Section: Pathology

Original Research Article

THE SPECTRUM OF ACUTE LEUKEMIA IN PUNJAB: STUDY FROM A TERTIARY CARE HOSPITAL

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Abstract

Background: Lymphoid-hemopoietic malignancies are an important category of neoplasms in India representing 9.5% of all cancers in men and 5.5% in women. Genetic aberration contributes to malignant transformation of the cell which can be a lymphoid precursor, a myeloid precursor or a pluripotent hemopoietic stem cell. The WHO classification stratifies hemopoietic neoplasms primarily according to lineage: myeloid, lymphoid and histiocytic / dendritic cell. It includes new defining criteria such as genetic criteria in some and others by a combination of morphology, immunophenotype and clinical features. **Materials and Methods:** The study was conducted at Christian Medical College, Ludhiana over a period of eighteen months which included both retrospective as well as prospective period. Patient data was retrieved from the medical records, hematology and histopathology requisition forms. Gross and microscopic findings noted and data analysed. The study was conducted after approval by institutional ethics research committee as applicable. **Conclusion:** To conclude, in the present study, the most common type of Acute leukemia is Acute Myeloid leukemia followed by Acute Lymphoblastic leukemia while Mixed phenotype T/Myeloid Leukemia is rare.

INTRODUCTION

Lymphohematopoietic neoplasms are the result of uncontrolled proliferation of hematopoietic and lymphoid cells that are unable to differentiate normally to form mature blood cells. They represent clonal expansions of either the myeloid or lymphoid lineage and are an uncommon, yet significant, cause of cancer-related deaths.[1] These are subdivided primarily by combinations of morphology, immunocytochemistry, genetic alterations, immunophenotype and clinical features into myeloid, lymphoid and histiocytic / dendritic cell. Myeloid neoplasms have been classified as Myeloproliferative neoplasms, Myeloid and lymphoid neoplasms with eosinophilia, Myelodysplastic/Myeloproliferative neoplasms and Acute myeloid Leukemias (AML). Lymphoid neoplasms include Hodgkins Lymphoma, Precursor lymphoid neoplasms B and T cell Lymphomas and Leukemias, Mature T and B cell neoplasms, the later includes plasma cell neoplasm, Non Hodgkins Lymphomas and Burkitt's lymphoma. Other rare neoplasms included are immunodeficiency associated Lymphoproliferative disorders and Histiocytic and dendritic cell neoplasm.[2]

With increasing age, the incidence of AML progressively increases, and in adults over the age of 65 years, the incidence is approximately 30 times the incidence of AML in children. Is is the most frequently diagnosed leukemia among middle age people with median age at diagnosis being 68 years.[3] The most common presentation is abnormal hematological results like leukocytosis, anemia, and thrombocytopenia. The diagnostic workup involves a good history, examination findings, and laboratory results. Laboratory evaluation includes morphologic evaluation on the peripheral blood, bone marrow aspirate and/or trephine biopsy, Immunophenotyping (IPT) and/or Immunohistochemistry (IHC), cytogenetic analysis and/or fluorescence in situ hybridization (FISH), and molecular testing.[4,5]

Bone marrow examination is the basic diagnostic test for work up and provides material for immunophenotyping and immunohistochemistry (IHC).[5]

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The blast percentage remains a practical tool for categorizing myeloid neoplasms and judging their progression[2]

Immunophenotyping allows lineage assignment particularly in differentiating lymphoid from immature myeloid leukemia and improves accuracy in delineation of ALL and AML to 95–98%.[6]

The application of IHC to diagnose leukemias in bone marrow trephine biopsy is a relatively new practice. Its advantages include identification of morphologic features, reproducibility of retrospective cases and cost effectiveness, and particularly in situations like "dry tap", it becomes the only available source of material for the diagnosis and classification of acute leukemia.[7,8]

Other than isolated case reports and study on specific hematologic malignancy, there have not been many studies from Punjab and neighbouring states on the spectrum of Acute leukemia. Hence it was considered pertinent to do this prospective study over a period of eighteen months.

