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Clinicopathological Spectrum of All Non-Hematological Paediatric Tumours

Dr. Rohit Singh[*1], Dr. Mala Sagar[2], Dr. Madhu Kumar[3], Dr. Suresh Babu[4], Dr. Rashmi Kushwaha[5] & Dr. Yogendra Narayan Verma[6]

[1]Senior Resident, Department of Pathology, King George Medical University, Lucknow

[2,4,5]Professor, Department of Pathology, King George Medical University, Lucknow

[3]Associated Professor, Department of Pathology, King George Medical University, Lucknow

[6]Associate Professor, Department of Pathology, GSVM Medical College, Kanpur

HIGHLIGHTS

1. Non-hematological tumors vary by location and type.
2. Diagnosis involves clinical and pathological evaluation.
3. Pediatric tumors often exhibit diverse histological patterns.
4. Early diagnosis improves treatment outcomes significantly.
5. Tumor staging guides therapeutic decision-making approaches.

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ABSTRACT

Introduction: Paediatric tumours, though rare, are a leading cause of cancer-related deaths in children. Thus, we aimed to study the clinic-pathological spectrum of all non-haematological paediatric tumours. **Methodology:** In this retrospective and prospective investigation, we incorporated confirmed histological cases of non-haematological paediatric tumours in individuals aged 0-18 years spanning from 2019 to 2022. **Results:** The majority of cases in 2019 and 2020 were between 15-18 years, while in 2021, the majority were in the 10–14-year age group. Males constituted a higher percentage across all years. Leukaemia was the most common malignancy in all three years, with notable variations in other tumour types. Benign tumours were more prevalent in 2019 and 2021, while malignant tumours were more common in 2020. Hematological malignancies were more frequent across all years, with acute lymphocytic leukaemia being the most prevalent. Significant age (15-18 years mostly) and tumour type variations were observed among the children over the three years. **Conclusion:** While this hospital-based study cannot offer precise incidence rates, it provides valuable insights into paediatric tumour trends and patterns. Unlike previous studies that predominantly concentrated on paediatric malignant tumours, our analysis encompasses benign and malignant tumour cases.

* Corresponding author.
Dr. Rohit Singh, Senior Resident, Department of Pathology, King George Medical University, Lucknow
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INTRODUCTION

Paediatric tumours are as different as those of adults and pose a variety of difficulties for pathologists. Paediatric malignancies are uncommon, comprising approximately 1% of the total number of cancer cases. Unlike tumors in adults, which are categorized based on where they originate, tumors in children are usually categorized based on their physical characteristic[1]. The International Classification of Paediatric Cancer (ICCC) serves as the authoritative system for presenting information on the occurrence and survival rates of children cancer. Commonly occurring are benign tumours rather than malignant ones. Most benign tumours do not cause severe complications, although their location or rapid growth can occasionally cause concern[2,3]. According to the Indian Cancer Registries, juvenile malignancies represented 0.8% to 5.8% of all malignancies in men and 0.5% to 3.4% in females. The user's text is[4]. Neoplasms in children exhibit distinct occurrence, structure, and characteristics in contrast to those seen in adults[5]. In addition, prenatal and neonatal cancers tend to differentiate or retreat on their own, resulting in excellent survival and curability rates[6]. The study by Punia R et al. found that bone cancers were the most prevalent, with 21 instances of Ewing's sarcoma including 14 cases involving osteosarcoma and a single case of chondrosarcoma[7]. The central nervous system tumors consisted of 9 instances of medulloblastoma in the rear fossa, 5 cases of low-grade astrocytoma, including 4 cases of pilocytic astrocytoma. Rhabdomyosarcoma was the most prevalent soft tissue sarcoma subtype, with 8 cases in the head and neck region. Malignant epithelial tumours included mucoepidermoid carcinoma, adenocarcinoma colon-signet ring cell type, and squamous cell carcinoma. Malignant tumours are less common than benign tumours. The vast majority of benign tumours are of little concern, although their location or rapid growth might occasionally cause serious disease[2]. Both benign and malignant tumours necessitate a thorough investigation in order to provide an accurate diagnosis for devising therapy and predicting prognosis[8]. This study aimed to estimate the trend of paediatric tumours in Uttar Pradesh, Northern India, using complete epidemiological data from hospital registries. This information will be crucial for planning and evaluating health strategies, as there are few studies on the clinicopathological spectrum of paediatric tumours in India.

MATERIALS AND METHODS

This study was carried out at the Department of Pathology in cooperation with the Department of Paediatrics and the Department of Surgical Oncology, King George's Medical University, Lucknow. After obtaining ethical clearance and informed consent from patients or their guardians, 720 children in 2019, 215 children in 2020, and 528 children in 2021 were enrolled. Demographic parameter, including age, sex, gender, clinical history and examination finding, was recorded. All clinical parameters encompassing family history, disease duration, associated symptoms, and radiological findings when accessible. Detailed records were maintained, incorporating cytology, bone marrow examinations, and histopathological assessments. This involved attending patients who sought services for cytology, fine needle aspiration, and bone marrow examinations in the pathology department. Specialized staining techniques such as Leishman Giemsa and Hematoxylin and Eosin (HE) were employed for precise tumour typing. Furthermore, patients whose biopsies were received underwent meticulous tissue processing, followed by H&E staining and in-depth analysis to categorize specific tumour types and determine their grading. Additionally, follow-ups were conducted via telephone, whenever feasible, to ensure comprehensive patient care and data collection.

