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Research Article

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Diagnostic Pattern of Adult Acute Leukemia in Benghazi Medical Center/ Libya

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Abstract

Objective: *To study the demographic characters and diagnostic tools of acute leukemia among adults in Benghazi/ Libya. Patients and Method: A retrospective cross sectional analysis of 54 cases of AML and ALL was conducted at hematology department at Benghazi medical center (BMC) from January 2013 to December 2014. Demographic data, Complete Blood Picture (CBC), Peripheral Blood Film (PBF), Bone Marrow Aspiration (BMA), immunophenotyping as well as cytogenetic if applicable were evaluated.*

Result: *Forty-two (77.8%) were diagnosed as AML and twelve (22.2%) as ALL. The median age for diagnosis of AML was 43 years. with male to female ratio 1.3:1 while for ALL the median age was 20 years, and male to female ratio was 2:1. Anemia was noted in (90.5%) and (100%) for AML and ALL, respectively. Thrombocytopenia was detected in (83%) for both types. Almost half of AML patients (47%) and (41%) of ALL cases presented with leukocytosis. Blasts were detected in more than two third (74%) of PBF of AML and (75%) in ALL patients. CD13 and CD33 and cyMPO were the most common positive myeloid presenting antigens. However, in ALL B-lymphoid markers CD10 and CD19 were the major positive antigens.*

Conclusion: *AML was most common than ALL in adults, AML was common in middle age while ALL in young age group. Hematology departments require urgent improvement of diagnostic services in Libya in order to ensure good clinical management.*

Keywords: Acute Leukemia, AML, ALL, Adult, Benghazi, Libya, Benghazi Medical Center, BMC, PBF, BMA

Introduction

Acute Leukemia (AL) account for less than 3 % of all cancer [1]. Adult acute myeloid leukemia (AML) account for 80 % of adult leukemia cases, while acute lymphocytic leukemia (ALL) account for 20% of all adult leukemia cases [2, 3]. Gender distribution of AL is different among different population. In India male: female ratio was 2.5:1 [4]. In Pakistan male: female ratio was 1.5:1, 1.4:1, and 1.3:1 [5-7]. In other study male: female ratio was 1.8:1 [8]. Age distribution is different among different population, where the median age of patients was 71 years in USA, while the median age of patients was 48.5 ±20 in Saudi Arabia, and 34.5 years Pakistan [9-11]. Acute leukemia is most commonly presented with one or more of CBC abnormalities including anemia, thrombocytopenia and white blood cells count abnormalities [12].

Microscopic examination of Peripheral Blood Film (PBF) and Bone Marrow Aspiration (BMA) examination remains the remain the first step in the diagnostic work-up for patients with suspected leukemia [13]. Thrombocytopenia noted in 84 % and anemia in 81.8 % of acute leukemia patients [11]. Others, noted thrombocy

Thrombocytopenia 96% and leukocytosis in 84% [14].

Immunophenotyping is mandatory for diagnosis of AL where it permit to identify cells lineage based on immunological characters [15]. CD33 myeloid marker present in all AML patients, and CD 13 in 77.9%. in ALL CD19 present in all patients, and CD 10 in 89.5% [16]. CD33, CD 13and CD45 expressed in all AML cases [17]. CD19, CD22 and HLA-DR present in 100 % of B-ALL, and cytCD3, CD7 present in 100 % of T-ALL. TdT was present in 84% and 50 % of B-ALL and T-ALL respectively [17].

World Health Organization (WHO) classification of leukemia based o morphology, cytochemistry, immunological cell markers, cytogenetic, molecular genetic finding and clinical features [3]. There is geographic discrepancy in adult AML incidence. Environmental, genetic and behavioral factors could play a role.

Risk factors associated with unfortunate prognosis for adults with ALL is elevated WBC count at time of diagnosis and certain genetic alternation [18]. In this study we would like to study epidemiological features and pattern of diagnosis of adult leukemia in Benghazi Medical center (BMC) in Benghazi/Libya.

Material and Method

A retrospective cross sectional analysis of 54 AML and ALL cases recorded between January 2013-December 2014, conducted at hematology department at BMC. BMC is a referral tertiary health care center located in the second city of Libya(Benghazi). BMC is serving the whole hetrogenous Eastern part of country. Patients referred to BMC are nearly representing the Libyan population.

All registered cases of adults adult (16-80) years patients with ALL and AML were included in this study. Data collected from medical archive at hematology department and from central laboratory at BMC. The variable included in collection are demographic data of the patients, provisional diagnosis, complete blood count done on (Sysmex KX-21N), PBF and BMA stained with Giemsa stain according to standard method. Percentage of myeloid and lymphoid blasts count ≥20 % as defined by WHO and morphological accurate diagnosis obtained from specialist hematologist. Immunophenotyping using a panel of monoclonal antibodies all marked with flurochrome (FITC, PE. Per CP, PE) to assess (lymphoid B or T/myeloid lineage on (BD Facs caliber) according to standard protocole. Some immunophenotyping and cytogenetic study were performed at Bio Scientia laboratory at Germany and King Hussin center at Jordan due to shortage of diagnostic materials.

