ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 07 | July - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AN OBSERVATIONAL STUDY OF CLINICO EPIDEMIOLOGICAL PROFILE OF HEMATOLOGICAL MALIGNANCIES IN PAEDIATRIC AGE GROUP AT SMS MEDICAL COLLEGE, ATTACHED HOSPITALS, JAIPUR.

Pathology

Dr Akshita Agrawal MBBS, MD, PG Resdient, Pathology, SMSMC, Jaipur

Dr Deepika Mishra* MBBS, MD, Senior Professor, Pathology, SMSMC, Jaipur *Corresponding Author

Dr Swati yadav MBBS, MD, PG Resdient, Pathology, SMSMC, Jaipur

ABSTRACT

Background- Hematological malignancy comprises a major health problem in the society due to its high mortality and morbidity. Among all the cancers, most frequent cancer in pediatric age group is the hematological malignancy. It is important to them for prognosis and management lacunae in the pediatric population for better risk stratification and treatment. Hence, the study aims to find out its prevalence,clinical hematological profile and to aid in early diagnosis of the disease. **Methods-** 120 specimens of hematological disorder in pediatric age group patient were studied in pathology department of SMS Medical College, Jaipur from December 2023 to December 2024. **Result-** Most of the patients in this study were from Rajasthan, Haryana, U.P. and Bihar region. The age of the patients ranged from 0-15 years, out of which 67%were Male, 33% were female with a M:F ratio of 2:1. Majority of the patients (58%) were in the age group of 0-5years.The most prevelant clinical symptom were fever (85%) followed by fatigue (60 %), while the most common clinical sign observed in the subjects was pallor (83%).Anemia, leucocytosis, thromocytopenia and splenomegaly were common finding in most of the patients.The most common malignancy that was diagnosed with the help of Flow cytometry and PCR was B-ALL (65%), followed by T-ALL (17%), AML (9%), CML (3%). None of the cases were found to demonstrate CLL and Lymphoma while about 4% cases were lost to attrition due to failure to follow up by the patient, consequently Flow cytometry results were not available for those cases. **Conclusion-** The accurate diagnosis, classification and timely management of hematological malignancies is effectively accomplished by a multifaceted approach which includes clinical presentation, peripheral blood film analysis, bone marrow aspiration study, immunophenotyping using flow cytometry and cytogenetics.

KEYWORDS

Haematological Malignancy, Paediatric Age.

INTRODUCTION

Hematological malignancies, characterized by the aberrant proliferation of blood cells, represent a heterogeneous group of cancers that encompass a wide spectrum of diseases affecting both children and adults. Pediatric hematological malignancies encompass a variety of diseases, including but not limited to acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), and various types of solid tumors originating from hematopoietic tissues.[1]

These conditions differ significantly in their biological behavior, treatment modalities, and outcomes, necessitating a comprehensive understanding of their clinico-epidemiological characteristics for optimal management strategies.[1] According to the International Agency for Research on Cancer (IARC), leukemia is the most common childhood cancer, accounting for approximately 30% of all malignancies among children aged 0-14 years worldwide. Immunophenotyping have revolutionised the methods of diagnosing leukemias, and today is the gold standard in its diagnosis and management. A multifaceted approach has evolved, including basic cytology, cytochemical study pattern, along with immunophenotyping and cytogenetics in the current setting of therapy and prognosis.[2]

It is important to identify hematological malignancies for prognosis and management lacunae in the pediatric population for better risk stratification and treatment. Hence, the study is designed with special interest to find out its prevalence and clinical hematological profile and other epidemiological distribution and to aid in early diagnosis of the disease, so these kind of malignancy can be made amenable to the treatment.

METHODS

Study Type: Observational study
Study Design: Descriptive, Cross-sectional study.
Study Setting: The study was conducted in Department of Pathology, S.M.S. Medical College, and attached hospitals Jaipur.
Study Duration: 1 year
Study Population: Pediatric age group (0-15years) presenting with hematological malignancy at SMS medical college and attached hospitals, Jaipur.
Study Population: -It is determined by applying:

Inclusion Criteria- Newly diagnosed cases of hematological malignancies in pediatric age group (0-15years).
Exclusion Criteria: -

- Patients who are not willing to participate in the study.
- Cases with relapse of disease

Sample Size: The sample size calculated is 120 specimens of hematological disorder in pediatric age group.
Sampling Technique :
Study of cases with detailed clinical history and relevant investigation (CBC, bone marrow typing, flow cytometry and cytogenetics) will be done at department of pathology, SMS Medical College, Jaipur.

