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Diagnostic Spectrum of Leukemias at a Tertiary Care Center

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Abstract: ***Introduction: Leukemia is a diverse group of hematological cancers with several subtypes. The cell types and rates of progression of acute and chronic leukemia differ. Leukemia's precise cause is yet unknown. However, a number of causes have been linked to the development of leukemia, including genetic abnormalities, epigenetic lesions, ionizing radiation, chemical and other occupational exposures, medicinal medications, smoking, and some viral agents. The incidence is higher among men and in some places. In specialized healthcare, disease knowledge enhances patient care and resource allocation. To diagnose leukemia, blood tests, bone marrow aspirations, bone marrow biopsies, and genetic studies are required. Therapy tailored to molecular abnormalities is promising but challenging. Material and method: The retrospective research, conducted at pathology department of a tertiary care hospital, during the period of one year 5/5/25 to 5/5/26, involved 85 recently diagnosed leukemia patients. Exclusion criteria excluded those undergoing cancer therapy or with other hematological cancers. Detailed medical history, hemodynamic parameters, bone marrow aspiration, bone marrow biopsy and flow cytometry and diagnostic procedures were meticulously documented. Inclusion criteria covered all age groups recently diagnosed with acute or chronic leukemia using FAB classification Results: In our study, commonest leukemia was chronic leukemia followed by acute leukemia. Out of total 85 cases studied 48 were of chronic leukemia and 34 were acute leukemia and 3 atypical cells with follow up. Male preponderance was observed. Most common age group affected was 40-50 years. Conclusion: This study highlights incidents prevalence and its significance in leukemia cases. Early diagnosis would provide better survival rates.***

Keywords: Acute leukemia, Chronic Leukemia, hematological malignancies, Lymphoblastic leukemia, Myeloid Leukemia

1. Introduction

The bone marrow and other blood-forming organs create more immature and aberrant leucocytes in leukemia, a malignant progressive disease that suppresses normal hematopoiesis. (1,2) These are made up of a number of different and biologically unique subgroups. It is a hematopoietic cell clonal neoplasia brought on by mutations in progenitor and pluripotent stem cells. The ability of mutated neoplastic cells to self-replicate, specialize, and supply progenitor cells into the distinct hematopoietic lineages is similar to that of hematopoietic stem cells. These leukemic stem cells can develop into phenocopies of mature blood cells to varied degrees. It's unclear exactly what causes leukemia. However, a number of interconnected elements, namely inherited traits, genetic mutations, epigenetic lesions, ionic radiation, chemical and other occupational exposures, medicinal medications, smoking, and and some viral agents, have been implicated in developing leukemia. (3,4) The eighth to twelfth most prevalent malignancy worldwide is leukemia. Despite having a higher risk in urbanized populations, it affects all countries and peoples worldwide without prejudice depending on their sociodemographic background. Leukemia has a significant impact on the financial and health welfare of the populace in developing nations since it causes early childhood deaths, parent deaths, lost productivity owing to disabilities, and high medical expenses. This study aims to investigate the epidemiology of leukemia in tertiary care centers because we know that early detection of any disease leads to early treatment and greater patient survival. (5, 6, 7) Understanding the prevalence of diseases within a specific healthcare setting, like a tertiary care teaching hospital, is a vital compass for healthcare provision. It serves as a navigational tool, guiding resource allocation, staffing, and patient care planning. This comprehension aids in recognizing healthcare demands, channeling efforts to improve diagnostics, treatments, and professional training where needed. Furthermore, it fuels research initiatives and quality enhancements, forming the basis for epidemiological studies and interventions that elevate care standards and patient outcomes. Ultimately, this group of disease prevalence in such a specialized setting steers the course towards optimized healthcare delivery and overall improvement in patient well-being. A precise diagnosis stands as the cornerstone for effective treatment strategies. Treating acute and chronic leukemia presents a multifaceted challenge stemming from various fronts. Diverse genetic and molecular aberrations, individualized to each patient, dictate Leukemia's course. These anomalies significantly influence treatment responses and prognostic outcomes. Tailored therapies that pinpoint and address these molecular irregularities offer a promising avenue for improving patient results. (8,9,10)

