ORIGINAL RESEARCH

Malignant solid tumors and lymphomas in children: Analysis of pattern in the India

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ABSTRACT

Background: Globally, childhood cancer incidence and mortality rates vary. In order to help with the design of treatment facilities and to learn more about the etiology, it is crucial to study incidence patterns and survival rates for childhood cancers. There are not many studies that look at survival rates for childhood solid tumors in India. **Objective:** Evaluation of the patterns, frequency, and prognosis of solid tumors and lymphomas in children admitted to and followed up at the Pediatric Oncology Department. **Methods:** A retrospective study involving 104 kids with solid tumors and lymphomas was carried out. Under the supervision of ophthalmologists, neurosurgeons, and orthopaedics, the medical records were examined, and pertinent data was gathered, including demographic, clinical, histopathological, laboratory, and imaging data. **Results:** The mean age of patients was 3.6±3.66 years at diagnosis. The patient population was split between 61 men and 43 women. The most frequent tumor type was non-Hodgkin lymphoma (NHL), followed by neuroblastoma (14.4%) and Hodgkin lymphoma (10.6%), in that order. The <5-years-of-age group exhibited the greatest number of patients when patients were stratified in terms of age (<5, ≥5 - <10, and ≥10 years). The most frequent initial clinical manifestations among the patients were fever, pallor, and pain. Stage II was the most prevalent stage (36.5%), then stage I, stage III, and stage IV. The study group's overall 5-year survival rate was 71.7%. **Conclusion:** The most prevalent tumors were NHL, HL, and neuroblastoma. To further explore the findings from this study, a larger multicenter study is needed.

Keywords: Childhood cancer, Lymphoma, Solid tumors, Prevalence, India

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INTRODUCTION

Cancer is a leading cause of death worldwide. Worldwide, millions of people are affected by cancer of various types, which causes fatalities. In the USA, cancer is the leading cause of death for children between the ages of 6 months and 15 years, and every year, >7,000 new cases of cancer in children under the age of 15 are diagnosed [1]. Leukemia accounts for about 25% of all childhood cancers in patients under the age of 15 worldwide, followed by central nervous system tumors, neuroblastoma, non-Hodgkin lymphoma, Wilm's tumor, Hodgkin disease, rhabdomyosarcoma, retinoblastoma, osteosarcoma, and Ewing sarcoma [2].

Solid malignant neoplasms in children (PSMNs) are a worldwide issue. Geographical location affects the incidence, place of origin, and histologic subtypes of PSMNs [3]. For the past 30 years, there have been improvements in the survival rates for infants and kids who have various cancers. Non-Hodgkin lymphoma, which makes up 8–10% of all childhood malignancies, is a heterogeneous group of illnesses characterized by clonal proliferation of lymphoid cells at different stages of differentiation. The World Health Organization (WHO) classification of malignant lymphoma (ML) has gained popularity since its introduction in 2001 and is used to categorize ML in many countries around the world [4]. Only a small number of studies on ML have been conducted in India to date [5] in order to determine how the relative proportion of various ML according to WHO classification varies by geographic region. In the past

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thirty years, there has been a sharp increase in the incidence of NHL [6]. Lymphomas were found to be second in frequency to leukemia in a recent study of childhood cancers in South India [7].

In order to inform quality improvement initiatives and the process of formulating policy, information about the incidence and distribution of a disease in a community is a crucial component of healthcare planning [8]. Although there is a wealth of information on the incidence and prevalence of infectious diseases worldwide, there is still a dearth of data on the epidemiology of malignancies. In India, unlike in the United States and Europe, data reporting is still in its early stages, particularly for pediatric malignancies. Poor reporting from public hospitals and a dearth of reporting by many private practitioners plague cancer registries that track disease incidence, with some population-based studies reporting an incidence of just over a thousand cases in ten years [3].

Understanding the regional differences in pediatric cancer may advance our understanding of the etiologic factors. Our objective was to assess the frequency and pattern of PSMNs at our academic hospital in India.