RESULT

The age of the patients in the study ranged between 0 to 15 years. Patients aged 0-5 years constitued most number of cases in the study (58 cases, or 48.33 %).

Table 1 Age Distribution

Age Group	No. of cases	Percentage
0-5	58	48.33
6-10	29	24.17
11-15	33	27.50
Total	120	100

While studying gender distribution of cases in the study, gender disparity was noticed with male gender, constituting two-third cases of the total number that is 66.67%.

Table 2: Gender Distribution

Gender	No. of cases	Percentage (%)
Female	40	33.33
Male	80	66.67
Grand Total	120	100

Most common reported symptom by the patients was fever (85%), followed by fatigue (57%). Bleeding manifestations (32%) and loss of appetite (28%) were reported in more than one fourth of the patients in our study. Other significant clinical symptoms were weight loss, bone pain, cough-cold and CNS symptoms.While examining the patient, Pallor was the most overlapping clinical sign among all the cases we studied, which was present in more than 83% cases. Splenomegaly (54%) and hepatomegaly (52%) were also found commonly in these cases. Lymphadenopathy was reported in 28% cases.

While assessing CBC findings, anemia was seen in more than 97% of patients and among them, 68% patients had severe anemia (<7 gm%). These findings are correlating with clinical examination, which shows pallor in 83% cases and fatigue in 56% cases. Majority of the patients were found to have WBC count >10,000/mm3 with 11% having more than 50,000/mm3. A small portion of our subjects also reported a WBC count of less than 5,000/mm3. While studying clinical symptoms, 32% patients complained of bleeding tendencies which can be attributed to thrombocytopenia which was observed in majority of these patients. More than 90% cases had a platelet count <1,00,000 while 34% cases were found to have platelets as low as <20,000/mm3.

Table 3 : Laboratory Finding

	Value	No. of cases	Percentage
Hemoglobin	<7	56	46.67
	7-11	61	50.83
	>11	3	2.50
WBC count	<5000	03	2.5
	5000-9999	28	23.33
	10000-49999	75	62.5
	>50000	14	11.66
Platelet count	<20000	41	34.17
	20000-99999	70	58.33
	>=100000	9	7.50

Out of 120 cases, 95% cases were diagnosed as Acute leukemia upon microscopic examination. A handful of cases came out to be myeloproliferative neoplasm (3%). Just 2 cases (1.67%) were proven to be Lymphoma on lymph node biopsy but bone marrow infiltration was not observed in both the cases.

Table 4: Morphological Diagnosis

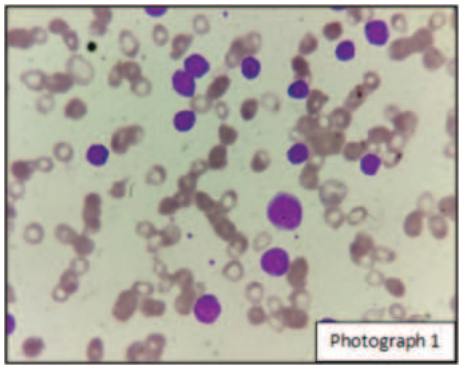
Morphologocal diagnosis	Count	Percentage
Acute Leukemia	114	95.00%
MPN	4	3.33%
k/c/o of NHL &BM is free from infiltration	2	1.67%
Grand Total	120	100.00%

B-ALL (65.83%) was the most common diagnostic conclusion that was observed. T-ALL were the second most common finding with 21 cases (17.50%). Other hematological malignancies were AML M2 (5.83%), AML M3 (3.33%) and CML (3.33%).None of the specimen showed CLL and Lymphoma in this age group in our study. The study suffered an attrition of total 5 cases (4.17 %) because of failure of patients to follow up due to which, flow cytometry was not done in those cases.

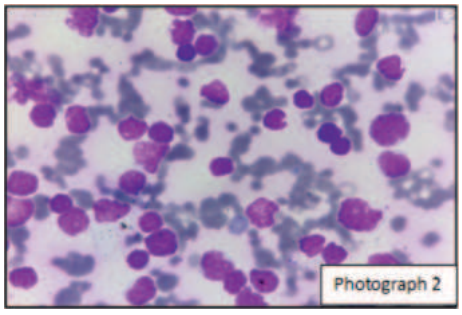
Table 5 : Advance Hematology Diagnosis

Advance hematology diagnosis	No of cases	Percentage
T-ALL	21	17.50%
B-ALL	79	65.83%
AML-M2	7	5.83%
AML-M3	4	3.33%
CML	4	3.33%
NOT DONE	5	4.17%
Lymphoma	0	0.00%
CLL	0	0.00%
Grand Total	120	100.00%