Results

Demographic and Clinical Data: Total diagnosed new cases with acute leukemia in BMC between 2013-2014 were 54 cases with slight predominance of Males (59.3%). Forty-two case (77.8) were diagnosed with AML and 12 (22.2) cases with ALL.

AML was most common in the middle age group (40.4%) followed by (33.3%) for older patients, while for ALL most patients were between 16-38years. AML incidence increased with the age (p=0.001) and showed direct correlation (r=0.456). On the other hand, ALL incidence rate decreased with attained age (p=0.000) with indirect correlation (r= - 0.464). Gender incidence rate was statistically insignificant for both types of acute leukemia (p= 0.562).

Anemia was found in 92.6% of cases. It was noted in (90.5%) and (100%) for AML and ALL, respectively. Around half of them have leukocytosis 46.3%, 25.9 % have leukopenia and 27.8 have normal leukocyte count. Thrombocytopenia found in 83.3% and 1.9% have thrombocytosis.

Peripheral Blood and Bone Marrow Examination: PBF results were available in 37 of AML and in 9 cases of ALL. BM results were available in 21 of AML and in 6 cases of ALL. PBF showed presence of ≥ 20% of blasts in (36 patients, 66.7%) of cases and presence of < 20% of blasts in (4 patients 7.4 %) of cases, and (11.1%) of cases had no blast. Unfortunately, data were missing in (14.8%) of cases. See Table-1& 2.

BMA examination showed that (50%) of patient's data were missing. Blast were found in (38%), and BM were diluted in (11.1%) of cases, See Table-3 & 4. In majority of patients (42 cases), blasts were of Myeloid origin (77.8%) and in 12 cases (22.2%) were of Lymphoid origin. Out of the 42 AML cases, blast percentage was reported in 31 cases (74%) and in 16 cases (38.9%) in PBF and BM, respectively. Just above these percentages were for 12 ALL cases regarding PB and BM in 9 cases (75%) and in 5 cases (41%) correspondingly, See Table -5.

Table-1: Percentage of blasts in PBF

Percentage of blasts		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	=>20% blast	36	66.7	78.3	78.3
	<20% blast	4	7.4	8.7	87.0
	No blast	6	11.1	13.0	100.0
	Total	46	85.2	100.0	
Missing	System	8	14.8		
Total		54	100.0		

Table-2: Percentage of Myeloid blasts in PBF

		AL		Total
		ALL	AML	
PBF =>20% blast	Count	7	29	36
	% within pbf	19.4%	80.6%	100.0%
	% within AML	77.8%	78.4%	78.3%
	% of Total	15.2%	63.0%	78.3%
<20% blast	Count	2	2	4
	% within pbf	50.0%	50.0%	100.0%
	% within AML	22.2%	5.4%	8.7%
	% of Total	4.3%	4.3%	8.7%
No blast	Count	0	6	6
	% within pbf	.0%	100.0%	100.0%
	% within AML	.0%	16.2%	13.0%
	% of Total	.0%	13.0%	13.0%
Total	Count	9	37	46
	% within pbf	19.6%	80.4%	100.0%
	% within AML	100.0%	100.0%	100.0%
	% of Total	19.6%	80.4%	100.0%

Table-3: Percentage of blasts in BMA

Percentage of blasts		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	=> 20%	21	38.9	77.8	77.8
BLAST	SEEN	6	11.1	22.2	100.0
	DILUTED	27	50.0	100.0	
	Total	27	50.0		
Missing	System	54	100.0		
Total					

Table-4: Percentage of blasts in BMA of patients with AML

		AL		Total
		ALL	AML	
BMA .20% BLAST SEEN	Count	5	16	21
	% within BMA	23.8%	76.2%	100.0%
	% within AML	83.3%	76.2%	77.8%
	% of Total	18.5%	59.3%	77.8%
DILUTED	Count	1	5	6
	% within BMA	16.7%	83.3%	100.0%
	% within AML	16.7%	23.8%	22.2%
	% of Total	3.7%	18.5%	22.2%
Total	Count	6	21	27
	% within BMA	22.2%	77.8%	100.0%
	% within AML	100.0%	100.0%	100.0%
	% of Total	22.2%	77.8%	100.0%

Table-5: Percentage of Myeloid and Lymphoid Blasts in PBF and BMA

Percentage of blasts	AML	ALL
PBF ≥20% ≤20% No blast	 29(69%) 2(4.7%) 6(14.2%)	 7(58.3%) 2(16%)
BM ≥20% Diluted	16(38%) 5(12%)	5(41.6%) 1(8.3%)

Immunophenotyping Test

Immunophenotyping showed that of available data, (50.0%) of cases were marked positive to myeloid markers and (13%) were marked positive to lymphoid markers. The data were missed for 37 patients. Immunophenotype was recorded for 27 cases of AML patients and in 7 of ALL patients. See Table-6.