STATISTICAL ANALYSIS

Statistical analysis was conducted using IBM SPSS version 26. We evaluated the normality of the data distribution using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The continuous variables were assessed using the mean (standard deviation) or range value as necessary. The dichotomous and continuous variables were displayed in terms of number/frequency and were examined using the Chi-square Test. A p-value less than 0.05 or 0.001 was considered statistically significant.

RESULTS

We observed significant trends in paediatric malignancies in 2019, 2020, and 2021. In 2019 and 2020, the 15-18-year age group held the highest prevalence, representing 39.03% and 31.16% of cases, respectively. However, a noteworthy shift occurred in 2021, with the 10-14 years group becoming the most prevalent at 27.27%.

Table 1: Clinico-demographics of cases enrolled from 2019-2021

Clinico-demographics	N	2019		2020		2021		P-VALUE
		N	%	N	%	N	%	
AGE DISTRIBUTION (years)								
0-4	282	120	16.67%	47	21.86%	115	21.78%	X=30.43 **p<0.0001***
5-9	336	149	20.69%	48	22.33%	139	26.33%	
10-14	367	170	23.61%	53	24.65%	144	27.27%	
15-18	478	281	39.03%	67	31.16%	130	24.62%	
GENDER								
Female	588	297	41.25%	96	44.65%	195	36.93%	X=4.448 p=0.1082
Male	875	423	58.75%	119	55.35%	333	63.07%	
MALIGNANCY								
Benign	543	317	64.30%	50	43.48%	176	63.08%	X=18.62 **p<0.0001***
Malignant	331	170	34.48%	64	55.65%	97	34.77%	
HAEMATOLOGICAL MALIGNANCY								
Haematological	576	227	39.41%	100	17.36%	259	44.97%	X=20.48 **p<0.0001***
Non-Haematological (Malignant)	331	170	51.36%	64	19.34%	97	29.31%	

Gender distribution showed a consistent male predominance across all three years. Leukaemia consistently emerged as the most prevalent cancer type across all three years (p<0.0001*). Benign tumours exhibited higher prevalence in 2019 and 2021 (p<0.0001*). Haematological malignancies consistently accounted for a significant portion, comprising 39.41%, 17.36%, and 44.97% of cases in 2019, 2020, and 2021, respectively (p<0.0001*). [Table-1]

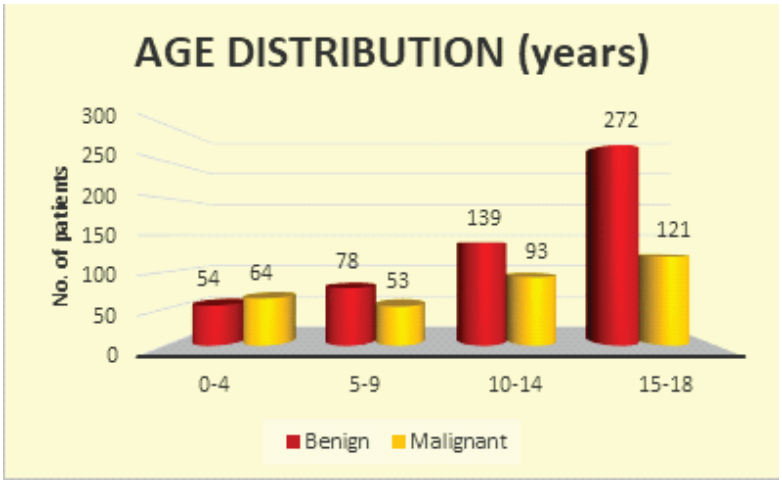

Figure 1: Distribution of subjects according to age and types of tumours.

Regarding age and tumour type, benign tumours were most common among patients aged 15-18 at 50.09%, with malignant tumours following at 36.56% (p<0.0001*). [Figure-1]

