Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

CLINICOPATHOLOGICAL EVALUATION IN PATIENTS OF LEUKEMIA IN TERTIARY CARE HOSPITAL, RAJKOT

Amit Agravat[1], Krupal Pujara[2], Gauravi Dhruva[3], Bhumika Baria[4]

[1]Professor, Department of Pathology, PDU Medical College and Hospital, Rajkot, India.
[2]Assistant Professor, Department of Pathology, PDU Medical College and Hospital, Rajkot, India.
[3]Professor & Head, Department of Pathology, PDU Medical College and Hospital, Rajkot, India.
[4]2nd year Resident, Department of Pathology, PDU Medical College and Hospital, Rajkot, India.

Received Date: 10/03/2024 Acceptance Date: 09/04/2024

Corresponding Author:
Dr Bhumika Baria, 2nd year Resident, Department of Pathology, PDU Medical College and Hospital, Rajkot, India.
Email: bhumikabaria2@gmail.com

Abstract

Background: Leukemias are caused by neoplastic proliferations of haematopoietic cells. Immature myeloid or lymphoid precursors (blasts) replace the normal hematopoietic tissues and invade other organs of the body as well. Leukemias are classified into subtypes: Acute/Chronic, Myeloid and Lymphoid. **Objective**: To evaluate types of leukemias and its clinico pathological correlation. **Method:** In this study the various types of leukaemia distribution among various ethnic groups, in terms of types, age, sex, socioeconomic status was carried out in the Central Clinical Laboratory (CCL), Department of Pathology, PDU Medical College, Rajkot over one year period between March 2023 to February 2024. Complete blood count, peripheral blood smear and cytochemistry study whenever required were used to diagnose. **Results:** Different patterns of leukemia were reported. In the present study, out of 69 cases, acute leukemias in 40 cases (57.97%) & chronic leukemias in 29 cases (42.03 %) were reported. Overall male preponderance was found comprising 52.17% of all cases. Acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) were found in 30.43% & 8.71% of the patients respectively. Of chronic type, 18.84% patients had chronic myeloid leukemia (CML) and only 23.18% had chronic lymphocytic leukemia (CLL). 18.84% of patients were reported acute leukemias without lineage specification as differentiation on morphological basis was not possible. In paediatric patients ALL was the predominant diagnosis (66.33%), whereas in adult AML cases were maximum (80.95%). Maximum number of patients (20.28%) came with generalized weakness. Most patients presented from lower socioeconomic status (65.21%). **Conclusion:** From our study, we can conclude that AML is more common than ALL, whereas, ALL is more commonly seen in children. The incidence of AML is higher in adults and it decreases in old age. Detailed

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

haematological analysis including peripheral blood smears, bone marrow aspiration smears examination with cytochemical analysis and genetic studies are necessary for early and definite diagnosis of haematological malignancies leading to their effective management.
Key Words: Leukemia, Myeloid, Lymphoid.

Introduction

Haematopoietic neoplasms majorly occur due to malignant proliferation of haematopoietic cells. Leukemias are classified into 2 subtypes: Myeloid and Lymphoid.[1] Typing of leukemia is necessary for effective therapy as prognosis and survival rate depends on each type and its sub-type.[2] Leukemia can be categorized as: Acute & Chronic. Acute leukemias consist of Acute Lymphoblastic Leukemia (ALL) and Acute Myeloid Leukemia (AML). In childhood, ALL is the most common type. In India, the incidence of ALL and AML are 35% & 15% respectively of all hematological malignancies. Chronic leukemias consist of Chronic Myeloid Leukemia (CML) and Chronic Lypmphocytic Leukemia (CLL).[3, 4]

Acute leukaemias are characterized by clonal expansion of immature precursors (blasts): myeloid or lymphoid. These blasts cells replace the normal hematopoietic tissues and invade other organs of the body. The most common complications of acute leukemia are anaemia, hemorrhage and infections due to bone marrow failure.[5, 6, and 7]. As per the WHO classification, more than 20% blast in the marrow or peripheral blood should be present for diagnosing acute leukemia.[8] We studied the prevalence of different types of leukaemias with age and gender distribution.