Table-6: Immunophenotyping of Acute Leukemia cases

Immunophenotyping	Frequency	Percent	Valid Percent	Cumulative Percent
POSITIVE MYELOID MARKERs	27	50.0	79.4	79.4
POSITIVE LYMPHOID MARKERs	7	13.0	20.6	100.0
Total	34	63.0	100.0	
Missing	20	37.0		
Total	54	100.0		

CD13 and CD33 and cyMPO were the most common positive myeloid presenting antigens. However, in ALL CD10 and CD19 were the major positive lymphoid antigens which considered B-lymphoid markers.

Cytogenetic Testing: Cytogenetic tests were available in 13 patients with AML. Two cases had t which considered as a diagnostic for promyelocytic leukemia (M3) which needs an urgent diagnosis and management [15, 17]. While in ALL cytogenetic test measured in 6 patients in which three of them were BCR-ABL positive which is associated with poor prognosis.

Discussion

Acute leukemia account for less than 3 % of all cancers [1]. In our study acute leukemia constituted 2.5% of all cancers, and about 20% of hematological malignancies.

AML accounted for 77.8% and ALL 22.2%. this is in accordance with S. Gosh study where adult AML accounted for 76% of AL [4]. Percentage of ALL in our study is lower than that observed in Mansoura experience study, while AML was higher [16].

AML is a disease of the elderly, with the median age around 67 years old [18]. Surprisingly, the median age of patients in our results was 43 years. When compared with international reports, our finding is in distinction with studies published from developed countries such as USA and Sweden, Where the median ages were 71 and 72 years respectively [9, 19]. However, studies reported from developing countries, as Egypt and Pakistan, the median age at diagnosis was significantly lower than that reported from rich communities. This difference could be explained by geographic and genetic difference.

In Pakistan a study showed that median age for AML patients was 34.5 years old (11) and other reports from Egypt and Pakistan reported mean age of 30.7 and 37 respectively [20, 6]. Age of our patients is in agreement with patients from Saudi Arabia [10].

ALL is a primary a disease of children with peak incidence between 2-5 years with gradually decreased during the age reaching a second small peak during a sixth decade with median age at diagnosis 14 years [13]. In our study the median age was 20 years and this is different from studies in the Sweden, France and Marocco with median age of 54 years 33 years and 31 respectively [19, 21, 17].

Very slight male dominance was reported in our study. This is consistent with other studies [7, 22]. Thrombocytopenia is a well-known manifestation in Leukemia. Thrombocytopenia reported in the (83%) of cases in our patients, which similar to other studies [11, 8]. High WBC count is a characteristic presentation of the illness. Most of our patients presented with leukocytosis in both types of Leukemia. In our study cy MPO, CD13, CD33 the most common positive myeloid makers, which is in agreement with study conducted by others [16, 4, 22].

B-ALL account for 70%, While T-ALL constitute 25% of ALL in adults [3]. in agreement with others [16, 17, 23]. We found that

B-ALL constitute the majority of the cases with CD 10 and CD19 the most common positive lymphoid markers.

Conclusion

AML was most common than ALL in adults. AML was common in middle age group while ALL was common in younger age group. Anemia, thrombocytopenia and leukocytosis were the main laboratory hematological parameters observed in leukemic patients at presentation. B-lineage ALL is more common than T-lineage ALL.

Oncology and Hematology departments in Libya have a very serious problem due to lack of documentation and archiving. Records and reports, as well as patient's investigation and files are usually incomplete or missing!

Another unacceptable and unsolved problem in health services in Libya, is lack of modern technology or shortage and interruption in supply of needed materials, and reagents, and controls. Despite being a routine and conventional laboratory investigation, immunophenotyping is not routinely available. Cytogenetic studies still not introduced in Libya, despite being an economically average country, due to un rational expenses and weakness in administration and management.

It is not possible to have a good health services nor state of art medical research without establishments of suitable infra-structure and quality assurance programs along with initiation of research culture. Use of modern technology and establishment of quality in Libyan hospitals is mandatory and represent an urgent need.