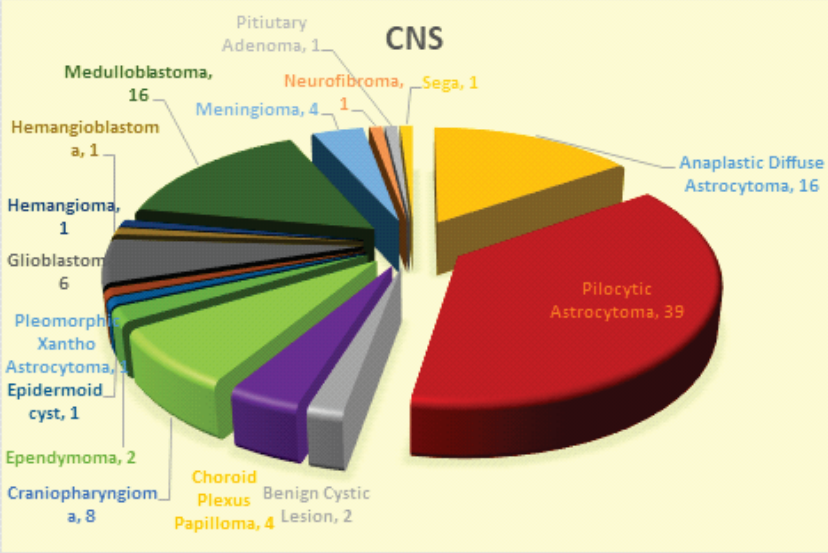

Figure 2: Distribution of patients according to brain tumours

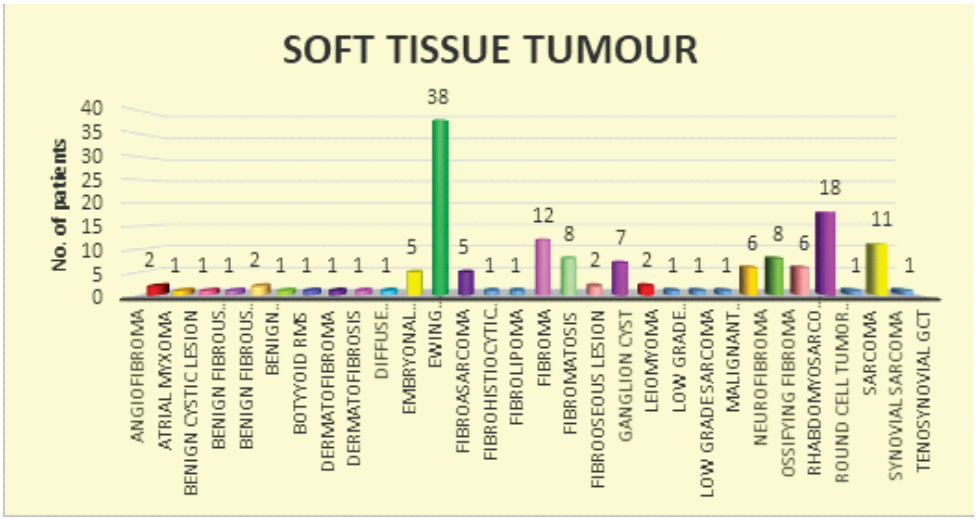

Figure 3: Distribution of patients according to soft tissue tumours.

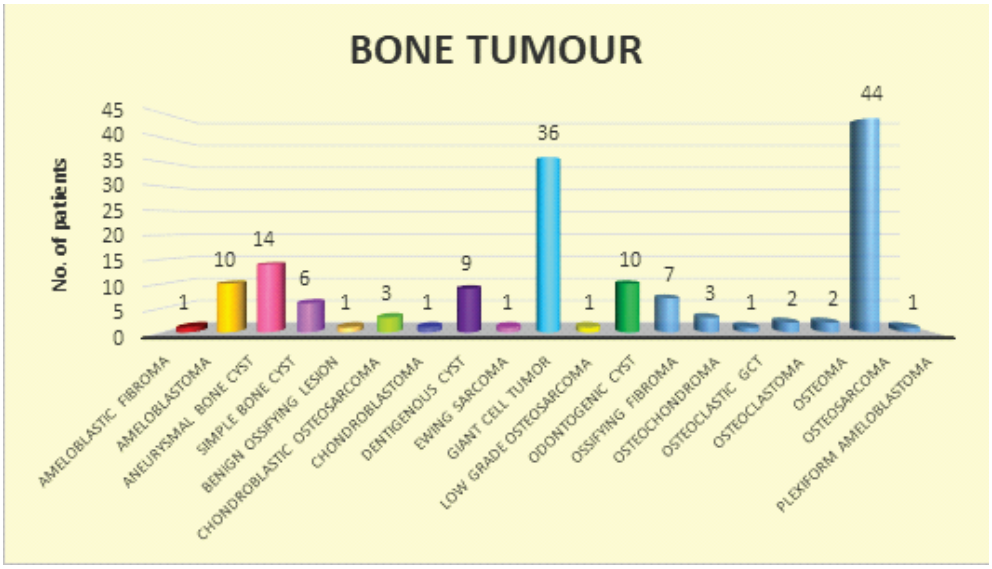

Figure 4: Distribution of patients according to bone tumours.

Among specific tumour types, Pilocytic Astrocytoma dominated at 37.50%, while soft tissue tumours were predominantly Ewing sarcoma/PNET (25.85%), and osteosarcoma was prevalent in the majority of cases (28.76%).

Table 2: Spectrum of benign and malignant tumours in children in 2019

SYSTEM	AGE DISTRIBUTION								P-VALUE
	0-4 years		5-9 years		10-14 years		15-18 years		
	N	%	N	%	N	%	N	%	
Benign Tumour									
Adrenal		0.00%		0.00%	1	1.28%	1	0.58%	X=98.60
Benign Epithelial Tumors	2	7.41%	3	7.32%	8	10.26%	13	7.60%	**p<0.0001***
Bone Tumor	1	3.70%	8	19.51%	11	14.10%	14	8.19%	
Breast		0.00%	1	2.44%	4	5.13%	41	23.98%	
CNS	3	11.11%	14	34.15%	11	14.10%	16	9.36%	
Gastroinstinal	2	7.41%	2	4.88%	2	2.56%	2	1.17%	
Gonadal Tumors	3	11.11%	2	4.88%	3	3.85%	5	2.92%	
Lipomatous Tumor	4	14.81%		0.00%	2	2.56%	10	5.85%	
Nose	2	7.41%	1	2.44%	5	6.41%	13	7.60%	
Peripheral Nerve Sheet Tumor		0.00%		0.00%	5	6.41%	7	4.09%	
Renal	2	7.41%		0.00%	1	1.28%		0.00%	
Salivary Gland Tumor		0.00%	1	2.44%	6	7.69%	5	2.92%	
Skin	1	3.70%		0.00%		0.00%	1	0.58%	
Soft Tissue Tumor	2	7.41%	2	4.88%	8	10.26%	24	14.04%	
Thyroid		0.00%		0.00%	2	2.56%	3	1.75%	
Urinary System	1	3.70%		0.00%		0.00%		0.00%	
Vascular Tumor	4	14.81%	7	17.07%	9	11.54%	16	9.36%	
Grand Total	27	100.00%	41	100.00 %	78	100.00 %	171	100.00%	
Malignant Tumour									
Bone Tumor	2	6.45%	2	6.67%	16	45.71%	27	36.49%	X=94.43
CNS	1	3.23%	5	16.67%	1	2.86%	4	5.41%	**p<0.0001***
Eye	9	29.03 %	3	10.00%	1	2.86%	2	2.70%	
Gastroinstinal		0.00%		0.00%		0.00%	3	4.05%	
Gonadal Tumors	2	6.45%	1	3.33%	1	2.86%	2	2.70%	
Lymphoma	2	6.45%	14	46.67%	8	22.86%	12	16.21%	
Malignant Epithelial Tumor		0.00%		0.00%		0.00%	3	4.05%	
Peripheral Nerve Shee Tumor		0.00%		0.00%		0.00%	1	1.35%	
Renal	11	35.48 %	4	13.33%	3	8.57%	2	2.70%	
Salivary Gland Tumor		0.00%		0.00%		0.00%	1	1.35%	
Soft Tissue Tumor	4	12.90 %	1	3.33%	5	14.29%	17	22.97%	
Grand Total	31	100.00 %	30	100.00%	35	100.00 %	74	100.00%	