Diagnosis of different leukemias depends on morphological details and genetic changes in subtypes. French American British (FAB) morphologic classification is used. Morphological assessment usually requires blood peripheral smears, bone marrow aspiration smears, marrow trephine biopsy sections and special cytochemical stains in some cases.[9, 10 and 11]

Materials And Method

In the present study, retrospective analysis of leukaemia cases comprising total of 69 cases was carried out over a period of 1 year (between March 2023 to February 2024), in the Central Clinical Laboratory (CCL), Department of Pathology, PDU Medical College, Rajkot. Detailed medical history was taken. On automated haematology analysers, blood counts were performed and all the haematological parameters were noted. The peripheral blood smears were stained with Leishman stain & May-Grunwald Geimsa stain. Special stains like Myeloperoxidase (MPO), Periodic acid-Schiff (PAS) and Sudan black B (SBB) were done whenever required. Cases with blast percentage ≥20% were diagnosed as Acute Leukemia according to WHO guidelines.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

Result

In our study, 57.97% of patients had acute leukemia while 42.03% had chronic leukemia (TABLE 1).

TABLE 1: PERCENTAGE OF ACUTE AND CHRONIC LEUKEMIAS

TYPE OF LEUKEMIA	NO. OF CASES	PERCENTAGE (%)
ACUTE LEUKEMIA	40	57.97 (%)
CHRONIC LEUKEMIA	29	42.03 (%)
TOTAL	69	100 (%)

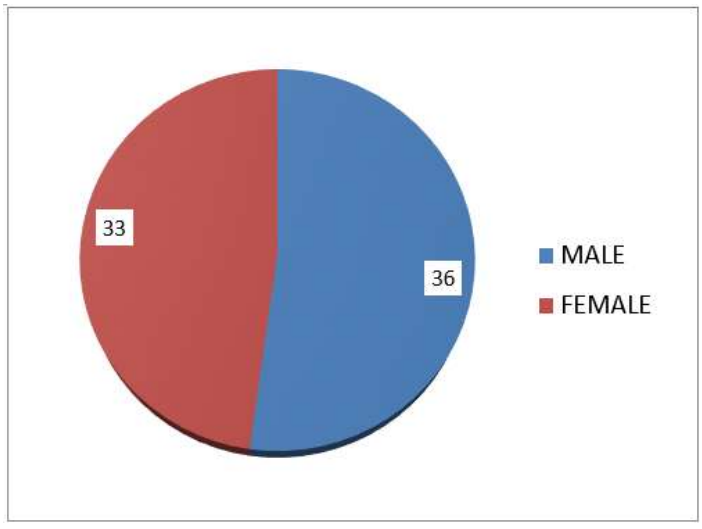
The haematological diagnosis of subtypes of leukaemias were reported by means of complete blood count (CBC), peripheral blood smear (PBS) and cytochemical stains. (TABLE 2)

TABLE 2: DISTRIBUTION OF LEUKEMIA ACCORDING TO FAB CLASSIFICATION

TYPE OF LEUKEMIA	NO. OF CASES	PERCENTAGE (%)
AML	21	30.43 (%)
ALL	6	8.71 (%)
CML	13	18.84 (%)
CLL	16	23.18 (%)
ACUTE LEUKEMIA	13	18.84 (%)
TOTAL	69	100 (%)

Acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) were found in 21(30.43 %) and 6 patients (8.71%) respectively. Of chronic type leukemia, 13(18.84%) patients had chronic myeloid leukemia (CML) and 16 (23.18%) had chronic lymphocytic leukemia (CLL). (TABLE 2)

In our study out of 69 cases, overall male preponderance was found with a percentage of 52.17 % of total cases and 47.83% in females. The overall male: female ratio was 1.1: 1 (CHART 1)



ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

CHART 1: SEX WISE DISTRIBUTION OF LEUKEMIA.