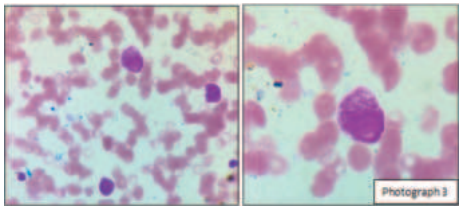
Photographs



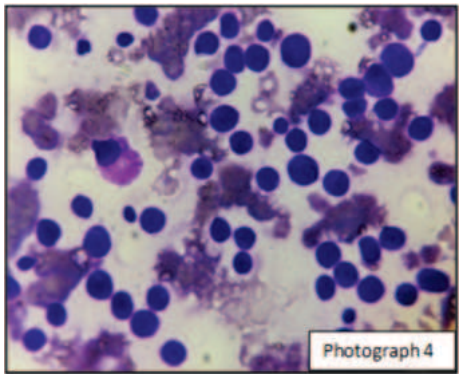
Photograph 1: Peripheral blood film showing lymphoblasts (L1 & L2) (100x Leishman stain)



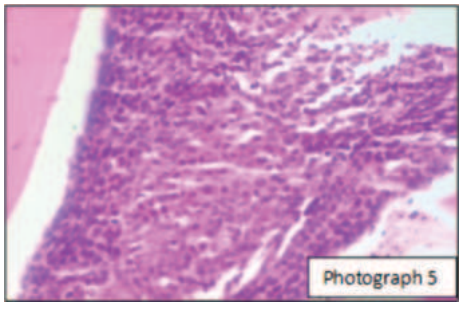
Photograph 2: Bone marrow aspirate of ALL showing heterogenous population lymphoblasts (L2) (100 x Leishman stain)



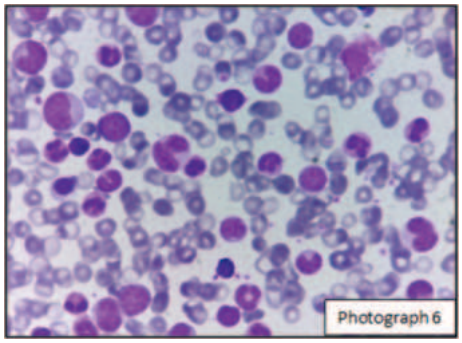
Photograph 3: Bone marrow aspiration of AML-M3 under High power (1000x) showing faggot cell. Faggot cell having multiple auer rods are characteristic of AML-M3.



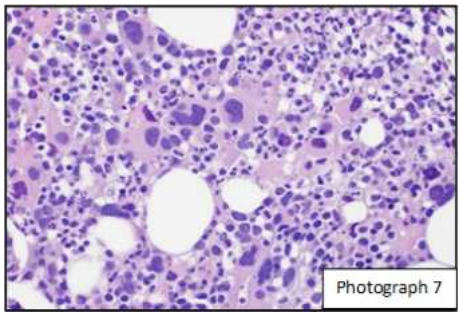
Photograph 4: Bone marrow aspiration of AML-M3 under medium power (1000x) showing faggot cell.Faggot cell having multiple auer rods are characteristic of AML-M3.



Photograph 5: H & E staining of bone marrow biopsy of AML-M3 under high power (1000x) showing bony trabeculae and sheets of blasts.



Photograph 6: Peripheral smear from a case of CML (100X) show mature neutrophils, myelocytes, metamyelocytes and band cells.



Photograph 7: Bone marrow biopsy shows markedly increased dwarf megakaryocytes in case of chronic myeloid leukemia.

DISCUSSION

In the present study out of 120 cases, 80 patients were males and 40 were females. Males formed the majority of patients similar in other studies done by siddairhagari SN et at [(3)] (2015), venkatasai et al [(4)] (2017), prajapati et al [(5)] (2017), alhajori et al [(6)](2023), where male to female ratio were 1:2:1, 2.2:1, 3.5:1 and 1:7:1 in these study groups respectively. One study by zubair et al [7](2022) shows the female predominance with male to female ratio 1:1:3.In this study, patients were predominantly in the age group of 0-5 years (48.33%), which is similar to the predominant age group found in studies done by prajapati et al [5](2017), Alhajori Faisal et al [6] (2023) and Siddaiangari SN et al (2015)[3.] In study done by Manzour A et al [8]6-10years was the predominant age group.The second most common age group in the present study was the adolescent age which was in contrast to the other two studies in which pre-adolescent age group was the second most common age group.

