Annual Report of the Korea Central Cancer Registry Program 2000: Based on Registered Data from 131 Hospitals

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Purpose: The Korea Central Cancer Registry (KCCR) program completed a nationwide hospital-based cancer registry to provide basic statistical data on cancer incidence.

Materials and Methods: In 2000, 131 hospitals participated in the KCCR program. All cancer registry data, which were submitted by the participating hospitals during the year, were reviewed and analyzed by the committee members.

Results: Of the 94,474 cases that were registered, 7,735 (8.2%) duplication cases were excluded. Of the remaining 86,739 cases, 2,893 cases (3.3%) of carcinoma in situ (morphology code/2) were excluded, leaving a final total of 83,846 cases for analysis, 48,005 (57.3%) male and 35,841 (42.7%) female. The leading age group was 60~64

years (15.1%). The six leading primary cancer sites in the order of their relative frequency were the stomach (20.8%), lung (12.2%), liver (12.2%), colorectum (10.3%), breast (6.5%), and uterine cervix (4.5%). In males, the three leading primary cancer sites were the stomach (24.5%), liver (16.3%), and lung (16.3%). In females, the stomach (15.8%), breast (15.1%), and uterine cervix (10.6%). Among the 1,126 cases of childhood malignancies, leukemia (32.7%) was the most common cancer type.

Conclusion: We report our analysis of the KCCR data from 131 nationwide hospitals during 2000. (*Cancer Research and Treatment* 2002;34:77-83)

Key Words: Neoplasms, Registries, Annual reports

INTRODUCTION

The Korea Central Cancer Registry (KCCR) is a nationwide hospital-based cancer registry, begun in 1980 (1). After "The Korea Cancer Control Workshop", held in 1978 with the aid of WHO, the Minister of Health and Welfare merged the various individual cancer registry programs into a single, nationwide, hospital-based program. The purpose was to accurately measure the cancer incidence in the nation and to construct useful databases for basic cancer research studies and treatment plans. Twenty annual reports and two 5-year reports (July 1982-June 1987, July 1988-June 1992) had been published by May 2001 (2). The Headquarters of KCCR moved to the National Cancer Center in September 2000. The central committee of KCCR is composed of a chief, an executive secretary, a medical record administrator, a statistician, and 11 advisory members.

The aim of this paper is to provide a summary of the 21st annual report of the KCCR program, which was published in

22 February 2002 (3). This 21st annual report contains information on the relative frequencies of malignant neoplasms in the Republic of Korea, and was derived from the database of the nationwide, hospital-based cancer registry program comprised of data collected between January 1, 2000 and December 31, 2000.

METHODS

Since 1992 the annual reports have shown the results of the data analysis from January to December of the preceding year, affording an easy comparison between the years. From 1993, all the data have been statistically analyzed by a PC program, which was constructed by the KCCR committee. In 1995, a PC software program for the cancer registry was developed and distributed to all participating hospitals after a training period for medical record administrators. The participating hospitals have sent their data in the form of diskettes since 1996. In 1996, the second edition of the International Classification of Diseases for Oncology (ICD-O, 2nd edition) was translated into Korean and distributed to all the participating hospitals. Topography and Morphology codes of the ICD-O, 2nd edition were used as extracted from the 16th annual report. On May 6th 1998, "In-service Training Workshop for Cancer Registry" was held to establish an efficient conduct of the cancer registry.

Among 170 registered hospitals, 131 participated in the KCCR program in 2000. All cancer registry data submitted by the participating hospitals on diskettes during the year were

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This study was supported by a grant of the 2000 Korea Central Registry program, Ministry of Health & Welfare, R.O.K

reviewed and analyzed by the committee members who were all Board-qualified clinical oncologists and pathologists. After correction of an erroneous coding of topography and morphology in the ICD-O2, the data were entered for computer analysis. To avoid duplication, the computer compared the resident registration number of all subjects. Much emphasis was placed on the diagnosis during this selection procedure. Cases diagnosed by histological examination were preferentially selected for inclusion. Of 94,474 registered malignancies, 7,735 (8.2%) duplicated malignancies were excluded. Of the remaining 86,739 malignancies, 2,893 malignancies (3.3%) of carcinoma in situ (Morphology code/2) were also excluded, leaving a total of 83,846 malignancies for final analysis. The advisory committee reevaluated the analysis results. The report of the KCCR program was published and released annually by the Ministry of Health and Welfare.

