

## Childhood Cancer Incidence in India: A Review of Population-Based Cancer Registries

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**Objectives:** To summarize and provide an overview of the childhood cancer incidence reported in 25 population-based cancer registries of India.

**Methods:** Secondary data on age-adjusted rates of cancer incidence for children (0-14 years) were collected from the report of the National Cancer Registry Programme in the year 2013. range of age-adjusted-rates per million children were tabulated for six regions of the country.

**Results:** Age-adjusted cancer incidence rates ranged from 18.6

per million to 159.6 per million for boys and 11.3 to 112.4 for girls. The highest incidence was observed for males (159.6) in Southern region of the country and the lowest in North-east in both boys (18.6) and girls (11.3). Leukemia and lymphoma were the commonest malignancies in boys whereas leukemia and brain tumors were commonest in girls.

**Conclusion:** Childhood cancer incidence appears to be increasing in India.

**Keywords:** Cancer statistics, Neoplasm, Pediatric cancer.

Cancer in children and adolescents is rare and biologically very different from cancer in adults [1]. It is estimated that about 148000 cancers occurred during 2008 in children aged 0–14 years in less-developed regions [2]. In India cancer is the 9th common cause for the deaths among children between 5 to 14 years of age [3]. The proportion of childhood cancers relative to all cancers reported by Indian cancer registries varied from 0.8% to 5.8% in boys, and from 0.5% to 3.4% in girls [4].

We earlier reported trends in childhood cancer risk based on incidence for the years 1982-2000 in Indian states [5]. There are few studies reporting childhood cancer incidence (CCI) from cancer registries in Indian states [6-11]. An updated overview of childhood cancer incidence data will be of help for researchers' and clinicians for quick reference of facts in cancer control. This report attempts to provide the reader an updated summary overview of the incidence of childhood cancer on the basis of the 2013 report from National Cancer Registry Program (NCRP) for the years 2006-2011 that covered 25 population-based cancer registries (PBCR) in India.

### METHODS

The Indian Council of Medical Research (ICMR) started the NCRP with a network of cancer registries across India in December 1981. Comprehensive annual reports

containing data such as incidence rates and mortality rates of cancer at the population level are brought out by NCRP. These reports describe the methods of data collection and quality control measures. Initially, there were six PBCRs in the NCRP's network, and these covered only 3% of the country's population. Latest NCRP report (2013) [4] provides data from 25 PBCRs covering 7.45% of the country's population. The data on CCI in terms of age-adjusted-rate (AAR) per million children of either sex for all sites combined in years 2006 to 2011 in 25 PBCRs were used for summarized. The 25 PBCRs data were summarized in different regions as follows: *North:* Delhi; *South:* Bangalore, Chennai, Kollam and Tiruvananthapuram; *Central:* Bhopal; *East:* Kolkata; *North-east:* Cachar, Dibrugarh, Kamrup, Manipur, Mizoram and Sikkim, Meghalaya, Tripura, Nagaland; *West:* Mumbai, Nagpur, Pune, Ahmadabad (urban) and Barshi (extended), Aurangabad, Wardha and *Rural West:* Barshi (rural) and Ahmedabad (rural). The grouping of registries as regions were presented by the authors for the purpose of study using the location of the registry. It was not there in the NCRP report.

For both boys and girls, CCIs as AARs for 10 selected broad types of childhood cancers [Central-nervous-system (CNS) tumours, SNS tumours, retinoblastoma, renal tumour, hepatic tumour, bone tumour, soft tissue sarcomas, germ cell tumours, leukemias and lymphomas].

**RESULTS**

**Table I** presents data on CCI presented as AARs from the 25 PBCRs and arranged as per the location of the registry. **Table II** depicts minimum and maximum AAR per million of CCI in broad types for six major cancer registries (Delhi, Mumbai, Chennai, Bangalore, Kolkata, Ahmedabad urban).

**Fig. 1** presents incidence of 10 major childhood cancers for 6 registries in boys and girls, respectively. Leukemias was the most common malignancy in both sexes.