Table 3: Spectrum of benign and malignant tumours in children in 2020

SYSTEM	AGE DISTRIBUTION								P-VALUE
	0-4 years		5-9 years		10-14 years		15-18 years		
	N	%	N	%	N	%	N	%	
Benign Tumour									
Benign Epithelial Tumors	1	25.00 %	1	25.00%		0.00%		0.00%	X=50.70 **p=0.0038 ***
Bone Tumor		0.00%		0.00%	2	25.00%	2	5.88%	
Breast		0.00%		0.00%		0.00%	14	41.18 %	
CNS	2	50.00 %		0.00%	2	25.00%	1	2.94%	
Gonadal Tumors		0.00%		0.00%	1	12.50%	4	11.76 %	
Lipomatous Tumor		0.00%	2	50.00%		0.00%	1	2.94%	
Nose		0.00%		0.00%		0.00%	1	2.94%	
Salivary Gland Tumor		0.00%		0.00%		0.00%	1	2.94%	
Soft Tissue Tumor		0.00%	1	25.00%	1	12.50%	7	20.59 %	
Vascular Tumor	1	25.00 %		0.00%	2	25.00%	3	8.82%	
Grand Total	4	100.00 %	4	100.00%	8	100.00 %	34	100.00 %	
Malignant Tumo ur									
Bone Tumor		0.00%		0.00%	4	28.57%	6	31.58 %	X=51.73 **p=0.0002 ***
CNS	1	5.26%	3	25.00%	1	7.14%	2	10.53 %	
Eye	5	26.32 %		0.00%		0.00%		0.00%	
Liver	2	10.53 %		0.00%	2	14.29%		0.00%	
Lymphoma	2	10.53 %	5	41.67%	1	7.14%		0.00%	
Renal	5	26.32 %	2	16.67%	2	14.29%		0.00%	
Salivary Gland Tumor		0.00%		0.00%		0.00%	2	10.53%	
Soft Tissue Tumor	4	21.05%	2	16.67%	4	28.57%	9	47.37%	
Grand Total	19	100.00 %	12	100.00%	14	100.00%	19	100.00 %	

In 2020, benign tumours were common among 15-18-year-olds 0-4 years and 15-18 years (p=0.0002*). (p=0.0038*), while malignant tumours were more common in

Table 4: Spectrum of benign and malignant tumours in children in 2021

SYSTEM	AGE DISTRIBUTION								P-VALUE
	0-4 years		5-9 years		10-14 years		15-18 years		
	N	%	N	%	N	%	N	%	
Benign Tumour									
Adrenal	1	4.35%		0.00%		0.00%		0.00%	X=108.2
Benign Epithelial Tumors		0.00%	1	3.03%	5	9.43%	10	14.93 %	**p<0.0001***
Bone Tumor		0.00%	8	24.24%	9	16.98%	11	16.42 %	
Breast		0.00%		0.00%		0.00%	10	14.93 %	
CNS	3	13.04 %	11	33.33%	9	16.98%	6	8.96%	
Gastroinstinal		0.00%	1	3.03%	3	5.66%		0.00%	
Gonadal Tumors	11	47.83 %	1	3.03%	3	5.66%	4	5.97%	
Lipomatous Tumor		0.00%	2	6.06%	1	1.89%	3	4.48%	
Nose	2	8.70%	1	3.03%	3	5.66%	6	8.96%	
Peripheral Nerve Sheet Tumor		0.00%		0.00%	2	3.77%	3	4.48%	
Salivary Gland Tumor		0.00%	2	6.06%	3	5.66%	1	1.49%	
Skin		0.00%		0.00%		0.00%	1	1.49%	
Soft Tissue Tumor		0.00%	3	9.09%	7	13.21%	5	7.46%	
Thyroid		0.00%		0.00%		0.00%	2	2.99%	
Urinary System	1	4.35%		0.00%		0.00%		0.00%	
Vascular Tumor	5	21.74 %	3	9.09%	8	15.09%	5	7.46%	
Grand Total	23	100.00 %	33	100.00%	53	100.00 %	67	100.00 %	
Malignant Tumour									
Bone Tumor	1	7.14%	4	36.36%	16	36.36%	9	32.14 %	X=39.67
Breast		0.00%		0.00%	1	2.27%	1	3.57%	p=0.0550
CNS	2	14.29 %	1	9.09%	3	6.82%	2	7.14%	
Eye	4	28.57 %	2	18.18%		0.00%	1	3.57%	
Gastroinstinal	1	7.14%		0.00%	2	4.55%	1	3.57%	
Gonadal Tumors	2	14.29 %	1	9.09%	1	2.27%	1	3.57%	
Lymphoma		0.00%		0.00%	2	4.55%		0.00%	
Malignant Epithelial Tumor		0.00%		0.00%		0.00%	1	3.57%	
Renal	3	21.43 %	2	18.18%	2	4.55%	1	3.57%	
Soft Tissue Tumor	1	7.14%	1	9.09%	17	38.64%	11	39.29 %	
Grand Total	14	100.00 %	11	100.00%	44	100.00 %	28	100.00 %	