Majority of the patients belonged to age groups 40-50 yrs. Among the subtypes, most common age group affected by ALL was of 10-20 yrs, in which 3 cases seen. 40-50 yrs age group was commonly involved in AML and CML, in which 7 and 4 cases were seen respectively. In CLL common age group affected was 60 - 80 yrs, in which total 10 cases reported. (CHART 2)

In children, maximum numbers of cases were diagnosed as ALL (66.33%). Maximum number of AML cases was found in adult (80.95%) (CHART 2)

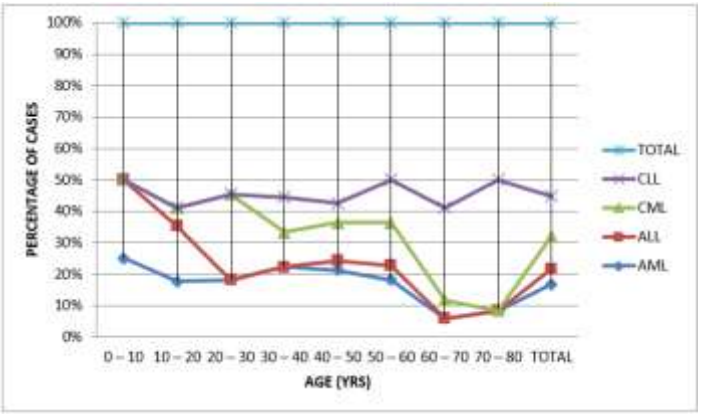


CHART 2: DISTRIBUTION OF CASES OF LEUKEMIA IN VARIOUS AGE GROUPS

In our study, adult patients (82.6%) were more affected than children (TABLE 3).

TABLE 3: DISTRIBUTION OF LEUKEMIA CASES IN CHILDREN AND ADULT

AGE	NO. OF CASES	PERCENTAGE (%)
CHIDREN (<18YRS)	12	17.40 (%)
ADULTS (>18 YRS)	57	82.60 (%)
TOTAL	69	100 (%)

All AML cases (21) were positive for special stains like Myeloperoxidase & Sudan black B & negative for Periodic acid shiff, whereas all ALL cases (6) were positive for PAS & negative for MPO & SBB.

Maximum number of patients (20.28%) came with generalized weakness. (CHART 3)

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

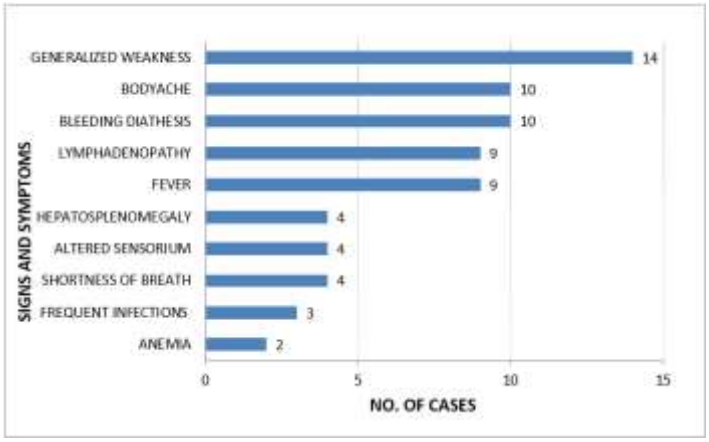


CHART 3: DISTRIBUTION OF SIGNS AND SYMPTOMS IN CASES OF LEUKEMIA

Most patients presented from lower socioeconomic class (65.21%) (CHART 4)

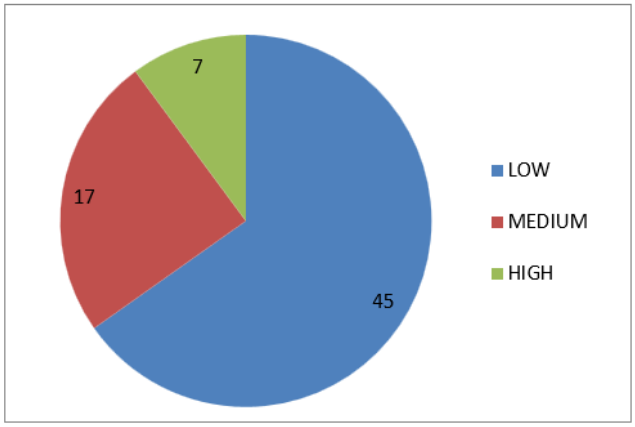


CHART 4: DISTRIBUTION OF LEUKEMIA IN DIFFERENT SOCIOECONOMIC CLASSES

Discussion

Diagnosis of primary hematological malignancies has multidimensional approach including evaluation of morphological details and phenotypic or genotypic pattern.[4, 11] Worldwide and also in paediatrics age group; it is one of the leading causes of death. It is observed in present study that Acute leukemia is more common than Chronic leukemia which is comparable with reports from Verghese *et al.*[22] , Dicosta *et al.*[23] & Chen *et al.* [13] .Nasim N *et al.* found 80% acute leukemic cases out of total leukemia and Humayan *et al.* showed 90% of acute type in their study.[14, 15] (TABLE 4)

