Increasing performance of a hospital-based cancer registry: Hacettepe University hospitals experience

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Summary

Purpose: High-quality hospital-based cancer registry systems are the key elements of a healthy population-based cancer data. The purpose of this study was to present a recent history of establishing a valuable and reliable hospital-based cancer registry in a university hospital in Turkey, and the data gathered by this system in the last 9 years.

Methods: This study included the cancer registry records of Hacettepe University Hospitals between 1-Jan-2003, and 31-Dec-2011. The study cohort included data of 39351 cancer patients and the cancer registry system was based on active data acquisition method.

Results: Most frequent departments of reference were Medical Oncology, Radiation Oncology, General Surgery, Urology, and Pediatrics. The annual number of records gradually increased from 2675 in 2003 to 5152 in 2011. The 5 cancer types most frequency seen in adults were lung (15.5%), prostate (13.5%), stomach (6.6%), bladder (6.2%),

and colon (5.8%) in men; and breast (32.7%), ovary (6.4%), uterine corpus (6.2%), uterine cervix (5.6%), and thyroid (5.0%) in women. Childhood cancers were classified according to the International Classification of Childhood Cancers, 3rd Edition (ICCC-3), and the most frequent 5 cancer types in children were tumors of the central nervous system (20.1%), lymphomas (14.6%), leukemia (14.1%), retinoblastoma (9.4%), and tumors of the sympathetic nervous system (7.7%).

Conclusion: Active data acquisition from departments that deal with oncologic patients in a hospital is the precise method for establishing a high-quality cancer registry system that is able to resemble the general population. Hospital-based cancer registry systems also provide highly critical information for planning, monitoring, and measuring the cancer-related services, research, and education.

Key words: cancer, epidemiology, hospital-based cancer registry, incidence, Turkey

Introduction

Cancer is the second most common chronic disease after the cardiovascular system diseases, and it is a growing health problem worldwide for its high morbidity and mortality rates. Surveillance Epidemiology and End Results (SEER) data, and International Agency for Research on Cancer (IARC) data are the two foremost sources of cancer statistics in the world [1,2]. According to the latter, the crude cancer incidence is 203/100,000 for men, and 164/100,000 for women. These rates are 182/100,000 and 113/100,000 in Turkey for men and women, respectively [3,4].

Prevention is one of the key concepts in the

fight against cancer. So, determining the cancer incidence and the most frequent cancers with highest mortality should provide effective strategies for creating and implementing health policies. Collecting, analyzing, and reporting cancer registries are mandatory for an accurate estimation of disease burden, which can be substantially variable according to geographical regions.

Cancer incidence in Turkey can not be determined precisely because of the lack of an effective cancer registry database. Studies about the cancer incidence in our country are also limited [5-7]. Owing to this, IARC and SEER data are frequently used in the scientific research, although their accuracy in reflecting the true cancer incidence and

the most frequent cancers in Turkey is controversial.

Hospital-based cancer registries provide annual reports about the localization, age groups, stage, treatment options, response rates and survival of cancer patients that refer to a hospital. These registries also provide a well-designed model for determining, summarizing, coding and analyzing data of population-based studies.

In this study, we evaluated the demographic and clinical data of patients diagnosed with cancer in Hacettepe University Hospitals between 2003 and 2011. Our aim was to determine the frequency distribution of cancers according to type, year at diagnosis, gender, and age groups of patients admitted to Hacettepe University Hospitals.

Methods

Historical development of cancer registry systems in Hacettepe University hospitals

Registering and reporting cancer patients were first started in 1983 via a specially designed patient follow-up form and without a certain cancer registry system. Until the early 1990s, the Departments of Medical Oncology, Pediatric Oncology, Radiation Oncology, and some other clinics reported themselves the cancer patients to the Ministry of Health. In 1992, a research assistant at the Department of Preventive Oncology started to record the data of cancer patients in an Amiga computer. In this way only a limited data could be collected from the Departments at the Hacettepe Oncology Hospital and the records were bounded to the reports of the physicians in this hospital. A network was established in 1996 between the Departments of the Hacettepe Oncology Hospital and Cancer Institute. Afterwards, each Department recorded its oncologic cases in their own computers, and the data was transferred to a central database unit in the Hacettepe Oncology Institute. The Department of Preventive Oncology was in charge of analyzing the data. For this purpose, research assistants of this Department programmed some software modules in Clipper language for performing analysis of invasion according to SEER and TNM, topographic and morphologic coding according to the International Classification of Diseases for Oncology (ICD-O), and accuracy evaluation of the central database. The software architecture was innovated between 2000 and 2002 to be compatible with Windows-based operating systems, and the registry setting was reorganized for minimizing the data leak, especially from the Medical Oncology Department. Meanwhile, the Department of Preventive Oncology continued to record the data gathered by passive feedback from the other Departments in the Hacettepe Oncology Hospital.

