ORIGINAL RESEARCH PAPER

Pathology

A RETROSPECTIVE CROSS SECTIONAL STUDY ON PATTERN & DISTRIBUTION OF PEDIATRIC HEMATOLOGICAL MALIGNANCIES IN CENTRAL PART OF INDIA

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ABSTRACT

Hematological Malignancies (HMs) consists of a diverse group of neoplastic diseases involving Bone Marrow, Lymph nodes or other Secondary Immune Organs. Conventionally, HMs represents 2 major group of diseases – Leukemia & Lymphoma. All Hematological Malignancies are on the rise as compared to few decades back worldwide but, it's major brunt is faced by the under developed countries of the world. A retrospective study in a Government Teaching Hospital was undertaken to characterize Pattern and Distribution of HMs in children in Chhattisgarh state of India. A total number of 65 Bone Marrow Aspiration Cytology cases were evaluated from 1st January 2019 to 31st December 2019 for a period of 1 year. Pediatric Population was categorized into 3 age groups – 0-2 years, 2-12 years and 12-16 years. Male to Female ratio was 2.4:1 in our study with most cases being of Acute Leukemias (95.4%). On further evaluation, ALL had highest numbers with 37 cases (57.0 %) followed by Acute Leukemia and AML with 14 (21.52%) & 10 (15.38%) cases respectively. The highest number of cases were seen in 2-12 years age group (n=49, 75.4%) implying that children of such age group presenting with signs and symptoms of HMs must be thoroughly evaluated for early diagnosis and treatment.

INTRODUCTION:

Hematological Malignancies is a common cause of Morbidity & Mortality in Pediatric Population worldwide. It is also fairly common in developing countries with more than 80% of 2 lakhs children developing cancers are from developing countries.[1] In India, pediatric cancer in males vary from 4 to 556 per million population while 2 to 309 per million in females.[3] Here, childhood cancers are 9th most common cause for death in 5-14 years age group.[2] But, Hematological Malignancies, Leukemia & Lymphomas ranks 1st & 2nd in death due to childhood cancers respectively.[3]

Hematologic malignancies (HM) are a group of cancers that arise from a malignant transformation of hematopoietic stem cells of the bone marrow or the cells of reticuloendothelial system.[6,7,8,18,22] They are characterized by diffuse replacement of bone marrow &/or Peripheral Blood or Lymph Nodes by neoplastic clonal cells.[6,8,22] According to the 2014 study by Ferlay J et al. HMs were estimated to represent about 6.5% of all cancers worldwide in 2012.[7,9]

There has been a considerable increase in the occurrence of HMs over the past decades. World Health Organization predicts the number of HMs cases to increase by about 48% in less developed countries in 2030 when compared to 2012.[7,9,10]

HMs are major burden to afflicted patients and their families psychologically, medically and financially.[7] As to our knowledge, no study has investigated the distribution of pediatric HMs in Chhattisgarh state – situated in central part of India and hence the present study.

For proper management and treatment of Childhood Hematological Malignancies adequate diagnosis is essential. Subtyping of Childhood Leukemias and Lymphomas are classified according to WHO 2016 Classification for Hematolymphoid Neoplasms in Acute/Chronic Myeloid or Lymphoid Leukemia & Non-Hodgkin's or Hodgkin's Lymphoma.

The present study is an attempt to look for the prevalence & pattern of Childhood Hematological Malignancies in the largest Tertiary Care Centre of Capital City of Raipur which is situated in Central part of Chhattisgarh State. Chhattisgarh state is having a predominantly indigenous tribe population and most of them are poor and hence the study also looks for the Hematological Malignancies prevalent in pediatric age group of such population.

AIMS & OBJECTIVE:

To study pattern distribution of Hematological Malignancies in Pediatric Population on the basis of morphology in Central Part of India.

MATERIALS & METHOD:

STUDY DESIGN: Retrospective Cross Sectional Study.

PLACE OF RESEARCH: Dr. Bhim Rao Ambedkar Memorial Hospital associated with Pandit Jawaharlal Nehru Memorial Medical College, Raipur (Chhattisgarh) – A Government Tertiary Care Hospital of Central India.

STUDY PERIOD: 1st January 2019 to 31st December 2019 – 1 year.

STUDY SUBJECTS: All patients of pediatric age group (< 16 years of age) presenting with suspected Hematological Malignancies.