In present study, the most common clinical finding in the subjects was fever which was present in 85% of the cases. This result resonated with three other studies done by Siddaiagagari et al [3] (2015), Zubarabdulah et al [7] (2022) and Manzour A et al [8]which also found fever to be the most common clinical presentation, while Prajapati et al [5](2017) and K.Das[9] demonstrated fatigue as the most common symptom in their study.

Pallor was present in most of the cases (83.33%) in our study, which resonates with study done by Siddaiangari SN et al [3.] K. Das[9]and Manzour A et al [8] while Splenomegaly (82.7%) was the most common clinical sign in study done by prajapati et al [5] (2017). Majority population in present study demostrated a hemoglobin value in the range (7-11gm%) while in the other two studies by K Das et al [10]and Prajapatiet al [5] (2017) most population resided in the <7gm% . Conclusively, in all the sudies, most of the subjects suffered from anemia of varying degree.

Most of cases in present study were found to have thrombocytopenia of varying severity with more the one third reporting a platelet count of <20,000/mm3 and majority cases demonstrating a platelet count between 20000-99,999/mm3. The other two studies done by K Das et al [10] and Prajapati et al [5] (2017) also found majority of subjects reporting thrombocytopenia in the same bracket.All the 4 studies including ours had majority of patients having leucocytosis in the range (10,000-49,999/mm^3) approximately 63 % in our study , same result was observed in the study done by Prajapati et al [5] (2017).

Table 1. Incidence of Cancer Malignancies is Various States.

Type of cancer	Maha-rashtra 11 (1998)	West-Bengal 12 (2003)	Karna-taka 13 (1996)	Kerala (2000) 14	Orissa (2007) 15	(2010) Guj-rat 16	(2017) Guj-rat 5	Present study
Leukemia	80%	48%	84%	77%	90%	91.1%	94%	100%
Lymphoma	20%	52%	16%	23%	10%	9%	06%	0

As per this table, we have compared studies from different states of India and present study.In all studies leukemia cases are more than lymphoma cases.

ALL is the most common among all the hematological malignancy. But the cases of ALL are very high in our group that is 87.53% compared to study done in honkong (57%) and USA (54%, France (57%).

Advance Hematology Diagnosis

In present study Flow cytometry diagnosis revealed that B-ALL was found to be more common than T-ALL , this result resonated with other studies done by FS A lhajori et al [6] (2023), Shrestha et al [18] (2013), Siddaiangari SN et al [(3)] (2015) which also showed B-ALL more common than T-ALL in pediatric age group.

The findings of our study differ from those of Kritika Patel et al[19] (2015), where T-ALL was reported as the more prevalent subtype.

In acute myeloid leukemia cases, M2 was most frequent subtype , similar results were observed in other studies done by Shrestha et al [20] (2013) ,Basharat M et al [21](2011) and Kumar et al [22](2016).

CML was observed in 3.33% of cases in our study, aligning with the findings of Prajapati et al [5](2017), where 2.53% of patients had CML, and Michel et al [23](Switzerland, 2015), where 05% of cases were reported as CML.

CONCLUSION

To conclude, the accurate diagnosis of hematological malignancies is effectively accomplished by a multifaceted approach which includes clinical presentation, peripheral blood film analysis, bone marrow aspiration study and immunophenotyping using flow cytometry. Although considered superior, flow cytometric analysis it is imperative to perform it in conjunction with cytomorphology for differential diagnosis of leukemia and lymphoma. Furthermore, BCR-ABL gene study should be done for confirmation of CML by PCR.

Acknowledgment: Not Applicable
Financial Support & Sponsorship: None
Conflict of Interest: None

