Chapter III

CHILDHOOD CANCER

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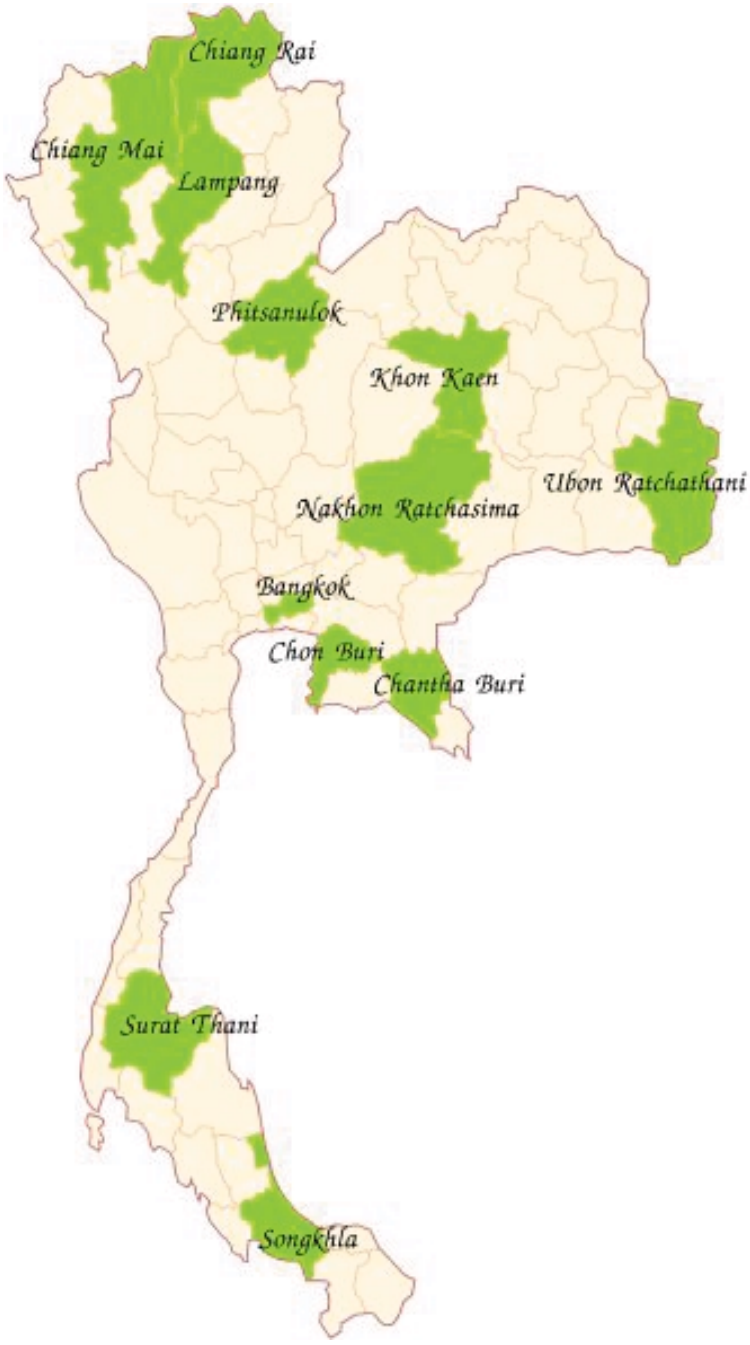
CHILDHOOD CANCER

Thai Pediatric Oncology Group (TPOG)

The population-based data for incidence of childhood cancer are provided by 20 centers in the country, comprising of 7 medical school hospitals, 10 provincial hospitals and 3medical institutions. (Figure 3.1) To assess the coverage of the childhood cancer treatment, questionnaires were sent to all hospitals in the whole country. The result revealed that all cases of childhood cancers were referred to 20 centers included in the study. All Thai children aged <15 years newly diagnosed with childhood malignancies according to International Childhood Cancer Classification (ICCC) during January 1 - December 31, 2003 were registered into a national database by Thai Pediatric Oncol-

Figure 3.1 *Registry sites*



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ogy Group (TPOG) (Kramarova, *et al.*, 1996). The data were collected through a web-based registry from 20 treatment centers under a standardized format, using double entry method and under internal and external audit process. The incidence was calculated by standard method (Boyle and Parkin, 1991). In 2003, nearly 21.5 percent of Thailand population is younger than 15 years of age (Ministry of Interior, 2003) (Table 3.1)

There were 999 new cancer cases in children; 94.0% was histologically confirmed. The percentage of histologically confirmed cases, however, does vary by ICCC category ranging from 66.7 for central nervous system (ICCC group III) to a high of 100 percent for leukemia (ICCC group I). There was no DCO-proved case.

