classified using two central systems: the French–American–British and the WHO classifications.^[14]

The pathogenesis of AML involves the abnormal proliferation and differentiation of myeloid stem cells in the bone marrow, chromosomal rearrangements, and molecular changes.^[15] Diagnostic tests of acute leukemia include immunophenotyping and complete blood count, which indicate thrombocytopenia, anemia, leukocytosis, and macrocytosis.^[16] Moreover, peripheral blood smears show the presence of Auer rods and blood film with blasts. Bone marrow biopsy or aspiration results indicate the presence of more than 20% of blast cells in the bone marrow cells. At the same time, a chest X-ray may show cardiomegaly and pulmonary infiltration. The management of acute leukemia includes chemotherapy to kill the malignant cells, which may include stem cell transplants.^[17]

The aim of this study was to evaluate the clinical presentation of acute leukemia and estimate the frequency of its signs and symptoms in Asmara, Eritrea.

Patients and Methods

A descriptive retrospective cross-sectional was conducted to study the presenting features and laboratory data among acute leukemia patients diagnosed at the National Health Laboratory in Asmara, Eritrea, from December 2015 to July 2017. The study consecutively included all cases who confirmed with diagnosis of acute leukemia during that period. The study data were collected from the patients' medical records using a questionnaire structured by the author. The study was approved by the review ethical committee of National Health Laboratory in Asmara, Eritrea, and being retrospective nature of the study so no written consent needed.

The diagnosis of acute leukemia was depended on complete blood count, peripheral blood film, and bone marrow examination using basic and special stains such as Sudan Black B and periodic acid–Schiff stain. Furthermore, specific study case data were obtained based on age, gender, presenting complaints, physical examination findings, and type of acute leukemia.

All the data collected were edited, coded, and analyzed using the Statistical Package for the Sciences version 12.01 (SPSS, The Statistical Package for Social Science, Chicago, Illinois, United States). Furthermore, the study findings were expressed using frequency and distribution tables.

Results

Out of 204 cases, 20 (9.8%) were confirmed with the diagnosis of acute leukemia.

Of the cases reviewed, 60% suffered from ALL, while the remaining 40% were battling AML. In this study, female patients made up 55% of the cancer center's patient population, and the majority of female patients were suffering from acute lymphoblastic leukemia, which accounts for 63.64% of all acute leukemias that affect females. In general, females are more likely to suffer from acute leukemia than males. Among male patients, 44.44% were suffering from AML and 55.56% were suffering from ALL. Among female patients, 36.36% were suffering from AML. More details are shown in Table 1.

Most of the patients suffering from acute leukemia were aged 1–10 years (45%), followed by those aged 11–20 years (25%). The age group of 21–30 years represented 10% of cases, while that of 31–40 years accounted for 15% of cases. Acute leukemia affected patients aged over 40 years the least (5%).

Most of the patients suffering from AML were aged 1–10 years and 21–40 years (25%), while those aged 11–20 years and over 40 years being the least affected (12.5%). While in ALL mainly affects those aged 1–10 years (58.3%), while those aged 20–30 years and over 40 years are unaffected (0%). More details are shown in Table 1.

Most of the patients who suffered from both acute leukemias presented with fever (70%), followed by fatigue (40%), pallor (35%), and bleeding (25%). More details are shown in Table 2.

The most common clinical finding in AML cases was hepatomegaly (87.5%), followed by splenomegaly (37.5%), and none of them had lymphadenopathy. The most common finding among ALL patients was splenomegaly (91.7%), followed by lymphadenopathy (66.7%). No organomegaly was recorded in 3 cases (25%). The last physical examination finding among the ALL cases studied was hepatomegaly, with 1 case (8.3%). More details are shown in Table 2.