In 2021, benign tumours remained most common in the 15-18 years age group (p<0.0001*), while malignant tumours were more prevalent in the 10-14 years group, though not statistically significant (p=0.0550).

Table 5: Spectrum of Haematological Tumours in children

HEMOTOLOGICAL TUMORS	AGE DISTRIBUTION								P-VALUE
	0-4 years		5-9 years		10-14 years		15-18 years		
	N	%	N	%	N	%	N	%	
ACUTE MYELOID LEUKEMIA	12	7.32%	28	13.79%	21	15.91 %	14	18.18 %	X=28 6.8 **p<0.0 001***
ALL	128	78.05 %	134	66.01%	79	59.85 %	36	46.75 %	
APML	1	0.61%	6	2.96%	2	1.52%	2	2.60%	
CML	4	2.44%	6	2.96%	10	7.58%	13	16.88 %	
HODGKIN LYPHOMA	7	4.27%	18	8.87%	6	4.55%	6	7.79%	
JMML	4	2.44%	3	1.48%	2	1.52%	1	1.30%	
MDS	1	0.61%	0	0.00%	0	0.00%	2	2.60%	
NHL	7	4.27%	8	3.94%	12	9.09%	3	3.90%	
Grand Total	164	100.00 %	203	100.00 %	132	100.00 %	77	100.00 %	

YEARWISE DISTRIBUTION	2019		2020		2021		P-VALUE
	N	%	N	%	N	%	
ACUTE MYELOID LEUKEMIA	30	13.22%	16	16.00 %	29	11.65 %	X=19. 13 p=0.1 601
ALL	149	65.64%	58	58.00 %	170	68.27 %	
APML	6	2.64%	2	2.00%	3	1.20%	
CML	18	7.93%	7	7.00%	8	3.21%	
HODGKIN LYPHOMA	9	3.96%	8	8.00%	20	8.03%	
JMML	2	0.88%	2	2.00%	6	2.41%	
MDS	3	1.32%	0	0.00%	0	0.00%	
NHL	10	4.41%	7	7.00%	13	5.22%	
Grand Total	227	100.00%	100	100.00 %	249	100.00 %	

Specific haematological tumours, particularly Acute Lymphocytic Leukaemia (ALL), consistently emerged as the most common, with the highest prevalence observed in the 5-9 age group. A significant difference in haematological tumour distribution was evident (p<0.0001*). Although the prevalence of specific haematological tumours varied across the years, ALL remained predominant without reaching statistical significance (p=0.1601).

DISCUSSION

The majority of juvenile tumors are of embryonal origin and arise in the lymphoreticular tissue, central nervous system, connective tissue, and the organs. Unlike in adults, epithelial tumours are uncommon in children. Geographically, the prevalence and frequency of paediatric tumours vary considerably. Although infections and malnutrition are the leading contributors to morbidity and mortality in India, malignancies are receiving more attention due to preventative efforts made for the former[9,10].

The peak incidence of paediatric tumours occurs between the ages of 15 and 18 years. Male preponderance is a prominent characteristic of numerous paediatric tumours. Malignant tumours are less common than benign tumours. In our analysis, the prevalence of malignant tumours was highest in 2020 (55.65%), followed by 2021 (34.77%) and 2019 (34.44%). Overall total non-haematological malignancy in the paediatric age group is 37.31% in 3 years. Punia et al. [7] studied 385 tumours in children aged 1 month to 14 years, revealing a male predominance (60%) and the highest incidence in children aged 10 to 14 years (58.18%).

Of these cases, 71.43% were malignant, with bone tumours (36 cases) being the most common. Benign tumours accounted for the same percentage, with vascular tumours (68 cases) being the majority. In addition, Fischer P et al. [11] conducted retrospective research research in Zaire, finding that 39% of 188 biopsy-confirmed malignant tumours in 0-15-year-olds were cancerous. Lymphoma was the most prevalent (28 cases), with 15 cases of Burkitt's Lymphoma. They also identified sarcoma, carcinoma, Wilms' tumour, and retinoblastoma cases. Lymphomas dominated in the first five years of life, while sarcoma and carcinoma became more common after age ten. The vast majority of juvenile breast tumours are benign; however, cancers occasionally arise[12]. Fibroadenoma is the most common type of breast tumour in teenage girls[13].