The present protocol was implemented in May 2002. The cancer registry system was renovated by

Table 1. Departments that contribute to active data acquisition

Neurosurgery	Medical Oncology
Dermatology	Nuclear Medicine
Hematology	Orthopedics and Traumatology
General Surgery	Pathology
Chest Diseases	Pediatric Surgery
Ophthalmology	Pediatric Hematology
Obstetrics and Gynecology	Pediatric Pathology
Cardiovascular Surgery	Plastic and Reconstructive Surgery
Otorhinolaryngology	Radiation Oncology
Urology	

Hacettepe University Hospitals' directorates, and began to collect data from every Department that dealt with oncologic patients. For this purpose, the data collection method was transformed from passive gathering to an active acquisition, and a full-time cancer registrar was employed. Afterwards the registrar began to arrange weekly visits to the clinics in the Hacettepe University Hospitals for gathering the data of new cancer cases. Another feature of centralization and active data acquisition was avoiding the recurrent records in the cancer registry database. The new system collected data from the Departments shown in Table 1.

This system was advanced until today, and came to a point that it is integrated into the hospital information system of Hacettepe University Hospitals. Today, two cancer registrars import the complete demographic and clinical data of cancer patients from the central data-processing servers, and perform cancer registry according to international standards by using the CanReg 4 software of the International Association of Cancer Registries.

Data review and quality control

Data were collected from the departments mentioned above, and recorded to the cancer registry database by the registrar. Then, a research assistant in the Department of Preventive Oncology reviewed the data to control the accuracy of gender, age, histologic and morphologic diagnosis of the patients according to ICD-O. Inaccurate data were revised and re-recorded. Crosschecks were also performed by the research assistant to increase the consistency of the database.

Statistics

After these steps, the central cancer database was transferred into SPSS 15.0 software for performing the statistical analyses. The variables in the database were year of diagnosis, gender, age at diagnosis, places of birth and residence, the diagnostic codes according to ICD-10, and histopathology. Frequencies of prevalent types of cancers were assessed according to the years of admission, and pediatric and adult age groups.
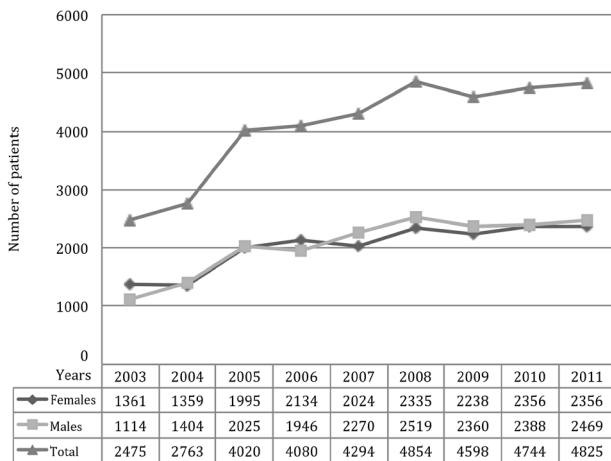
Figure 1. Annual number of adult patients recorded in the cancer registry system between 2003 and 2011.
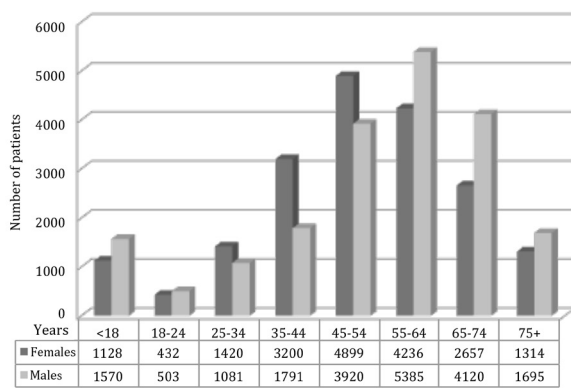

Figure 2. Distribution of age groups according to gender between 2003 and 2011.

Categorical data are presented as frequencies and percentages, and continuous variables as mean ± standard deviation. Kruskall-Wallis non-parametric analysis of variances test and Chi-square test were used for statistical comparisons of continuous and categorical variables, respectively, between independent groups.

Results

This study covered a 9-year period between 2003 and 2011, and 39351 cases of cancer registry database of Hacettepe University Hospitals. The numbers of records in the cancer registry were 2675, 3008, 4324, 4356, 4618, 5195, 4934, 5089, and 5152 between 2003 and 2011, respectively. Patients were frequently male (N=20,065; 51.0%) and between 55-64 years of age (24.5%). The annual numbers of oncologic cases in adulthood are shown in Figure 1. The mean age (± standard deviation) of patients between 2003 and 2011 was 50.8±18.7, 52.8±19.6, 48.0±21.0, 51.0±19.9, 51.4±18.7, 51.6±18.0, 51.4±19.0, 52.1±18.7, and 52.2±18.2, respectively. The difference between