Discussion

Eritrea is among the developing economies in East

Table 1: Sociodemographic characteristics of the patients

Social character	AML, n (%)	ALL, n (%)	Total, n (%)
Gender			
Male	4 (50)	5 (38.5)	9 (45)
Female	4 (50)	7 (61.5)	11 (55)
Age (years)			
1-10	2	7	9 (45)
11-20	1	4	5 (25)
21-30	2	0	2 (10)
31-40	2	1	3 (15)
>40	1	0	1 (5)
Total	8	12	20 (100)

AML=Acute myeloid leukemia, ALL=Acute lymphocytic leukemia

Table 2: Clinical characteristics of the patients

	AML	ALL	Total (%)
Fever	6	8	14 (70)
Pallor	3	4	7 (35)
Bleeding diathesis	1	4	5 (25)
Joint pain	2	1	3 (15)
Abdominal pain/distention	1	1	2 (10)
Shortness of breath	1	3	4 (20)
Weight loss	1	1	2 (10)
GBW/fatigue	4	4	8 (40)
Headache	3	0	3 (15)
Splenomegaly	3	11	14 (70)
Hepatomegaly	7	1	8 (40)
Lymphadenopathy	0	8	8 (40)
Absence of organomegaly	1	3	4 (20)

GBW=Generalized body weakness, AML=Acute myeloid leukemia, ALL=Acute lymphocytic leukemia

Africa. The most preferred laboratory institution is the National Health Laboratory, located in Asmara, the capital city. The National Health Laboratory's structure is based on a three-level system of regional, national, and peripheral hospital laboratories, functioning as the country's referral and research facility for hematological malignancies.^[7]

The study described the incidence trends regarding age, gender, clinical findings, and presenting complaints among acute leukemia patients. The study findings indicate that overall, the majority of 20 recorded acute leukemia cases are of ALL, which accounts for 60%, while AML represents 40% of cases. However, a study conducted by Kasili indicated that 67% of the acute leukemia cases were of the AML type, while 31.8% accounted for ALL.^[18]

The age of the patients being studied was a significant factor in the research. The types of leukemia, AML, and ALL affect different age groups differently. According to this study's findings, the majority of the patients battling acute leukemia were those aged 1–10 years, representing 45% of cases, followed by the 11–20 years age group. A study in Kenya showed that younger populations were the most likely to have acute leukemia.^[19] Other adolescent studies have shown that AML is more common than ALL cases.^[11,12] According to the study findings, more women suffer from ALL (63.64%) compared to those battling AML (36.36%). This is consistent with other studies.^[20,21]

The primary presenting complaint from patients suffering from acute leukemia was fever (70%). Likewise, several studies indicated that fever was the most common presenting complaint among patients battling acute leukemia.^[22-25] Regarding the presence of bleeding as a clinical complaint, the study findings indicate that 20% of the acute leukemia cases reported this, which is consistent with Ratnamala *et al.* findings.^[22]

Anemia leads to presentations of fatigue, shortness of breath, and pallor. In this study, fatigue represents 40% of all acute leukemia cases, shortness of breath accounts for 20%, while pallor represents 35%. Similarly, studies indicated the same presentations among patients.^[26-29]

Patients suffering from acute leukemia exhibit physical signs. According to the study, splenomegaly is the most common physical examination finding, accounting for 70% of cases, followed by hepatomegaly and lymphadenopathy, each at 40%.^[29]

However, Shoket *et al.* found that lymphadenopathy and splenomegaly are the most common physical examination findings in both ALL and AML.^[28] Splenomegaly results

from the increased rate of destruction of immature blood cells produced by the hematopoietic stem cells in the bone marrow. As immature blood cells have a shorter life span than mature blood cells, most of them are transported to the spleen for destruction. Moreover, hepatomegaly is the liver's enlargement to accommodate the immature and abnormal proliferated cells. Likewise, studies have indicated that splenomegaly is in a higher proportion of patients suffering from AML compared to those with ALL.^[28]

Despite cancer's etiology being idiopathic, genetic mutation, viruses, and familial history have been linked to the high rates of acute leukemia among younger populations,^[30] with high prevalence rates of successful treatment among patients with ALL in Finland and Sweden given proper adherence to pediatric protocols. On the other hand, the age groups 21–30 years and 31–40 years accounted for 10% and 15% of the cases studied, respectively. Likewise, as in another study,^[31] those aged over 40 had a minor proportion of 5% of all the cases studied. Therefore, the burden of acute leukemia still affected the younger population, which might grow into a threat and even a global health concern. Compared to other cancers, global leukemia cases rose quickly from 1998 to 2018, creating a more significant global health concern.^[32]

This study regarded one of a few studies conducted in Eritrea; however, the main limitation of it was attributed to its short period with a small sampling size.