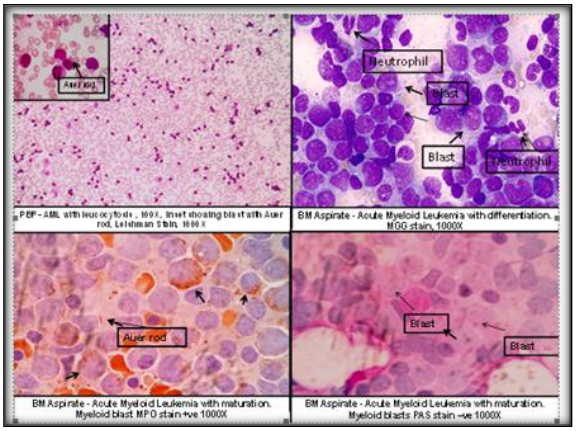
MATERIALS AND METHODS

All acute leukemia cases diagnosed over a period of 18 months, were included in the study with the aim to study their spectrum in Punjab. The Peripheral blood and bone marrow trephine biopsies were routinely processed by Beckman coulter and in Leica automatic histopathology tissue processor. Relevant Flowcytometry and Immunohistochemistry (IHC) markers were done wherever possible. The relevant clinical details, haematological and histopathological findings were noted in all patients. For statistical analysis averages and proportions were used.

The study was conducted after approval by the institutional Research and Ethics committee as applicable.

RESULTS

There were a total of 71 cases of Acute Leukemia of which the most common was AML comprising 51 (71.8%) cases, followed by Acute Lymphoblastic Leukemia 20 (28.16%) and 1 single case of (1.40%) Mixed phenotypeT/Myeloid Leukemia as shown in Table 1.



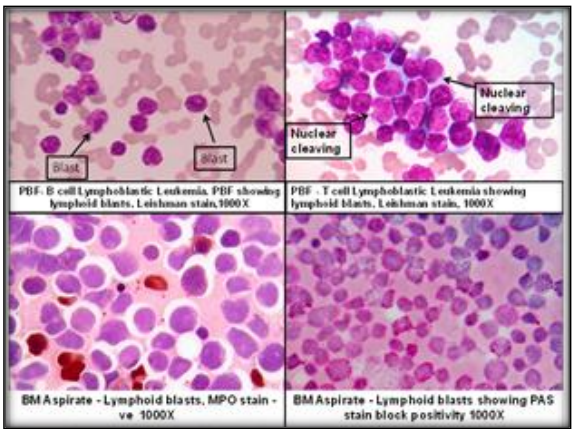


Table 1: Spectrum of Acute Leukemia

Type of Leukemia	Number of cases (71)	%
Acute Myeloid Leukemia	51	71.8
Acute Lymphoblastic Leukemia	20	28.16
Mixed phenotypeT/Myeloid Leukemia	1	1.40

There were 6 cases of AML with recurrent cytogenetic abnormality (wherever genetic studies were available) which included 2 cases (33.3%) of t (8,21) and 4 cases (66.6%) of APML t(15,17).

Six other AML cases (11.7%) were associated with Myelodysplastic features. The rest 38 cases (74.5%) were classified as AML NOS as shown in Table 2.

Table 2: Spectrum of AML NOS.

Subtype of AML-NOS	Number of cases (38)	%
AML M0	3	7.8
AML M1	7	18.4
AML M2	11	28.9
AML M3	5	13.1
AML M4	3	7.8
AML M5	5	13.1

We diagnosed 19 cases of Acute Lymphoblastic leukemia, including14 cases (70%) of B-cell ALL, 3 cases of (15%) of T cell ALL, 1 case (5%) each of ALL NOS and Mature B cell Neoplasm: Burkitt Leukemia/ Lymphoma in descending order of frequency as shown in table no. 3. One of these cases of B cell ALL was diagnosed as

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Precursor B cell ALL with recurrent cytogenetic abnormality with BCR-ABL genetic abnormality. The Mature B cell Burkitt's neoplasm was HIV positive.

