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RESEARCH ARTICLE

Trends in Pediatric Malignancy Cases at a Tertiary Care Center in Bihar, India: A Retrospective Study

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Abstract

Background and objective: Pediatric malignancies constitute a significant proportion of cancer cases in India, and yet, there is a dearth of information on the distribution of these cancers in the state of Bihar. To address this knowledge gap, we conducted this study to analyze the pattern of pediatric malignancies. **Materials and Methods:** This cross-sectional observational study was conducted in a tertiary care hospital in eastern India. The study was carried out at the Department of Radiotherapy, where we enrolled patients between the ages of 0-18 years who were referred to our department. **Results:** We analyzed the data of 306 patients, of which 22 (7.19%) were diagnosed with benign tumors, and 284 were diagnosed with malignancies. Among the 284 patients with malignancies, 208 (73.24%) had solid tumors, and 76 (26.76%) had hematological malignancies. The most common hematological malignancy was acute lymphoblastic leukemia (32.89%), followed by Hodgkin lymphoma (30.27%) and non-Hodgkin lymphoma (27.63%). Among solid malignancies, sarcoma was the most prevalent (31.25%), followed by germ cell tumors (17.79%), and Wilms' tumor (16.83%). **Conclusion:** We analyzed the data of 306 patients, of whom 22 (7.19%) were diagnosed with benign tumors, and 284 were diagnosed with malignancies. Among 284 patients with malignancies, 208 (73.24%) had solid tumors, and 76 (26.76%) had hematological malignancies. The most common hematological malignancy was acute lymphoblastic leukemia (32.89%), followed by Hodgkin lymphoma (30.27%) and non-Hodgkin lymphoma (27.63%). Among solid malignancies, sarcoma was the most prevalent (31.25%), followed by germ cell tumors (17.79%), and Wilms' tumor (16.83%).

Keywords: Pediatric malignancies- cancer burden- Bihar- acute lymphoblastic leukemia- sarcoma

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Introduction

Each year, an estimated 4,00,000 children and adolescents aged 0-19 years are diagnosed with malignancies, with more than 80% of cases occurring in developing nations [1]. In India, pediatric malignancies account for 5% of the total cancer burden, with significant variations observed across different populations [2]. In the Western world, the adoption of uniform guidelines and clinical trials with national cooperative groups has led to improved outcomes for pediatric cancers, with cure rates varying between 80% and 90% [3]. However, middle- and low-income countries have not been able to report such high cure rates. While some centres are reporting a high cure rate like western literature, population-based cancer registries from other parts of India report survival rates of 30-40% only [4, 5]. This wide disparity in outcomes may be attributed to the lack of dedicated pediatric oncology centers and a paucity of data on pediatric cancers. A previous study reported pediatric cancer in a tertiary center in Bihar [6]. In this study, we aimed to fill this knowledge gap by providing more data on the pediatric cancers over two years in a tertiary care center in Patna, the capital of Bihar state.

Objective

The objective of the study was to assess the profile of the pediatric patients with respect to age, gender, and

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diagnosis.

Materials and Methods

Study design and setting

This was a retrospective cross-sectional study conducted in All India Institute of medical Sciences, Patna, Bihar, India. Data were collected from January 2019 to December 2021.

Sampling method

We used a hospital register based convenience sample with pre-defined inclusion and exclusion criteria for this study. We collected data of pediatric patients aged 0-18 years with any malignancy registered under the department of Radiotherapy.

Inclusion criteria

All the patients newly registered in the department with any provisional diagnosis with age up to 18 years were included in the study.

Exclusion criteria

Any previous history of malignancy and or previous history of treatment of malignancy were excluded from the study.

Data collection

We collected the age, gender, and final diagnosis. The patients were classified into two groups: hematological malignancies and solid malignancies. Hematological malignancies were further subdivided into acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), chronic myeloid leukemia (CML), Hodgkin's lymphoma (HL), and non-Hodgkin's lymphoma (NHL), while solid malignancies were subdivided into central nervous system (CNS) malignancies, sarcomas, Wilms' tumors, and other malignancies.