Conclusions

We found that ALL was more than AML. In addition, similar to other studies, we demonstrated that ALL is more common in children. Furthermore, AML affected both sexes equally with slightly higher rate of ALL among females. Fever was found to be the most prominent presenting feature, and splenomegaly was the most common clinical finding.

Financial support and sponsorship
Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Adwas AA, Elkhoely AA, Kabel AM, Abdel-Rahman MN, Eissa AA. Anti-cancer and cardioprotective effects of indol-3-carbinol in doxorubicin-treated mice. *J Infect Chemother* 2016;22:36-43.
- Adom H, Tesfamichael D, Weldu H, Hailemichael M, Eman D, Mehari T, *et al.* Trends in the incidence of cancer in Eritrean hospitals and Eritrean National Health Laboratory 2000-2010. *Pharmaceutical and Biosciences Journal*. 2016;4:47-55.: doi.org/10.20510/ukjpb/4/i5/118035.
- Lin X, Wang J, Huang X, Wang H, Li F, Ye W, *et al.* Global, regional, and national burdens of leukemia from 1990 to 2017: A systematic analysis of the global burden of disease 2017 study. *Aging (Albany NY)* 2021;13:10468-89.
- Ghazawi FM, Le M, Cyr J, Netchiporouk E, Rahme E, Alakel A, *et al.* Analysis of acute myeloid leukemia incidence and geographic distribution in Canada from 1992 to 2010 reveals disease clusters in Sarnia and other industrial US border cities in Ontario. *Cancer* 2019;125:1886-97.
- Snodgrass R, Nguyen LT, Guo M, Vaska M, Naugler C, Rashid-Kolvear F. Incidence of acute lymphocytic leukemia in Calgary, Alberta, Canada: a retrospective cohort study. *BMC Res Notes* 2018 ;11:104. <https://doi.org/10.1186/s13104-018-3225-9>.
- Mohr SB, Garland CF, Gorham ED, Grant WB, Garland FC. Ultraviolet B and incidence rates of leukemia worldwide. *Am J Prev Med* 2011;41:68-74.
- Belai N, Ghebrenegus AS, Alamin AA, Alamin AA, Embaye G, Andegiorgish AK. Patterns of bone marrow aspiration confirmed hematological malignancies in Eritrean National Health Laboratory. *BMC Hematol* 2019;19:8.
- Alamin AA. Bone marrow aspiration: The Indications and the diagnostic value. *Cyprus J Med Sci* 2021;6:112-6.
- Dowd AA, Salah OM. Pattern and Age Distribution of Leukemia in Sudan-Retrospective Analysis. *Clin Oncol*. 2020;5:1679.
- Vlaanderen J, Portengen L, Rothman N, Lan Q, Kromhout H, Vermeulen R. Flexible meta-regression to assess the shape of the benzene-leukemia exposure-response curve. *Environ Health Perspect* 2010;118:526-32.
- De Kouchkovsky I, Abdul-Hay M. 'Acute myeloid leukemia: A comprehensive review and 2016 update'. *Blood Cancer J* 2016;6:e441.
- Rodriguez-Abreu D, Bordoni A, Zucca E. Epidemiology of hematological malignancies. *Ann Oncol* 2007;18 Suppl 1:i3-8.
- Estey EH. Acute myeloid leukemia: 2012 update on diagnosis, risk stratification, and management. *Am J Hematol* 2012;87:89-99.
- Bennett JM, Catovsky D, Daniel MT, Flandrin G, Galton DA, Gralnick HR, *et al.* Proposals for the classification of the acute leukaemias. French-American-British (FAB) co-operative group. *Br J Haematol* 1976;33:451-8.
- Tallarico M, Odenike O. Secondary acute myeloid leukemias arising from Philadelphia chromosome negative myeloproliferative neoplasms: Pathogenesis, risk factors, and therapeutic strategies. *Curr Hematol Malig Rep* 2015;10:112-7.
- Nickels EM, Soodalter J, Churpek JE, Godley LA. Recognizing familial myeloid leukemia in adults. *Ther Adv Hematol* 2013;4:254-69.
- Master S, Koshy N, Mansour R, Shi R. Effect of stem cell transplant on survival in adult patients with acute lymphoblastic leukemia: NCDB analysis. *Anticancer Res* 2019;39:1899-906.
- Kasili EG. Leukaemia and lymphoma in Kenya. *Leuk Res* 1985;9:747-52.
- Stock W, La M, Sanford B, Bloomfield CD, Vardiman JW, Gaynon P, *et al.* What determines the outcomes for adolescents and young adults with acute lymphoblastic leukemia treated on cooperative group protocols? A comparison of children's cancer group and cancer and leukemia group B studies. *Blood* 2008;112:1646-54.
- Saeed IE, Weng HY, Mohamed KH, Mohammed SI. Cancer incidence in Khartoum, Sudan: First results from the cancer registry, 2009-2010. *Cancer Med* 2014;3:1075-84.
- Ferlay J, Soerjomataram I, Dikshit R, Sultan Eser, Colin Mathers, Marise Rebelo, *et al.* Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *Int J Cancer*. 2015;136:E359-86. doi:10.1002/ijc.29210.
- Ratnamala C, Sreevalli A, Balakrishnan CH, Ross CR. Clinical