RESULTS

1) Marginal frequency of malignant neoplasm and carcinoma in situ by age, sex, and topography (Table 1)

Of the total of 83,846 registered malignancies, 48,005 (57.3%) were male and 35,841 (42.7%) were female; a sex ratio of 1.34. The most common age groups in the order of their relative frequency were 60~64 years (15.1%), 55~59 (13.4%), 65~69 (13.3%), 70~74 (10.2%), 50~54 (10.2%), and 45~49 (8.4%). The relative frequencies of the age groups below 45 were 0.1~7.5%. The cumulative frequency of the age groups above 75 was 9.5%. The leading primary cancer sites in the order of their relative frequency were the stomach (20.8%), bronchus & lung (12.2%), liver & intrahepatic bile ducts (12.2%), colorectum (10.3%), breast (6.5%), uterine cervix (4.5%), thyroid (3.5%), hematopoietic & reticuloendothelial systems (2.8%), urinary bladder (2.4%), and pancreas (2.3%) (Fig. 1).

In males, the leading primary cancer sites were the stomach (24.5%), liver & intrahepatic bile ducts (16.3%), bronchus & lung (16.3%), colorectum (10.2%), urinary bladder (3.5%), esophagus (2.9%), hematopoietic & reticuloendothelial systems (2.7%), pancreas (2.3%), prostate (2.2%), and kidney (1.9%).

In females, the stomach (15.8%) was the most common site, followed by the breast (15.1%), uterine cervix (10.6%), colorectum (10.5%), thyroid (6.9%), bronchus & lung (6.8%), liver & intrahepatic bile ducts (6.7%), ovary (4.1%), hematopoietic & reticuloendothelial systems (2.9%), and pancreas (2.2%).

In the total of 2,893 cases of carcinoma in situ, 108 (3.7%) were male and 2,785 (96.3%) were female (Table 2). Among these females, the major cancer sites were the uterine cervix [2,327 cases (83.6%)] and breast [369 cases (13.2%)], which composed 38.0% of the registered uterine cervix cancer cases and 6.4% of the registered female breast cancer cases, respectively.

2) Distribution by province

The leading metropolitan areas and regional provinces in the order of their relative frequency of registered malignancies were Seoul city (23.2%), Gyeonggido (17.6%), Busan city (8.5%), Gyeongsangbugdo (6.6%), Gyeongsangnamdo (6.3%), Daegu city (5.0%), Incheon city (4.9%), Chungcheongnamdo (4.8%), Jeonlanamdo (4.5%), Jeonlabugdo (4.3%), Gangweondo (3.8%), Chungcheongbugdo (3.5%), Daejeon city (2.5%), Gwangju city (2.2%), Ulsan city (1.4%) and Jeju (0.7%). These results

Fig. 1. Ten leading primary cancer sites in total registered cases.

Table 1. Ten leading primary cancer sites by sex

Total (n=83,846)			Male (n=48,005)		Female (n=35,841)			
	Organ	Cases (%)		Organ	Cases (%)		Organ	Cases (%)
1	Stomach	17,439 (20.8)		Stomach	11,761 (24.5)		Stomach	5,678 (15.8)
2	Lung	10,230 (12.2)		Liver	7,825 (16.3)		Breast	5,409 (15.1)
3	Liver	10,214 (12.2)		Lung	7,809 (16.3)		Cervix uteri	3,803 (10.6)
4	Colorectum	8,648 (10.3)		Colorectum	4,897 (10.2)		Colorectum	3,751 (10.5)
5	Breast	5,444 (6.5)		Bladder	1,666 (3.5)		Thyroid	2,469 (6.9)
6	Cervix uteri	3,803 (4.5)		Esophagus	1,394 (2.9)		Lung	2,421 (6.8)
7	Thyroid	2,921 (3.5)		Hematopoietics	1,320 (2.7)		Liver	2,389 (6.7)
8	Hematopoietics	2,366 (2.8)		Pancreas	1,120 (2.3)		Ovary	1,480 (4.1)
9	Urinary bladder	2,045 (2.4)		Prostate	1,057 (2.2)		Hematopoietics	1,046 (2.9)
10	Pancreas	1,894 (2.3)		Kidney	891 (1.9)		Pancreas	774 (2.2)