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

TABLE 4: VAROUS STUDIES SHOWING DISTRIBUTION OF ACUTE & CHRONIC LEUKEMIAS

REFERENCE STUDY	REGION (PERIOD OF STUDY)	AML	ALL	CML	CLL
PRESENT STUDY	RAJKOT (2024)	30.43%	8.71%	18.84%	23.18%
VERGHESE *ET AL.*	KERALA (1983)	19.6%	39.2%	16.4%	1.9%
DICOSTA *ET AL.*	MUMBAI (1984)	22%	36%	38%	2%
CHEN *ET AL.*	CHINA (2007)	36.8%	22.1%	11.2%	19.7%
NASIM N *ET AL.*	LAHORE (2012)	31%	49%	1%	2%
HUMAYAN *ET AL.*	PESHAWAR (2001)	46.6%	43.2%	6.6%	3.3%

A total 12 leukemia cases were diagnosed in children (≤18 years), in which ALL subtype was the most prevalent, which shows ALL is more common than AML in children.[2, 3.] This similar observation (ALL>AML) was also observed by Nasim N *et al.* [14] , Rego MF *et al.*[16] ,N. Gupta[24] and Shuchismita[12] (TABLE 5)

TABLE 5: COMPARISONS OF STUDIES SHOWING MAXIMUM PREVALENCE OF ALL IN CHILDREN

REFERENCE STUDY	CHILDREN	ADULT	TOTAL NO. OF CASES OF ALL
PRESENT STUDY(Rajkot,2024)	4 (66.67%)	2 (33.33%)	6
NASIM N *ET AL.* (Lahore,2012)	13 (59%)	9 (41%)	22
REGO MF ET EL (Brazil,2000)	179 (77.83%)	51 (22.17%)	230
N. GUPTA (Kolkata, 2019)	197 (58.99%)	137 (41.01%)	334
SHUCHISMITA (Bihar, 2021)	51 (85.9%)	9 (14.1%)	60

Maximum number of AML (n=21) cases were found in adult (17) as compared to children (4) in our study. Nasim N *et al.*[14], Rego MF *et al.*[16,] N.Gupta[24], Shuchismita[12] and Paul B *et al.*[21] reported similar results. (TABLE 6)

TABLE 6: COMPARISONS OF STUDIES SHOWING MAXIMUM PREVALENCE OF AML IN ADULT

REFERENCE STUDY	CHILDREN	ADULT	TOTAL NO. OF CASES OF AML
PRESENT STUDY (Rajkot,2024)	4 (19.04%)	17 (80.96%)	21
NASIM N *ET AL.* (Lahore,2012)	5 (36%)	9 (64%)	14

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

REGO MF ET EL (Brazil,2000)	26 (22.60%)	89 (77.40%)	115
N. GUPTA (Kolkata, 2019)	53 (19.14%)	224 (80.86%)	277
SHUCHISMITA (Bihar, 2021)	5 (5.4%)	88 (94.6%)	93

Overall male preponderance was found in our study with a percentage of 52.17% in males and 47.83% in females (ratio ≈ 1.1:1). Similar distribution of gender was reported in Harani MS *et al.*, Jmili NB *et al.*, Ullah K, Salkar AB & Shuchismita with male to female ratio 1.5:1, 1.2:1, 1.7: 1, 2:1 and 1.6:1 respectively.[17, 18, 19, 2 and 12].

All AML cases (21) were positive for special stains like Myeloperoxidase & Sudan black B & negative for Periodic acid shiff, whereas all ALL cases (6) were positive for PAS & negative for MPO & SBB.