**DISCUSSION**

This article summarizes childhood cancer incidence

**TABLE I** CHILDHOOD CANCER INCIDENCE IN INDIA FOR THE YEAR 2006-2011 ACCORDING TO THE LOCATION OF REGISTRY

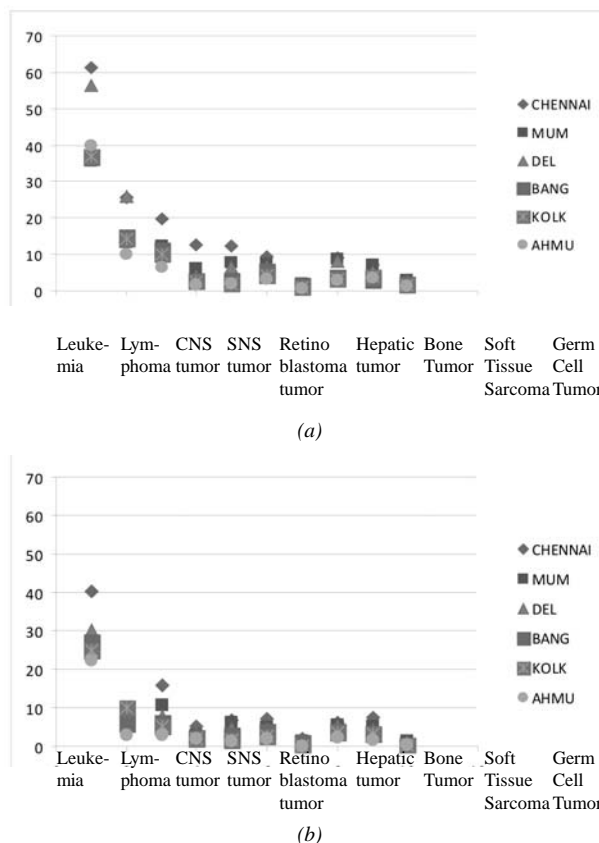
Registry location*	Cancer Incidence AARpm (% of cancers in childhood out of all cancers)	
	Boys	Girls
North	149.4 (5.8)	77.7 (2.8)
South	91.6-159.6 (1.7-3.1)	69.9-112.4 (1.4-2.0)
Central	70.7 (3.3)	61.9 (2.5)
East/north-east	18.6-111.1 (0.8-2.9)	11.3-69.3 (0.5-2.5)
West	32.9-117.4 (2.2-4.2)	18.0-84.6 (1.3-1.9)
Rural west	60.7-72.8 (3.5-4.7)	38.7-51.0 (2.2-3.4)
All regions	18.6-159.6 (0.8-5.8)	11.3-112.4 (0.5-3.4)

AARpm: Age-adjusted rates of incidence per million; Data source: NCRP report 2009-2011 [4].

**TABLE II** CHILDHOOD CANCER INCIDENCE IN BROAD CANCER TYPES FOR SIX MAJOR REGISTRIES

Tumor type in Childhood (0-14 years)	AAR per million	
	Boys	Girls
Leukemia	35.7-61.3	22.3-40.2
Lymphoma	9.9-25.6	2.9-10.1
Central-nervous-system tumor	6.6-19.8	3.0-16.0
SNS tumor	1.5-12.6	1.8-5.3
Retinoblastoma	1.9-12.3	1.3-6.7
Renal tumor	3.1-9.5	1.8-7.0
Hepatic tumor	0.5-2.0	1.0-1.8
Bone tumor	2.8-9.0	2.3-6.2
Soft tissue Sarcoma	2.8-7.2	1.6-7.6
Germ cell tumor	1.3-12.9	0.2-1.3

AAR : Age-adjusted rates; Source: NCRP report 2009-2011 [4].



**FIG. 1** Childhood cancer incidence for broad Cancer-types in selected registries among boys (a) and girls (b).

reported by NCRP. The highest CCI was observed for males in Southern region of the country and the lowest in North east in both boys and girls. Leukemias, lymphomas and CNS tumours were the most common malignancies.

An earlier review [7] reported childhood cancers to contribute 1.6 to 4.8% of all cancers (CCI as 38 to 124 per million) in India for the years 2001-2004. There is apparent increase in magnitude of CCI over period of seven years. The differences in proportion and magnitude of CCI among different regions in India could be due to various compliance to cancer registration as well as geographical and gender variations. An earlier report [12] stated that the gender-differences in the childhood cancer registration in developing countries exist and suggested that international differences in the incidence of childhood cancer should be interpreted cautiously as they may not necessarily reflect natural differences. A recent review suggested that some of these differences might originate from exposures during prenatal development [13]. In low- and middle-income countries, where 80% of children live, the 200,000 children diagnosed with cancer each year have limited access to curative

treatment, and only about 25% survive [14]. The difference in survival for children diagnosed with cancer between high and low-income countries continues to widen as curative therapies are developed in the former but not implemented in the latter [15].

In conclusion, the study observed a general increase in childhood cancer incidence; higher incidence is seen among boys of Southern region.

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