Table 3.1 *Population younger than 15 years, 2003*

Age	Male		Female		Total
	number	%	number	%	
<1	356,830	5.18	335,407	5.14	692,237
1-4	1,652,131	23.97	1,558,128	23.88	3,210,259
5-9	2,441,841	35.43	2,312,325	35.44	4,754,166
10-14	2,440,525	35.41	2,318,833	35.54	4,759,358
Total	**6,891,327**	**100.00**	**6,524,693**	**100.00**	**13,416,020**

Incidence

A total of 999 new cancer cases were registered. Five hundred and sixty-six cases (56.7%) were males. The male: female ratio was 1.3:1, 80 (8.0%) were under 1 year, 361 (36.1%) were between 1 and 4 years, 282 (28.2 %) were between 5 and 9 years, and 276 (27.6%) were between 10 and 15 years old. The median age at diagnosis was 5.64 years old. The ASRs for boys and girls are 86.9 and 72.1 per mil-

Figure 3.2 *Age-adjusted incidence rates for childhood cancer by ICCC group, age <15, both sexes, 2003*

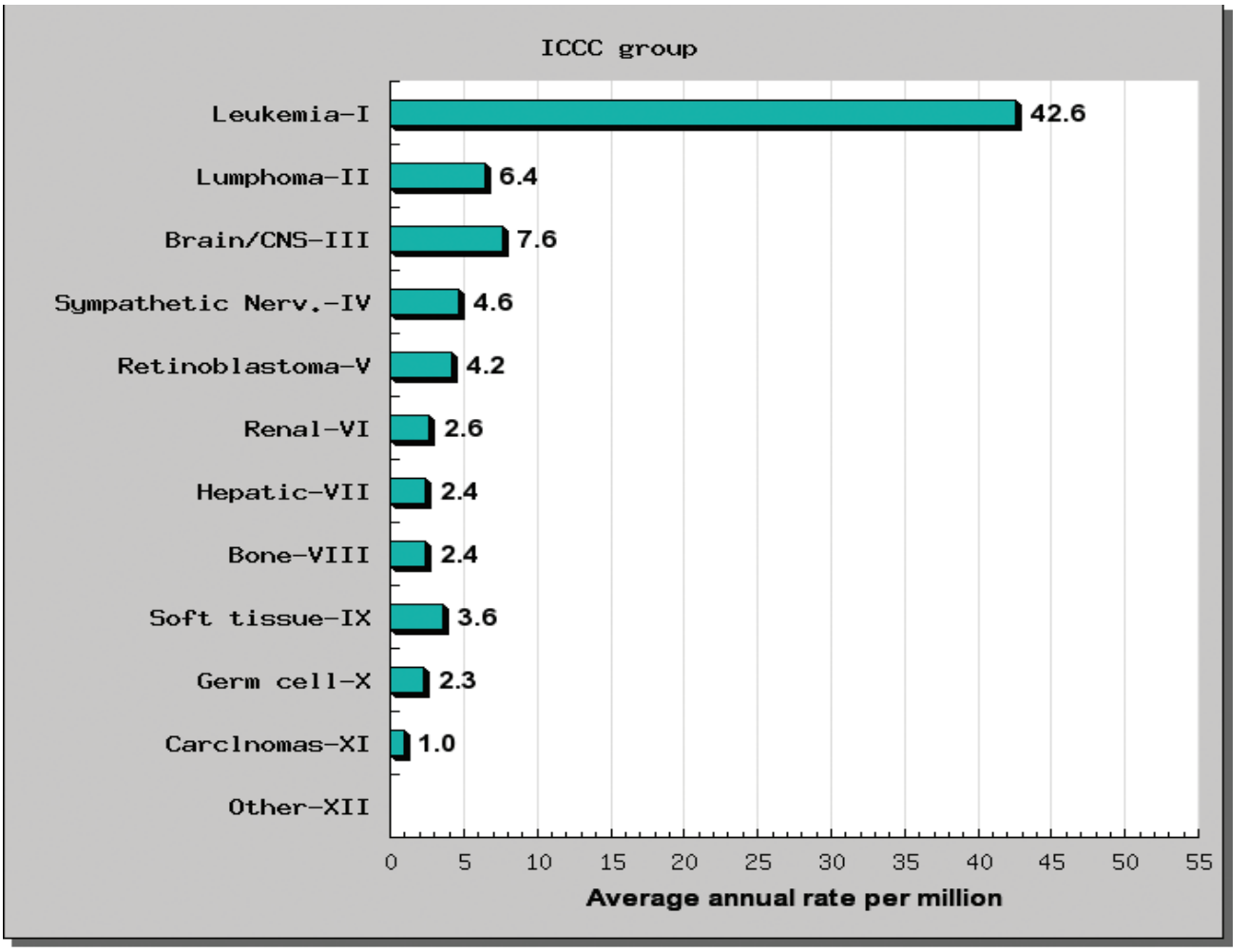

Table 3.2 *Incidence of cancer in childhood, both sexes, Thailand 2003*

	Number of cases					Rel. Freq. (%)			Rate per million						
	<1	1-4	5-9	10-14	ALL	M/F	Overall	Group	0-4	5-9	10-14	Crude	ASR	Cum.	%MV
I. Leukemias	38	207	148	136	529	1.1	53.0	100.0	62.8	31.1	28.6	39.4	42.6	612.5	100.0
Lymphoid	18	172	118	81	389	1.2	38.9	73.5	48.7	24.8	17.0	29.0	31.8	452.5	100.0
Acute non-lymphocytic	17	28	28	46	119	0.9	11.9	22.5	11.5	5.9	9.7	8.9	9.2	135.5	100.0
Chronic myeloid	2	6	2	8	18	1.3	1.8	3.4	2.0	0.4	1.7	1.3	1.4	20.5	100.0
Other specified	1	1	0	1	3	2.0	0.3	0.6	0.5	0.0	0.2	0.2	0.3	3.5	100.0
II. Lymphomas	2	15	39	34	90	3.1	9.0	100.0	4.4	8.2	7.1	6.7	6.4	98.5	94.4
Hodgkin disease	0	3	13	7	23	6.7	2.3	25.6	0.8	2.7	1.5	1.7	1.6	25.0	100.0