Table 3: Spectrum of ALL

Subtype of ALL	Number of cases (19)	%
B-cell ALL	14	70
T cell ALL	3	15
ALL NOS	1	5
Mature B cell Neoplasm: BurkittLeukemia/ Lymphoma	1	5

The single case of Mixed phenotype T/Myeloid Leukemia, a 53-year-old male patient with fever, weight loss, hepatosplenomegaly and generalised lymphadenopathy. BM was hypercellular with increase in blasts upto 72%. Morphologically showing 2 population of blasts. IHC showed positivity for CD3, CD5, Anti MPO, CD117, TdT, CD34 CD56 and Bcl6. while negativity for CD20, CD10 and CD30.

DISCUSSION

In the present series, 71 cases of acute leukemia were diagnosed. AML comprised 71.8%, Acute lymphoblastic leukemia comprised 28.16% and Acute leukemia of ambiguous lineage comprised 1.4%. Rathee et al 9 2014, Dores et al.[10] 2012 reported similar results in their study. Lee HG et al.[11] 2019 reported 3.2% of Acute leukemia of ambiguous lineage which was close to our study.

Table 4: Spectrum of Acute Leukemia

	Total no. of Acute leukemia cases	% of AML	% of ALL	% of Acute leukemia of Ambiguous lineage
Present series	71	71.8	28.16	1.4
Indian series				
[9] Rathee et al 2014	332	66.2	33.7	-
International Series				
[10] Dores et al 2012	29,682	65.7	31	3.4
[11] Lee HG et al 2019	377	-	-	3.2

There were 6 (11.7%) cases of AML with myelodysplasia related changes. Gibson et al.[12] 2006 reported 6% cases of AML with previous myelodysplastic syndrome which was in concordance with our study as shown in table no. 5.

Table 5: Percentage of AML with MDS out of total AML cases

	Total no. of cases of AML	% of cases of AML with MDS out of AML
Present study (2014)	51	11.7
Gibson et al (2006) [12]	83	6

AML, NOS

Comparison of classification of AML, NOS into subtypes as seen in our study and different studies is depicted in table no. 6.

Table 6: Prevalence of subtypes of AML, NOS

AML, NOS	Present series %	Mahmood H et al 2014 % [13]	Lu Q et al 2013 % [14]	Walter RB 2013 et al % [15]
No. of cases of AML, NOS	38	130	101	5848
AML with minimal differentiation (AML FAB M0) %	7.8	1.5	1.9	0.6
AML without maturation (AML FAB M1) %	18.4	7.4	3.9	24.6
AML with maturation (AML FAB M2) %	28.9	21.5	40.5	28.3
Acute Promyelocytic leukemia (AML FAB M3)%	13.1	17.0	24.7	-
Acute myelomonocytic leukemia (AML FAB M4) %	7.8	21.5	5.9	21.2
Acute monoblastic and monocytic leukemia (AML FAB M5) %	13.1	16.3	20.7	14.8

A single case of Mixed phenotype T/Myeloid Leukemia in our study was similar to studies done by Colovic et al.[17] 2012 and Lee HG et al.[11] 2019.

CONCLUSION

To conclude, in the present study, the most common type of Acute leukemia is Acute Myeloid leukemia followed by Acute Lymphoblastic leukemia while Mixed phenotype T/Myeloid Leukemia is rare.

There is a felt need for a leukemia screening program, since the common man is not aware of this deadly disease. Frequent application of Flowcytometry and

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genetic studies using peripheral blood, bone marrow, and lymph node samples have led to the detection of small clonal populations in asymptomatic individuals. Alas due to high costing such investigations are not for the average man.

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