the mean age of patients according to the year of admission was statistically significant (p<0.001). Distribution of age groups by gender is presented in Figure 2. The database reflected a generalized referral pattern from each geographical location of Turkey, but most frequent regions of reference for adult patients were the Central Anatolia Region (62.9%), the Black Sea Region (15.4%), and the Mediterranean Region (6.2%). This distribution changed a little for pediatric patients, who presented from the Central Anatolia Region (45.8%), the Black Sea Region (14.4%), and the Southeastern Anatolia Region (11.3%). Adult patients were admitted most frequently to the Departments of Medical Oncology (38.5%), Radiation Oncology (21.7%), General Surgery (8.4%), Urology (7.8%), and Obstetrics and Gynecology (3.1%). Most prevalent Departments dealing with pediatric cancers were the Pediatric Oncology (54.0%), the Pediatric Emergency (7.8%), the Radiation Oncology (6.5%), the Pediatric Hematology (4.5%), and the Ophthalmology (3.1%) Department.

Most common cancer sites were the lung (15.5%), prostate (13.5%), stomach (6.6%), bladder (6.2%), and colon (5.8%) for men, and breast (32.7%), ovary (6.4%), uterine corpus (6.2%), uterine cervix (5.6%), and thyroid (5.6%) for women (Table 2). Lung and breast for men and women, respectively, were the most common sites of cancers each year (Table 3). The annual trends in the most frequent 5 cancer sites in women and men are presented in Figure 3 and Figure 4, respectively.

Childhood cancers were evaluated according to the criteria of ICCC-3 [8]. There was a trend for male gender predominance in childhood cancers through the years (Figure 5, Table 4). Most frequently diagnosed cancers were central nervous system tumors (20.1%), lymphomas (14.6%), leukemia (14.1%), retinoblastoma (9.4%), and tumors of the sympathetic nervous system (7.7%) (Table 5).

Discussion

Absence of an effective cancer registry system and the difficulties in the centralization of data are the major limitations for determining and interpreting the cancer incidence and prevalence in Turkey. Hacettepe University has utilized a cancer registry system since the early 1990s, and modernized that system in 2002. This database provides reliable information about the cancer incidence in the population since then. Actually, this application is mainly a hospital-based system,

Table 2. Most frequent sites of cancers in adult patients according to gender

Females	N	%	Males	N	%
Breast	5944	32.7	Lung & bronchus	2866	15.5
Ovary	1159	6.4	Prostate	2494	13.5
Uterine corpus	1123	6.2	Stomach	1220	6.6
Uterine cervix	1012	5.6	Urinary bladder	1140	6.2
Thyroid	902	5.0	Colon	1081	5.8
Brain & other nervous system	807	4.4	Brain & other nervous system	992	5.4
Colon	756	4.2	Larynx	829	4.5
Stomach	721	4.0	Testis	586	3.2
Lung & bronchus	679	3.7	Cutaneous melanoma	585	3.2
Cutaneous melanoma	455	2.5	Pancreas	569	3.1
Non-Hodgkin lymphoma	433	2.4	Non-Hodgkin lymphoma	560	3.0
Rectum	373	2.1	Kidney	549	3.0
Pancreas	351	1.9	Rectum	537	2.9
Soft tissue (including heart)	281	1.5	Nasopharynx	435	2.4
Kidney	278	1.5	Liver & intrahepatic bile duct	396	2.1
Eye & orbit	256	1.4	Soft tissue (including heart)	353	1.9
Urinary bladder	219	1.2	Eye & orbit	301	1.6
Bones & joints	192	1.1	Thyroid	290	1.6
Myeloid leukemia	187	1.0	Bones & joints	288	1.6
Hodgkin lymphoma	179	1.0	Hodgkin lymphoma	246	1.3
Other & unspecified primary sites	1851	10.2	Other & unspecified primary sites	2180	11.1
Total	18158	100.0	Total	18495	100.0