Statistical analysis

Data were presented in number and percentage. Categorical data between boys and girls were compared by the Binomial test. Sex-wise distribution in haematological and solid malignancy was statistically compared by Chi-square test. We used GraphPad Prism 8 (GraphPad Software Inc, USA). A P value <0.05 was considered statistically significant.

Ethics

This study was approved by the institutional ethics committee of All India Institute of Medical Sciences, Patna (Ref no. IEC/2020/485 dated 25/06/2020). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

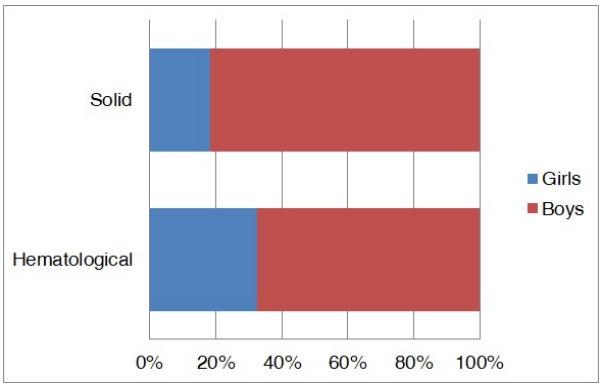

Figure 1. Sex-wise Distribution in Haematological and Solid Malignancy; Chi-square, 7.12; P, 0.007

Results

This retrospective study analyzed the profiles of 306 pediatric patients with a median age of 9 (Q1-Q3: 7-10) years. Among the patients, 22 were confirmed to have benign tumors and 284 had malignancies. Out of these, 208 (73.24%) had solid tumors, and 76 (26.76%) had hematological malignancies.

The two benign tumor types observed were craniopharyngiomas (n = 2) and lipomas (n = 20).

The most common hematological malignancies were ALL (32.89%), Hodgkin lymphoma (30.26%), and non-Hodgkin lymphoma (27.63%). Sarcoma was the most common solid malignancy (31.25%), followed by germ cell tumors (17.79%) and Wilms' tumor (16.83%). Number of patients according to sex is shown in Table 1 and distribution of various solid malignancies is shown in Table 2.

Percentage-wise distribution of boys and girls in haematological and solid tumors are shown in Figure 1. There was higher number of boys suffering from both types of malignancy.

Discussion

The goal of this study was to provide an overview of pediatric cancer types in Bihar, India. We found that the most common type of malignancy observed was solid tumors followed by hematological malignancies. The specific types of tumors varied within each category, with craniopharyngiomas and lipomas being the two benign tumor types observed, and ALL, Hodgkin lymphoma, non-Hodgkin lymphoma, sarcoma, germ cell tumors, and Wilms' tumor being the most common malignancies. This result is corroborative with the other study in the state conducted by Pandey et al., [6] and Ganguly et al. [7]. The relatively lower incidence of pediatric CNS tumors compared to HICs may be due to poor recognition and missed diagnosis of common symptoms like headache, vomiting, and seizures [8].

Globally, developing countries bear the majority of the burden of pediatric cancer, with more than 2 lakh cases diagnosed annually. In recent years, the global burden of pediatric cancer has gained more attention with initiatives

Table 1. Distribution of Paediatric Haematological Malignancies

Category	Diagnosis	Total	Percentage	Boy	Girl	P
Haematological malignancy	ALL	25	32.89	18	7	0.04*
	HL	23	30.26	18	5	0.01*
	NHL	21	27.63	14	7	0.19
	CML	5	6.58	3	2	>0.9
	AML	2	2.63	2	0	-
	Total	76	100	55	21	0.0001*
Solid malignancy	Sarcoma	65	31.25	36	29	0.46
	Other malignancies	40	19.23	21	19	0.87
	Germ cell tumor	37	17.79	14	23	0.19
	Wilms' tumor	35	16.83	21	14	0.31
	CNS malignancies	31	14.9	22	9	0.03*
	Total	208	100	114	94	0.19