Table 2. Frequency of in situ cases

Male (n=108)		Female (n=2,785)	
Organ	Cases (%)	Organ	Cases (%)
1 Bladder	21 (19.4)	Cervix uteri	2,327 (83.6)
2 Stomach	14 (13.0)	Breast	369 (13.2)
3 Colon	11 (10.2)	Vulva	18 (0.6)
4 Larynx	10 (9.3)	Skin	13 (0.5)
5 Skin	9 (8.3)	Uterus, NOS	5 (0.2)
etc.	43 (39.8)		53 (1.9)

Table 3. Distribution of the diagnosis methods

Diagnosis methods	Total (%)	Male (%)	Female (%)
Microscopic test*	82.1	79.2	85.9
Clinical only	2.1	2.1	2.2
Clinical Investigation	15.2	18.1	11.3
Exploratory surgery	0.2	0.2	0.2
Specific biochemical, immunological test	0.5	0.5	0.5

*by cytology, hematology, histology, exploratory surgery and autopsy with histologic exam.

Table 4. Frequency of topography and morphology in primary cancer sites

	T-code	Topography	Cases	%	M-code	Morphology	Cases	%
Stomach (C16)	C16.3	Gastric antrum	5677	32.6	814	Adenocarcinoma	8470	48.6
	C16.2	Body	3634	20.8	821	Tubular adeno ca.	3840	22.0
	C16.8	Overlapping lesion	2441	14.0	849	Signet ring cell ca.	2702	15.5
	C16.0	Cardia, NOS	621	3.6	848	Mucinous adeno ca.	287	1.6
	C16.5	Lesser curvature	435	2.5	826	Papillary adeno ca.	149	0.9
Lung (C34)	etc.		4631	26.5	etc.		1991	11.4
	C34.1	Upper lung	2921	28.6	807	Squamous cell ca.	3371	33.0
	C34.3	Lower lung	2109	20.6	814	Adenocarcinoma	2625	25.7
	C34.0	Main bronchus	458	4.5	804	Small cell ca.	1363	13.3
	C34.2	Middle lobe	340	3.3	825	Bronchiolo-alveolar adenocarcinoma	152	1.5
Liver (C22)	C34.8	Overlapping lesion	209	2.0	824	Carcinoid tumor	65	0.6
	C34.9	Lung, NOS	4193	41.0	etc.		2654	25.9
	C22.0	Liver	8591	84.1	817	Hepatocellular ca.	7262	71.1
	C22.1	Intrahepatic bile duct	1623	15.9	816	Cholangiocarcinoma	553	5.4
					814	Adenocarcinoma	293	2.9
Breast (C50)					897	Hepatoblastoma	25	0.2
					818	Combined hepatocellular ca and cholangio ca.	17	0.2
					821	Tubular adeno ca.	17	0.2
					etc.		2047	20.0
					850	Infiltrating duct ca.	4348	79.9
Rectum (C19~C20)	C50.4	Upper outer	1742	32.0	852	Lobular ca.	193	3.5
	C50.8	Overlapping lesion	658	12.1	848	Mucinous adeno ca.	122	2.2
	C50.2	Upper inner	586	10.8	851	Medullary ca.	108	2.0
	C50.5	Lower outer	306	5.6	805	Papillary ca.	54	1.0
	C50.1	Central portion	212	3.9	etc.		619	11.4
Colon (C18)	etc.		1940	35.6	814	Adenocarcinoma	2774	61.7
	C20.9	Rectum, NOS	3997	88.9	821	Tubular adeno ca.	940	20.9
	C19.9	Rectosigmoid junction	499	11.1	848	Mucinous adeno ca.	164	3.6
					826	Papillary adeno ca.	92	2.0
					824	Carcinoid tumor	50	1.1
Cervix uteri (C53)					etc.		476	10.6
	C18.7	Sigmoid colon	1579	38.0	814	Adenocarcinoma	2513	60.5
	C18.2	Ascending colon	790	19.0	821	Tubular adenocarcinoma	774	18.6
	C18.4	Transverse colon	300	7.2	848	Mucinous adenocarcinoma	243	5.9
	C18.0	Cecum	252	6.1	826	Papillary adenocarcinoma	54	1.3
	C18.6	Descending colon	204	4.9	849	Malignant lymphoma, large cell, diffuse, specified type	36	0.9
	etc.		1,027	24.7	etc.		532	12.8
	C53.9	Cervix uteri	3633	95.5	807	Squamous cell ca.	2928	77.0
	C53.1	Exocervix	106	2.8	814	Adenocarcinoma	282	7.4
	C53.0	Endocervix	52	1.4	856	Adenosquamous ca.	83	2.2
	C53.8	Overlapping lesion	12	0.3	805	Papillary carcinoma	26	0.7
					821	Tublar adeno ca.	17	0.4
					etc.		467	12.3