Non-Hodgkin lymphomas	1	7	16	20	44	2.4	4.4	48.9	2.0	3.4	4.2	3.3	3.1	48.0	93.2
Burkitt lymphoma	1	4	5	1	11	1.8	1.1	12.2	1.3	1.1	0.2	0.8	0.9	13.0	100.0
Miscellaneous lympho-reticular neoplasms	0	0	1	1	2	1.0	0.2	2.2	0.0	0.2	0.2	0.1	0.1	2.0	100.0
Unspecified	0	1	4	5	10	9.0	1.0	11.1	0.3	0.8	1.1	0.7	0.7	11.0	80.0
III. Brain and spinal neoplasms	5	22	45	30	102	1.1	10.2	100.0	6.9	9.5	6.3	7.6	7.6	113.5	66.7
Ependymoma	2	0	3	0	5	-	0.5	4.9	0.5	0.6	0.0	0.4	0.4	5.5	80.0
Astrocytoma	0	5	8	12	25	1.1	2.5	24.5	1.3	1.7	2.5	1.9	1.8	27.5	84.0
Primitive neuroecto-dermal tumors	1	9	16	6	32	0.7	3.2	31.4	2.6	3.4	1.3	2.4	2.5	36.5	90.6
Other gliomas	2	4	14	6	26	0.9	2.6	25.5	1.5	2.9	1.3	1.9	1.9	28.5	46.2
Unspecified	0	4	4	6	14	2.5	1.4	13.7	1.0	0.8	1.3	1.0	1.0	15.5	14.3
IV. Sympathetic nervous system tumors	8	30	11	2	51	0.9	5.1	100.0	9.7	2.3	0.4	3.8	4.6	62.0	94.1
Neuroblastoma	8	30	11	2	51	0.9	5.1	100.0	9.7	2.3	0.4	3.8	4.6	62.0	94.1
V. Retinoblastoma	9	33	0	0	42	2.2	4.2	100.0	10.8	0.0	0.0	3.1	4.2	54.0	90.5
	9	33	0	0	42	2.2	4.2	100.0	10.8	0.0	0.0	3.1	4.2	54.0	90.5
VI. Renal tumors	5	16	6	2	29	1.1	2.9	100.0	5.4	1.3	0.4	2.2	2.6	35.5	89.7
Wilms' tumor	4	15	4	1	24	1.2	2.4	82.8	4.9	0.8	0.2	1.8	2.2	29.5	87.5
Renal carcinoma	1	0	2	1	4	1.0	0.4	13.8	0.3	0.4	0.2	0.3	0.3	4.5	100.0
Other specified	0	1	0	0	1	-	0.1	3.4	0.3	0.0	0.0	0.1	0.1	1.5	100.0
VII. Hepatic tumors	6	13	1	7	27	1.1	2.7	100.0	4.9	0.2	1.5	2.0	2.4	33.0	74.1
Hepatoblastoma	6	13	0	1	20	0.7	2.0	74.1	4.9	0.0	0.2	1.5	2.0	25.5	75.0
Hepatic carcinoma	0	0	1	6	7	6.0	0.7	25.9	0.0	0.2	1.3	0.5	0.4	7.5	71.4
VIII. Malignant bone tumors	0	3	9	24	36	1.4	3.6	100.0	0.8	1.9	5.0	2.7	2.4	38.5	100.0