MATERIALS AND METHODS

PATIENTS

From the hospital database, all patients under the age of 15 with a histologically proven disease were located. A retrospective study was done on 104 kids, 32 of whom had solid tumors and 72 of whom had malignant lymphomas. Data on malignant lymphomas were gathered from Tertiary Care Cancer Hospital over a four-year period, including different subtypes of non-Hodgkin lymphoma (NHL) and Hodgkin lymphoma (HL).

CONFIRMATION OF DIAGNOSIS

Routine hematological (estimation of hemoglobin, total, and various leucocyte count, platelet count, peripheral smear for abnormal/blast cells, etc.) and biochemical (liver function tests, urea, creatinine, uric acid) investigations were performed on all patients. The radiological examination included computed tomography, abdominal ultrasonography, and a chest radiograph. The histologic slides of all lymphoma cases were reviewed with a hematopathologist to ensure that all diagnoses complied with the current WHO lymphoma classification system, which was introduced during the time of our study. Retinoblastoma was identified by its radiological and clinical characteristics, and some liver tumors were identified by their elevated tumor markers and the presence of a mass in the liver. To determine whether reactive fibrosis and neoplastic cells were present in the bone marrow, trephine biopsies were performed using the reticulin stain. The diagnosis of each solid tumor was made by a committed pathologist with expertise in pediatric solid tumors.

EXCLUSION CRITERIA

Patients without a firm diagnosis of malignancy, regardless of the clinicoradiological characteristics, and those who had previously received treatment for suspected or confirmed malignancy elsewhere were excluded from the analysis.

ASSESSMENT

All medical records were examined, and a standardized data abstraction form was created to collect the necessary data regarding the patient's demographics, clinical information, histopathological information, laboratory information, imaging information, treatment plan, and outcome. The diagnosis of each solid tumor was made by a committed pathologist with expertise in pediatric solid tumors.

We assessed the histologic type, pattern, and frequency of these tumors. A hematopathologist reviewed the histologic slides of all lymphoma cases to ensure that all diagnoses complied with the most recent WHO lymphoma classification system, which was implemented during the time of our study.

STATISTICAL ANALYSIS

The distribution of all tumors' ages and sexes was assessed using descriptive analysis. The frequency distribution and its percentage were calculated to estimate the relative incidence of a specific diagnosis. The distribution of patients into the three equal age groups of 4 years or less, 5-9 years, and 10-15 years were analyzed in order to determine the age distribution. Using SPSS, version 24, data was gathered and analyzed.

RESULTS

In all, 294 patients signed up for the study; 87 were found to be malignancy-free, and 103 patients without histological confirmation of malignancy were excluded. Thus, 104 patients with lymphoma (n = 72) and solid tumors (n = 32) made up the study cohort [Table 1]. A 25-day-old infant was the youngest patient. The average age was 3.6 years. The male patients were 61 (58.65%) males and 43 (41.3%) females. The majority of the patients (n=61, 58.65%) belonged to the 0–5 age group, while 28 (26.9%) of the patients were between the ages of ≥5-10 and 15 (14.4%) of the patients were >10 years old.

NHL was the most common tumor in males (n=40) as well as females (n=24). Primary intraocular lymphoma was also found in 6 patients as confirmed with the help of ophthalmologist. HL was found in 15 patients.

Soft tissue tumors made up 30.8% (n=32) of all tumors, making them the most prevalent type. Of all soft tissue tumors, rhabdomyosarcoma made up 12.5%. Children under the age of 5 were more likely to develop rhabdomyosarcoma than children over the age of 10. In both groups, though, men outnumbered women. The extraskeletal Ewing sarcoma,

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fibromatosis, synovial sarcoma, extrarenalrhabdoidtumors, malignant nerve sheath tumors, inflammatory myofibroblastictumors, and infantile fibrosarcoma were the most common histological types of nonrhabdomyosarcoma. Similar to retinoblastoma (12.5%), neuroblastoma (34.4%) and Wilm'stumor (15.6%) was the most common tumor and tended to affect younger children.The patients' most frequent initial clinical manifestations were fever, pallor, and pain (91.6, 83.9, and 77.4%, respectively).