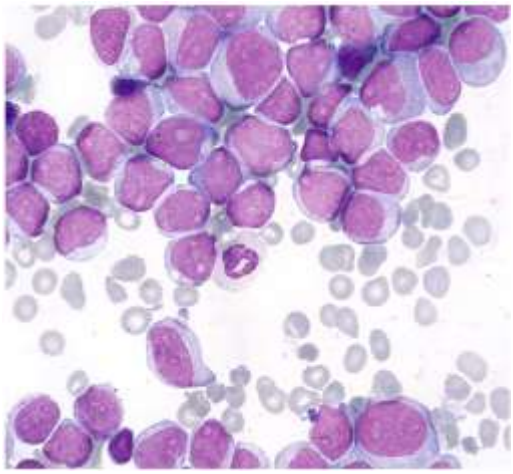


FIGURE 1: Acute Myeloid Leukemia showing characteristic inclusions -Auer's rods in the cytoplasm of Myeloblasts.

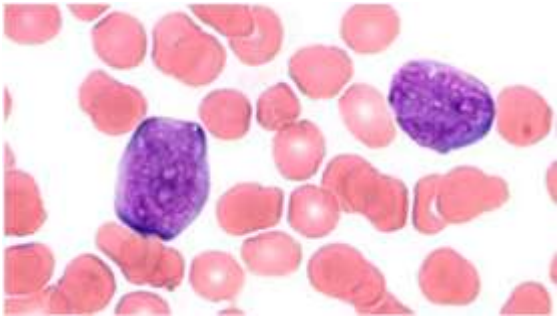


FIGURE 2: Peripheral blood smear in a patient with Acute Lymphoblastic Leukemia (ALL) showing blast cells (lymphoblasts)

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

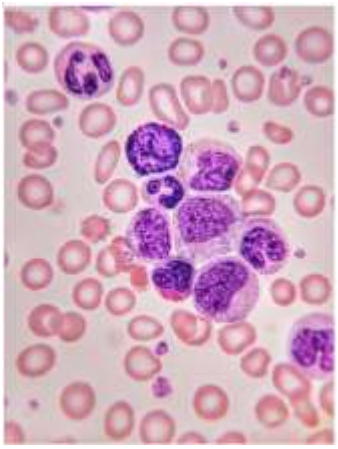


FIGURE 3: Peripheral blood smear demonstrating myeloid precursors and a few blasts seen in Chronic Myelogenous Leukemia (CML).

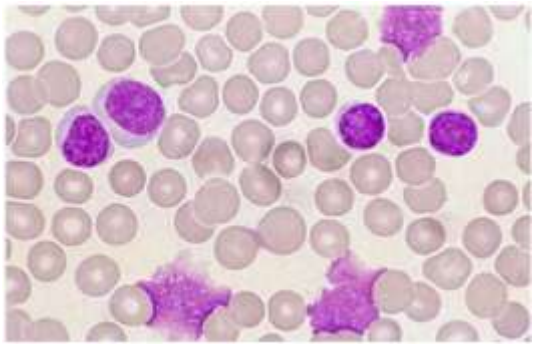


FIGURE 4: Peripheral blood smear in a patient with Chronic Lymphocytic Leukemia (CLL)

Conclusion

This study concludes that acute leukaemias were most common. Among the children ALL is the most common leukaemia and among the adults AML is the most common followed by CLL. Early identification of signs and symptoms which are suspicious clinically of leukemia will aid in early diagnosis of hematological malignancies. Detailed hematological analysis including peripheral blood smears and bone marrow aspiration smears with cytogenetic analysis are necessary for early and definite diagnosis as well as effective management of haematological malignancies (leukemia).

References

1. Harris NL, Jaffe ES,Vardiman JW, Stein H, Diabold J, Flandrin G. WHO Classification of tumors of haematopoietic and lymphoid tissues-Introduction. In: Harris NL, Jaffe ES,Vardiman JW, editors. Pathology and genetics of tumors of haematopoietic and lymphoid tissues. Lyon France: IARC press; 2008: p 1-15.
2. Salkar AB, Patrikar A, Bothale K, Malore S, Salkar A, Modani S. Clinicohematological evaluation of leukemias in a tertiary care hospital. IOSR-JDMS. 2014;13:126-34.
3. McKenna RW. Multifaceted Approach to the Diagnosis and Classification of Acute Leukemias. Clin Chem. 2000;46:1252-9.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

