

## Patterns of Cancer in the Children Admitted in Avicenna Hospital in Sari, Iran, between 2001 and 2010

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### Abstract

**Background:** Recent studies have shown the trends in children cancer types, its frequencies, and mortality in some areas of the world. The aim of this study was to analyze the pattern of childhood cancer in a university affiliated hospital for the first time in Sari in a period of 10 years (2001-2010) and to compare the results with similar reports.

**Methods:** This descriptive retrospective study includes all the consecutive pathologically or cytologically proved childhood cancer cases diagnosed in Avicenna Hospital from 2001 to 2010. Malignancies were grouped according to the third international classification of childhood cancer. The frequencies of each type of cancer cases were determined by three age groups (0-4, 5-9, 10-14 years) and gender. The patients' job and home residency were noted.

**Results:** We found 148 cases of cancer among 0-14 year old children with the boy/girl ratio of 1.24. The highest frequency was seen in 5-9 year age group. The most frequent childhood cancers were leukemias (30.5%) followed by lymphomas (16.4%), carcinomas and melanoma (14.5%), and soft tissue sarcomas (9.5%). Fifty four percent of the patients were urban. A gradual increase in the number of new diagnosed cases was observed per year.

**Conclusion:** The two most common childhood cancers diagnosed during this study were leukemias and lymphomas consistent with reported series from other Asian countries and similar to that of Latin America. The third most common one was distinct with respect to the apparently higher frequency of carcinomas.

**Keywords:** Children, Cancer, Epidemiology

### Introduction

Childhood cancers comprise a variety of malignancies diagnosed at 0-14 year old patients and differ notably from adult cancer.(1- 4) The incidences of these malignancies are varied throughout the world with regard to age, gender, ethnicity, socioeconomic status and geography.(2-8)

The findings of the clinical epidemiologic studies about pediatric malignancies are challenging and limited.(4- 6) The study of childhood cancers influences our knowledge about etiopathogenesis and their regional predisposing factors.(1, 2, 5)

Furthermore, it improves medical attention strategies for diagnosis, treatment and care of these susceptible patients and helps their parents.(2, 3, 5) Recently trends in incidence rate and frequency of diagnostic type of childhood cancer in some countries were observed that should be considered in planning of medical attention for these children.(2- 4, 9, 15)

The main objective of this study is to evaluate childhood cancer patterns in children referred in Avicenna Hospital, in Sari. The results of this study will provide beneficial information to plan new childhood cancer management.

## Material and Methods

Present study retrospectively described all the pathologically or cytologically proved cancers among 0-14 year old children diagnosed in university affiliated Avicenna Hospital in Sari between 2001 and 2010.

Sari Avicenna hospital is served as a referral center in the highly specialized aspects of pediatric diseases and cancers that committed to all children living in Mazandran province.

Childhood cancer cases were classified in 12 different histologic groups according to third international classification of childhood cancer (ICC-3).<sup>(16)</sup> The frequencies of each histologic type of cancer cases were determined by three age groups (0-4, 5-9, 10-14 years) and gender. The patient's job and home residency were noted.

## Results

This study described a total of 148 childhood cancers including 82 (55.4%) boys and 66 (46.6%) girls with the mean age of  $7.85 \pm 4.52$ . Overall the five most common malignancies in descending order of frequency were leukemias (30.5%), lymphomas (16.4%), carcinomas and melanoma (14.5%), soft tissue sarcomas (9.5%) and neuroblastoma and ganglioneuroblastoma (6.5%), as showed in table 1. Acute lymphoblastic leukemia (28.4%) was the commonest subtype of leukemias and malignancy. Hodgkin lymphoma (10.3%) was the commonest histologic subtype of lymphomas; astrocytoma (2.6%) was the predominant subtype of central nervous system (CNS) neoplasm and finally, osteosarcomas (4.1%) were the commonest malignant bone tumors. Rhabdomyosarcoma especially embryonal type (n=7) and Fibrous sarcoma (n=3) were two most common soft tissue tumors respectively. Majority (66.5%) of germ cell tumors were extragonadal, especially sarcooccygeal. The only subtypes identified in sympathetic nervous system and renal tumors were neuroblastoma/ganglioneuroblastoma and nephroblastoma, respectively. The all diagnosed hepatic malignancy were consisted of hepatoblastoma. Skin carcinomas (6.3%) were the most frequent epithelial neoplasm followed by papillary carcinoma of thyroid (3.4%). As showed in table 2 percentage distribution of childhood cancers varied by age group and gender. On the whole, the malignancy was 1.24 times more common in boys than girls. The highest frequency of childhood cancers was found in 5-9 year age group (38.5%) and the lowest in 0-4 years (28.4%). Among the patients, 56% (n=83) were urban and