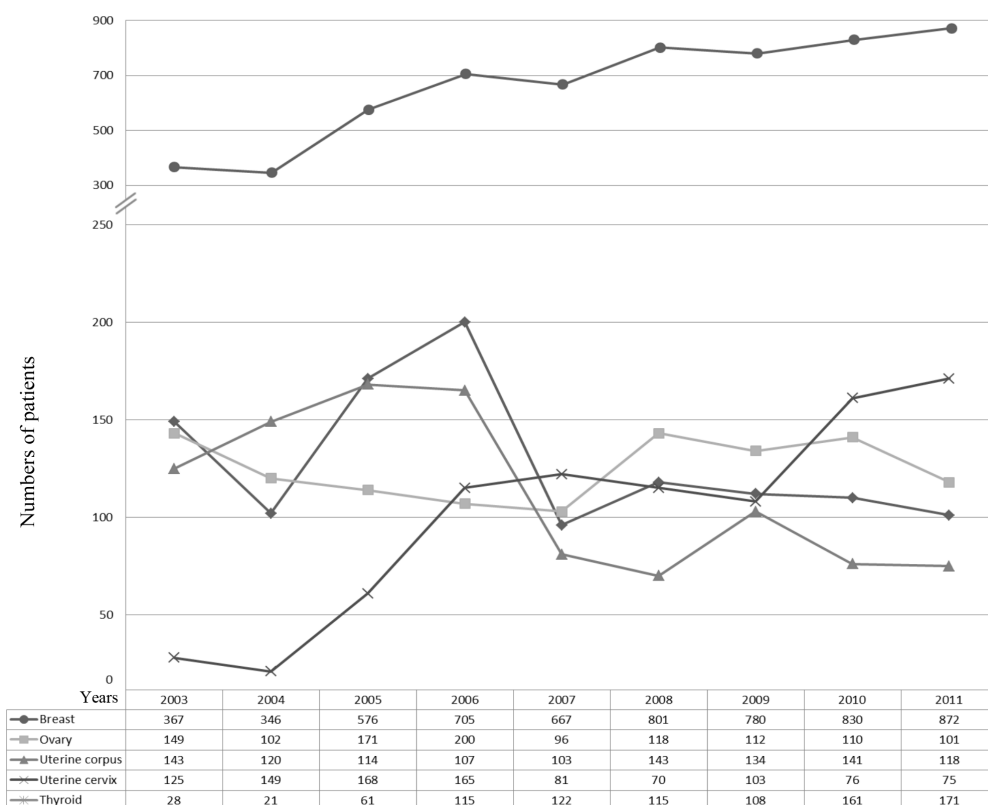| Years	2003	2004	2005	2006	2007	2008	2009	2010	2011
Breast	367	346	576	705	667	801	780	830	872
Ovary	149	102	171	200	96	118	112	110	101
Uterine corpus	143	120	114	107	103	143	134	141	118
Uterine cervix	125	149	168	165	81	70	103	76	75
Thyroid	28	21	61	115	122	115	108	161	171

Figure 3. Annual trends of the most frequent 5 cancers in females.

Table 3. Number of adult patients for each year and gender between 2003 and 2011

	2003		2004		2005		2006		2007		2008		2009		2010		2011		Total	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Oral cavity & Pharynx	29	49	53	78	55	136	58	124	51	146	60	115	55	97	63	92	40	116	464	953
Nasopharynx	3	10	20	32	14	54	21	49	19	72	24	54	22	53	26	48	13	63	162	435
Tongue	12	8	8	6	13	22	11	19	9	14	11	7	9	13	7	11	4	18	84	118
Parotis gland	5	8	3	4	11	8	4	15	4	12	2	9	4	5	4	2	4	4	41	67
Other	9	23	22	36	17	52	22	41	19	48	23	45	20	26	26	31	19	31	177	333
Digestive system	146	197	162	277	273	411	232	381	322	514	389	623	376	583	363	580	352	622	2615	4188
Stomach	32	51	41	90	79	134	80	120	75	147	108	195	125	183	88	138	93	162	721	1220
Colon	42	50	46	69	75	112	52	71	107	127	105	159	113	156	102	158	114	179	756	1081
Rectum	30	43	31	38	36	52	31	73	57	73	59	68	43	50	51	71	35	69	373	557
Pancreas	13	22	18	35	37	47	25	40	38	77	55	77	45	86	58	85	62	100	351	569
Esophagus	3	7	5	5	9	11	11	9	8	21	18	29	13	23	14	19	9	22	90	146
Liver & intrahepatic bile duct	12	13	9	22	12	28	15	38	16	49	15	61	24	54	31	72	20	59	154	396
Other	14	11	12	18	25	27	18	30	21	20	29	34	13	31	19	37	19	31	170	239
Respiratory system	45	261	44	274	75	417	102	434	106	493	117	510	84	460	92	452	111	471	776	3772
Lung & bronchus	39	181	41	166	55	326	96	312	100	398	97	387	75	363	81	365	95	368	679	2866
Larynx	4	79	1	97	11	83	3	119	2	85	10	113	6	88	4	79	2	86	43	829
Other	2	1	2	1	9	8	3	3	4	10	10	10	3	9	7	8	14	17	54	77
Bones & joints	14	16	19	32	35	57	24	36	19	31	23	35	22	27	24	32	12	22	192	288
Soft tissue (including heart)	11	11	9	14	25	38	22	33	39	44	52	85	45	50	43	34	35	44	281	353
Skin (excluding basal & squamous)	39	42	39	49	59	72	50	70	48	56	59	77	48	85	49	68	64	66	455	585
Breast	367	4	346	14	576	14	705	3	667	9	801	21	780	19	830	23	872	17	5944	120
Genital system	432	162	385	191	498	341	552	329	311	345	350	412	363	434	335	443	303	429	3529	3086
Uterine corpus	143		120		114		107		103		143		134		141		118		1123	
Ovary	149		102		171		200		96		118		112		110		101		1159	
Uterine cervix	125		149		168		165		81		70		103		76		75		1012	
Other, female	15		14		45		80		31		19		14		8		9		235	
Prostate		105		141		276		273		281		333		363		366		354		2492
Testis		57		48		64		54		64		79		68		77		75		586
Other, male		0		2		1		2				3		3						8
Urinary system	43	120	26	130	44	158	51	193	57	188	59	210	73	233	84	246	68	242	505	1720
Urinary bladder	23	87	9	88	19	107	14	125	22	123	31	144	33	147	42	169	26	150	219	1140
Kidney	20	33	16	42	25	50	36	65	33	50	26	64	39	82	42	74	41	89	278	549
Other			1	1		1	1	3	2	15	2	9	1	4	3	3	1	3	8	31
Eye & orbit	14	10	19	24	19	24	23	31	27	35	34	42	28	28	49	51	43	56	256	301
Brain & other nervous system	52	63	92	108	106	124	65	86	88	122	126	143	87	122	108	123	83	101	807	992
Endocrine system	33	9	29	11	66	30	117	40	125	51	120	46	113	40	170	55	180	51	953	333
Thyroid	28	5	21	9	61	24	115	38	122	46	115	37	108	38	161	48	171	45	902	290
Other	5	4	8	2	5	6	2	2	3	5	5	9	5	2	9	7	9	6	51	43
Lymphoma	41	53	50	76	29	52	78	101	92	122	81	113	66	70	63	82	112	137	612	806
Non-Hodgkin lymphoma	33	39	35	55	17	28	53	68	58	86	60	86	46	50	49	63	82	85	433	560
Hodgkin lymphoma	8	14	15	21	12	24	25	33	34	36	21	27	20	20	14	19	30	52	179	246
Myeloma	10	19	11	23	19	29	1	3	33	49	15	21	23	25	19	17	33	19	164	205
Leukemia	29	41	28	39	53	68	57	63	34	52	33	40	37	52	31	51	36	54	318	460
Myeloid leukemia	18	26	19	26	33	37	22	32	23	26	16	16	19	24	20	29	17	23	187	239
Lymphoid leukemia	11	15	8	8	20	31	15	30	11	24	12	22	17	24	11	22	12	24	117	200
Other			1	5				1		2	5	2	1	4			7	7	14	21
Other & unspecified primary sites	56	52	47	47	63	65	17	17	5	13	16	26	38	35	33	39	12	22	287	333
Total (Gender/Annual)	1361	1114	1359	1404	1995	2025	2134	1946	2024	2270	2335	2519	2238	2360	2356	2388	2356	2469	18158	18495
Total (Annual)	2475		2763		4020		4080		4294		4854		4598		4744		4825		36653	

