RESEARCH COMMUNICATION

Childhood Cancer in Thailand: 1995-1997

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Abstract

The incidences of childhood cancers in Thailand between 1995 and 1997 were determined from cancer registrations collected at five locations around the kingdom and compared with similar analyses performed at cancer registries in Asia, Europe and the USA. The incidence in Thailand was found to be lower than in some Asian and Western countries. Between 1988-1994 and 1995-1997, the incidence of childhood cancer rose 32.5%. As elsewhere in the world, leukemias, brain tumors and lymphomas comprised two-thirds of all childhood cancers. The age-peak for incidence was between 2 and 5 years, particularly for acute lymphoblastic leukemia. Carcinomas were rare. Several features of the cancer pattern correspond to other Asian populations, in particular the low incidence of Hodgkin's disease, Wilms' tumor and Ewing's sarcoma. Neuroblastoma was more common than in neighboring Southeast Asian countries.

Key Words: Childhood cancer - incidence rates - Thai cancer registries

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Introduction

Childhood cancers comprise a small proportion of all cancers worldwide; however, they represent the most common cause of disease-related death and morbidity in children in developed countries (Barr et al., 1995). The situation in less developed nations is remarkably different.

In Thailand, nearly one-quarter of the population is <15 years of age (National Statistics Office 2002) and, although cancer among this age group is rare, ~1,500 were expectedly diagnosed with cancer in 2000 calculating based on the incidence in 1992-1994 (Vatanasapt et al., 1999). In 1982, cancer ranked as the fifth cause of death behind infectious diseases, accidents, cardiac diseases and respiratory ailments (Porapakkham et al., 1986). Between 1987 and 1998, it was sixth behind drownings, accidents, dengue hemorrhagic fever, malformations and HIV (Chooprapawan et al., 2000).

Population-based cancer registration is relatively recent in Thailand. The first registry was established at Chiang Mai (the North) in 1986, followed by Khon Kaen (the Northeast) in 1988, Songkhla (the South) in 1990, Bangkok (Central) in 1991, and Lamphang (the North) in 1992. Based on results from the first four registries, Vattanasapt (1999) published a monograph on the incidence of childhood cancer between 1992 and 1994. In this paper, we shall present the recent incidence of childhood cancer with data from all five of Thailand's cancer registries.

Materials and Methods

Sources of Data

The population-based data for incidence of childhood cancer between 1995 and 1997 are from Cancer Registries in the provinces of Khon Kaen, Chiang Mai, Songkhla, Lamphang, and Bangkok (Figure 1).

Cases are coded according to the revised International Classification of Childhood Cancer (ICCC) (Kramarova, 1996). Average incidence rates (per million) were calculated for the combined data set from all five centers. Aged-standardization was performed using a direct method with groups <15 years: (0-4, 5-9 and 10-14 years) (Parkin et al., 1998).

Population Denominators

The population denominators used for calculation of incidence rate were taken from the population census from the Bureau of the Census (National Statistic Office, 2002.). These provide annual estimates by age group and sex for

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Figure 1. Thailand: Regions, and the Areas Covered by Cancer Registries

each province in Thailand and the average annual population by age and sex, for the five centers combined is shown in Table 1.

Results

The registries are situated in five provinces, which cover ~ 22% of Thailand's population. In the 1996 census, ~ 16 million children were <15 years or 27.4 % of the population.

Our series included 636 cancers diagnosed between 1995 and 1997 in persons <15, residing in Khon Kaen, Chiang Mai, Songkhla, Lamphang and Bangkok (Table 2).

Histological Confirmation

Most (87.7%) of the pediatric cancers were confirmed histologically but the proportion varied between 65.3% for cancers of the central nervous system (ICCC group III) and 97.0% for leukemias (ICCC group I) (Table 3).