44% (n=65) rural. Of them, 50.7% were students, 4% farmhands and the remaining vacant. Percentage of annual diagnosis of new cases in relation to total number was continuously increasing with an average of 2 % increase per year. Leukemias, especially acute lymphoid leukemia (ALL), were the most common malignancies in children under 1 year old and in both genders. Lymphomas were the second most frequent malignant tumor in children between 5 and 14 years old, while carcinoma was the most common malignant tumor in 10-14 year age group. Tumors of CNS, germ cell, soft tissue and neuroblastoma were more frequent in girls; on the other hand, lymphomas were more common in boys.

## Discussion

The present study, conducted for the first time in Sari in the north of Iran from 2001 till 2010, revealed childhood cancer pattern according to ICC-3. The findings indicated 148 new cases of malignancies in 0- 14 year old children. The boy/girl ratio was 1.24 which was consistent with similar reports in Yazd (1.53), England (1.28), and Mexico City (1.1).<sup>(2, 17, 18)</sup> The highest frequency was seen in 5- 9 year age group which was compatible with other regions of Iran and other countries such as India, England and Switzerland.<sup>(1, 7, 8, 17)</sup> The data obtained in this study showed childhood cancer pattern diagnosed in Sari consisted of a variety of histologic types relatively matched with similar reports presented in the world; however, there were few notable differences in the percentage distribution which will be discussed below. Overall, similar to other regions of Iran and other countries in Asia, Latin America, the USA and Europe, acute lymphoid leukemia was the first most common malignancy in both genders in our study.<sup>(1, 2, 6, 8, 17, 19)</sup> Leukemia comprised 30.5% of malignant neoplasm which was consistent with the findings reported from other Asian countries 29-40%.<sup>(2, 6, 17)</sup> The second most common observed malignancy was lymphoma (16.4%), parallel to the reports from Latin America and Asian countries, and in contrast to developed countries where CNS tumors were reported to be more common than lymphomas.<sup>(4, 8)</sup> In the third location of frequency, carcinomas and melanoma (14.5%) were significantly more common than developed countries.<sup>(2, 4, 8, 12)</sup> The third most common childhood cancers reported from Yazd, Iran, Chennai, India and Latin America were CNS tumors, whereas in developed countries, lymphomas were in the third place.<sup>(1, 2, 4, 6, 8, 17)</sup>

**Table- 1. Percentage distribution of cancer cases by site/histology in 0-14 year old children diagnosed in Avicenna Hospital in Sari (2001-2010).**

	Site/Histology group	Frequency	
		No.	%
<b>I</b>	Leukemia, myeloproliferative diseases and myelodysplastic diseases	45	30.5 <sup>1</sup>
<b>II</b>	Lymphomas and reticuloendothelial neoplasms	24	16.4 <sup>2</sup>
<b>III</b>	CNS and miscellaneous intracranial and intraspinal neoplasm	7	4.7
<b>IV</b>	Neuroblastoma and other peripheral nervous cell tumors	10	6.5 <sup>3</sup>
<b>V</b>	Retinoblastoma	2	1.4
<b>VI</b>	Renal tumors	7	4.7
<b>VII</b>	Hepatic tumor	7	4.7
<b>VIII</b>	Malignant bone tumor	8	5.5
<b>IX</b>	Soft tissue and other extraosseous sarcoma	14	9.5 <sup>4</sup>
<b>X</b>	Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	9	6
<b>XI</b>	Other malignant epithelial neoplasm and malignant melanoma	21	14.5 <sup>3</sup>
<b>XII</b>	Other and unspecified malignant tumor	0	0.0
<b>Total</b>		<b>148</b>	<b>100</b>

Note: superscript numbers show the five most common childhood cancers in descending order of frequency.