Table 4. Number of children for each year and gender between 2003 and 2011

	2003		2004		2005		2006		2007		2008		2009		2010		2011		Total	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Leukemias, myeloproliferative diseases, and myelodysplastic diseases	12	15	14	14	26	37	20	32	20	30	19	25	14	28	13	22	14	25	152	228
Lymphomas and reticuloendothelial neoplasms	14	22	7	26	10	32	12	18	13	28	14	43	11	37	14	40	20	32	115	278
CNS and miscellaneous intracranial and intraspinal neoplasms	17	25	32	47	30	43	22	47	30	30	16	36	25	26	15	37	37	28	224	319
Neuroblastoma and other peripheral nervous cell tumors	12	8	3	4	11	15	13	12	13	15	11	14	11	13	9	18	14	12	97	111
Retinoblastoma	9	5	9	7	5	11	11	8	11	21	13	16	19	24	18	27	19	20	114	139
Renal tumors	6	10	3	13	7	3	10	3	13	10	6	7	10	11	6	4	6	8	67	69
Hepatic tumors	2	1	7	4	3	3	3	3	4	3	4	5	1	1	2	6	4	3	30	29
Malignant bone tumors	3	6	5	7	9	8	5	9	8	16	6	5	4	10	6	8	6	8	52	77
Soft tissue and other extraosseous sarcomas	5	8	8	6	5	13	6	8	9	10	15	21	16	16	11	18	5	13	80	113
Germ cell tumors, trophoblastic tumors, and neoplasms of the gonads	5	5	6	6	8	8	5	6	11	7	11	12	14	9	7	7	7	9	74	69
Other malignant epithelial neoplasms and malignant melanomas	3	5	6	6	10	6	4	8	3	12	20	14	14	20	19	15	15	11	94	97
Other and unspecified malignant neoplasms	1	1	1	4	0	1	3	8	3	4	3	5	1	1	11	12	6	5	29	41
Total (Gender/Annual)	89	111	101	144	124	180	114	162	138	186	138	203	140	196	131	214	153	174	1128	1570
Total (Annual)	200	245	304	276	324	341	336	345	327	2698	117	510	84	460	92	452	111	471	776	3772