Table 1. Average Annual Population in the 0-14 Age Group : 5 Registries 1995-1997

Age (year)	Male	Female
0-4	372,517	350,967
5-9	429,027	401,076
10-14	453,464	442,662
Total	1,255,008	1,194,705

Table 2. Contributing Registries

Registry	Cases	(%)	Person-years	(%)
Bangkok	356	56.0	3,499,122	47.6
Chiang Mai	86	13.5	963,339	13.1
Khon Kaen	83	13.1	1,385,306	18.8
Lamphang	36	5.7	511,357	7.0
Songkhla	75	11.8	990,015	13.5
Overall Thailand	636	100.0	7,349,138	100.0

Incidence

Between 1995 and 1997, the registries inventoried 636 childhood cases, in 354 boys and 282 girls. The corresponding aged-standardized incidence rate (ASR) for all cancers was 99.7 per million per year in boys and 85.9 per million per year in girls. The combined ASR for both sexes was 93.0 per million per year (Figure 2, Tables 3 & 4). The incidence of all cancers was higher in boys than girls (1.3:1), particularly Hodgkin's disease (7:1).

The average age-grouped incidence revealed much higher rates for children <5 (ASR 135.9); particularly for leukemia (ASR 57.6), followed by tumors of the sympathetic nervous system (ASR 15.2), retinoblastoma (ASR 11.1) and renal tumors (ASR 9.2). Older children had greater incidence of tumors of the central nervous system (CNS) and bone. The peak age-incidence for acute lymphoblastic leukemia (ALL) was the group aged between 2 and 5 (46.9%). By contrast, only 31 cases (4.8%) were under a year old (Figure 3).

Sixty-five percent of cancers found in children under 15 comprised leukemias (38.7%), malignant tumors of the central nervous system (15.9%) and lymphomas (10%). The

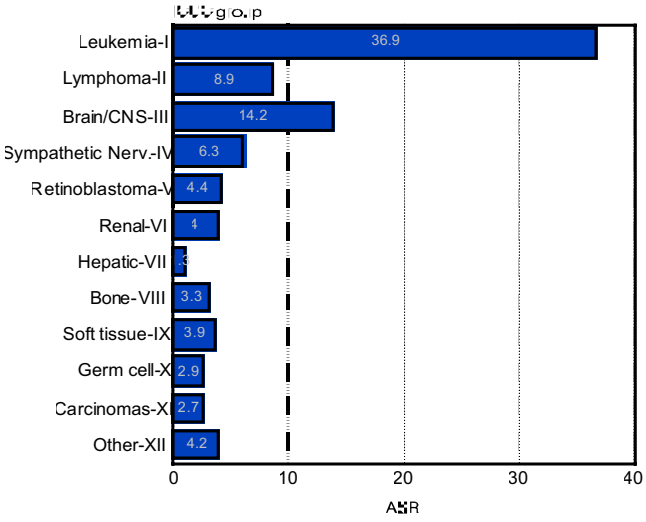

Figure 2. Incidence Rate for Childhood Cancers by ICCC Group, Age <15 both Sexes, Thailand, 1995-1997

Table 3 Incidences of Cancers in Childhood, Both Sexes, THAILAND (1995-1997)