REFERENCES

1. Chennamadhavuni A, Lyengar V, Mukkamalla SKR, Shimanovsky A. Leukemia. In: StatPearls. Treasure Island (FL): StatPearls Publishing; January 17, 2023.
2. Mckenna RW. Beckman Conference. Multifaceted Approach to the Diagnosis and Classification of Acute Leukemias.Clinical Chemistry. 2000,46(8).
3. Siddaiahgari S, Awaghad M, Latha M. Clinical, immunophenotype and cytogenetic profile of acutelymphoblasticleukemiainchildrenattertiary healthcarecentreinIndia. MullerJ.Med.Sci.Res.2015;6:112.
4. Venkatasai JP, Srinivasamaharaj S, Sneha LM, Scott JX, Baby AK, Rajan M. Pediatrichematological malignancy: Identification of issues involved in the road to diagnosis. South Asian J Cancer. 2017;6(1):28-30. doi:10.4103/2278-330X.202559
5. Prajapati Z, Kokani MJ, Gonsai RN. Clinicoepidemiological profile of hematological malignancies in pediatric age group in Ahmedabad. Asian Journal of Oncology. 2017 Jan 1;3(1):54
6. Alhajori FS, Makkawi MH, Alasmari SZ, Shaikh AA, Baig MA. Estimating the prevalence of pediatrichematological malignancies in Al-Madinah Al-Munawwarah, Saudi Arabia. Saudi Med J. 2023;44(5):504-508. doi:10.15537/smj.2023.44.5.20220915
7. Zubair AB, Razzaq MT, Hashmi AW, et al. Clinical Characteristics and Etiological Spectrum of Pancytopenia in Pediatric Age Group: A Cross-Sectional Outlook From a Developing Country. Cureus. 2022;14(8):e27842. Published 2022 Aug 10. doi:10.7759/cureus.27842.
8. Manzour A, Makkeyah SM, Shawiesh MM, Ragab IA. Pattern and Survival of Childhood Malignancies:A10-YearRetrospective Study. Journalof High Institute of Public Health. 2021 Apr1;51(1):39-46.
9. Clemmensen SB, Harris JR, Mengel-From J, et al. Familial Risk and Heritability of Hematologic Malignancies in the Nordic Twin Study of Cancer. Cancers (Basel). 2021;13(12):3023. Published 2021 Jun 16. doi:10.3390/cancers13123023
10. Das KV, Aboobacker CM, Mathew O. Clinical presentation of leukemias in children in south Kerala. Indian Pediatric
11. Yeolle BB, Jussawalla DJ, Advani SH. Descriptive epidemiology of leukemias in Greater Mumbai. Natl Med J India 1998;11:116-9.
12. Britto TI, Fattah SA, Rahman MAU, Chowdhury MAU. A Systematic Review on Childhood Non-Hodgkin Lymphoma: An Overlooked Phenomenon in the Health and Research Sector of Bangladesh. Cureus. 2023;15(9):e45937. Published 2023 Sep 25. doi:10.7759/cureus.45937
13. Nandakumar A, Anantha N, Appaji L, Swamy K, Mukherjee G, Venugopal T, et al. Descriptive epidemiology of childhood cancers in Bangalore, India. Cancer Causes Control 1996;7:405-10.
14. Das KV, Aboobacker CM, Mathew O. Clinical presentation of leukemias in children in south Kerala. Indian Pediatric
15. S aqib Qayyum Ahmad, Rizwan Yusuf, Shamaila Burney. Frequency of various types of leukaemias diagnosed at paf hospital mianwali. Pak Armed Forces Med J .2015, 65(4): 474-77
16. Salaam Abu, Mani Senthil.Clinical and haematological evaluation of leukaemias using cytochemical stains and immunophenotyping. Journal of Evolution of Medical and Dental Sciences 8(19):1572-1577.
17. Li CK, Mang OWK, Foo W. Epidemiology of paediatric cancer in Hong Kong, 1982 to 1991. Hong Kong Cancer Registry. HKMJ 1999;5:128-34
18. Shrestha S, Shrestha J, Pun C.B, Pathak T, Bastola S, Bhatta R. Immunophenotypic study of acute leukemia by flow cytometry at BPKMCH. Journal of Pathology of Nepal. 2013, 3: 345 -350.
19. Hillman R., and Ault K. Hematology in Clinical Practice. 3rd Ed. 2002, Chapter 17: 24, 195-206,278-283
20. Shrestha S, Shrestha J, Pun C.B, Pathak T, Bastola S, Bhatta R. Immunophenotypic study of acute leukemia by flow cytometry at BPKMCH. Journal of Pathology of Nepal. 2013, 3: 345 -350.
21. Basharat M, Khan SA, Nasir ud Din, Ahmed D. Immunophenotypic characterisation of morphologically diagnosed cases of Acute Myeloid Leukaemia (AML). Pak J Med Sci. 2019, 35(2):470-476
22. Kumar S, Anand S, Sahu TP. Clinico-hematological profile of paediatric patient admitted with acuteleukemiaintertiarycarecentreofcentralIndia.IndianJournalofChild Health. 2016Dec25;3(4):308-10.
23. Michel G, Von Der Weid NX, Zwahlen M, Redmond S, Strippoli MP, Kuehni CE. Incidence of childhood cancer in Switzerland: The Swiss childhood cancer registry. Pediatric blood & cancer. 2008 Jan 1;50(1):46 51.