Table 1: Demographic characteristics of patients stratified by tumor type

Tumor	Frequency, n (%)	Mean age, y	Age groups, n (%)			Gender, n (%)	
			<5 y	≥5, <10 y	≥10 y	Male	Female
Lymphoma	**72 (69.2)**	**3.9**	**41 (56.9)**	**21 (29.2)**	**10 (13.9)**	**40 (55.5)**	**32 (44.5)**
NHL	51 (70.8)	4.3	31 (43.1)	14 (19.4)	6 (8.3)	27 (37.5)	24 (33.3)
HL	15 (20.8)	3.3	7 (9.7)	5 (6.9)	3 (4.2)	9 (12.5)	6 (8.3)
Primary intraocular lymphoma	6 (8.3)	4.1	3 (4.2)	2 (2.8)	1 (1.9)	4 (5.5)	2 (2.8)
Solid tumors	**32 (30.8)**	**3.5**	**20 (62.5)**	**7 (21.9)**	**5 (15.6)**	**21 (65.6)**	**11 (34.8)**
Neuroblastoma	11 (34.4)	2.3	5 (15.6)	3 (9.8)	3 (9.8)	7 (21.8)	4 (12.5)
Wilm'stumor (renal)	5 (15.6)	2.8	3 (9.8)	1 (3.1)	1 (3.1)	3 (9.4)	2 (6.3)
Rhabdomyosarcoma	4 (12.5)	1.9	3 (9.8)	1 (3.1)	0	2 (6.3)	2 (6.3)
Bone tumors	3 (9.4)	4.1	1 (3.1)	1 (3.1)	1 (3.1)	2 (6.3)	1 (3.1)
Brain tumors	2 (6.2)	5.2	2 (6.3)	0	0	2 (6.3)	0 (0.0)
Hepatoblastoma (Liver)	3 (9.4)	4.2	3 (9.8)	0	0	2 (6.3)	1 (3.1)
Retinoblastoma (Eye)	4 (12.5)	3.8	3 (9.8)	1 (3.1)	0	3 (9.4)	1 (3.1)

Over the course of the study, there was an uneven distribution of the number of patients diagnosed each year [Table 2].

Table 2: Distribution during study period

Tumor	Year 1	Year 2	Year 3	Year 4
Lymphoma (n=72)	**26**	**20**	**17**	**19**
NHL (n=51)	21	16	10	14
HL (n=15)	3	3	5	4
Primary intraocular lymphoma (n=6)	2	1	2	1
Solid tumors	**13**	**8**	**7**	**6**
Neuroblastoma (n=11)	5	2	1	3
Wilm'stumor (n=5)	2	1	1	1
Rhabdomyosarcoma (n=4)	1	2	1	1
Bone tumors (n=3)	1	0	2	0
Brain tumors (n=2)	0	1	1	0
Hepatoblastoma (n=3)	3	0	0	0
Retinoblastoma (n=4)	1	2	1	1
Total	**39**	**28**	**24**	**25**

Tumor stage was identified for all the patients and classified into 4 stages. According to Table 3, stage II had the highest prevalence rate (n=38, 36.5%), followed by stages I (n=28, 26.9%), III (n=26, 25%) and IV (n=12, 11.5%). The five-year survival rate as a whole was 71.7%. Regarding the 5-year survival rate, there were no discernible differences between the various age groups or between males and females (P>0.05). Conversely, a significant correlation was observed between tumor stage and the 5-year survival rate, where the 5-year survival rate was significantly higher in patients with stages I (98%) and II (85%). Survival rate significantly lower in stage IV patients (33%). The 5-year survival rate was significantly higher in patients with Wilm'stumor and Hodgkin lymphoma followed by. The mortality rate was significantly higher in patients with neuroblastoma.