Osteosarcoma	0	2	6	21	29	1.4	2.9	80.6	0.5	1.3	4.4	2.2	1.9	31.0	100.0
Ewing sarcoma	0	1	3	3	7	1.3	0.7	19.4	0.3	0.6	0.6	0.5	0.5	7.5	100.0
IX. Soft tissue sarcomas	4	15	13	13	45	2.0	4.5	100.0	4.9	2.7	2.7	3.4	3.6	51.5	100.0
Rhabdomyosarcoma	3	11	7	8	29	1.9	2.9	64.4	3.6	1.5	1.7	2.2	2.4	34.0	100.0
Fibrosarcoma	0	1	3	3	7	6.0	0.7	15.6	0.3	0.6	0.6	0.5	0.5	7.5	100.0
Other specified	1	3	3	2	9	1.3	0.9	20.0	1.0	0.6	0.4	0.7	0.7	10.0	100.0
X. Germ cell and gonadal neoplasms	2	5	7	18	32	1.5	3.2	100.0	1.8	1.5	3.8	2.4	2.3	35.5	90.6
Intracranial and intraspinal germ cell	1	1	3	10	15	2.8	1.5	46.9	0.5	0.6	2.1	1.1	1.0	16.0	93.3
Other and unspecified non-gonadal germ cell	0	0	1	2	3	0.5	0.3	9.4	0.0	0.2	0.4	0.2	0.2	3.0	66.7
Gonadal germ cell	1	4	3	5	13	0.9	1.3	40.6	1.3	0.6	1.1	1.0	1.0	15.0	100.0
Gonadal carcinoma	0	0	0	1	1	-	0.1	3.1	0.0	0.0	0.2	0.1	0.1	1.0	0.0
XI. Carcinomas and epithelial neoplasms	1	2	3	8	14	1.8	1.4	100.0	0.8	0.6	1.7	1.0	1.0	15.5	100.0
Thyroid	0	0	0	3	3	-	0.3	21.4	0.0	0.0	0.6	0.2	0.2	3.0	100.0
Nasopharyngeal	0	0	1	4	5	-	0.5	35.7	0.0	0.2	0.8	0.4	0.3	5.0	100.0
Skin	0	0	1	0	1	-	0.1	7.1	0.0	0.2	0.0	0.1	0.1	1.0	100.0
Adrenocortical carcinoma	1	1	0	0	2	-	0.2	14.3	0.5	0.0	0.0	0.1	0.2	2.5	100.0
Other and unspecified	0	1	1	1	3	0.5	0.3	21.4	0.3	0.2	0.2	0.2	0.2	3.5	100.0
XII. Other and unspecified neoplasms	0	0	0	2	2	-	0.2	100.0	0.0	0.0	0.4	0.1	0.1	2.0	50.0
Other unspecified	0	0	0	2	2	-	0.2	100.0	0.0	0.0	0.4	0.1	0.1	2.0	50.0
Total	**80**	**361**	**282**	**276**	**999**	**1.3**	**100.0**	**100.0**	**113.0**	**59.3**	**58.0**	**74.5**	**79.7**	**1,151.5**	**94.0**