Table 5. Distribution of childhood malignancies

Total (n=1,126)		Boy (n=596)		Girl (n=530)	
Organ/disease	Cases (%)	Organ/disease	Cases (%)	Organ/disease	Cases (%)
1 Leukemia	368 (32.7)	Leukemia	201 (33.7)	Leukemia	167 (31.5)
2 CNS*	186 (16.5)	CNS*	98 (16.4)	CNS*	88 (16.6)
3 Lymphoma	88 (7.8)	Lymphoma	58 (9.7)	Gonadal/germ cell	41 (7.7)
4 Gonadal/germ cell	76 (6.8)	SNS†	41 (6.9)	Bone tumor	33 (6.2)
5 SNS†	69 (6.1)	Gonadal/germ cell	35 (5.9)	Renal tumor	33 (6.2)
6 Bone tumor	60 (5.3)	Soft tissue sarcoma	33 (5.5)	Lymphoma	30 (5.7)
7 Soft tissue sarcoma	59 (5.2)	Bone tumor	27 (4.5)	SNS†	28 (5.3)
8 Renal tumor	56 (5.0)	Renal tumor	23 (3.9)	Soft tissue sarcoma	26 (4.9)
9 Hepatic tumor	34 (3.0)	Hepatic tumor	20 (3.4)	Hepatic tumor	14 (2.6)
10 Retinoblastoma	24 (2.1)	Retinoblastoma	14 (2.3)	Retinoblastoma	10 (1.9)
Etc.	106 (9.4)		46 (7.7)		60 (11.3)

*Central nervous system, † Sympathetic nervous system

should be carefully interpreted considering the general population characteristics (e.g. age, sex) and the medical service utilization in each area. In all areas, the relative frequencies of males (54.0~61.8%) were higher than those of females.

3) Distribution of diagnosis methods for malignant neoplasms by gender (Table 3)

In general, microscopic examination (82.1%) was the primary method of diagnosis, followed by clinical investigation (15.2%), clinical findings only (2.1%), specific biochemical/immunologic tests (0.5%), and exploratory surgery (0.2%). Eighteen percent of the cancers were diagnosed by clinical judgement alone without having microscopic examination.

4) Frequency of topography and morphology in primary cancer sites (Table 4)

Table 4 shows the marginal frequencies of topography and morphology in leading malignancies. The most common morphologies (M-code) according to the order of their marginal frequency were adenocarcinomas (814~838) [37,494 (44.7%)], papillary & squamous cell neoplasms (805~808) [12,807 (15.3%)], ductal, lobular & medullary neoplasms (850~854) [4,890 (5.8%)], cystic, mucinous & serous neoplasms (844~849) [4,700 (5.6%)], epithelial neoplasms, NOS (801~804) [3,166 (3.8%)], transitional cell carcinomas (812~813) [2,133 (2.5%)], Hodgkin's & non-Hodgkin's lymphomas (959~970) [1,802 (2.2%)] and leukemias (980~994) [1,686 (2.0%)]. There were 10,438 cases of malignancies not diagnosed morphologically (M-8000) (12.4%), similar with the previous year's number [10,655 cases, 12.9%].