References

1. Barbara Deschier, Micheal lubbert (2006) Acute myeloid leukemia: epidemiology and etiology. 107: 2099-2107.
2. Alberta Health service (2016) Clinical practice guideline LYHE-005. Acute lymphoblastic leukemia. http://www.albertahealthservices.ca/assets/info/hp/cancer/if-hp-cancer-guide-lyhe005-all.pdf.
3. McKenzie SB, Williams J (2010) Clinical laboratory hematology. 2nd ed. Boston: Pearson 506: 532-536.
4. Ghosh S, Shinde SC, Kumaran GS, Sapre RS, Dhond SR, et al. (2003) Haematologic and immunophenotypic profile of acute myeloid leukemia: an experience of Tata Memorial Hospital 40: 71-6.
5. Sultan S, Zaheer HA, Irfan SM, Ashar S (2016) Acute Myeloid Leukemia: Clinical Spectrum of 125 Patients. Asian Pacific Journal of Cancer Prevention 17: 369-372.
6. Asif N, Hassan K (2013) Acute myeloid leukemia amongst adults. J Islamabad Med Dental College 2: 58-63.
7. Chaudhry MT, Tayyab M, Farooqui IA (1993) Acute nonlymphoblastic leukaemia in adults. Journal-Pakistan Medical Association 43: 259.
8. Chang F, Shamsi TS, Waryah AM (2016) Clinical and Hematological Profile of Acute Myeloid Leukemia (AML) Patients of Sindh. Journal of Hematology& Thromboembolic Diseases 4: 1-5.
9. George TI, Erba HP, Steensma DP, Pollyea DA, Abedi M, et al. (2016) Current Diagnosis Patterns for Acute Myeloid Leukemia (AML) in Clinical Practice Compared with World Health Organization (WHO) 2008 Myelodysplastic ®Recommendations: Outcomes from the CONNECTSyndromes (MDS) and AML Disease Registry. ASH.
10. Faleh AA, Al-Quozi A, Alaskar A, Zahrani MA (2015) Clinical features and outcome of acute myeloid leukemia, a single institution experience in Saudi Arabia. Journal of Applied Hematology 6: 6-12.
11. Sultan S, Zaheer HA, Irfan SM, Ashar S (2016) Acute Myeloid Leukemia: Clinical Spectrum of 125 Patients. Asian Pacific Journal of Cancer Prevention 17: 369-372.
12. Abdulsalam AH (2011) Diagnosis of Acute Leukemia in Under-Resourced Laboratories. INTECH Open Access Publisher.
13. Fiegl M (2016) Epidemiology, pathogenesis, and etiology of acute leukemia. In: Hiddemann W, editor. Hanbook of acute leukemia [internet]. Switzerland: Springer International publishing.
14. Farzana Chang, Tahir Sultan Shamsi, Ali Muhammad (2016) Waryah Clinical and Hematological Profile of Acute Myeloid Leukemia (AML) Patients of Sindh. J Hematol Thrombo Dis 4: 2.
15. Mannelli F (2016) Immunophenotyping of Acute Leukemias–From Biology to Clinical Application. InFlowCytometry-Select Topics 2016. InTech.
16. Salem DA, El-Aziz SM (2012) Flowcytometricimmunophenotypic profile of acute leukemia: mansoura experience. Indian journal of hematology and blood transfusion 28: 89-96.
17. Lahjouji A, Bachir F, Bennani S, Quessar A, Amzazi S (2015) The immunophenotype of adult T acute lymphoblastic leukemia in Morocco. Exp Oncol 37: 64-69.
18. Juliusson G, Lazarevic V, Hörstedt AS, Hagberg O, Höglund M (2012) Acute myeloid leukemia in the real world: why population-based registries are needed. Blood 119: 3890-3899.
19. Hamed NA, EL-Halawani N, Nafie D, Swelem R, Araby AA (2015) Regulatory T cells in Egyptian acute myeloid leukemia patients. Acta Medica International 2: 134-137.
20. Kinney MC, Lekens JN (1998) The acute leukemias, classification, and differentiation of the acute leukemias. Wintrobe's clinical hematology 38: 2209-2232.
21. Osman IM, Humeida AA, Eltayeb O, Abdelrhman I, Elhadi TA (2015) Flow cytometric Immunophenotypic Characterization of Acute Myeloid Leukemia (AML) in Sudan. International Journal of Hematological Disorders 23: 10-17.
22. Thomas X, Olteanu N, Charrin C, Lhéritier V, Magaud JP, et al. (2001) Acute lymphoblastic leukemia in the elderly: The Edouard Herriot Hospital experience. American journal of hematology 67: 73-83.
23. Boucheix CD, David B, Sebban C, Racadot E, Bene MC, et al. (1994) Immunophenotype of adult acute lymphoblastic leukemia, clinical parameters, and outcome: an analysis of a prospective trial including 562 tested patients (LALA87). French Group on Therapy for Adult Acute Lymphoblastic Leukemia. Blood 84: 1603-1612.