	NUMBER OF CASES					REL.FREQ.(%)			RATES PER MILLION						
	0	1-4	5-9	10-14	All	M/F	Overall	Group	0-4	5-9	10-14	Crude	ASR	Cum.	%MV
I. LEUKAEMIAS	6	119	71	50	246	1.3	38.7	100.0	57.6	28.5	18.6	33.5	36.9	523	97.6
Lymphoid	3	92	51	30	176	1.3	27.7	71.5	43.8	20.5	11.2	23.9	26.8	377	100.0
Acute non-lymphocytic	1	15	10	10	36	1.4	5.7	14.6	7.4	4.0	3.7	4.9	5.2	75	100.0
Chronic myeloid	-	1	2	4	7	1.3	1.1	2.8	0.5	0.8	1.5	1.0	0.9	13	100.0
Other specified	-	-	1	-	1	-	0.2	0.4	-	0.4	-	0.1	0.1	2	100.0
Unspecified	2	11	7	6	26	1.2	4.1	10.6	6.0	2.8	2.2	3.5	3.9	55	76.9
II. LYMPHOMAS	5	16	25	18	64	1.7	10.1	100.0	9.7	10.0	6.7	8.7	8.9	132	96.9
Hodgkin's disease	-	3	4	1	8	7.0	1.3	12.5	1.4	1.6	0.4	1.1	1.2	16	100.0
Non-Hodgkin lymphomas	2	1	8	6	17	3.3	0.7	26.6	1.4	3.2	2.2	2.3	2.2	34	100.0
Burkitt's lymphoma	-	2	1	1	4	3.0	0.6	6.3	0.9	0.4	0.4	0.5	0.6	8	100.0
Miscellaneous lymphoreticular neoplasms	3	4	1	1	9	0.3	1.4	14.1	3.2	0.4	0.4	1.2	1.5	19	100.0
Unspecified	-	6	11	9	26	1.4	4.1	40.6	2.8	4.4	3.3	3.5	3.5	52	92.3
III. BRAIN AND SPINAL NEOPLASMS	6	33	26	36	101	1.1	15.9	100.0	18.0	10.4	13.4	13.7	14.2	209	65.3
Ependymoma	-	3	-	1	4	0.3	0.6	4.0	1.4	-	0.4	0.5	0.6	8	100.0
Astrocytoma	2	7	8	14	31	0.7	4.9	30.7	4.1	3.2	5.2	4.2	4.2	62	100.0
Primitive neuroectodermal tumors	1	9	4	7	21	1.6	3.3	20.8	4.6	1.6	2.6	2.9	3.1	44	100.0
Other gliomas	-	2	5	2	9	2.0	1.4	8.9	0.9	2.0	0.7	1.2	1.2	18	100.0
Unspecified	3	12	9	12	36	1.3	5.7	35.6	6.9	3.6	4.5	4.9	5.1	74	2.8
IV. SYMPATHETIC NERVOUS SYSTEM TUMORS	2	31	3	-	36	1.8	5.7	100.0	15.2	1.2	-	4.9	6.3	82	100.0
Neuroblastoma	2	31	3	-	36	1.8	5.7	100.0	15.2	1.2	-	4.9	6.3	82	100.0
V. RETINOBLASTOMA	4	20	1	-	25	0.7	3.9	100.0	11.1	0.4	-	3.4	4.4	57	100.0
VI. RENAL TUMORS	2	18	3	-	23	0.8	3.6	100.0	9.2	1.2	-	3.1	4.0	52	73.9
Wilms' tumor	1	15	1	-	17	0.5	2.7	73.9	7.4	0.4	-	2.3	3.0	38	100.0
Unspecified	1	3	2	-	6	2.0	0.9	26.1	1.8	0.8	-	0.8	1.0	13	0.0
VII. HEPATIC TUMORS	2	3	1	3	9	1.3	1.4	100.0	2.3	0.4	1.1	1.2	1.3	19	77.8
Hepatoblastoma	1	2	1	-	4	1.0	0.6	44.4	1.4	0.4	-	0.5	0.7	8	100.0
Hepatic carcinoma	-	1	-	2	3	0.5	0.5	33.3	0.5	-	0.7	0.4	0.4	6	100.0
Unspecified	1	-	-	1	2	-	0.3	22.2	0.5	-	0.4	0.3	0.3	4	-
VIII. MALIGNANT BONE TUMORS	-	2	7	19	28	2.5	4.4	100.0	0.9	2.8	7.1	3.8	3.3	53	100.0
Osteosarcoma	-	-	6	19	25	2.6	3.9	89.3	-	2.4	7.1	3.4	2.8	47	100.0
Ewing's sarcoma	-	2	1	-	3	2.0	0.5	10.7	0.9	0.4	-	0.4	0.5	6	100.0
IX. SOFT TISSUE SARCOMAS	4	7	9	7	27	0.9	4.2	100.0	5.1	3.6	2.6	3.7	3.9	56	100.0
Rhabdomyosarcoma	1	6	7	2	16	1.3	2.5	59.3	3.2	2.8	0.7	2.2	2.4	33	100.0
Fibrosarcoma	1	-	1	2	4	1.0	0.6	14.8	0.5	0.4	0.7	0.5	0.5	8	100.0
Kaposi's sarcoma	-	1	-	-	1	-	0.2	3.7	0.5	-	-	0.1	0.2	2	100.0
Other specified	2	-	-	3	5	0.7	0.8	18.5	0.9	-	1.1	0.7	0.7	10	100.0
Unspecified	-	-	1	-	1	-	0.2	3.7	-	0.4	-	0.1	0.1	2	100.0
X. GERM CELL AND GONADAL NEOPLASMS	-	2	7	15	24	1.0	3.8	100.0	0.9	2.8	5.6	3.3	2.9	46	100.0
Intracranial and intraspinal germ cell	-	-	1	4	5	4.0	0.8	20.8	-	0.4	1.5	0.7	0.6	9	100.0
Other and unspecified non-gonadal germ cell	-	-	-	4	4	-	0.6	16.7	-	-	1.5	0.5	0.4	7	100.0
Gonadal germ cell	-	2	4	7	13	0.4	2.0	54.2	0.9	1.6	2.6	1.8	1.6	25	100.0
Gonadal carcinoma	-	-	2	-	2	-	0.3	8.3	-	0.8	-	0.3	0.3	4	100.0