Table 3.3 *Incidence of cancer in childhood, males and females, Thailand 2003*

	Males								Females							
	Number of cases					Rate per million			Number of cases					Rate per million		
	<1	1-4	5-9	10-14	ALL	Crude	ASR	Cum.	<1	1-4	5-9	10-14	ALL	Crude	ASR	Cum.
I. Leukemias	21	102	82	77	282	40.9	43.7	632.0	17	105	66	59	247	37.9	41.5	591.5
Lymphoid	13	87	64	49	213	30.9	33.6	480.5	5	85	54	32	176	27.0	29.9	423.5
Acute non-lymphocytic	6	12	16	23	57	8.3	8.3	125.0	11	16	12	23	62	9.5	10.1	147.0
Chronic myeloid	1	2	2	5	10	1.5	1.4	21.5	1	4	0	3	8	1.2	1.4	19.5
Other specified	1	1	0	0	2	0.3	0.4	5.0	0	0	0	1	1	0.2	0.1	2.0
II. Lymphomas	1	8	32	27	6	9.9	9.2	143.5	1	7	7	7	22	3.4	3.5	51.0
Hodgkin disease	0	1	12	7	20	2.9	2.6	41.5	0	2	1	0	3	0.5	0.6	7.5
Non-Hodgkin lymphomas	0	5	12	14	31	4.5	4.2	65.5	1	2	4	6	13	2.0	1.9	29.5
Burkitt lymphoma	1	1	5	0	7	1.0	1.0	15.0	0	3	0	1	4	0.6	0.7	10.0
Miscellaneous lymphoreticular neoplasms	0	0	0	1	1	0.1	0.1	2.0	0	0	1	0	1	0.2	0.1	2.0
Unspecified	0	1	3	5	9	1.3	1.2	18.5	0	0	1	0	1	0.2	0.1	2.0
III. Brain and spinal neoplasms	5	9	21	18	53	7.7	7.6	115.0	0	13	24	12	49	7.5	7.5	112.5
Ependymoma	2	0	3	0	5	0.7	0.8	11.0	0	0	0	0	0	0.0	0.0	0.0
Astrocytoma	0	2	4	7	13	1.9	1.7	27.5	0	3	4	5	12	1.8	1.8	27.5
Primitive neuroectodermal tumors	1	4	4	4	13	1.9	1.9	28.5	0	5	12	2	19	2.9	2.9	43.5
Other gliomas	2	1	8	1	12	1.7	1.8	26.0	0	3	6	5	14	2.1	2.1	32.0
Unspecified	0	2	2	6	10	1.5	1.4	21.5	0	2	2	0	4	0.6	0.7	10.0
IV. Sympathetic nervous system tumors	5	13	6	0	24	3.5	4.3	57.5	3	17	5	2	27	4.1	5.1	68.5
Neuroblastoma	5	13	6	0	24	3.5	4.3	57.5	3	17	5	2	27	4.1	5.1	68.5
V. Retinoblastoma	3	26	0	0	29	4.2	5.6	72.0	6	7	0	0	13	2.0	2.7	34.5
	3	26	0	0	29	4.2	5.6	72.0	6	7	0	0	13	2.0	2.7	34.5
VI. Renal tumors	3	9	1	2	15	2.2	2.7	36.0	2	7	5	0	14	2.1	2.6	35.0
Wilms' tumor	3	9	0	1	13	1.9	2.4	32.0	1	6	4	0	11	1.7	2.0	27.0