5) Distribution of childhood malignancies by sex and primary sites (Table 5)

The frequency childhood malignancies, defined as children under the age of 15, were 1,126 cases (1.3%). There were 596 male cases and 530 female cases, a sex ratio of 1.1. Leukemia was the most common malignancy (32.7%), with a sex ratio of 1.2, of which subtypes in their order of frequency were ALL (62.5%), acute non-lymphocytic leukemia (27.2%), and CML

Fig. 2. Numbers of registered hospitals and cases.

(5.2%). Following leukemia in order of frequency were CNS tumors (16.5%), lymphomas (7.8%), gonadal & germ cell tumors (6.7%), tumors of the sympathetic nervous system (6.1%), malignant bone tumors (5.3%), soft tissue sarcomas (5.2%), renal tumors (5.0%), carcinomas and epithelial neoplasms (3.9%), hepatic tumors (3.0%), and retinoblastomas (2.1%).

DISCUSSION

Because the Ministry of Health and Welfare required that all University and training hospitals join the KCCR program, the number of affiliated hospitals, and therefore of registered cases of malignancies, have increased year by year (Fig. 2). Because of this fact, the KCCR database is recognized to contain about 80% of all true cancer cases and to include about 96% of all cancer patients that visited the KCCR-affiliated hospitals (4).

The KCCR database is especially useful for exhibiting trends

Fig. 3. Trends of the registry in KCCR program by cancer sites in Korean males.

Fig. 4. Trends of the registry in KCCR program by cancer sites in Korean females.

[Appendix] List of the hospitals participating the KCCR program, 2000

Ajou University Hospital	Gachon Medical College Gil Medical Center
Andong General Hospital	Gyeongsang University Hospital
Andong Presbyterian Hospital	Hae Dong Hospital
Asan Foundation Kangnung Hospital	Hallym Sacred Heart Hospital
Asan Medical Center	Hallym University Hang Gang Sacred Heart Hospital
Bag Ae Hospital	Hallym University Medical Center ChunCheon Sacred Heart Hospital
Benedict Hospital	Hangdong University Sunlin Presbyterian Hospital
Bupyeong Serim General Hospital	Hanil Hospital
Busan Veterans Hospital	Hanyang University Hospital
Carollo Hospital	Hanyang University Kuri Hospital
Catholic GEN Hospital	Holy Family Hospital
Changwon General Hospital	Il Sin Christian Hospital
ChonBuk National University Hospital	In Je University, Pusan Paik Hospital
Chongji St. Mary's Hospital	Inchon Christian Hospital
Chonnam University Hospital	Inchon Red Cross Hospital
Choon Hae Hospital	Inchon Choongang General Hospital
Chosun University Hospital	Inha University Hospital
Chung-Ang University Hospital	Inha University Medical Center Inha Hospital
ChungAng University Medical Hospital	Inje University Sanggye Paik Hospital
Chungbuk National University Hospital	Inje University, Seoul Paik Hospital
Chungnam National University Hospital	Kang Dong Sacred Heart Hospital
College of Medicine, Pochon CHA university CHA General Hospital	Kangbuk Samsung Hospital
Dae Dong Hospital	Kangnam General Hospital Public Corporation
Dae Jeon Veterans Hospital	KangNam Sacred Heart Hospital Hallym University
Dae Rim St. Mary's Hospital	Keimyung University Medical Center
Daegu Madical Center	Koje Hospital
DanKook University Hospital	Kon Kuk University Medical Center Seoul Hospital
Dong Kang General Hospital	Konyang University Hospital
Dong Kang General Hospital	Korea Center Center Hospital
Dong Rae Bong Seng Hospital	Korea University Ansan Hospital
Dong-A University Hospital	Korea University College of Medical, Guro Hospital
Dongeuil Medical Center	Korea University Hospital
Dongguk University Kyong Ju Hospital	Korea Veterans Hospital
Dong-In Hospital	Kosin University Gospel Hospital
Dong-Kuk University Po-Hang Hospital	Kumi CHA Medical Center
Ewha Womans University Mokdong Hospital	Kwak's Hospital
Ewha Womans University Tongdaemun Hospital	Kwang Ju Christian Hospital