CNS: central nervous system

Years	2003	2004	2005	2006	2007	2008	2009	2010	2011
Lung & bronchus	181	166	326	312	398	387	363	365	368
Prostate	105	141	276	273	281	333	363	366	354
Stomach	51	90	134	120	147	195	183	138	162
Urinary bladder	87	88	107	125	123	144	147	169	150
Colon	50	69	112	71	127	159	156	158	179
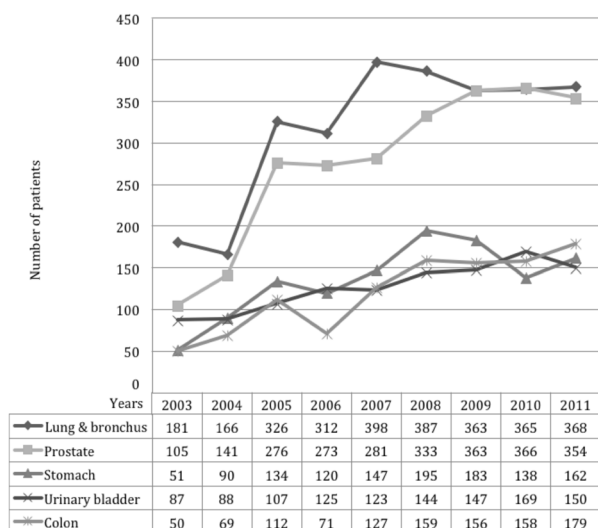
Figure 4. Annual trends of the most frequent 5 cancers in males.

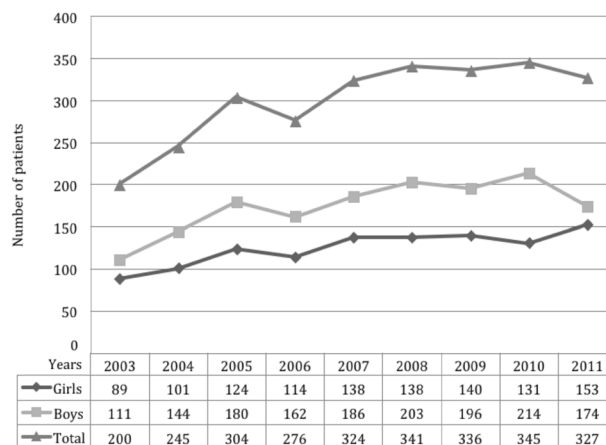| Years	2003	2004	2005	2006	2007	2008	2009	2010	2011
Girls	89	101	124	114	138	138	140	131	153
Boys	111	144	180	162	186	203	196	214	174
Total	200	245	304	276	324	341	336	345	327

Figure 5. Annual number of children recorded in the cancer registry system between 2003 and 2011.

Table 5. Most frequent sites of cancers in children according to gender

Site	Girls			Boys			Total		
	N	%	Rank	N	%	Rank	N	%	Rank
Leukemias, myeloproliferative diseases, and myelodysplastic diseases	152	13.5	2	228	14.5	3	380	14.1	3
Lymphomas and reticuloendothelial neoplasms	115	10.2	3	278	17.7	2	393	14.6	2
CNS and miscellaneous intracranial and intra-spinal neoplasms	224	19.9	1	319	20.3	1	543	20.1	1
Neuroblastoma and other peripheral nervous cell tumors	97	8.6	5	111	7.1	5	208	7.7	5
Retinoblastoma	114	10.1	4	139	8.9	4	253	9.4	4
Renal tumors	67	5.9	9	69	4.4	9	136	5.0	9
Hepatic tumors	30	2.7	11	29	1.8	12	59	2.2	12
Malignant bone tumors	52	4.6	10	77	4.9	10	129	4.8	10
Soft tissue and other extraosseous sarcomas	80	7.1	7	113	7.2	6	193	7.2	6
Germ cell tumors, trophoblastic tumors, and neoplasms of the gonads	74	6.6	8	69	4.4	8	143	5.3	8
Other malignant epithelial neoplasms and malignant melanomas	94	8.3	6	97	6.2	7	191	7.1	7
Other and unspecified malignant neoplasms	29	2.5	12	41	2.6	11	70	2.6	11
Total	1128	100.0		1570	100.0		2698	100.0	

CNS: central nervous system

but our hospital is one of the primary reference centers that provide health services to patients from every location of our country, therefore it is capable of commenting on the commonly seen cancers in the population. Facts and figures about cancer incidence in our country can be achieved only by establishing cancer registry system in every hospital, and by serious work on this issue.

This study showed that the number of patients diagnosed with cancer at Hacettepe University Hospitals increased gradually each year; this number doubled by the end of the 9th year from the beginning. We claim that this increase is related both with an increase in cancer incidence, and also with a decrease in data leak. According to our data, the most common cancer types in men were lung, prostate, stomach, bladder, and colon cancers. The prevalent cancers in women were breast, ovary, uterine corpus, uterine cervix, and thyroid. Table 6 presents the results of some studies about the cancer incidence in Turkey and in the world. According to 2008 data in USA, 4 of our most frequent cancer types (lung, prostate, colorectal, and bladder cancers) were in common with our results [9]. Lung cancer rates were about 15% in both cohorts, and also, bladder and colorectal cancer rates were similar. But, prostate cancer rates in USA were nearly 2-fold higher than our rates. The most frequent cancers that had similar rates in USA and in the present study for women were breast and colorectal cancers. Breast cancer was the most prevalent cancer type for women in both cohorts, but our rates were slightly higher than the USA data (32.7 vs 26.0%).

