

**ORIGINAL ARTICLE-II****Childhood Cancer Incidence in Delhi, 1996 – 2000**

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**ABSTRACT**

**Background :** Rates of cancer incidence in children are scarce in developing countries. The purpose of this study is to provide the cancer incidence rates among the children of Delhi during 1996-2000.

**Methods :** Data from the Delhi Population based cancer registry were utilized for this study. The analysis was limited to children <15 years of age. Cancer cases were restricted to those patients with a malignant neoplasm diagnosed between 1<sup>st</sup> January 1996 and 31<sup>st</sup> December 2000.

**Results:** The share of childhood cancer up to 14 years of age in Delhi was 4.8% of all cancers. The incidence of Leukemia was predominant among both males and females. In general rates were higher among male children compared to females. When standardized age adjusted incidence rates obtained from different national registries were compared, the age adjusted incidence rates in Delhi were higher in both male and female children except in Chennai Registry where the female cancer incidence is higher.

**Conclusion:** The results of the present study reveals that the cancer incidence among male children is more in Delhi compared to their female counter parts.

**INTRODUCTION**

Reliable data on incidence and mortality of childhood cancers are available from only a few areas in developing countries<sup>1</sup>. The types of cancer occurring in childhood are very different from those in adults. Childhood cancers are rare as compared to adult cancers. The incidence is 2% in developed countries and about 3% in developing countries<sup>2</sup>. There is also a significant geographic variation in its incidence in various parts of the world. An attempt has been made in this paper to study the nature and magnitude of the cancer problem among children whose families are residents of Delhi for a period of minimum one year.

**METHODS**

The data collected at the Delhi Population Based Cancer Registry for the five years period (1996-2000) was used for this study. An extensive analysis was carried out in childhood cancers for incidence by age, sex, site, histology etc. The classification scheme used for primary site was ICD-9 (1) and ICD-(1) for histology. Crude, age-adjusted (world) and age-specific incidence rates were calculated.

Delhi is a densely populated urban metropolis situated between the Himalayas and Aravalli ranges of mountain in the heart of the Indian sub continent. It lies between latitude 28° 25' and 28° 53' N and longitude 76°50' and 73°22' E and covers an area of 1483 square kilometers. It comprises both rural and urban areas.

The collection of data was done from the so-called "Delhi Urban Agglomeration". The constituents of the Delhi Urban Agglomeration are three statutory towns (Delhi Municipal Corporation, New Delhi Municipal Committee

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and Delhi Cantonment) and 23 census towns. As per 2001 census it covers an area of 891.09 square kilometers. The registration area does not include rural area of the Union Territory of Delhi.

The population-based cancer registry of Delhi was established in 1986. It is located at the Dr. B.R.Ambedkar Institute Rotary Cancer Hospital attached to the All India Institute of Medical Sciences, New Delhi. The Delhi

**RESULTS**

An estimate of the mean resident population as on 1<sup>st</sup> July 1998 below the age of 15 years in Delhi by age and sex is presented in Table 1. It comprises 34% of total population in Delhi.

During the period 1996-2000, 44250 new cancer cases were registered for entire population. Among them 2103 were children accounting for 4.8% of the total cancer load. Of these, 1401 were boys and 702 were girls (Fig.1)

**Table-1 Estimated Resident Population of children by age and sex as on 1<sup>st</sup> July 1998, Delhi.**

Age Group	Male	Female	Total
0 – 4	703672	627321	1330993
5 – 9	712484	634579	1347063
10 - 14	642620	548517	1191137
0 - 14	2058776	1810417	3869193

registry today covers more than 159 major government hospitals/centers, 250 private hospital and nursing homes and Department of Vital Statistics of Municipal Corporation of Delhi, New Delhi Municipal Committee and Delhi Cantonment Board. The Medical Social Workers personally visit the co-operating hospitals regularly, interview all the identified cancer patients and also those under investigation. They also examine the case records maintained by various departments of those hospitals namely pathology, hematology and radiology etc. All the information collected is crosschecked for completeness of the data. Sometimes the same patient may be registered in more than one hospital for treatment. Care is taken to exclude these duplicates and ensure that each patient is included only once in the record.