In our study, most cases observed during three years were of leukaemia, followed by bone tumour, soft tissue tumour, lymphoma, and CNS tumour. Most paediatric malignancies develop in the haematological system, nerve tissue, soft tissue, bone, or kidney. In contrast, colon, lung, prostate, skin, and breast, and are the most prevalent locations for adult tumours. Childhood tumors covers a different type of malignancies, the incidence of which varies globally based on age, gender, ethnicity, and location. Punia et al. [7] found a greater incidence of CNS tumours, malignant bone tumours, and soft tissue sarcomas in their study. This could be due to geographic variation or bias in selection, given our study were hospital-based and the sample size of patients was lower than in other studies. Bone tumours are diagnosed by correlating clinical, radiographic, and pathologic findings. In our study, we found only a few cases of liver (8), Malignant Epithelial Tumour (8), skin tumour (6) and urinary system (4) instances. In our study, we observed that most benign cases were between the age group 5-9 years, 10-14 years, and 15-18 years, while malignant tumours were more in the age group of 0-4 years. Haematological malignancy was observed to be higher as compared to non-haematological malignancy in all three years in our study. Juvenile CNS cancers remain extremely resistant to treatment regimens, and the therapy itself frequently carries significant risks and potential morbidity. The mortality rate for CNS tumors in children age 0-14 decreased modestly since 1985[14]. In our study, Pilocytic astrocytoma was shown to be most prevalent compared to other CNS tumours. Most medulloblastoma were of classical variant and found in the posterior fossa, which was also found in other studies[7]. Punia et al. [7] observed 8 cases of rhabdomyosarcoma, accompanied 5 cases of botryoid rhabdomyosarcoma, including three instances of embryonal rhabdomyosarcoma. They were all located in the cranium and neck region. In our study, 6 cases of rhabdomyosarcoma were identified, comprising 5 embryonal and 1 case of botryoid rhabdomyosarcoma. In the present study, Ewing sarcoma/PNET was the most common malignant soft tissue tumour in children, and fibroma was the highest benign soft tissue tumour. Further, osteosarcoma (n=48) was the most common bone tumour, followed by giant cell tumour (n=38). Banerjee et al. [10] reported 112 bone tumours, comprising 63 cases of malignant sarcoma. There were 30 cases of osteogenic sarcoma, 24 cases of Ewing's sarcoma, 6 cases of chondrosarcoma, and 3 cases of giant cell tumour. Further, Eyre et al. [15] found that Ewing sarcoma and Osteosarcoma cases and were the most frequently diagnosed malignant bone tumours. According to Punia R et al. [7], The most common benign bone lesion in infancy was osteochondroma (n=48), however 14 instances of osteosarcoma and a single case of chondrosarcoma were also identified as malignancy bone tumours. Furthermore, the growing dominance with age, the equal frequency of male and female cases among 0 and 14 years of age, and the overwhelming majority of osteosarcoma and Ewing sarcoma revealed in this study are typical patterns reported in previous studies[10,15,16]. Globally, bone tumours are the most prevalent paediatric cancer, followed by CNS tumours (22-25%) and lymphomas[17,18]. In India, lymphomas frequently outnumber CNS tumors, especially among men. The prevalence of CNS tumors in Indian metropolises is lower (10-20 per million children each year) than in developed countries. Neuroblastoma, which is the second most prevalent solid tumour in children following CNS tumors, is less commonly recorded in India[20]. In the 2019 spectrum of benign tumours in children, it was observed that in the age group of 15-18 years, a percentage of breast tumours, followed by Soft Tissue Tumour, CNS tumour, Vascular Tumour, Benign Epithelial Tumours, and Lipomatous Tumour were higher as compared to another age group 10-14 years, 5-9 years and 0-4 years. Bone tumour, lymphoma and soft tissue tumour were observed to be higher between the age group of 15-18 years. Breast tumour was highly prevalent among all the tumours and occurred only in the age group of 15-18 years. No case was observed between the 0-4 years, 5-9 years, and 10-14 years. In 2020, malignant tumour in children's soft tissue was higher in the age group of 15-18 years, while eye and liver tumour were higher between the 0-4 years age group. The majority of soft tissue tumors in young adults are ben-