IARC data for Turkey presented as most frequent cancer types and rates the lung (37.3%), stomach (9.6%), bladder (8.6%), colorectal (7.4%), and larynx (6.4%) tumors [2]. This data is consistent with our data except larynx cancer, which is substituted with prostate cancer in our patients. Also IARC suggested as most prevalent cancers for women in Turkey the breast (19.9%), colorectal (7.6%), stomach (5.7%), ovary (4.8%), and lung (4.7%) cancers. Breast and colorectal cancers were common between our and the IARC data, but with different rates and order.

The Izmir Cancer Registry (KIDEM) is the first population-based cancer registry study in our country for determining the cancer incidence in Izmir and surroundings [5]. According to this study the 5 most frequent cancer types were lung (38.6%), skin (7.1%), larynx (6.9%), bladder (6.8%), and stomach (5.2%) cancers in men and breast (26.7%), skin (8.8%), endometrium (6.5%), ovary (6.4%), and cervix (5.9%) cancers in women. When the results of this study were compared with our data, we found that 3 cancer types (lung, bladder and stomach) were common in men, and 2 cancer types (breast and gynecological cancers as a group) were common in women. There is a 10-year time gap between the two studies, but the

Table 6. National and International studies about the cancer incidence in Turkey and the USA

Hacettepe 2003-2011		KIDEM [5]		KETEM [6]*		SSK Okmeydani [7]		IARC Turkey		USA	
Most frequent cancers in men (%)											
Lung	15.5	Lung	38.6	Lung	51.9	Lung	36.1	Lung	37.3	Prostate	25.0
Prostate	13.4	Skin	7.1	Prostate	19.4	Colorectal	8.8	Stomach	9.6	Lung	15.0
Colorectal	9.1	Larynx	6.9	Skin	18.5	Stomach	7.2	Bladder	8.6	Colorectal	10.0
Stomach	6.6	Bladder	6.3	Bladder	15.3	Larynx	4.1	Colorectal	7.4	Bladder	7.0
Bladder	6.1	Stomach	5.2	Stomach	12.0	NHL	4.0	Larynx	6.4	NHL	5.0
Most frequent cancers in women (%)											
Breast	32.7	Breast	26.7	Breast	34.7	Breast	33.4	Breast	19.9	Breast	26.0
Gynecologic	19.4	Skin	8.8	Skin	14.9	Colorectal	8.9	Colorectal	7.6	Lung	14.0
Colorectal	6.4	Endometrium	6.5	Thyroid	7.2	Thyroid	6.6	Stomach	5.7	Colorectal	10.0
Thyroid	5.0	Ovarian	6.4	Lung	6.7	Ovarian	6.0	Ovarian	4.8	Endometrium	6.0
CNS	4.4	Cervix	5.9	Stomach	6.7	Endometrium	5.5	Lung	4.7	NHL	4.0

*Numbers presented as per 100,000.
NHL:Non-Hodgkin lymphoma, CNS:central nervous system, KIDEM:Cancer Registry of Izmir, Turkey, KETEM:Cancer Early Diagnosis, Screening and Education Center, SSK:Social Security Organization, IARC:International Agency for Research on Cancer, USA:United States of America

Table 7. Most frequent cancer types in childhood (%)

Hacettepe 2003-2011		KIDEM [5]		TPOG/TPHD [11]		SSK Okmeydani*[7]		USA	
CNS tumors	20.6	Leukemia	34.9	Leukemia	27.2	CNS tumors	40.8	Leukemia	31.5
Lymphomas	15.1	CNS tumors	16.3	Lymphomas	16.7	Bone	13.7	CNS tumors	20.2
Leukemia	14.4	Lymphomas	15.1	CNS tumors	11.6	Leukemia	10.7	Lymphomas	10.7
Retinoblastoma	9.3	SNS tumors	7.6	SNS tumors	10.6	STS	7.7	SNS tumors	7.8
SNS tumors	8.0	STS	7.0	Retinoblastoma	7.7	NHL	6.8	STS	7.0

*Original article reported the ratios in the 0-14 age group.
CNS:central nervous system,SNS:sympathetic nervous system,NHL:Non-Hodgkin Lymphoma, STS:soft-tissue sarcomas, KIDEM:Cancer Registry of Izmir, Turkey, TPOG:Turkish Pediatric Oncology Group, TPHD:Turkish Society of Pediatric Hematology, SSK:Social Security Organization, USA:United States of America

similarity of the results was notable.