2. Material and Method

The sample size for the current prospective study was 85 leukemia cases that were identified in the pathology department of a tertiary care centre. Clinically suspected cases were submitted to the Department of Pathology, where they underwent a full blood count utilizing an automated hematology analyzer Horiba Pentra XLR and a peripheral

leishman stain smear study. Then, a preliminary diagnosis was made. Following a peripheral smear test, a salah's needle was used to aspirate bone marrow from the posterior superior iliac spine in adults and the shin of the tibia in children. Leishman stain was then used to fix by methanol and stain bone marrow samples. When necessary, special stains (PAS, Sudan Black B) were applied to prepared peripheral smear and bone marrow smears on clean glass slides fixed by methanol. This study was conducted after getting informed consent from patient. Many patients were confirmed of Leukemia by flow cytometry at higher centers

Inclusion criteria

- All patients who were diagnosed as leukemia
- Patient with abnormal hematological parameters and diagnosed as leukemia

Exclusion criteria

- Patient whose all hematological parameters were normal.
- Non-hematological cancers with abnormal hematological markers.
- Patients who have received treatment for a prior diagnosis
- Patients who refuse to provide their consent

3. Results

In our study we evaluated 85 cases of leukemias. Following are our results in a tabulated form

Table 1: Age group wise incidence

Age Group in Years	Male	Female	Total
1-10	11	7	18
11-20	5	4	09
21-30	3	6	09
31-40	8	6	14
41-50	8	4	12
51-60	11	4	15
61-70	2	2	04
Atypical cells	3	1	04

Table 2: Age and sex wise distribution of leukemia

Age/ Sex	AML			CML			ALL			CLL		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
1-10	00	00	00	00	00	00	11	6	17	00	00	00
11-20	02	01	03	00	00	00	02	03	05	00	00	00
21-30	04	04	08	00	00	00	00	00	00	00	00	00
31-40	01	00	01	03	05	08	00	00	00	00	00	00
41-50	00	00	00	08	01	09	00	00	00	02	01	00
51-60	00	00	00	04	02	06	00	00	00	05	01	06
61-70	00	00	00	08	04	12	00	00	00	02	01	03
70-80	00	00	00	01	00	01	00	00	00	02	01	03

Table 3: Percentage of acute and chronic leukemia

Type of Leukaemia	No of Cases	Percentage
Chronic Leukaemia	48	57%
Acute Leukaemia	34	40%
Atypical cells	03	03%

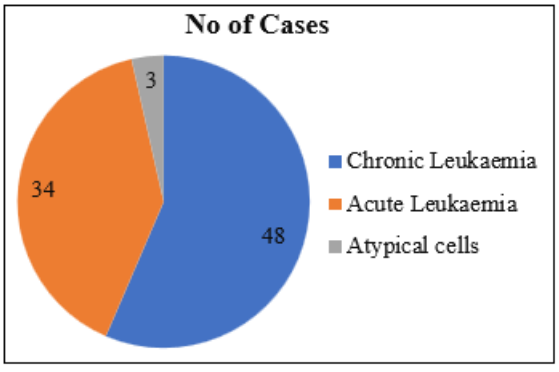
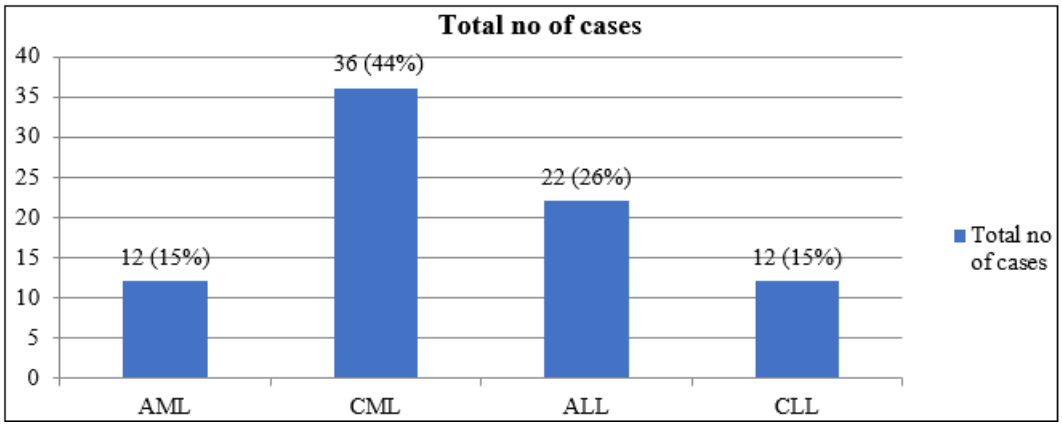