INCLUSION CRITERIA:

1. All Pediatric Age Group Patients (< 16 years of age) with suspected Hematological Malignancies presenting for Bone Marrow Aspiration Study to Hematopathology Section, Department of Pathology, Dr Bhim Rao Ambedkar Memorial Hospital Associated to Pt. Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh.

EXCLUSION CRITERIA:

1. Patients > 16 years of age with suspected Hematological Malignancies.
2. Patients with Non-Malignant Hematological Diseases.

METHODOLOGY:

Retrospective Data collected of all pediatric patients suspected for Hematological Malignancies which underwent Bone Marrow Aspiration Cytology at Hematopathology Section, Department of Pathology, Dr Bhim Rao Ambedkar Memorial Hospital associated to Pandit Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh from 1st January 2019 to 31st December 2019. Dry smears were prepared and MGG staining was done. Subsequent Diagnosis & Classification was done on basis of morphology under Microscope.

The data was collected and compiled and presented in form of Tables, Percentages, Charts, Graphs and Histograms.

RESULTS:

Total 65 Pediatric Bone Marrow Aspiration Cytology specimens showing Hematological Malignancies were obtained, including 46 Males and 19 Females. They were distributed in 3 age groups according to USFDA & NICHD – (a) Infants and toddlers (0-2 years) (b) Children (2 to 11 years) (c) Adolescents (12 to 16 years).[16,17] Specimens were collected, processed, stained and studied under the Microscope during the study period. Male to Female ratio was approximately 2.4:1 in the present study (Table 1, Chart 1a &1b).

Table 1:

	No. of Specimens Collected	Percentage Data	M:F Ratio
Male	46	71%	2.4
Female	19	29%	1
Total	65	100%	

Chart 1a: Percentage Data
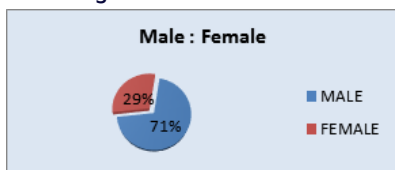
CHART 1b: Numerical Data
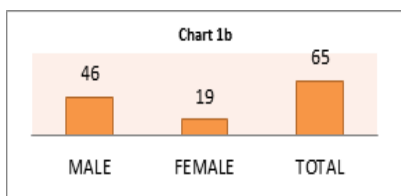
The Age wise distribution of HMs are as below-

Table 2a:

S.No.	DIAGNOSIS	MALES			FEMALES		
		0-2 Year	2-12 Year	12-16 Year	0-2 Year	2-12 Year	12-16 Year
1	Acute Leukemia	0	6	2	2	3	1
2	ALL	3	22	2	1	8	1
3	AML	1	6	1	0	1	1
4	APML	0	0	1	0	0	0
5	CML	0	1	0	0	1	0
6	NHL with BM Spillover	0	1	0	0	0	0
7	TOTAL	4	36	6	3	13	3

- ALL – Acute Lymphoblastic Leukemia
- AML – Acute Myeloid Leukemia
- APML – Acute Promyelocytic Leukemia
- CML – Chronic Myeloid Leukemia
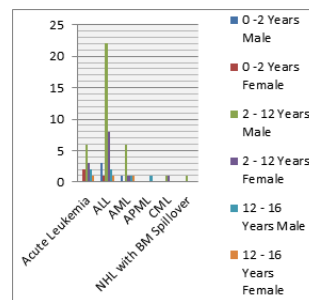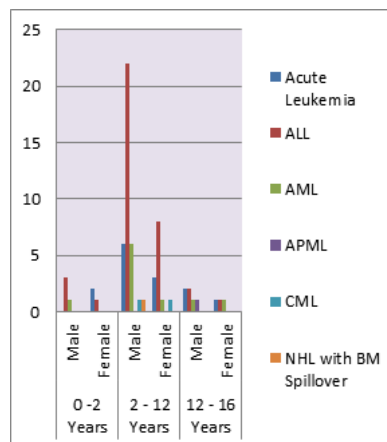- NHL – Non Hodgkin's Lymphoma
- BM – Bone Marrow

Chart 2a:

Table 2b:

S. No.	Age Group	Gender	Acute Leukemia	ALL	AML	APML	CML	NHL with BM Spillover
1	0 – 2 Year	M	0	3	1	0	0	0
		F	2	1	0	0	0	0
2	2 – 12 Year	M	6	22	6	0	1	1
		F	3	8	1	0	1	0
3	12 – 16 Year	M	2	2	1	1	0	0
		F	1	1	1	0	0	0
4	TOTAL		14	37	10	1	2	1

Chart 2b:

The case diagnosis were elaborated as below –

Table 3:

S. No.	Diagnosis	Male	Female	Total	Percentage
1	Acute Leukemia	08	06	14	21.52%
2	ALL	27	10	37	57.00%
3	AML – M0	01	00	01	1.54%
4	AML – M1	03	01	04	6.12%
5	AML – M2	01	01	02	3.06%
6	AML – M4	01	00	01	1.54%
7	AML – M5	01	00	01	1.54%
8	APML	01	00	01	1.54%
9	AML with Secondary Malignancies	01	00	01	1.54%
10	CML	01	01	02	3.06%
11	NHL with BM Spillover	01	00	01	1.54%
12	TOTAL	46	19	65	100%

Chart 3: Numerical Data
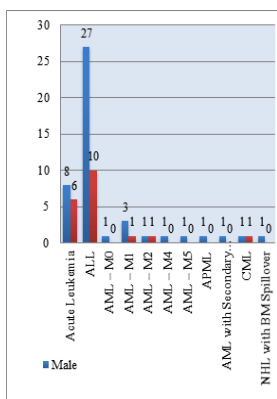
DISCUSSION:

Haematological Malignancies (HMs) affects all ages and genders.[23] The incidence of Leukemia has increased considerably because of better diagnosis and treatment methods available now.[24] Leukemias constitute major proportions of HMs and are classified into Acute/ Chronic Myeloid & Lymphoid subtype.[27]. In our study, total number of 65 cases were evaluated with Males (n=46) being affected more than Females (n=19) and Male to Female ratio of 2.4:1. The prevalance of gender bias against Females in India can also have a role here.[3,6] Among 65 total cases, 62 cases (95.4%) were of Acute Leukemias while only 2 cases (3.1%) were of Chronic Myeloid Leukemia (CML) and 1 case (1.5%) was of NHL with BM Spillover. No case of Chronic Lymphocytic Leukemia (CLL) was presented in our study. Acute Leukemias (AML and ALL) are more common than Chronic Leukemias (CML and CLL) worldwide. The results were in concordance with many previous studies viz. Kaur A et al (2018), Bavishkar JB et al (2016) & Gupta R et al (2015) etc.

On sub-division of Pediatric Population in 3 age groups – Among total number of 65 cases, maximum numbers were seen in 2-12 years age group (n=49; 75.4%) followed by 12-16 & 0-2 years age group with 9 (13.8 %) and 7 (10.8%) cases respectively.

The present study showed preponderance of ALL (n=37), followed by Acute Leukemia (n=14) and AML (n=9). There were 2 cases of CML among Pediatric Population while single cases of APML, AML with Secondary Tumor (Warthin's Tumor) and NHL with BM Spillover. On sub-classification of AML amongst Pediatric age-group in our study, AML-M1 (n=4) was highest followed by AML-M0, AML-M2, AML-M4 & AML-M5 with single case each. No case of AML-M6 & AMl-M7 was found in the present study. The results are in concordance with study of Kaur A et al (2018), Bavishkar JB et al (2016), Singh G et al (2016), Gupta R et al (2015) and Naseem N et al (2013).

The broad category of Acute Leukemias need modern techniques such as Immunophenotyping, Special Stains, Fluorescence In Situ Hybridization (FISH) and Cytogenetical Analysis for further classification and diagnosis on which modern management modalities depends.

CONCLUSION:

This study concludes that Acute Leukemias are more common than Chronic Leukemias in Pediatric Population. Also, Acute Lymphoblastic Leukemia (ALL) is much more common than Acute Myeloid Leukemia (AML) in children. 2-12 years age group has highest probability of having Hematological Malignancies among Pediatric Population. Males have more chances of getting all type of Hematological Malignancies (HMs) than Females. Ancillary techniques such as Immunophenotyping, Special Stains, Fluorescence In Situ Hybridization (FISH) and Cytogenetical Analysis are essential for further classification of Acute Leukemias.

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