The KETEM study (Cancer Early Detection and Treatment Education Center) evaluated the 8 databases of 12 cities with cancer registries based on active data acquisition. The KETEM database covered 20% of the national population, so it was postulated to represent the cancer incidence in Turkey [6]. According to the results of this study, the annual cancer incidence in our country is 167.7 per 100,000 (194 and 141 per 100,000 for men and women, respectively). The 5 most frequent cancer types were lung, prostate, skin, bladder, and stomach tumors, but colon and rectum tumors were presented as separate tumors in this study, and when the rates were combined, colorectal tumors took the 5th place with a rate of 13.5%. The most frequent cancers reported for women were breast, skin, thyroid, lung, and stomach cancers. The KETEM study also reported the cancer rates of Ankara city separately. When the skin cancers were excluded, the reported cancer types for men were correlated with our results. And, for women,

our results presented the gynecological tumors in the top 5 of the list, but KETEM study included only ovarian cancers.

The Cancer Control Department of the Ministry of Health reported the cancer statistics between 1995 and 1999 in their study [10]. According to this study, the most frequent cancers for men were similar with our results, but the data for women was different. Another study reported the cancer statistics of SSK Okmeydani Research and Training Hospital between 1999-2004 [7]. According to the result of this study, 55% of the patients were male, and the most frequent cancers were lung, colorectal, stomach, larynx and non-Hodgkin lymphoma for men, and breast, colorectal, thyroid, ovarian, and endometrial cancers for women.

The number of pediatric cancer cases was 200 in 2003, and this number reached 314 in 2011. Boys constituted the majority of the pediatric cases each year. The most frequent 3 cancer types in the pediatric age group between 2003 and 2011 were CNS tumors (20.1%), lymphomas (14.6%),

and leukemia (14.1%) and our results were consistent with previous studies [5,11]. The results of these studies are presented in Table 7. The Turkish Pediatric Oncology Group and the Turkish Pediatric Hematology Group reported as the prevalent types of childhood cancers leukemia (27.2%), lymphomas (16.7%), and CNS tumors (11.6%) [11]. Likewise, the Izmir Cancer Registry reported as the most frequent 3 types of childhood cancers leukemia (34.9%), CNS tumors (16.3%), and lymphomas (15.1%) [5]. USA data also reported as the most frequent cancers under 15 years of age leukemia (31.5%), CNS tumors (20.2%), and lymphomas (10.7%) [12]. As a conclusion, the rates of frequently seen cancers in childhood may vary, but the main diagnoses are generally similar.

The above-mentioned studies all reported similar age distribution. Cancer incidence increases with the age. The most frequent age group in our study were patients aged 55-64 years. This can be explained with the predominant cancer types seen in our study. Lung cancer and breast cancer generally peaks approximately in this age group. And, cancers that belong the older age groups are relatively rare, because our country has a young population.

Conclusion

Determination of the true incidence of cancer in our country will be only possible by renovation in the current cancer registry systems. Our suggestions at this point can be summarized as recruiting specialized human resources for cancer registry, using standardized forms for data collection through the country, centralization of the databases, and establishing preferably web-based networks for online data acquisition from Departments in a hospital to avoid recurrent records in a national manner. These efforts will provide guidance for planning health policies, and also a high-quality data for future cancer research.

References

1. Ries LAG, Melbert D, Krapcho M et al (Eds):SEER Cancer Statistics Rewiev, 1995-2004, National Cancer Institute. http://seer.cancer.gov/csr/1975_2004 (assessed on November 18, 2008).

2. http://www-dep.iarc-fr (Assessed on 31.03.2009)

3. Eaton L. World cancer rates set to double by 2020. Br Med J 2003;326:728

4. Pisani P, Parkin DM, Bray F, Ferlay J. Estimates of the worldwide mortality from 25 cancers in 1990. Int J Cancer 1999;83:18-29.

5. Fidaner C, Eser SY, Parkin DM. Incidence in Izmir in 1993-1994:first results from Izmir Cancer Registry. Eur J Cancer 2001;37:83-92.

6. www.ketem.org/istatistik2.php (Assessed on 31.03.2009)

7. Izmirli M, Altin S, Dernek BO, Unsal M. Cancer statistics of SSK Okmeydani Training and Research Hospitals Department of Oncology from 1999 to 2004. Turk Onkoloji Dergisi 2007;22:172-182.

8. Steliorova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer (3rd Edn). Cancer 2005;103:1457-1467.

9. Jemal A, Siegel R, Ward E et al. Cancer statistics, 2008. CA Cancer J Clin 2008;58:71-96.

10. Cancer Control Policy and Cancer Facts (1995-1999). Ministry of Health of the Republic of Turkey, Department of Cancer Control. MoH Publications #618, Ankara, Turkey, 2002.

11. Kutluk T. Cancer Burden 2006. Oncology 2006. Hacettepe University Institute of Oncology Annual Symposium, November 23-28, 2006, Ankara, Turkey.

12. http://seer.cancer.gov/publications/childhood/introduction.pdf