[Appendix] Continued

Kwang Ju Veterans Hospital	Seoul National University Hospital
Kwang Myung Sung Ae General Hospital	Seoul Red Cross Hospital
Kwanghye Geneal Hospital	Severance Hospital Yonsei University Medical College
Kyung Hee Medical Center	Shin Chun Hospital
Kyungpook National University Hospital	Soonchunhyang GuMi Hospital
Local Public Corp. Inchun Medical Center	Soonchunhyang University Chonam Hospital
Local Public Corporation Chung Cheong Nam-Do Hong Sung Medical Center	Soonchunhyang University Hospital
Maryknool General Hospital	St, Mary's Hospital, The Catholic University of Korea
Masal Samsung Hospital	St, Francisco General Hospital
Metro Hospital	St, Paul's Hospital
Missionary Benedictine Sisters Fatima Hospital	Sun General Hospital
Mokpo Catholic Hospital	Sung Ae Hospital
Nam Kwang Hospital	Taeback Choongang General Hospital
National Health Insurance Corporation Ilsan Hospital	Taegu Catholic University Hospital
National Medical Center	Taegu Fatima Hospital
National Police Hospital	Taegu Veterans Hospital
Pohang St. Mary's Hospital	Tae-jeon Eul-ji College Hospital
Presbyterian Medical Center	The Catholic University of Korea Kangnam St. Mary's University
Pundang Je-Saeng Hospital	The Catholic University of Korea Taejon St. Mary's University
Pusan Adventist Hospital	The Catholic University of Korea, Our Lady of mercy University
Pusan Medical Center	The Catholic University of Korea, St. Vincent's Mary's University
Pusan National University Hospital	Uijongbu St. Mary's Hospital The Catholic University Korea
Samsun Hospital	Ulsan University Hospital
Samsung Medical Center	Wallace Memorial Baptist Hospital
Sansung Cheil Hospital & Women's Health Care Center	Wonju Christian Hospital, Won Ju Clooge of Medicine, Yonsei University
Sejong General Hospital	Wonkwang University Hospital
Seo San Medical Center	Yeungnam University Medical Center
Seoul Adventist Hospital	Yonsei Medical Center, Yong-Dong Severance Hospital
Seoul Municipal Boramea Hospital	Young Dong Hospital

of cancer occurrence in Korea because information on the-changing trends of cancer incidence over time is an essential component in the planning and monitoring of programs for cancer prevention, early detection and treatment. For example, while stomach cancer has shown a decreasing trend in both Korean males and females since 1980s, the incidence of lung cancer is rapidly increasing, especially in males (Fig. 3, 4). The confirmation of this trend suggests the necessity of introducing some control programs.

The one of the limitations of the KCCR data was the impossibility of estimating the prevalence rate because only incident cases that followed the registration protocol were reported. Moreover, being a nationwide hospital-based cancer registry, the KCCR data could not provide the true incidence rate. To overcome these limitations, some population-based, regional cancer registry programs were conducted as an ongoing part of this KCCR program in December 2001 in 8 areas, Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, and Jeju. The KCCR database will continue to hold the most important position until a nationwide, population-based, data acquisition program is constructed on the basis of international standards.

One caution in the interpretation of the KCCR data is that the numbers represent cases rather than patients. The patients with distinct cancers at several sites were treated as multiple primary patients and reported according to the cancer site. A

further caution in the interpretation of this data is that some registered patients in one annual report might also be registered in another annual report. This possibility necessitates the keeping of comparisons of annual reports of cases in which there was a delay in registration. To resolve this problem, we gathered annual report data for 5 years and have published two 5-year reports (5,6). We have also planned to report all registered cases.

ACKNOWLEDGEMENTS

We would like to acknowledge the medical record administrators in the KCCR-affiliated hospitals [Appendix] whose enthusiastic participation in the KCCR program, 2000.

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