Table 3. continued next page

	NUMBER OF CASES					REL.FREQ.(%)			RATES PER MILLION						
	0	1-4	5-9	10-14	All	M/F	Overall	Group	0-4	5-9	10-14	Crude	ASR	Cum.	%MV
XI. CARCINOMAS AND EPITHELIAL NEOPLASMS	-	3	3	16	22	0.8	3.5	100.0	1.4	1.2	6.0	3.0	2.7	42	100.0
Thyroid	-	-	2	3	5	0.3	0.8	22.7	-	0.8	1.1	0.7	0.6	9	100.0
Nasopharyngeal	-	-	-	3	3	0.5	0.5	13.6	-	-	1.1	0.4	0.3	5	100.0
Skin	-	1	-	3	4	0.3	0.6	18.2	0.5	-	1.1	0.5	0.5	7	100.0
Other and unspecified	-	2	1	7	10	2.3	1.6	45.5	0.9	0.4	2.6	1.4	1.2	19	100.0
XII. OTHER AND UNSPECIFIED NEOPLASMS	-	10	9	12	31	1.4	4.9	100.0	4.6	3.6	4.5	4.2	4.2	63	12.9
Other unspecified	-	10	9	12	31	1.4	4.9	100.0	4.6	3.6	4.5	4.2	4.2	63	12.9
TOTAL	31	264	165	176	636	1.3	100.0	100.0	135.9	66.3	65.5	86.5	93.0	1338	87.7

relative percentage, however, varied by age group (Figure 2). Leukemia was the most common diagnosis for those under 5, 5 to 9 and 10 to 14 years of age, but the relative proportion decreased as age increased; 42.4% for those under 5 and 28.4% for adolescents (10 to 14 years). Among the diagnostic groups, leukemias were most common (38.7%) of childhood cancers (ASR 36.9) with a small male predominance (1.3:1): ALL was the most common subcategory (71.5%): 26.8 per million per year. The ratio of ALL to acute nonlymphocytic leukemia (ANLL) was 4.9:1.

Malignant tumors of the CNS (ASR 14.2) ranked second. The majority of brain tumors were astrocytoma (30.7%), medulloblastoma (20.8%) or other gliomas (8.9%). Lymphoma ranked third with an ASR of 8.9 per million per year. Hodgkin's disease (ASR 1.2) was less frequent than non-Hodgkin's lymphoma (ASR 2.2). Burkitt's lymphoma accounted for 6.3%. Males predominated the lymphomas (1.7:1), especially HD. (Figures 2 & 3). Neuroblastoma ranked fourth (ASR 6.3) with 91.7% of patients being under 5. Retinoblastoma ranked fifth (ASR 4.4) with 80% aged between 1 and 4. There was no data for unilateral or bilateral tumors. Renal tumors ranked sixth (ASR 4.0) and Wilms' was most common (73.9%).

