

Clinical Case Study

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A Descriptive Study of Childhood Malignancies: A Ten Year Study (1999-2008) In Regional Cancer Centre Kidwai Memorial Institute of Oncology, Bangalore

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ABSTRACT

Objective: The objective of this study was to find out the profile of childhood cancers in kidwai Memorial Institute of Oncology (KMIO), Regional Cancer Centre Karnataka, India during 1999 to 2008.

Methodology: It was a retrospective study using hospital based cancer registry records from January 1999 to December 2008. All the children below 15 years with confirmed diagnosis of cancer by means of Clinical, Imaging techniques, histological and cytological examinations were included in this study.

Results: There were 79909 new confirmed cases attended outpatient department of KMIO during these 10 years. Among which 3879 were below 15 years of age. An average 388 cases attended per year. Overall pediatric tumors were 4.9% of total cancers. The frequency of cancer was found to be higher among boys (64%) than girls (36%) with a ratio of 1.6:1. Majority of the children were from Karnataka state (81%) compared to (19%) from others area of India. The results showed that Leukemia (42.9%), Lymphoma (14.1%) and CNS (12.1%) were the commonly found childhood cancers among the children attended at KMIO, Bangalore during data collection period. Other commonly found tumor was bone tumour (5.2%), renal tumour (4.6%).

Conclusion: leukemia, Lymphoma and CNS commonly found in Male children same pattern also observed in females children also from 0-15 ages below 5 years in contradiction to retinoblastoma, hepatic tumour neuroblastoma and renal tumour which were prevalent in children less than 5 years of age.

Key-words: Hospital based Cancer registry, paediatric malignancies, cancer profile.

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Introduction

Worldwide, the annual number of new cases of childhood cancer exceeds 200,000 and more than 80% of these are from the developing world.¹ In India 45000 children's diagnosed with cancer every year.² Cancer remains one of the major causes of death in children between the ages of 0 to 14 years.¹ Paediatric cancers differ markedly from adult cancers in their nature, distribution and prognosis. Paediatric oncologists face unique challenges because treatment with irradiation, surgery and chemotherapy can adversely affect the children's growth and development.³ The incidence of childhood cancer and type vary greatly throughout the world. Though lower compared with the incidence of some adult cancers, it comes next to accidents as the leading cause of death among children in the developed world.¹ Cancer is rare in children under 15, compared to adults; but cancer patterns at a young age present peculiar characteristics and deserve separate analysis.

Unfortunately, good-quality population-level statistics on the occurrence of cancer at young ages have been more difficult to obtain than in adults⁴ and serious under-reporting, even in western countries, has been documented^{5,6}. However, PBCRs have inherent problems, the primary one being the difficulty of ensuring comprehensive data collection. Even in the so-called resource-rich environments, childhood cancers may go unreported to PBCRs⁷. Nevertheless in North America 99% of the cancer patients are reported to a PBCR, whereas, the estimate for South Asia is only 8%⁸. There are further problems in India: as cancer is not a notifiable disease, PBCRs must rely heavily on the diligence and experience of their workers in seeking out hospital data and death certificate information.

As many of common childhood malignancies are curable there is a need to have a dedicated pediatric cancer registry for assessing the magnitude of problem in our country. However, there is a dearth of data due to lack of nationwide population based cancer registries on the incidence and patterns of childhood cancer in developing countries. Although many papers have been published on this in some developing countries⁹, reports on the pattern and incidence of childhood cancer in India. The objective of this study was to find out the profile of childhood cancer in a regional cancer centre, Kidwai Memorial Institute of Oncology (KMIO), Bangalore, India.

Materials and Methods:

Ten years hospital Based cancer registry data consider for this retrospective study from January 1999 to December 2008. All children with cancer, aged 0 to 14 years diagnosed by means of histological or cytological examination during that period, were included in the study. In KMIO, hospital based cancer registry is running from 1984, under supervision of Department of Epidemiology and Biostatistics. Patients from all over the country attend this government hospital for better care and cure.

The profile of childhood cancer was studied focusing on the prevalence of tumors according to age, sex, state wise distribution. Data were processed by editing and post-coding and analyzed by MS-office Version 2007.