Table 4: Prevalence of different types of acute/ chronic leukemias

Type of Leukaemia	Total no of cases	Percentage
AML	12	15%
CML	36	44%
ALL	22	26%
CLL	12	15%
TOTAL	82	100%



4. Discussion

Two types of classification systems are commonly used for leukemia: The French-American-British (FAB) classification system which is based on morphology and cytochemical staining to define specific types of leukemia and the World Health Organization (WHO) which reviews classification information, cellular morphology, cytochemistry, immunophenotyping, cytogenetics, and clinical features to define and categorize clinically significant disease entities [1, 8, 9].

In the 1970s, a group of French, American, and British leukemia experts divided myeloid leukemia into acute myeloid leukemia (AML-with subtypes, M0 through M7), Chronic Myeloid leukemia (CML), and myelodysplastic syndromes (MDS) based on the type of cell, leukemia develops from and how mature the cells are. This was based mainly on how the leukemia cells looked under the microscope after routine staining and some cytochemical characteristics [11, 12].

Lymphoid malignancies represent a heterogeneous group of disorders divided into four categories based on the maturity of the neoplastic cells and the distribution of disease as acute lymphoblastic leukemia (ALL), chronic lymphocytic leukemia (CLL), malignant lymphoma and plasma cell neoplasms, and hairy cell leukemia [8.13].

Chronic leukemia was more common than acute leukemia with Chronic Myeloid Leukemia (CML) being the most common type, followed by Acute Lymphoblastic Leukemia (ALL), Acute Myeloblastic Leukemia (AML) and Chronic Lymphocytic Leukemia (CLL) in studies by Ahirwar R. *et al*. [11] In our study chronic leukemia was more common than acute leukemia with chronic Myeloid leukemia (CML) being the most common type and in acute leukemia, acute Lymphoblastic leukemia (ALL) was more prevalent than acute Myeloid leukemia (AML) (table no. 4).

5. Conclusion

Since leukemias are diverse group of malignancies, they vary not only in terms of prognosis and specialized treatment but also in terms of clinical, morphological, immunological, and genetic traits. It has been found there is a ratio of male to female, 1:1 is observed at our tertiary care hospital.this can be due to actual increase in incidence or can be due to increased detection rate of such cases at tertiary hospital level. Most of the patients were of age 40 to 50 years 23% and 21% were of age group 61 to 70 years. Overall incidence of leukemia was found to be 0.06% of all the patients who presented at our tertiary care hospital. As this is the first study of its kind here, for detection of undetected or hidden etiological factor in tertiary care hospital, further study with a larger sample size is required, as there is a markedly increase in incidence of chronic lymphocytic leukemia (CLL) in this tertiary care hospital. Chronic leukemia was more prevalent than acute leukemia in this part of the country and its risk factors & pathogenesis needs to be addressed so that modifiable risk factors can be reduced to a minimum.

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