Renal carcinoma	0	0	1	1	2	0.3	0.2	4.0	1	0	1	0	2	0.3	0.3	4.5
Other specified	0	0	0	0	0	0.0	0.0	0.0	0	1	0	0	1	0.2	0.2	2.5
VII. Hepatic tumors	3	4	1	6	14	2.0	2.2	32.0	3	9	0	1	13	2.0	2.6	33.5
Hepatoblastoma	3	4	0	1	8	1.2	1.5	19.5	3	9	0	0	12	1.8	2.4	31.5
Hepatic carcinoma	0	0	1	5	6	0.9	0.7	12.0	0	0	0	1	1	0.2	0.1	2.0
VIII. Malignant bone tumors	0	3	6	12	21	3.0	2.8	44.5	0	0	3	12	15	2.3	1.9	32.5
Osteosarcoma	0	2	4	11	17	2.5	2.2	35.5	0	0	2	10	12	1.8	1.5	26.0
Ewing sarcoma	0	1	2	1	4	0.6	0.6	8.5	0	0	1	2	3	0.5	0.4	6.5
IX. Soft tissue sarcomas	3	10	10	7	30	4.4	4.7	67.5	1	5	3	6	15	2.3	2.4	35.5
Rhabdomyosarcoma	2	9	5	3	19	2.8	3.1	43.5	1	2	2	5	10	1.5	1.5	23.5
Fibrosarcoma	0	0	3	3	6	0.9	0.7	12.0	0	1	0	0	1	0.2	0.2	2.5
Other specified	1	1	2	1	5	0.7	0.8	11.0	0	2	1	1	4	0.6	0.7	9.5
X. Germ cell and gonadal neoplasms	1	5	2	11	19	2.8	2.7	41.5	1	0	5	7	13	2.0	1.8	28.5
Intracranial and intraspinal germ cell	0	1	2	8	11	1.6	1.4	23.0	1	0	1	2	4	0.6	0.6	9.0
Other and unspecified non-gonadal germ cell	0	0	0	1	1	0.1	0.1	2.0	0	0	1	1	2	0.3	0.2	4.0
Gonadal germ cell	1	4	0	1	6	0.9	1.1	14.5	0	0	3	4	7	1.1	0.9	15.0
Gonadal carcinoma	0	0	0	1	1	0.1	0.1	2.0	0	0	0	0	0	0.0	0.0	0.0
XI. Carcinomas and epithelial neoplasms	1	1	3	4	9	1.3	1.2	19.0	0	1	0	4	5	0.8	0.7	11.0
Thyroid	0	0	0	0	0	0.0	0.0	0.0	0	0	0	3	3	0.5	0.4	6.5
Nasopharyngeal	0	0	1	4	5	0.7	0.6	10.0	0	0	0	0	0	0.0	0.0	0.0
Skin	0	0	1	0	1	0.1	0.1	2.0	0	0	0	0	0	0.0	0.0	0.0
Adrenocortical carcinoma	1	1	0	0	2	0.3	0.4	5.0	0	0	0	0	0	0.0	0.0	0.0
Other and unspecified	0	0	1	0	1	0.1	0.1	2.0	0	1	0	1	2	0.3	0.3	4.5
XII. Other and unspecified neoplasms	0	0	0	2	2	0.3	0.2	4.0	0	0	0	0	0	0.0	0.0	0.0
Other unspecified	0	0	0	2	2	0.3	0.2	4.0	0	0	0	0	0	0.0	0.0	0.0
Total	**46**	**190**	**164**	**166**	**566**	**82.1**	**86.9**	**1,263.5**	**34**	**171**	**118**	**110**	**433**	**66.4**	**72.1**	**1,033.5**