Results:

There were seventy nine thousand nine hundred nine confirmed new cases during January 1999 to December 2008. Among which thirty eight hundred and seventy cases belong to pediatric group (below 15 years of age). An average of 387 cases attended every year. The pediatric tumours comprised of 4.9% of all malignancies during these 10 years time. Out of 3870 patients, 2460 (62%) were male and 1410 (38%) were female. Almost all were (84%) Hindus followed by Muslims (15%) and Christen (2%). Most of the children with cancer came from the Karnataka State (81%) followed by Andrapradesh (10.4) (Fig-1).

Year- wise frequency of pediatric tumours was worked out as shown in Fig.2. There were 342 cancer children in 1999, 305 in 2000, 374 in 2001, 425 in 2002 and it reaches to 432 in the year 2008

attended KIMC for seeking cancer treatment. There was a gradual rise of paediatric cancer patients during the study period except some year.

Tumours were arranged according to patient's sex and age group in 0-4 year, 5-9 year and 10-14 years. The distribution of children according to their age showed that the majority of them belonged to 05-09 age group (35.7%), followed by 10-14 years (34.3%) and rest 30.1% were from 0-4 years age group. In females the majority of patients are distributed in 10-14 age group (34.5%) followed by 0-04 (33.5%) and 32% of female paediatric patients are 05-09 age group. The mean age of the patients was 7.32 (SD±4.04) years (Table-I and II).

Leukemia's were the most prevalent malignancies, accounting for 1160 cases (42.9%) while considering both sex followed by lymphomas and CNS (Table-III). Among the male paediatric patients leukemia's were most prevalent cancer, if we study specifically in Leukaemia, Lymphoid leukemia (63.7%), Acute myeloid leukaemia (17.5%) followed by Unspecified, acute lymphoid, Chronic myeloproliferative diseases and Myelodysplastic syndrome and other myeloproliferative diseases. Lymphoid leukaemias were found more in 00-04 age groups (68.1%) compared to 05-09 age group (64.2) and 10-14 (59.0%) in males, acute myeloid and chronic myeloproliferative diseases followed exactly opposite pattern in distribution of cases over the age group (Table IV).

Lymphoma was the second (14.1%) most commonly found cancer in children by considering both sex. In male gender also exhibited same result about 48% belonged to 05-09 years age group, among lymphomas Hodgkin lymphoma were more prevalent than non Hodgkin, Burkitt and other lymphomas. There was not much difference between male to female for lymphoma (44%) among our patients, although proportionally in both sex lymphoma distribution may be same but central nervous system (CNS) occupied second position in females constituted about 13% of all childhood malignancies; among them Intracranial and intraspinal embryonal tumors were commonly found and almost 42% and it found more in 05-09 age group. Intracranial and intra spinal embryonal tumors and Astrocytoma were first two predominant CNS in males (Table IV and V).

Bone tumour (5.3%) and renal tumour shared fourth and fifth position 5.2% and 4.6% respectively and it found more common among 10-14 years children in both sex. About 42% (males) and 49% (females) sufferers from Osteogenic sarcomas. Kidney tumour were found 4.6% among the children and 5.7% were male. Majority suffered from Nephroblastoma and other non epithelial renal tumors and was found most commonly in 00-04 year's age group the detailed statistics given in table (III, IV and V).

Table1: Distribution of Childhood Cancer according to age group-males(1999-2008)

Primary morphology	0-4		05-09		10-14		Total	
	#	%	#	%	#	%	#	%
Leukaemia	335	30.8	399	36.7	354	32.5	44.2	1088
Lymphomas and reticuloendothelial neoplasms	55	12.8	206	48.0	168	39.2	17.4	429
CNS	50	17.6	115	40.5	119	41.9	11.5	284
Bone tumour	8	6.7	17	14.3	94	79.0	4.8	119
Renal tumors	61	62.9	25	25.8	11	11.3	3.9	97
Other and unspecified malignant neoplasms	27	28.7	39	41.5	28	29.8	3.8	94
Soft tissue and other extraosseous sarcomas	26	34.2	30	39.5	20	26.3	3.1	76
Neuroblastoma	49	65.3	20	26.7	6	8.0	3.0	75
Retinoblastoma	61	84.7	10	13.9	1	1.4	2.9	72
Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	34	63.0	7	13.0	13	24.1	2.2	54
Hepatic tumors	25	65.8	5	13.2	8	21.1	1.5	38
Other malignant epithelial neoplasms and malignant melanomas	5	20.8	2	8.3	17	70.8	1.0	24
Malignant bone tumors	4	40.0	2	20.0	4	40.0	0.4	10
Total	740	30.1	877	35.7	843	34.3	100.0	2460

