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Incidence & prevalence of leukemia with sub-typing in tertiary care centre: A retrospective & prospective study

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Abstract
Introduction: Leukemia is a heterogeneous group of haematological malignancies that comprises several diverse and biologically distinct subgroups. The exact cause of leukemia is not yet clear. However, several factors, mainly hereditary inheritance, genetic mutations, epigenetic lesion, ionic radiation, chemical and other occupational exposures, therapeutic drugs, smoking, and some viral agents, have been implicated in developing leukemia. It is one of the fatal diseases and their morbidity and mortality rates increase day by day all over the world.
Material and Method: 52 patients of leukemia were evaluated during May 2020 to June 2022 retrospectively & prospectively having chief complains of fatigue, weakness, infections, bleeding tendencies & bone pain out of total 81552 presenting to the OPD.
Result: It was found that leukemia was equally prevalent in male and female patients, ratio being 1: 1 & most of the patients were over the age of 51 years. It was also observed that chronic leukemia was more prevalent than acute leukemia. Amongst types of leukemia, Acute myelogenous Leukemia (AML) was more prevalent (29%) than Acute lymphocytic Leukemia (ALL) (10%), similarly Chronic lymphocytic leukemia (CLL) was more prevalent (34%) than chronic myeloid leukemia (CML) (27%).
Conclusion: 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.

Keywords: Hematological malignancy, acute lymphoblastic leukemia, acute myeloid leukemia, chronic lymphocytic leukemia, chronic myeloid leukemia

Introduction

Leukemia is a malignant progressive disease in which the bone marrow & other blood forming organs produce increased number of immature & abnormal leucocyte leading to suppression of normal haematopoiesis. These comprise several diverse and biologically distinct subgroups. It is a clonal neoplasm of hematopoietic cells resulting from arrays of factors leading to somatic mutations in pluripotent stem cells and progenitor cells. Mutated neoplastic cells behave like a hematopoietic stem cell in that it can self-replicate, differentiate, and feed progenitor cells into the various hematopoietic lineages. These leukemic stem cells can undergo varying degrees of maturation to phenocopies of mature blood cells [1, 2].

The exact cause of leukaemia is not very clear. But several inter-related factors, mainly hereditary inheritance, genetic mutations, epigenetic lesion, ionic radiation, chemical and other occupational exposures, therapeutic drugs, smoking, and some viral agents, have been implicated in developing leukemia [3, 4, 5, 6, 7, 8].

Leukemia is the 8th to 12th most common cancer disease in the globe. It affects all nations and peoples of the world without discrimination based on their socio-demographic background, even though it has a greater risk in urbanized populations [9]. The impact of leukemia in developing countries is huge due to premature death of children, loss of parents, loss of productivity due to a disability, and high medical cost that affects the socioeconomic and health welfare of the population [10, 11, 12].

We know that early diagnosis of any disease results in early treatment & better patient survival, hence this study is undertaken to study the epidemiology of leukemia in tertiary care centre.

Aims and Objectives

This study is aimed to determine the incidence and prevalence of leukemia in tertiary care centre of Gujarat in India among all the patients who presented to the outdoor patient clinic.

Materials and Methodology

Study Duration

This is a Retrospective and Prospective study of two years from May 2020 to June 2022.

Sample size

81552 patients were evaluated out of which 52 were selected fitting the criteria of any type of leukemia.

Ethical Approval

Was obtained from I.E.C (Ref: Project No. 20/01/22)

Inclusion criteria

1. All patients who were presenting with pyrexia of unknown origin.
2. Patient having severe weakness and fatigue
3. Patient having severe infection not treatable by routine antibiotics.
4. Bleeding tendencies or petechia.
5. Bone pain or tenderness.
6. Patient with abnormal hematological parameters.

Exclusion criteria

Patient whose all hematological parameters were normal.

Method

CBC and PS reports of all the patients were assessed to find out the incidence and prevalence of leukemia and subtype them as well. The CBC reports were analysed on Sysmex KX 21 and Horiba Pentra XLR hematology Analysers and peripheral smear examined were stained by Leishman, Giemsa and Field's Stains. Special stains were done wherever needed. Many patients were confirmed of Leukemia by flow cytometry at higher centres.

Result

In our study we evaluated 52 cases of leukemia. The incidence is 0.06% (52 out of 81552) was found who presented to the outdoor clinic.

Following are our results in a tabulated form

Table 1: Distribution of patients according to Age and Gender (n=52)

Age group in years	Male	Female	Total (%)
00 - 10	1	2	3 (06%)
11 - 20	5	3	8 (15%)
21 - 30	4	2	6 (11%)
31 - 40	2	1	3 (06%)
41 - 50	1	4	5 (10%)
51 - 60	4	8	12 (23%)
61 - 70	8	3	11 (21%)
71 - 80	1	1	2 (04%)
81 - 90	0	2	2 (04%)
Total	26	26	52 (100%)

Table no. 1 shows that most of the patients were of age 51 to 60 years 23% and 21% were of age group 61 to 70 years. The male to female ratio was 1:1. It is evident from the data that leukemia was more prevalent in elder patients.

Table 2: Distribution of patients according to Types of Leukemia (n=52)

Type of leukemia	Male	Female	Total (%)
ALL	3	2	5 (10%)
AML	4	11	15 (29%)
CLL	10	8	18 (34%)
CML	9	5	14 (27%)
Total	26	26	52 (100%)

Table no. 2 and figure no. 1 shows that chronic leukemia is more prevalent than acute leukemia. AML is more prevalent (29%) than ALL (10%) and AML is more common in female patients. CLL is more prevalent (34%) than CML (27%) and more common in male patients.