The Medical Social Workers also visit the office of the New Delhi Municipal Committee and Municipal Corporation of Delhi and collect information about deaths where the death certificates states that the cause of death as cancer or tumour.

giving a sex ratio of 2 :1. It is interesting to note that the corresponding sex ratio in the general population among the children was 1.14:1. In both males and females about 34% of children suffering from cancer were found to be in the 0 - 4 age group (Table 2).

Fig. 1. Distribution of cancer incidence among children in Delhi, 1996-2000

**Table-2 : Number of New cases and percentage distribution of childhood cancers by age and sex, Delhi, 1996-2000.**

Age Group	Male		Female		Total	
	Number	%	Number	%	Number	%
0 - 4	482	34.4	240	34.2	722	34.3
5 - 9	465	33.2	213	30.3	678	32.2
10 - 14	454	32.4	249	35.5	703	33.4
0 - 14	1401	100.0	702	100.0	2103	100.0

The number of new cases of the most common cancers in both sexes along with the Crude rate (CR) and Age adjusted (world population) rate (AAR) is presented in Table 3. Leukemia was the most common cancer accounting for 32% in boys and 36% in girls. The other common cancers were brain tumour, lymphomas, bone and eye. The total crude incidence rates per 100,000 populations were 13.6 for males and 7.8 for females. Age adjusted incidence rate for world population and crude rate did not show any differences in either sexes (Fig.2). In both sexes, Leukemia showed the highest incidence (4.4 per 100,000 persons for boys and 2.8 per 100,000 persons for girls) followed by brain tumours (1.6 per 100,000 persons for boys and 0.9 per 100,000 for girls). Male preponderance was observed for almost all

Fig. 2. Crude (CR) and World age-adjusted (AAR) cancer Incidence rates among children in Delhi, 1996-2000

sites. The age specific incidence rate are also more in male children compared to their female counterparts (Fig.3).

Fig. 3. Age specific incidence rates among children in Delhi. 1996-2000

The age adjusted incidence rates by sex for various national population are presented in table 4. For national comparison the incidence rates for the year 1999-2000 have been compared.<sup>3</sup> The table shows that cancer incidence is higher in boys than in girls in all registry areas. It could be as a result of our social factors wherein boys get more attention and are brought to hospital more often for management. The highest incidence rate in male was observed in Delhi (13.0) and the lowest incidence was noted in Barshi (4.2). The highest and lowest incidence rate in female was observed in Chennai (9.4) and Barshi (1.7) respectively.

**Table 3: Number, percentage, crude (CR) and world age-adjusted (AAR) incidence rates per 100,000 population by sex and site for childhood cancers, Delhi, 1996-2000.**

Sex	Site	0-4	5-9	10-14	Total	%	CR	AAR
Male	Bone	9	29	60	98	7.0	1.0	0.9
	Connective tissue	26	22	12	60	4.4	0.6	0.6
	Testis	20	0	4	24	1.7	0.2	0.3
	Kidney	53	14	5	72	5.1	0.7	0.8
	Eye	58	20	5	83	5.9	0.8	0.9
	Brain	45	56	61	162	11.4	1.6	1.6
	Other Endo. Glands	29	10	6	45	3.2	0.4	0.5
	NHL	30	41	42	113	8.0	1.1	1.1
	Hodgkin's disease	13	64	46	123	8.8	1.2	1.1
	Leukemia	146	151	156	453	32.3	4.4	4.4
	Others	53	58	57	168	12.0	1.6	1.6
	Total		482	465	454	1401	100.0	13.6
Female	Bone	3	8	36	47	6.7	0.5	0.5
	Connective tissue	15	9	12	36	5.1	0.4	0.4
	Ovary	5	6	17	28	4.0	0.3	0.3
	Kidney	18	7	4	29	4.1	0.3	0.3
	Eye	29	9	0	38	5.4	0.4	0.5
	Brain	19	28	34	81	11.5	0.9	0.9
	Other Endo. Glands	12	5	4	21	3.0	0.2	0.2
	NHL	9	18	11	38	5.4	0.4	0.4
	Hodgkin's disease	4	12	17	33	4.7	0.4	0.4
	Leukemia	91	82	82	255	36.3	2.8	2.8
	Others	35	29	32	96	13.8	1.1	1.1
	Total		240	213	249	702	100.0	7.8