lion respectively. The age standardized rate (ASR) for all cancers was 79.7 per million. (Figure 3.2, Table 3.2 & 3.3)

Leukemia was most common (ASR 42.6, male = 282, 28% vs. female = 247, 24%) followed by CNS tumors (ASR 7.6, male = 53, 5.3% vs. female 49, 4.9%): medulloblastoma and astrocytoma being the most common comprising 3.2% and 2.5% respectively. Leukemia and CNS tumors constituted 63.1% of pediatric cancers and lymphoma was third (ASR = 6.4, male = 68, 6.8% vs. female 22, 2.2%). The ratio of non-Hodgkin lymphoma to Hodgkin disease was 1.9:1. Neuroblastoma (ASR 4.6) and retinoblastoma (ASR 4.2) ranked fourth and fifth, respectively, followed by soft tissue malignancies (ASR 3.6), bone tumors, (ASR 2.4), renal tumors (ASR 2.6), liver (ASR 2.4), germ cell (ASR 2.3) and nasopharyngeal carcinoma (ASR 0.3)

Age

The average age-specific incidence rate for each age and age group of the three calendar periods of observation show higher cancer rates for the young (younger than 5 years of age) particularly, leukemia, sympathetic nervous system, retinoblastoma, renal tumor and older age group for central nervous system and bone tumors. (Figure 3.3, 3.4)

Age and ICCC group

Sixty-three percent of the cancers found among children were leukemia and malignant tumors of central nervous system. The relative percentage, however, varied by age group. (Figure 3.4) Leukemia comprised of 53 percent of all childhood cancer and was the most common diagnosis for those younger than 5, 5-9 and 10-14 years of age but the relative proportion of it decreased as age increased, from 56 percent in those younger than 5 years of aged to 49 percent in adolescents 10-14 years of age. Acute lymphoblastic leukemia comprised 74 percent of all leukemia.

Among infant aged below 1 (N = 80, 8.1%), leukemia is the most common cancer (47.5%) with similar frequency of ALL and ANLL. The other common cancers are retinoblastoma and neuroblastoma.

Commentary

The incidence of childhood malignancy in Thailand is lower in comparison to Western and regional countries (Parkin, *et al.*, 1988; Parkin, *et al.*, 1998; Ries, *et al.*, 1999). However, it is higher than the incidence rate registered during 1988-1994 (Vattanasapt, 1999) but lower than the incidence during 1995-1997 (Wiangnon, *et al.*, 2003a; Wiangnon, *et al.*, 2003b). However, this is the registration of cancer cases from 20 centers with complete coverage of cases instead of extrapolation of the incidences from the 5 main registries in Chiang Mai, Lampang, Khon Kaen, Bangkok and Songkhla. The diagnoses were higher histologically confirmed than the previous reports. Leukemia was the most common cancer in Thai children. Lymphoma is much lower than that of Western countries. However, duration of case collection is only 1 year.

Figure 3.3 *Incidence of childhood cancer by age, both sexes, 2003*

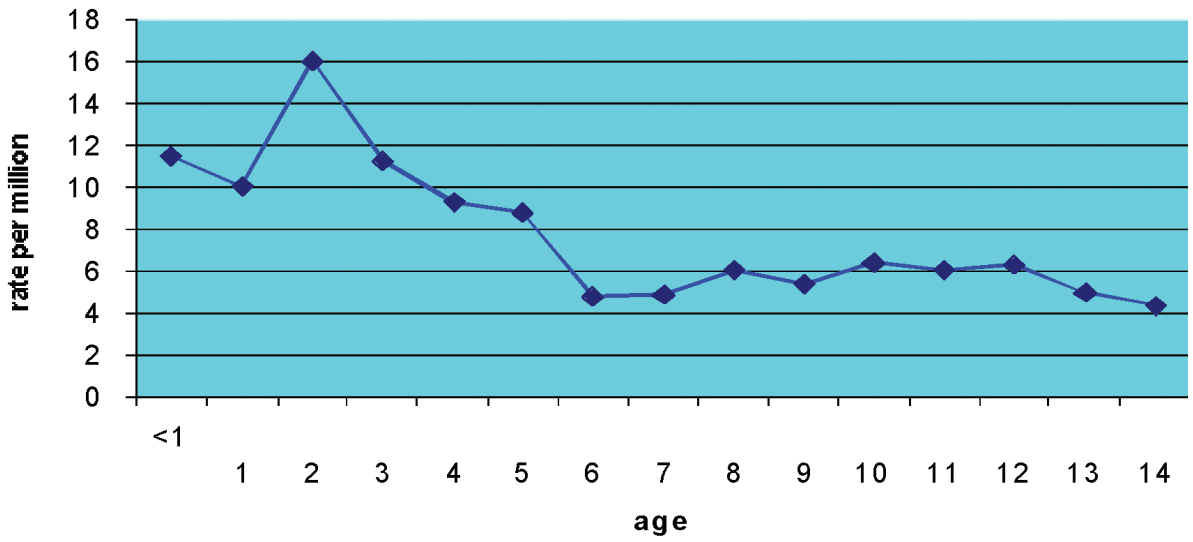

Figure 3.4 *Age-specific incidence rates for childhood cancer by ICCC group, both sexes, 2003*