4. Arber DA, Cousar J. Hematopoeitic Tumors: Principles of pathologic diagnosis. In: Greer JP, Rodgers GM, Foerster J, Paraskevas F, Lukens JN, Glader B, editors. Wintrobe's Clinical Hematology.13th edition, vol 2. Philadelphia: Lipincotts Williams and Wilkins; 2014: p 1663-68.
5. L Robins V D Kumar Haematopoietic and lymphoid systemBasic Pathol
6. Philadelphia: Saunders1987351406
7. Childs S A Stass Characterization & Diagnosis of acute leukemia. In the Acute Leukemia. (ed by) Stass SA. New York and BaselMarcel Dekker Inc1987126
8. D Bonnet E D John Human AML is organized as a hierarchy that originates from a primitive haematopoietic cellNature Med19973730737.
9. Bennett JM, Catovsky D, Daniel MT, Flandrin G, Galton DA, Gralnick HR *et al.* Proposal for the classification of the acute leukaemias. French American British (FAB) Cooperative group. Bri J of Haematol. 1976;33:451-
10. Bennett JM, Catovsky D, Daniel MT, Flandrin G, Galton DAG, Gralnik HR *et al.* Proposed revised criteria for the classification of acute myeloid leukemia: A report of the French –American-British Co-operative group. Ann Int Med. 1985;103:620-9.
11. Bain BJ, Baits I. Approach to the diagnosis and classification of blood diseases. In: Lewis SM, Bain BJ, Baits I, editors. Dacie and Lewis Practical Haematology. 11th ed. Philadelphia; Churchill Livingstone: 2012: p. 549-63.
12. Clinico-Hematological Profile of Acute Leukemia Cases in Bihar: A Multiparameter Study in a Tertiary-Care Hospital Shuchismita, Iffat Jamal , Ravi Bhushan Raman, Vijayanand Choudhary
13. B Chen Z Huang X Zhang J Ou-Yang J Li Y Zhai An epidemiological investigation of leukemia incidence between 2003 and 2007 in Nanjing, China J Hematol Oncol2003321
14. N Nasim K Malik N K Malik S Mobeen S Awan M Mazhar Investigation on the prevalence of leukaemia at a tertiary care hospital, LahoreBiomed2013291922.
15. M Humayun S A Khan W Muhammad Investigation on the prevalence of leukemia in North West Frontier Province of PakistanTJC2005353119122.
16. Rego MF, Pinheiro GS, Metze K, Lorand-Metze I. Acute leukemias in Piaui: comparison with features observed in other regions of Brazil. Brazilian Journal of Medical and Biological Research. 2003;36(3):331-7.
17. Harani MS, Adil SN, Shaikh MU, Kakepoto GN, Khurshid M. Frequency of FAB subtypes in acute myeloid leukemia patients at Aga Khan University Hospital Karachi. J Ayub Med Coll Abbottabad. 2005;17:26-9.
18. Braham-Jmili N, Sendi-Senana H, Labiadh S, Ben Abdelali R. Hematological characteristics, FAB and WHO classification of 153 cases of myeloid acute leukemia in Tunisia. Ann Biol Clin. 2006;64:457-65.
19. Ullah K, Ahmed P, Raza S, Satti TM, Chaudhry QU, Akhtar F, Kamal MK , *et al.* Management of acute myeloid leukemia-5 years' experience at Armed Forces Bone Marrow Transplant Centre. Rawalpindi. J Pak Med Assoc. 2007;57:434-9.
20. Gupta R, Kaul KK, Dewan D. Clinicomorphological profile in acute leukemias: experience from a tertiary care centre in Jammu. Indian J Res. 2015;4:4-6.
21. Paul B, Mukiibi JM, Mandisodza A, Levy L, Nkrumah FK. A three-year study of 137 cases of acute leukaemia inZimbabwe. Cen Afr J Med. 1992;38:95-9.
22. Varghese PR, Elayidom NB, Joseph CD, Kumar S. Epidemiological observations on

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 04, 2024

leukaemia in Kerala (A study of 1016 cases over three years), Ind J Haematol, 1984;2:15-17.

23. D'Costa G, Siddiqui HM, Pradhan RM, Gupte SS. Pattern of leukemias: a ten-year incidence study of 242 cases. J Postgrad Med. 1989 Oct;35(4):191-5.
24. N. Gupta, Spectrum and Immunophenotypic profile of Acute Leukemia: A Tertiary Centre Flow Cytometry experience.