Soft tissue sarcomas ranked seventh with an ASR of 3.9 per million per year; 59% were rhabdomyosarcoma. Bone tumors ranked eighth with an ASR of 3.3 per million per year. Osteosarcoma was the most common bone tumor (89.3%) and Ewing's sarcoma second (10.7%). The age distribution was different, with osteosarcoma occurring at a higher rate in older children (aged 10 to 14). The ninth and tenth ranking tumors were germ cell and hepatic tumors (ASR 2.9, 1.3), respectively. The most common type in the germ cell category was the gonadal germ cell tumor (54%).

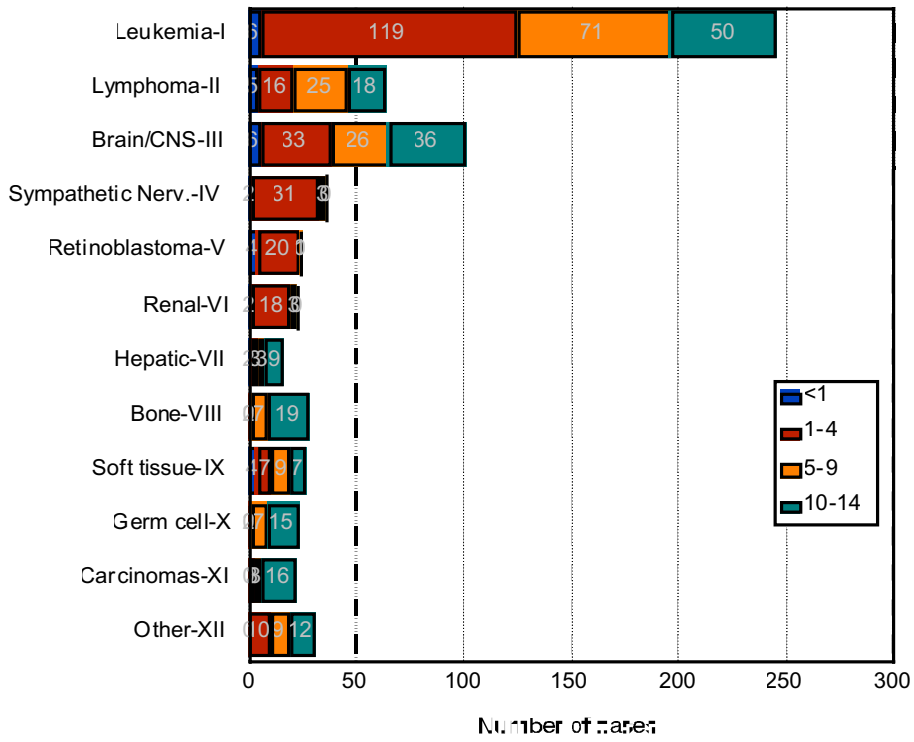

Figure 3. Number of Cases of all Childhood Cancers by ICCC and Age Group, both Sexes, Thailand, 1995-1997

Table 4. Incidences of Cancers in Childhood, Males and Females, THAILAND (1995-1997)