Table2: Distribution of Childhood Cancer according to age group-females (1999-2008)

Primary morphology	0-4		05-09		10-14		Total	
	#	%	#	%	#	%	#	%
Leukaemia	203	35.5	192	33.6	177	30.9	572	40.6
CNS	29	15.8	90	48.9	65	35.3	184	13.0
Lymphomas and reticuloendothelial neoplasms	16	13.6	52	44.1	50	42.4	118	8.4
Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	16	19.5	15	18.3	51	62.2	82	5.8
Bone tumour	4	4.9	11	13.6	66	81.5	81	5.7
Renal tumors	41	50.6	21	25.9	19	23.5	81	5.7
Other and unspecified malignant neoplasms	26	38.8	24	35.8	17	25.4	67	4.8
Retinoblastoma	55	85.9	9	14.1		0.0	64	4.5
Soft tissue and other extraosseous sarcomas	29	46.0	19	30.2	15	23.8	63	4.5
Neuroblastoma	37	77.1	9	16.7	3	6.3	49	3.5
Malignant bone tumors	8	36.4	6	27.3	8	36.4	22	1.6
Hepatic tumors	8	50.0	3	18.8	5	31.3	16	1.1
Other malignant epithelial neoplasms and malignant melanomas	1	9.1		0.0	10	90.9	11	0.8
Total	472	33.5	452	32.1	486	34.5	1410	100.0

Table3: Distribution of Childhood Cancer according to Sex (1999-2008)

Primary morphology	Males		Females		Total	
	#	%	#	%	#	%
Leukaemia	1088	44.2	572	40.6	1660	42.9
Lymphomas and reticuloendothelial neoplasms	429	17.4	118	8.4	547	14.1
CNS	284	11.5	184	13.0	468	12.1
Bone tumour	119	4.8	81	5.7	200	5.2
Renal tumors	97	3.9	81	5.7	178	4.6
Other and unspecified malignant neoplasms	94	3.8	67	4.8	161	4.2
Soft tissue and other extraosseous sarcomas	76	3.1	63	4.5	139	3.6
Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	54	2.2	82	5.8	136	3.5
Retinoblastoma	72	2.9	64	4.5	136	3.5
Neuroblastoma	73	3.0	48	3.4	121	3.1
Hepatic tumors	38	1.5	16	1.1	54	1.4
Other malignant epithelial neoplasms and malignant melanomas	24	1.0	11	0.8	35	0.9
Malignant bone tumors	10	0.4	22	1.6	32	0.8
Neuroblastoma	2	0.1	1	0.1	3	0.1
Total	2460	100.0	1410	100.0	3870	100.0

Table4: Detail tabulation of Childhood cancer according to age group-males (1999-2008)

Primary Histology	0-4		05-09		10-14		Total	
	#	%	#	%	#	%	#	%
Lymphoid leukemias	228	68.1	256	64.2	209	59.0	693	63.7
Acute myeloid leukemias	47	14.0	63	15.8	80	22.6	190	17.5
Unspecified and other specified leukemias	27	8.1	37	9.3	30	8.5	94	8.6
Acute Lymphoid leukemias	25	7.5	32	8.0	17	4.8	74	6.8
Chronic myeloproliferative diseases	7	2.1	10	2.5	18	5.1	35	3.2
Myelodysplastic syndrome and other myeloproliferative diseases	1	0.3	1	0.3	0	0.0	2	0.2
All leukemias	335	100.0	399	100.0	354	100.0	1088	100.0
Hodgkin lymphomas	20	36.4	121	58.7	98	58.3	239	55.7
Non-Hodgkin lymphomas (except Burkitt lymphoma)	15	27.3	33	16.0	37	22.0	85	19.8
Burkitt lymphoma	8	14.5	27	13.1	12	7.1	47	11.0
Unspecified lymphomas	6	10.9	19	9.2	18	10.7	43	10.0
Miscellaneous lymphoreticular neoplasms	6	10.9	6	2.9	3	1.8	15	3.5
All Lymphomas	55	100.0	206	100.0	168	100.0	429	100.0
Intracranial and intraspinal embryonal tumors	28	56.0	55	47.8	46	38.7	129	45.4
Astrocytomas	9	18.0	28	24.3	45	37.8	82	28.9
Other gliomas	2	4.0	22	19.1	15	12.6	39	13.7
Ependymomas and choroid plexus tumor	9	18.0	8	7.0	7	5.9	24	8.5
Other specified intracranial and intraspinal neoplasms	1	2.0	2	1.7	6	5.0	9	3.2