- and laboratory profile of acute leukemia with special reference to flow cytometry. *Med Innovatica* 2017;6:12-9.
23. Shahab F, Raziq F. Clinical presentations of acute leukemia. *J Coll Physicians Surg Pak* 2014;24:472-6.
 24. Perveen R, Yasmeen N, Hassan K. Prognostic factors of acute lymphoblastic leukemia in children. *Ann Pak Inst Med Sci* 2010;6:24-7.
 25. Kakepoto GN, Burney IA, Zaki S, Adil SN, Khurshid M. Long-term outcomes of acute myeloid leukemia in adults in Pakistan. *J Pak Med Assoc* 2002;52:482-6.
 26. Azaad M, Li Y, Zhang Q, Wang H. Detection of Pancytopenia Associated with Clinical Manifestation and Their Final Diagnosis. *Open Journal of Blood Diseases*, 2015;5:17-30. doi: 10.4236/ojbd.2015.53004.
 27. Alamin AA, Berhe A, Raja SM, Embaye G. Pancytopenia: A clinico-hematological cross-sectional study in Asmara, Eritrea. *Eur J Biomed Pharm Sci* 2018;5:41-8.
 28. Shoket N, Muzamil J, Zargar TB, Wani B, Toka V, Bhat JR, *et al.* Clinical profile of acute myeloid leukemia in North India and utility of nontransplant measures in its management. *Indian J Med Paediatr Oncol* 2019;40:S44-53. doi: 10.4103/ijmpo.ijmpo_175_17.
 29. Shamebo M. Acute leukaemias in adult Ethiopians in a teaching hospital. *Ethiop Med J* 1994;32:17-25.
 30. Usvasalo A, Rätty R, Knuutila S, Vettenranta K, Harila-Saari A, Jantunen E, *et al.* Acute lymphoblastic leukemia in adolescents and young adults in Finland. *Haematologica* 2008;93:1161-8.
 31. Gunz FW, Hough RF. Acute leukemia over the age of fifty: A study of its incidence and natural history. *Blood* 1956;11:882-901.
 32. Hao T, Li-Talley M, Buck A, Chen W. An emerging trend of rapid increase of leukemia but not all cancers in the aging population in the United States. *Sci Rep* 2019;9:12070.