**Table- 2. Frequency of childhood cancer by gender and age group, diagnosed in Avicenna Hospital in Sari, Iran, (2001-2010).**

Histologic group		Age group (years)			Gender	
		0- 4	5- 9	10- 14	Boy	Girl
<b>I</b>	Leukemias	19 (45.2) <sup>1</sup>	23 (40.5) <sup>1</sup>	3 (6.1)	27 (32.9) <sup>1</sup>	18 (27.3) <sup>1</sup>
<b>II</b>	Lymphomas	1 (2.4)	13 (22.8) <sup>2</sup>	10 (20.4) <sup>2</sup>	19 (23.2) <sup>2</sup>	5 (7.6)
<b>III</b>	CNS neoplasms	1 (2.4)	2 (3.5)	4 (8.1)	2 (2.4)	5 (7.6)
<b>IV</b>	Neuroblastomas	6 (14.3) <sup>3</sup>	1 (1.6)	3 (6.1)	4 (4.9)	6 (9.1)
<b>V</b>	Retinoblastoma	0 (0.0)	1 (1.6)	1 (2)	1 (1.2)	1 (1.6)
<b>VI</b>	Renal tumor	2 (4.7)	5 (8.9)	0 (0.0)	4 (4.9)	3 (4.5)
<b>VII</b>	Hepatic tumor	0 (0.0)	0 (0.0)	1 (2)	1 (1.2)	0 (0.0)
<b>VIII</b>	Bone tumors	0 (0.0)	2 (3.5)	6 (12.5) <sup>3</sup>	5 (6.1)	3 (4.5)
<b>IX</b>	Soft tissue tumor	7 (16.7) <sup>2</sup>	2 (3.5)	5 (10.2)	6 (7.3)	8 (12.1) <sup>3</sup>
<b>X</b>	Germ cell tumors	5 (11.9)	1 (1.6)	3 (6.1)	1 (1.2)	8 (12.1) <sup>3</sup>
<b>XI</b>	Carcinoma and melanomas	1 (2.4)	7 (12.5) <sup>3</sup>	13 (26.5) <sup>1</sup>	12 (14.7) <sup>3</sup>	9 (13.6) <sup>2</sup>
<b>Total</b>		42 (100)	57 (100)	49 (100)	82 (100)	66 (100)

Note: Superscript numbers show the three most common cases according to age and gender, in descending order of frequency.

Besides, a ten year study (1990-1999) at Bs Medical College of India showed the common malignant neoplasm in children in descending order of frequency were ALL, retinoblastoma, lymphoma and Wilm's tumor.(19) The most common childhood cancers observed in Malawi between 1985 and 1993 were lymphoma followed by retinoblastoma, nephroblastoma and Hodgkin's lymphoma.(20) It is recommended that future studies investigate higher frequency of carcinoma of thyroid, skin carcinoma, and gastric adenocarcinoma, among children in Sari than other series.(1, 4, 6, 8, 19, 20)

In our opinion high exposure to preventable unwanted environmental agents such as sunlight, radiation, free radicals species and poor diet probably underly this observed discrepancy, and the magnitude of disparity reported here suggest it is unlikely to be a data artifact collection however sophisticated studies is needed. It is notable to know skin cancer and colorectal carcinoma compromised one of ten frequent malignancy

among children residence in Pakistan.(25) Also carcinomas with 6.3% frequency were the sixth common childhood cancer in a report from Tunisia( 26)

In addition, we found an average percentage increase of 2% annually which is somewhat higher than 0-1/5% annual percentage increase observed in other studies.(21, 22, 23) It can be postulated the incidence of childhood cancer in sari as showed by others(21, 24, 25) has truly increased, however it should be clarified by pooled studies. In contrast to that reported from Chennai, India in which it was equal among both genders, in the present study, the percentage distribution of the ICCC-3 histologic groups was found to be different among girls and boys. During this study, it was found that lymphomas, bone tumors and carcinomas were more common in boys than girls. On the other hand, CNS tumors, nephroblastoma, soft tissue tumors and especially germ cells tumor were more common among girls. The latter was consistent with similar studies.(2, 17, 25) Finally the five most

common malignancies diagnosed in children in Sari were leukemias, lymphomas, carcinomas, soft tissue sarcomas and neuroblastic tumors. This study revealed Sari had one of the highest frequencies of epithelial derived malignant neoplasms among children, especially in 10-14 year old age group that should be considered in future childhood cancer investigation and prevention programs. This project recommends a childhood cancer registry for detailed analysis of pediatric malignancies and their outcome in Mazandaran province.

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