Ewing tumor and related sarcomas of bone	1	2.0		0.0		0.0	1	0.4
All CNS	50	100.0	115	100.0	119	100.0	284	100.0
Other specified malignant bone tumors	8	100.0	9	52.9	50	53.2	67	56.3
Osteosarcomas		0.0	8	47.1	42	44.7	50	42.0
Chondrosarcomas		0.0		0.0	2	2.1	2	1.7
All Bone	8	100.0	17	100.0	94	100.0	119	100.0
Nephroblastoma and other nonepithelial renal tumors	60	98.4	15	60.0	4	36.4	79	81.4
Renal carcinomas	1	1.6	8	32.0	6	54.5	15	15.5
Renal tumors		0.0	2	8.0	1	9.1	3	3.1
All Kidney	61	100.0	25	100.0	11	100.0	97	100.0
Hepatoblastoma	16	64.0	3	60.0		0.0	19	50.0
Hepatic carcinomas	9	36.0	2	40.0	7	87.5	18	47.4
Hepatic carcinomas		0.0		0.0	1	12.5	1	2.6
All Hepatic	25	100.0	5	100.0	8	100.0	38	100.0

Table5: Detail tabulation of Childhood cancer according to age group-females (1999-2008)

Primary Histology	0-4		05-09		10-14		Total	
	#	%	#	%	#	%	#	%
Lymphoid leukemias	138	68.0	121	63.0	77	43.5	336	58.7
Acute myeloid leukemias	24	11.8	36	18.8	57	32.2	117	20.5
Unspecified and other specified leukemias	16	7.9	13	6.8	18	10.2	47	8.2
Acute Lymphoid leukemias	22	10.8	9	4.7	14	7.9	45	7.9
Chronic myeloproliferative diseases	2	1.0	13	6.8	11	6.2	26	4.5
Myelodysplastic syndrome and other myeloproliferative diseases	1	0.5		0.0		0.0	1	0.2
All leukemias	203	100.0	192	100.0	177	100.0	572	100.0
Hodgkin lymphomas	5	31.3	21	40.4	27	54.0	53	44.9
Burkitt lymphoma	6	37.5	9	17.3	6	12.0	21	17.8
Non-Hodgkin lymphomas (except Burkitt lymphoma)	3	18.8	9	17.3	9	18.0	21	17.8
Unspecified lymphomas	2	12.5	9	17.3	7	14.0	18	15.3
Miscellaneous lymphoreticular neoplasms		0.0	4	7.7	1	2.0	5	4.2
All Lymphomas	16	100.0	52	100.0	50	100.0	118	100.0
Intracranial and intraspinal embryonal tumors	12	41.4	44	48.9	23	35.4	79	42.9
Astrocytomas	6	20.7	20	22.2	26	40.0	52	28.3
Other gliomas	2	6.9	11	12.2	10	15.4	23	12.5
Ependymomas and choroid plexus tumor	7	24.1	9	10.0	3	4.6	19	10.3
Other specified intracranial and intraspinal neoplasms	1	3.4	5	5.6	3	4.6	9	4.9
Ewing tumor and related sarcomas of bone	1	3.4	1	1.1		0.0	2	1.1
All CNS	29	100.0	90	100.0	65	100.0	184	100.0
Osteosarcomas	1	25.0	4	36.4	35	53.0	40	49.4

Other specified malignant bone tumors	3	75.0	7	63.6	29	43.9	39	48.1
Chondrosarcomas		0.0		0.0	1	1.5	1	1.2
Ewing tumor and related sarcomas of bone		0.0		0.0	1	1.5	1	1.2
All Bone	4	100.0	11	100.0	66	100.0	81	100.0
Nephroblastoma and other nonepithelial renal tumors	41	100.0	16	76.2	3	15.8	60	74.1
Renal carcinomas			5	23.8	16	84.2	21	25.9
All Kidney	41	100.0	21	100.0	19	100.0	81	100.0
Hepatoblastoma	6	75.0	2	66.7	1	20.0	9	56.3
Hepatic carcinomas	2	25.0	1	33.3	2	40.0	5	31.3
Hepatic carcinomas				0.0	1	20.0	1	6.3
Unspecified malignant hepatic tumors				0.0	1	20.0	1	6.3
All Hepatic	8	100.0	3	100.0	5	100.0	16	100.0