Table 3: Tumor stages in the patients

Tumor	Stage I, n (%)	Stage II, n (%)	Stage III, n (%)	Stage IV, n (%)
Lymphoma (n=72)	**19 (26.4)**	**24 (33.3)**	**20 (27.7)**	**9 (12.5)**
NHL (n=39, 54.2%)	10 (13.8)	14 (19.4)	12 (16.6)	3 (4.2)
HL (n=18, 25.0%)	4 (5.5)	6 (8.3)	4 (5.5)	4 (5.5)
Primary intraocular lymphoma (n=15, 20.8%)	5 (6.9)	4 (5.5)	4 (5.5)	2 (2.8)
Solid tumors (n=32)	**9 (28.2)**	**14 (43.8)**	**6 (18.8)**	**3 (9.4)**
Neuroblastoma (n=9, 28.1%)	3 (9.4)	5 (15.6)	1 (3.1)	0

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Wilm'stumor (n=7, 21.9%)	2 (6.2)	3 (9.4)	2 (6.2)	0
Rhabdomyosarcoma (n=2, 6.3%)	1 (3.1)	1 (3.1)	0	0
Bone tumors (n=2, 6.3%)	1 (3.1)	0	0	1 (3.1)
Brain tumors (n=5, 15.6%)	2 (6.2)	1 (3.1)	1 (3.1)	1 (3.1)
Hepatoblastoma (n=5, 15.6%)	0	3 (9.4)	1 (3.1)	1 (3.1)
Retinoblastoma (n=2, 6.3)	0	1 (3.1)	1 (3.1)	0

DISCUSSION

Planning and assessing programs to control cancer requires up-to-date statistics on the incidence and prognosis of cancer cases. The only reference pediatriccenter in the tertiary care hospital provided data for the current study, which compiled a list of pediatric malignant solid tumors and lymphomas. Our goal was to examine the trends, prevalence, and results of these tumors. Over the course of four years, the study examined 104 kids with malignant solid tumors and lymphomas, resulting in a mean of 29 cases per year. A study based in a single hospital cannot provide an exact incidence rate, but the data is helpful in identifying patterns of childhood malignancies in this area.

The most prevalent tumor in the current study was NHL, which was followed by Hodgkin lymphoma and neuroblastoma. Similar findings were made in a study of 77 kids with malignant tumors, in which lymphomas were found to be the most common type of cancer, followed by retinoblastoma and Wilm'stumor [9]. The majority of patients with brain tumors were referred to the Neurosurgery Department, where surgery and radiotherapy were the suggested treatments, which resulted in the low incidence of brain tumors in the current study. Patients with bone tumors also showed signs of this. The majority of participants in the current study were men, with a male to female ratio of 2:1 overall. This is higher than that reported in another Egyptian study [10] where the male to female ratio was 1.6:1, and in a Turkish study [11], where the male to female ratio was 1.4:1.

The majority of the patients in the current study (58.6%) were under 5 years old when they were diagnosed. The age range of 1- to 5-year-olds was the one in which cancer was found to occur most frequent[12]. Results are in line with earlier studies in terms of the age of patients at diagnosis. As in previous studies, the majority of patients in the current study began with fever, pallor, and pain [13]. Children with lymphoma most frequently experienced lymph node enlargement, while children with neuroblastoma and Wilm'stumor were more likely to experience abdominal mass.

Stage II made up the majority of patients in the current study, followed by stage I, stage III, and stage IV. Several studies [12,14] had previously examined the frequency of cancer stages. The majority of the 1,702 new cases of pediatric cancer in a significant Mexican study (12) were stage III (36.8%), followed by stage IV, stage II, and stage I (30.1, 19.6, and 13.5%, respectively). The increased prevalence of advanced-stage cases in the current study can be attributed to general practitioners and parents being ignorant of the early signs of these cancers.

In conclusion, neuroblastoma and NHL were the most prevalent tumors. Patients with Hodgkin lymphoma and Wilm'stumor had higher survival rates than patients with neuroblastoma, who had a lower survival rate. To validate these findings, a larger multicenter study is necessary. The lack of communication with neurosurgeons and orthopedic surgeons, who are primarily involved in the treatment of these tumors, is the cause of the low incidence of brain and bone tumors in the current study. As a result, neurosurgeons and orthopedic surgeons must be included in tumor boards to ensure accurate registration and team management of patients with brain and bone tumors.

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