Table 3: Distribution of hematological parameters for various leukemia type in patients (n=52)

Hematological parameters		ALL (%)	AML (%)	CLL (%)	CML (%)	Total (%)
White blood cells count	Leucopenia	0 (00%)	0 (00%)	0 (00%)	0 (00%)	0 (00%)
	Normal	1 (20%)	3 (20%)	1 (06%)	0 (00%)	5 (10%)
	Leucocytosis	4 (80%)	12 (80%)	17 (94%)	14 (100%)	47 (90%)
Red blood cells count	Low	4 (80%)	14 (93%)	7 (39%)	13 (93%)	38 (73%)
	Normal	1 (20%)	1 (07%)	11 (61%)	1 (07%)	14 (27%)
Platelet count	Low	4 (80%)	14 (93%)	11 (61%)	2 (14%)	31 (60%)
	Normal	1 (20%)	1 (07%)	7 (39%)	11 (79%)	20 (38%)
	High	0 (00%)	0 (00%)	0 (00%)	1 (07%)	1 (02%)
haemoglobin	Normal	1 (20%)	1 (07%)	8 (44%)	1 (07%)	11 (21%)
	Low	4 (80%)	14 (93%)	10 (56%)	13 (93%)	41 (79%)

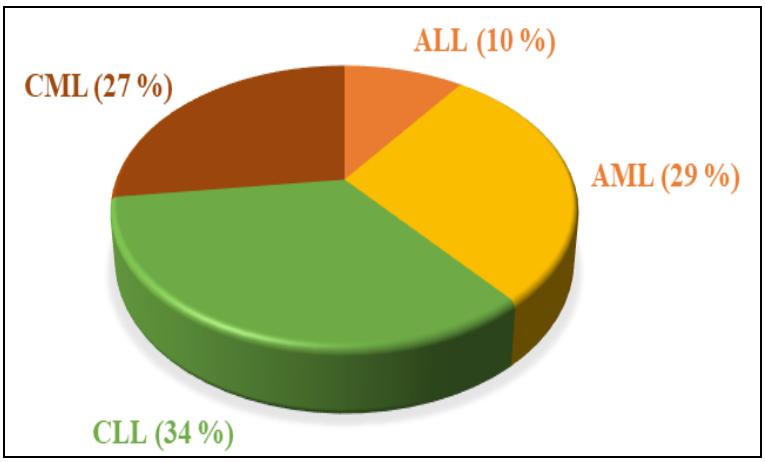

Fig 1: Distribution of patients according to types of leukemia

The distribution of some hematological parameters with respect to leukemia types with reference values of WBC count (4.5-11.0 x 10^9/L), red blood cells count (men: 4.7-6.1 million cells per micro-litre, women: 4.2- 5.4 million cells per micro-litre), platelet counts (150-450 x 10^3/microliter), hemoglobin (men: 13.2 - 16.6 g/dl, women: 11.6-15.0 g/dl) was analysed and their proportions were calculated. In table no. 3 leukemia shows prevalence of leucocytosis (90%), thrombocytopenia (60%), anemia (79%) were recorded.

Table 4: Distribution of hematological parameters in percentage of acute and chronic leukemia type of patients who have abnormal hematological parameters (n=52)

Hematological parameters		Acute leukemia (%)	Chronic leukemia (%)	Total (%)
White blood cells count	Leucopenia	00 (00%)	00 (00%)	0 (00%)
	Normal	04 (00%)	01 (03%)	5 (10%)
	Leucocytosis	16 (80%)	31 (97%)	47 (90%)
Red blood cells count	Low	18 (90%)	20 (62%)	38 (73%)
	Normal	02 (10%)	12 (38%)	14 (27%)
Platelet count	Low	18 (90%)	13 (41%)	31 (60%)
	Normal	02(10%)	18 (56%)	20 (38%)
	High	00 (00%)	01 (03%)	1 (02%)
Hemoglobin	Normal	02 (10%)	09 (28%)	11 (21%)
	Low	18 (90%)	23 (72%)	41 (79%)

In table no. 4 acute leukemia shows prevalence of leucocytosis (80%), thrombocytopenia (90%), anemia (90%) were recorded.

Table 5: Distribution of organomegaly and lymphadenopathy in various leukemia type in patients (n=52)

	Hepatomegaly	Splenomegaly	Lymphadenopathy
Acute lymphoblastic leukemia	00 (00%)	0 (00%)	1 (11%)
Acute myeloid leukemia	04 (33%)	6 (35%)	2 (22%)
Chronic lymphocytic leukemia	02 (17%)	01 (06%)	6 (67%)
Chronic myeloid leukemia	06 (50%)	10 (59%)	0 (00%)

In table no. 5 shows prevalence of hepatomegaly (50%) and splenomegaly (59%) more in chronic myeloid leukemia. Prevalence of lymphadenopathy (67%) more in chronic lymphocytic leukemia were recorded.

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 [13, 14].

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 [13, 15, 16].

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 [17].

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.* [18] In our study chronic leukemia was more common than acute leukemia with chronic lymphocytic leukemia (CLL) being the most common type and in acute leukemia, acute

myeloid leukemia (AML) was more prevalent than acute lymphoblastic leukemia (ALL) (table no. 2 & Figure 1).

Conclusion

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 51 to 60 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 to the outdoor clinics 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.

Conflict of Interest

Not available

Financial Support

Not available

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