Figure1: Multiple Diagrams showing sex of the respondents by year

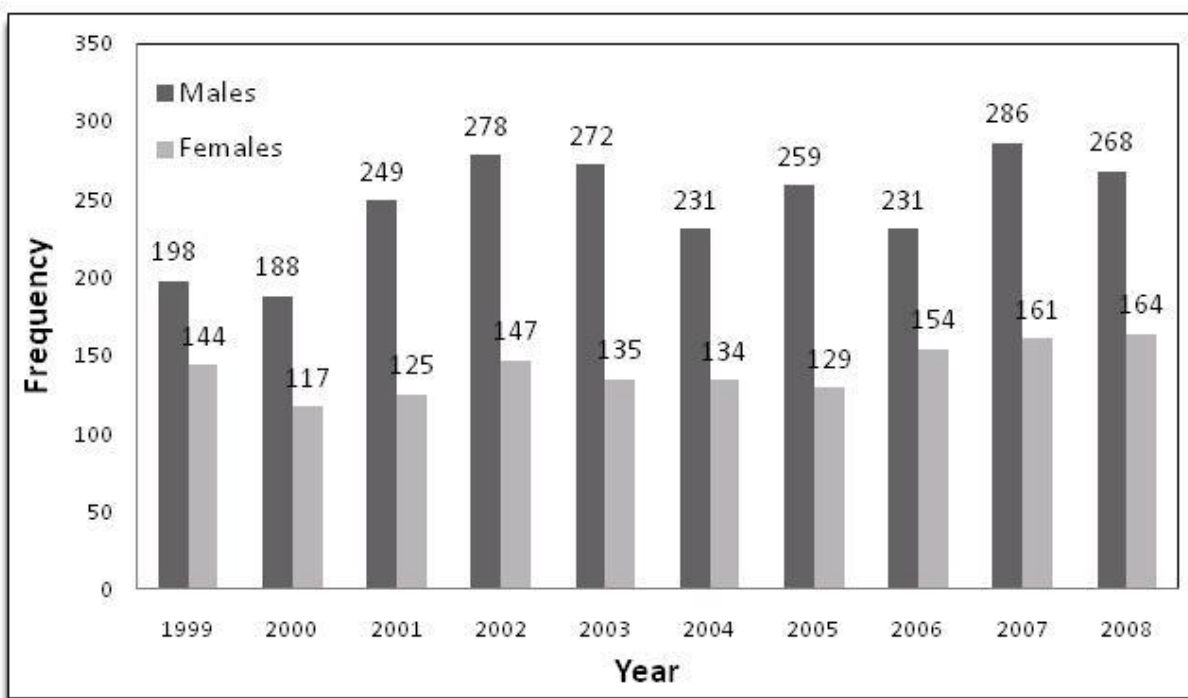
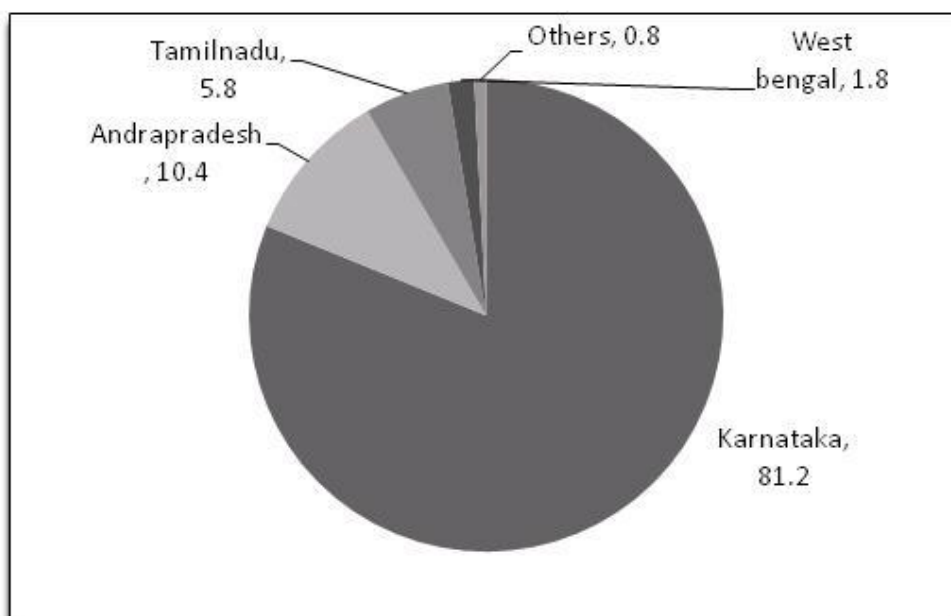