-ign vascular or fibroblastic growth. The majority of breast lumps in children are benign, however cancers can arise[16]. Nerve sheath tumours are uncommon in children, accounting for 3–5% of soft tissue malignancies. Less than 40% are connected with a nerve bundle or Von Recklinghausen's syndrome. Sarcomatous transition of a plexiform neurofibroma occurs with increasing age and is uncommon before the age of 20. Aggressive peripheral nerve sheath tumors are typically seen in the head and neck, chest wall, and limb[21]. In 2021, spectra of benign tumour in children showed that bone tumour was highly prevalent, followed by breast and nose tumour between the age group of 15-18 years, while CNS tumour was higher in the age group of 5-9 years and soft tissue tumour was higher in between the age group of 10-14 years. Statistically, a significant difference was observed in children suffering from benign tumours. According to a separate study, vascular tumours were the most prevalent, with 51 hemangioma and 17 cases of lymphangioma. The majority of bone tumours (48 cases) were osteochondroma. The remaining cases included six instances of osteoid osteoma, five instances of enchondroma, two instances of chondromyxoid fibroma, and one instance of osteoclastoma[7]. The 2021 spectrum of malignant tumour in children revealed that bone and soft tissue tumours were higher between the age group of 10-14 years. Punia R et al. [7] discovered an increased incidence of CNS tumors, aggressive bone tumours, and connective tissue sarcoma The alveolar region soft tissue sarcoma mostly impacts the soft tissues of the limbs and arms, with the head and neck less commonly affected. Females are disproportionately impacted. Approximately one-fifth of the instances have been identified around the age of 15. The majority of lesions are less than 4 cm in diameter. Usually, people who live in the head and neck area are small[22]. As per haematological tumours, Acute lymphocytic leukaemia (ALL) constituted one of the most prevalent tumors noticed, and the majority of the cases occurred in 0–4 years. 78.05%. Statistically, a significant difference was observed in children who suffered from Haematological Tumours in 2021 [$p<0.0001$*]. Leukemias (>95% of which are acute) constitute the most common diagnostic group of childhood cancers worldwide and in India. Similar to our findings, Pui et al. [23] and others [20] also found ALL as the major tumour type. Leukaemia is India's most prevalent paediatric cancer, accounting for between 25 and 40 per cent of all cases. ALL accounts for 60 to 85 per cent of all leukaemias reported. In comparison to the advanced nations, the genetic makeup of Both in India appears to be unique, with a greater proportion of T-Cell ALL (20-50 percent against 10-20 percent in the established world), hypodiploidy, and mutations, all of which lead to a poorer outcome for this malignancy[24,25]. In the present study, we observed a statistically insignificant but dramatic decrease in paediatric tumour cases during COVID-19 confinement. Similar results were found by De Vincentiis et al. [26], who recorded a significantly lower number of tumours compared to the preceding two-year period. Among internal cancers, the decline in CRC diagnoses was deemed the most cr-ucial area for intervention. Similarly, Chiaravalli et al. [27] report that sixteen newly diagnosed patients were registered during the closure period (from March 9 to May 3, 2020). Particularly, within the identical duration in 2017, 2018, and 2019, they recorded 34, 35, and 36 cases. As a result, only 45.7% of the expected cases were detected during the lockdown ($p=0.0416$). Nonetheless, it is possible that the COVID-19 pandemic has caused a 50% decrease in new diagnoses. Several papers have reported on insufficient access to care and the subsequent delay in cancer patients' diagnosis during this emergency period[26,28,29]. Availability to medical care, particularly emergency departments and visits from specialists in the event of suspected signs and symptoms, was hampered by closure-imposed travel limitations. Healthcare facilities were no longer regarded as places that afforded protection and therapies, but as possible sources of disease. Consecutively, Arduino et al. 2021 [28] observed identical results as people's reluctance to enter hospital facilities may also have been prompted by a fear of contracting coronavirus, even though acute pain is commonly assumed to be the cause of emergencies. Early OSCCs have a favourable trajectory on average. In contrast, as previously stated, OSCC cases with a longer diagnosis delay, a lower histological grade, a greater size, and neck inclusion had a worse prognosis[30]. Finally, we indicate that one potential collateral effect of the epidemic of COVID that should be considered is the lower likelihood of paediatric cancer patients attending referral centres, and therefore receiving a quick diagnosis. This is something to keep in mind.

CONCLUSION

Our study identified a notable gap in collaborative research on paediatric malignancies in India. Our findings revealed that most cases in 2019, 2020, and 2021 occurred among adolescents aged 15-18, with a higher prevalence of males. Leukaemia was the most common cancer type, and benign tumours were more frequent than malignant ones on average, with haematological malignancies surpassing non-haematological malignancies. Interestingly, we observed a unique pattern where benign tumours were more common in the 15-18 age group than malignant ones, distinct from other age groups. In 2019 and 2020, breast, soft tissue, and bone tumours were prevalent among 15-18-year-olds, while in 2021, soft tissue and bone tumours were more common in the 10-14 age group. Our study is noteworthy for including both benign and malignant cancers, a departure from previous research focused primarily on malignancies. Given the absence of data on paediatric malignancies in India, our findings underscore the potential for developing a comprehensive population-based registry for childhood cancer, serving critical healthcare and research purposes. However, we acknowledge the study's limitations, including its retrospective nature and reliance on data from a single institution with a limited sample size. Further investigations and comparisons with existing data sources are essential to build upon our findings.

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CONSENT

The authors have collected and preserved written participant consent per international or university standards.

ETHICAL APPROVAL

The author(s) has collected and preserved written ethical permission per international or university standards.