	MALES								FEMALES							
	NUMBER OF CASES				All	RATES PER MILLION			NUMBER OF CASES				All	RATES PER MILLION		
	0	1-4	5-9	10-14		Crude	ASR	Cum.	0	1-4	5-9	10-14		Crude	ASR	Cum.
I. LEUKAEMIAS	2	66	45	27	140	37.2	40.6	578	4	53	26	23	106	29.6	33.0	465
Lymphoid	2	51	32	16	101	26.8	29.8	420	1	41	19	14	75	20.9	23.6	331
Acute non-lymphocytic	-	8	7	6	21	5.6	5.8	85	1	7	3	4	15	4.2	4.6	65
Chronic myeloid	-	1	2	1	4	1.1	1.1	15	-	-	-	3	3	0.8	0.7	11
Other specified	-	-	-	-	-	-	-	-	-	-	1	-	1	0.3	0.3	4
Unspecified	-	6	4	4	14	3.7	3.9	57	2	5	3	2	12	3.3	3.8	53
II. LYMPHOMAS	1	10	15	14	40	10.6	10.6	158	4	6	10	4	24	6.7	7.2	104
Hodgkin's disease	-	3	3	1	7	1.9	2.0	28	-	-	1	-	1	0.3	0.3	4
Non-Hodgkin lymphomas	1	1	5	6	13	3.5	3.2	50	1	-	3	-	4	1.1	1.2	17
Burkitt's lymphoma	-	1	1	1	3	0.8	0.8	12	-	1	-	-	1	0.3	0.4	4
Miscellaneous lymphoreticular neoplasms	-	1	-	1	2	0.5	0.6	8	3	3	1	-	7	2.0	2.5	32
Unspecified	-	4	6	5	15	4.0	4.0	59	-	2	5	4	11	3.1	3.0	45
III. BRAIN AND SPINAL NEOPLASMS	3	17	18	15	53	14.1	14.6	214	3	16	8	21	48	13.4	13.7	202
Ependymoma	-	-	-	1	1	0.3	0.2	3	-	3	-	-	3	0.8	1.1	14
Astrocytoma	-	3	4	6	13	3.5	3.3	51	2	4	4	8	18	5.0	5.0	75
Primitive neuroectodermal tumors	1	6	3	3	13	3.5	3.8	53	-	3	1	4	8	2.2	2.2	33
Other gliomas	-	1	5	-	6	1.6	1.6	23	-	1	-	2	3	0.8	0.8	12
Unspecified	2	7	6	5	20	5.3	5.7	81	1	5	3	7	16	4.5	4.5	67
IV. SYMPATHETIC NERVOUS SYSTEM TUMORS	2	19	2	-	23	6.1	7.8	101	-	12	1	-	13	3.6	4.7	61
Neuroblastoma	2	19	2	-	23	6.1	7.8	101	-	12	1	-	13	3.6	4.7	61
V. RETINOBLASTOMA	1	9	-	-	10	2.7	3.5	44	3	11	1	-	15	4.2	5.4	70
VI. RENAL TUMORS	1	7	2	-	10	2.7	3.3	43	1	11	1	-	13	3.6	4.7	61
Wilms' tumor	1	5	-	-	6	1.6	2.1	26	-	10	1	-	11	3.1	3.9	51
Unspecified	-	2	2	-	4	1.1	1.2	16	1	1	-	-	2	0.6	0.7	9
VII. HEPATIC TUMORS	1	1	1	2	5	1.3	1.4	20	1	2	-	1	4	1.1	1.3	18
Hepatoblastoma	-	1	1	-	2	0.5	0.6	8	1	1	-	-	2	0.6	0.7	9
Hepatic carcinoma	-	-	-	1	1	0.3	0.2	3	-	1	-	1	2	0.6	0.6	8
Unspecified	1	-	-	1	2	0.5	0.6	8	-	-	-	-	-	-	-	-
VIII. MALIGNANT BONE TUMORS	-	1	4	15	20	5.3	4.6	75	-	1	3	4	8	2.2	2.0	32
Osteosarcoma	-	-	3	15	18	4.8	4.0	66	-	-	3	4	7	2.0	1.7	27
Ewing's sarcoma	-	1	1	-	2	0.5	0.6	8	-	1	-	-	1	0.3	0.4	4
IX. SOFT TISSUE SARCOMAS	2	2	6	3	13	3.5	3.5	52	2	5	3	4	14	3.9	4.3	60
Rhabdomyosarcoma	1	2	5	1	9	2.4	2.5	36	-	4	2	1	7	2.0	2.2	31
Fibrosarcoma	-	-	1	1	2	0.5	0.5	7	1	-	-	1	2	0.6	0.6	8
Kaposi's sarcoma	-	-	-	-	-	-	-	-	-	1	-	-	1	0.3	0.4	4
Other specified	1	-	-	1	2	0.5	0.6	8	1	-	-	2	3	0.8	0.8	12
Unspecified	-	-	-	-	-	-	-	-	-	-	1	-	1	0.3	0.3	4
X. GERM CELL AND GONADAL NEOPLASMS	-	1	2	9	12	3.2	2.8	45	-	1	5	6	12	3.3	3.0	48
Intracranial and intraspinal germ cell	-	-	-	4	4	1.1	0.9	14	-	-	1	-	1	0.3	0.3	4
Other and unspecified non-gonadal germ cell	-	-	-	4	4	1.1	0.9	14	-	-	-	-	-	-	-	-
Gonadal germ cell	-	1	2	1	4	1.1	1.1	15	-	1	2	6	9	2.5	2.2	35
Gonadal carcinoma	-	-	-	-	-	-	-	-	-	-	2	-	2	0.6	0.5	8