Figure2: Diagram showing distribution of the respondents by region/State (1999-2008)



Discussion

Incidence of paediatric tumours is on rise⁴. In our ten year study paediatric tumours constituted 4.7% of all malignancies by combining both sex, our result is almost similar to Jabeen S et al.³, where they found 4.4% childhood cancers among all malignancies. But the proportion of childhood cancers seems to be high compared to that of developed countries. In USA, where childhood cancers are 0.8% of the total,¹⁰ two possible reasons for this difference could be that our data is from hospital and so is not a true representation of the cancer burden. Moreover, children form a larger part of the population in a developing country where the life expectancy is lower than in the developed world. Majority (83.7%) of our respondents was Hindus, out of 3780 patients, 63.6% were males and 36.4% were female.

We found that the three most common cancer groups in our series were leukemia's (42.9%), lymphomas (14.1%) and CNS (12.1%). This is similar to that reported from Indian population based cancer registry¹¹ and our result more or less equivalent to developed country, for example, in the USA¹⁰ the three most frequent major childhood cancers diagnosed were leukemia (30.2%), central nervous system cancers (21.7%) and lymphomas (10.9%).

Leukemia (1660, 42.9%) by considered both sex in male (1088, 44.2) and female (572, 40.6) were the commonest cancer among the children attended KMIO during the study period. Lymphoid leukemia was more frequent than acute myeloid leukemia and acute lymphoid leukemia in both the sex. Lymphoid leukemia constituted 63.7% and 58.7% in male and females respectively of all Leukemia, acute myeloid leukemia has been reported to be around 17.5% in male and 20.5% in females of total leukemia in some study lymphoid leukemia constitute 60.5% of all leukemia in Bangalore PBCR¹¹. In our study of lymphoid leukemia frequency was found higher around 00-04 year's age group and it goes on reducing while increasing age group in both sexes.

Lymphomas and reticuloendothelial neoplasm's (Both: 547, 14.1%, Male: 429, 17.4%, Female: 118, 8.4%) were the second commonest cancer among the children attended KMI during the study period. Hodgkin's disease was more frequent than non Hodgkin's Burkitt's. Hodgkin's disease constituted 55.7% in male and 44.9% in female of all lymphomas, Burkitt's lymphoma was about 11% and 17.8% in males and females respectively, in some studies, Burkitt's lymphoma has been reported to be around 18-20% of total lymphomas¹². In our study of Hodgkin's disease frequency was found higher around 10-14 years age group similar result reported in National Institute of Cancer Research and Hospital, (NICRH), Dhaka during 2005 to 2009³.

CNS (12.1%) was the third most common childhood tumour affecting 11.7% in male and 13.0% in females of study population. Almost 41.9% of CNS at our hospital presented between 10-14 years of age in males, 48.9% of CNS cases between 05-09 age group. Intracranial and intraspinal embryonal tumors constitute 45% in male and 42.9% in females of all CNS. Majority of astrocytomas occurred in age >5 years. In developed countries CNS cancers is the second most common childhood cancer (22-25%)¹³. In females CNS was second leading site but in males CNS was third leading site, similar finding expressed by Block W C in India lymphomas often exceed CNS tumours, particularly in males. Interestingly, the incidence of CNS tumours in children in developed world has increased in the last 30-40 years with increasing availability of CT and MRI scanners.¹⁴

Bone tumour comprises 5.2% of all malignancies among our children. Almost 42% of male and 48.1% of female belonged to osteogenic sarcoma of long bones. This study accords with Mirabello study¹⁵, where they reported that osteosarcoma occurs predominantly in adolescents and young adults and osteosarcoma accounts for approximately 5% of childhood tumors.

Renal tumour (Total: 4.6%, male: 3.9%, Female: 5.7%) was the fifth most common cancer identified in both sex in the study; this is comparable with data from other countries.¹⁶

Conclusion

It can be concluded that Leukemia, Lymphomas, CNS, Bone tumour and renal tumour are dominant in Bangalore hospital based cancer registry. The pattern of childhood tumours showed wide variation among the age groups. Frequency of lymphoma and CNS was higher in age group more than 5 years children and lymphomas distribution showed uniform, bone tumour increased with age and neuroblastoma and retinoblastoma more frequent in lesser age.

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