P-value of Binomial test (between boy and girl with expected 50% distribution in two categories); *Statistically significant

Table 2. Distribution Sub Sites of Paediatric Solid Malignancies

Diagnosis	Total	Percentage	Boy	Girl	P
Germ cell tumor	37	17.78	14	23	0.19
Wilms' tumor	35	16.85	21	14	0.31
Rhabdomyosarcoma	18	8.65	9	9	>0.9
Osteogenic sarcoma	16	7.69	9	7	0.8
Soft tissue sarcoma*	16	7.69	9	7	0.8
Ewing sarcoma	15	7.21	9	6	0.61
Medulloblastoma	13	6.25	10	3	0.09
Neuroblastoma	13	6.25	8	5	0.58
Retinoblastoma	10	4.8	4	6	0.75
Ependymoma	5	2.4	4	1	0.36
Astrocytoma	5	2.43	4	1	0.36
Glioma	4	1.92	3	1	0.63
Colon cancer	4	1.92	3	1	0.63
Thyroid carcinoma	3	1.44	0	3	-
GIST	3	1.44	3	0	-
Brainstem glioma	3	1.44	0	3	-
Rectal carcinoma	2	0.96	1	1	>0.9
Thymoma	2	0.96	0	2	-
Stomach carcinoma	1	0.48	1	0	-
Glioblastoma multiforme	1	0.48	1	0	-
Anal canal carcinoma	1	0.48	1	0	-
Parotid carcinoma	1	0.48	0	1	-
Total	208	100	114	94	0.19

P-value of Binomial test (between boy and girl with expected 50% distribution in two categories)

like the World Health Assembly cancer resolution in May 2017 and the World Health Organization's global initiative for childhood cancer announced at the United Nations General Assembly in September 2018. However, low- and middle-income countries (LMICs) still struggle to achieve comparable survival outcomes to high-income countries (HICs) [9]. Defining the burden of pediatric cancer in India is crucial for pediatric oncologists and clinical oncologists to focus on improving therapeutic and survival outcomes.

Predominance of cancers in boys is a common phenomenon for many pediatric cancers. We also found 59.51% of our sample as boys. The persistent sex disparity in cancer registration may be due to poor health system and low female education rates. Hence, result of this study should be interpreted with caution as in low- and middle-income countries there may be potential underestimation of female cancer cases [10].

This study provides individual consecutive pediatric malignancy data from a tertiary care center. However,

the exact incidence and demographic profile of pediatric malignancy in Bihar are unknown due to the absence of a registry and an inadequate number of tertiary cancer care centers. The low coverage and quality assurance of conventional data collection methods are the main challenges in the functioning of centralized registry [9]. Therefore, there is a need to improve data collection by setting up new cancer registry to highlight the burden of pediatric cancer in this region [11].

Limitations of this study includes the single centre study, retrospective nature of the study, availability of limited demographic data, and limited ability to compare the data from different parts of the country. This study finding may not be generalizable as this study used a single-center, hospital-based convenience sample which is a non-probability sample. Further multi centric study is need of the hour for getting further insight on the trends in pediatric malignancy in Indian states. Further exploration of the underlying mechanisms, genetic predispositions, and therapeutic targets specific to hematological malignancies, including ALL, Hodgkin lymphoma, and non-Hodgkin lymphoma, are essential. Understanding the reasons behind the gender disparity observed in this study and its implications for prevention, early detection, and treatment would provide valuable insights. Long-term follow-up studies evaluating outcomes, survival rates, treatment effects, and recurrence patterns are crucial for optimizing the management of pediatric tumors.

In conclusion, the two most common pediatric hematological malignancies are ALL and Hodgkin's lymphoma. The most common pediatric solid tumor is sarcoma, followed by germ cell tumors and Wilms' tumor. Central nervous system tumors are least prevalent among pediatric solid malignancies. To accurately determine the burden of pediatric cancers, it is important to establish new population-based cancer registry and strengthen the referral system and data collection and storage.

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Conflicts of Interest
Nothing to declare

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