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	MALES								FEMALES							
	NUMBER OF CASES				All	RATES PER MILLION			NUMBER OF CASES				All	RATES PER MILLION		
	0	1-4	5-9	10-14		Crude	ASR	Cum.	0	1-4	5-9	10-14		Crude	ASR	Cum.
XI. CARCINOMAS AND EPITHELIAL NEOPLASMS	-	2	2	6	10	2.7	2.5	38	-	1	1	10	12	3.3	2.8	46
Adrenocortical	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thyroid	-	-	1	-	1	0.3	0.3	3	-	-	1	3	4	1.1	0.9	15
Nasopharyngeal	-	-	-	1	1	0.3	0.2	3	-	-	-	2	2	0.6	0.4	7
Skin	-	-	-	1	1	0.3	0.2	3	-	1	-	2	3	0.8	0.8	12
Other and unspecified	-	2	1	4	7	1.9	1.8	27	-	-	-	3	3	0.8	0.7	11
XII. OTHER AND UNSPECIFIED NEOPLASMS	-	5	6	7	18	4.8	4.7	71	-	5	3	5	13	3.6	3.7	55
Other unspecified	-	5	6	7	18	4.8	4.7	71	-	5	3	5	13	3.6	3.7	55
TOTAL	13	140	103	98	354	94.0	99.7	1444	18	124	62	282	282	78.7	85.9	1225

The nine hepatic tumors (1.4%) included four cases of hepatoblastoma, three of hepatocellular carcinoma and two tumors of an unspecified type. One case of hepatocellular carcinoma was in a child under four.

The 22 epithelial carcinomas comprised five tumors of the thyroid (1 boy, 4 girls), three nasopharyngeal carcinomas (1 boy, 2 girls), four melanomas (all boys) and other carcinomas.

Discussion

The quality of diagnostic data for these childhood cancers was within acceptable standards. Overall, 87.7% of cases had a histological diagnosis. The histological confirmation of CNS tumors was poor, while almost all leukemias and lymphomas were confirmed histologically.

The incidence rates of childhood cancers in Thailand are lower than international rates (Giles et al., 1995; Parkin et al., 1998; Ries et al, 1999; Castillo et al., 2001; Minaev, 2001) even with the 32.5% rise since the 1988-1994 study (Vattanasapt et al., 1999). (Table 4) The sharp increase is the result improved registration procedures so we may still have some under-reporting. For example, it is difficult to extract information from private hospitals, particularly in Bangkok, due to confidentiality issues. The increased incidence of childhood cancers in the 1988-1994 report was due to a rise in leukemias, CNS tumors, neuroblastomas and renal tumors; while hepatic tumors had decreased.