REFERENCES

1. Lanier AP, Holck P, Ehrsam Day G, Key C. Childhood cancer among Alaska natives. Paediatrics. 2003 Nov 1;112(5):e396-.
2. Maitra A. Diseases of infancy and childhood. In: Robbins and Cotran Pathologic Basis of Disease. 8th ed. Kumar V, Abbas AK, Fausto N, Aster JC, eds. Pennsylvania: Saunders; 2010. pp 447–483.
3. American Cancer Society. Cancer Facts & Figures 2016. American Cancer Society. 2016.
4. Three-year report of the population based cancer registries of India: 2009-2011. Report of 25 PBCRs; National Cancer Registry Programme, ICMR, Bangalore 2013.
5. Saad R, Singh H, Silverman J. Paediatric tumours. In : Orell S, Sterrett G, editors. Orell and Sterrett's Fine Needle Aspiration Cytology. 5th ed. New Delhi: Elsevier Publishing; 2012:428- 50.
6. Schalper JA. Paediatric tumours. In: Bibbo M, Wilbur D, editors. Comprehensive Cytopathology. 3rd ed. Saunders Elsevier Publisher; 2008:915-50
7. Punia RS, Mundi I, Kundu R, Jindal G, Dalal U, Mohan H. Spectrum of nonhematological paediatric tumours: A clinicopathologic study of 385 cases. Indian Journal of Medical and Paediatric Oncology. 2014 Apr;35(02):184-6.
8. Pepe MS, Feng Z, Janes H, Bossuyt PM, Potter JD. Pivotal evaluation of the accuracy of a biomarker used for classification or prediction: standards for study design. Journal of the National Cancer Institute. 2008 Oct 15;100(20):1432-8.
9. Kusumakumary P, Rojimon J, Rema J, Nair MK. Profile of paediatric malignancies: a ten year study. Indian paediatrics. 2000;37(11):1234-8.
10. Banerjee CK, Walia BN, Pathak IC. Pattern of neoplasms in children. The Indian Journal of Paediatrics. 1986 Jan;53:93-7.
11. Fischer PR, Ona Ahuka L, Wood PB, Lucas S. Malignant Tumours: In Children of Northeastern Zaire A Comparison of Distribution Patterns. Clinical paediatrics. 1990 Feb;29(2):95-8.
12. Kaneda HJ, Mack J, Kasales CJ, Schetter S. Paediatric and adolescent breast masses: a review of pathophysiology, imaging, diagnosis, and treatment. AJR Am J Roentgenol. 2013 Feb 1;200(2):W204-12.
13. Bock K, Duda VF, Hadji P, Ramaswamy A, Schulz-Wendtland R, Klose KJ, Wagner U. Pathologic breast conditions in childhood and adolescence: evaluation by sonographic diagnosis. Journal of ultrasound in medicine. 2005 Oct;24(10):1347-54.
14. Marrett LD, De P, Airia P, Dryer D. Cancer in Canada in 2008. Cmaj. 2008 Nov 18;179(11):1163-70.
15. Eyre R, Feltbower RG, Mubwandarikwa E, Jenkinson HC, Parkes S, Birch JM, Eden TO, James PW, McKinney PA, Pearce MS, McNally RJ. Incidence and survival of childhood bone cancer in northern England and the West Midlands, 1981–2002. British journal of cancer. 2009 Jan;100(1):188-93.
16. Stiller CA, Bielack SS, Jundt G, Steliarova-Foucher E. Bone tumours in European children and adolescents, 1978–1997. Report from the Automated Childhood Cancer Information System project. European journal of cancer. 2006 Sep 1;42(13):2124-35.
17. Stiller C, editor. Childhood cancer in Britain: incidence, survival, mortality. OUP Oxford; 2007 Feb 15.
18. Gurney JG, Bondy ML. Epidemiology of childhood cancer. In: Pizzo PA, Poplack DG, Editors. Priciples and Practice of Paediatric Oncology, 5th edition. Philadelphia; Lippincott Williams and Wilkins: 2006:2-14.
19. Black WC. Increasing incidence of childhood primary malignant brain tumours—enigma or no-brainer?. JNCI: Journal of the National Cancer Institute. 1998 Sep 2;90(17):1249-51.
20. Arora RS, Eden TO, Kapoor G. Epidemiology of childhood cancer in India. Indian journal of cancer. 2009 Oct 1;46(4):264-73.
21. Malone M. Soft tissue tumours in childhood. Histopathology. 1993 Sep;23(3):203-16.
22. Ramot B, Magrath I. Hypothesis: The environment is a major determinant of the immunological sub type of lymphoma and acute lymphoblastic leukaemia in children. British Journal of Haematology. 1982 Feb;50(2):183-9.
23. Pui CH, Yang JJ, Hunger SP, Pieters R, Schrappe M, Biondi A, Vora A, Baruchel A, Silverman LB, Schmiegelow K, Escherich G. Childhood acute lymphoblastic leukemia: progress through collaboration. Journal of Clinical Oncology. 2015 Sep 9;33(27):2938-48.
24. Amare P, Gladstone B, Varghese C, Pai S, Advani S. Clinical significance of cytogenetic findings at diagnosis and in remission in childhood and adult acute lymphoblastic leukemia: experience from India. Cancer genetics and cytogenetics. 1999 Apr 1;110(1):44-53.
25. Magrath I, Shanta V, Advani S, Adde M, Arya LS, Banavali S, Bhargava M, Bhatia K, Gutiérrez M, Liewehr D, Pai S. Treatment of acute lymphoblastic leukaemia in countries with limited resources; lessons from use of a single protocol in India over a twenty year peroid. European journal of cancer. 2005 Jul 1;41(11):1570-83.
26. De Vincentiis L, Carr RA, Mariani MP, Ferrara G. Cancer diagnostic rates during the 2020 'lockdown', due to COVID-19 pandemic, compared with the 2018–2019: an audit study from cellular pathology. Journal of Clinical Pathology. 2021 Mar 1;74(3):187-9.
27. Chiaravalli S, Ferrari A, Sironi G, Gattuso G, Bergamaschi L, Puma N, Schiavello E, Biassoni V, Podda M, Meazza C,

Spreafico F. A collateral effect of the COVID‐19 pandemic: delayed diagnosis in paediatric solid tumours. Paediatric blood & cancer. 2020 Oct;67(10): e28640.

28. Arduino PG, Conrotto D, Broccoletti R. The outbreak of Novel Coronavirus disease (COVID‐19) caused a worrying delay in the diagnosis of oral cancer in north‐west Italy: The Turin Metropolitan Area experience. Oral Diseases. 2021 Apr;27(3):742.
29. Molica M, Mazzone C, Cordone I, Pasquale A, Niscola P, de Fabritiis P. SARS‐CoV‐2 infection anxieties and general population restrictions delay diagnosis and treatment of acute haematological malignancies. British Journal of Haematology. 2020 Jul;190(1):e5-8.
30. Arduino PG, Carrozzo M, Chiecchio A, Broccoletti R, Tirone F, Borra E, Bertolusso G, Gandolfo S. Clinical and histopathologic independent prognostic factors in oral squamous cell carcinoma: a retrospective study of 334 cases. Journal of oral and maxillofacial surgery. 2008 Aug 1;66(8):1570-9