**Table 4: National comparison of world age-adjusted incidence rates for childhood cancers by sex, 1999-2000.**

Place	Male	Female
Bangalore	6.3	5.7
Barshi	4.2	1.7
Bhopal	5.5	4.2
Chennai	12.6	9.4
Delhi	13.0	7.1
Mumbai	10.2	6.3

## DISCUSSION

The cancer incidence rates calculated in this study are based on reliable sources of data. The population for the denominator was estimated from the actual population counts published by Census Bureau of India. In India, population census is undertaken every ten years. The Delhi Cancer Registry has been collecting data over the past 17 years and has standardized the method of data collection and reporting. In almost 80% of cases diagnosis was made on pathology. Thus, we believe our rates represent the most reliable estimates of actual cancer incidence in children <15 years of age.

Parkins et al suggested that Leukemias are the most common cancers affecting the children accounting for 25 and 35 percents of total malignancies.<sup>4</sup> In our study, leukemia accounts for approximately 34% of all childhood cancers in Delhi. The majority of leukemias (25%) are Acute Lymphoblastic Leukemia (ALL). The incidence of ALL was highest among children under five years of age. A study conducted by Greaves et al suggested that the ALL of the common B-cell type precursor type accounts for the peak in the incidence of childhood leukemias at the age of 2 to 5 years.<sup>5</sup>

In our study tumours of the central nervous system (CNS) are the second most frequent form of cancer in children and

constituted about 12 percent of childhood cancers and the incidence is more in boys compared to girls. In most population, the CNS tumours comprise between 17 to 25 percent of all neoplasms and more boys are affected with CNS tumours than girls.<sup>7</sup> In some other studies also increasing CNS tumour incidence has been observed in adults as well as children.<sup>9-15</sup> It has been postulated that these increases may be largely attributed to the diagnostic improvements in brain imaging.

Hodgkin's and Non-Hodgkin's lymphoma together constituted about 15 percent of malignancies in children in Delhi. In boys the share of Hodgkin's and Non-Hodgkin's lymphomas together were 17 percent and it was 10 percent in females in their respective group's total childhood cancer load. Hodgkin's disease comprised 51% of cases of lymphomas. The incidence rates of Hodgkin's disease are higher in boys (1.1 per 100,000) than girls (0.4 per 100,000). The incidence is lower in the 1-4 age group. The highest incidence in the world for Hodgkin's disease in children was 12.0 per million population noted among Kuwaitis in Kuwait.<sup>2</sup>

The incidence rate of Non-Hodgkin's lymphoma for males was 1.1 and 0.4 for females giving a 2.8 fold difference. In a SEER program study<sup>16</sup> a 2.6 fold difference between the incidence of NHL among boys and girls were

observed. The highest incidence of NHL among the children in the world is observed in Alexandria, Egypt<sup>2</sup>.

This study demonstrates higher incidence of childhood cancer among male children than female children in Delhi in almost in all sites during 1996-2000. When the sex ratio (male: female) in general population among the children were 1.14:1, the ratio of cancer incidence was 2.0:1 in Delhi which is noteworthy. Future analytic studies of genetic, environmental, prenatal and socio-economic factors are necessary to explore the possible reasons for these increased rates. This may lead to advances in our understanding of childhood cancer etiology.

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