As frequently noted in other Asian countries, a relatively small number of under-one-year-olds are registered (Parkin et al., 1998) perhaps because parents are unaware of the possibility of cancer in young children so try home remedies

Table 5. Age-standardized Incidence of Childhood Cancer (per million) in Thailand and Comparable Registries

	Thai	Thai	China (Tianjin)	Japan	Philippines (Manila & Rizal)	Singapore (Chinese)	Denmark	US, S.E.E.R. (White)
	1988-1994	1995-1997	1981-1992	1980-1992	1983-1992	1983-1992	1983-1991	1975-1995
Leukemias	27.9	36.9	40.3	38.5	48.1	51.0	53.0	37
Lymphomas	7.4	8.9	12.3	10.6	7.1	11.8	11.8	24
Brain and Spinal neoplasms	9.8	14.2	17.3	21.1	9.6	19.1	38.8	25
Sympathetic nervous system Tumors	3.0	6.3	3.0	12.6	2.3	5.8	11.9	7
Retinoblastoma	3.2	4.4	2.6	5.0	7.7	7.5	6.0	3
Renal tumors	2.6	4.0	2.7	4.2	4.6	4.6	10.4	6
Hepatic tumors	2.5	1.3	3.3	2.5	2.2	3.4	1.8	2
Malignant bone tumors	1.9	3.3	4.1	4.0	4.0	4.1	4.5	9
Soft tissue sarcomas	3.0	3.9	3.4	6.9	4.2	7.4	10.5	11
Germ-cell & gonadal Neoplasms	2.8	2.9	5.8	7.5	3.6	8.7	4.7	10
Carcinomas & epithelial Neoplasms	2.4	2.7	1.9	2.1	5.6	4.6	4.1	14
Other & unspecified Neoplasms	4.3	4.2	8.3	1.3	1.8	1.2	1.1	1
All sites	70.7	93.0	104.9	116.3	100.8	129.3	158.7	149

rather than seeking a medical diagnosis and treatment.

Internationally, the most common childhood cancer in Thailand is ALL; the ASR being similar to the incidence reported by SEER (Ries et al., 1999; McNeil et al., 2002) and other Asian countries but lower than Europe (Parkin et al., 1998). The ratio of ALL:ANLL is higher than in the USA (Miller et al., 1994), the peak of incidence of ALL by age was similar to other reports.

The difficulty in obtaining brain stem biopsy for brain tumors limits accurate assessment of their incidence and histologic confirmation. The incidence of CNS tumors in our study was slightly lower than in other Asian countries (Parkin et al., 1998) and markedly lower than in developed countries (Ries et al., 1999; Parkin et al., 1998).

The lymphomas provided some interesting comparisons. The ratio of NHL:HD was 2.1:1 with a strong male preponderance for HD (7:1). The incidence of Burkitt's lymphoma (ASR 0.6) was not as high as previously reported (ASR 1.9) (Sriamporn et al., 1996) and comprised 6.3% of all lymphomas. The incidence of HD (ASR boy 2.0, girl 0.3) was as low as observed elsewhere in East and Southeast Asia (Parkin et al., 1998).

Neuroblastoma was the fourth most common cancer in our registries; incidence doubled since the 1988-1994 report to a level comparable to Singapore but was still half that reported by Japan and twice that of China and the Philippines (Parkin et al, 1998).

Retinoblastoma incidence in Thailand is lower than the incidence in neighboring countries while the incidence of neuroblastoma and Wilms' tumor were similar (Parkin et al., 1998).

The rate of bone tumor was low but similar to incidence elsewhere in Asia. The incidence of soft tissue sarcomas was low as in other Asian populations while the incidence of gonadal-germ-cell tumors among girls was high.

Carcinomas are rare in Thai children, as they are elsewhere but the most frequent sites (i.e. the liver and naspharynx) in Thais are rare in Caucasians. Although melanoma is rare in Thais, we found four cases.

Conclusion

The incidence rates of childhood cancers in Thailand are lower than those in the West. The three most common cancers were leukemias, CNS tumors and lymphomas. Survival and cancer trends should be evaluated in the future.

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