

Cancer incidence and mortality in Iran

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Background: Cancer is the third main cause of death in Iran. This report was provided for explaining cancer incidence and mortality.

Patients and methods: The National Cancer Registry reports from 2003 to 2006, population-based cancer registry reports from five provinces in 2006 and National Death Registry reports from 1999 to 2004 have been applied in this report.

Results: The age-standardized incidence rate of cancers was 98 and 110 per 100 000 among females and males. The male to female standard ratio was 1.12. The most common cancer among women and men was breast cancer (24) and stomach cancer (15), respectively. The estimated mortality rate for cancer was 41.1 and 65 per 100 000 for females and males in 2004.

Conclusion: The current low cancer incidence rates in Iran might be due to lack of national cancer screening programs for prostate, colorectal or breast cancer, a consequence of incomplete registration as well as incomplete diagnosis of cancer patients; it is expected that it will rise dramatically in the future because of anticipated increase in life expectancy and westernized lifestyle. The first priorities for health policy makers should be developing, establishing and implementing national cancer control; or else, the health system could not respond to the demands regarding to diagnosis, treatment and palliation for these patients in the future.

Key words: cancer, incidence, Iran, mortality

introduction

Cancer is the third cause of death in Iran after coronary heart disease, accidents and other phenomena. This article is the first report which explains the cancer incidence and mortality according to the National Cancer Registry (NCR) reports from 2003 to 2006, population-based cancer registry reports from five provinces in 2006 and National Death Registry (NDR) from 1999 to 2004 in Iran.

history of National Cancer Registration in Iran

The first cancer registry was established on 1967 in Babol city (North of Iran). Later, other activities started in Shiraz (in the center of Iran) and Cancer Institute of Tehran University has gathered paraffin blocks at least during 50 years, and a bank of these blocks has been saved in this Institute. Many specimens were not recruited because there were no sufficient pathology centers and the diagnosis was based on clinical or surgical tests. Therefore, the law of obligatory cancer registry and report was approved by The Islamic Consultative Assembly of Iran in October 1984. Accordingly, all physicians and related cancer

clinical agencies (Pathology and medical diagnosis laboratories) are obliged to complete the histology exam form with clinical, identity and demographic data. The executive plan of this law was designed by The Organization for Fighting Cancer in July 1986 and the first report of cancer registration in Iran was reported in 1986 [1]. In 1989, this organization was merged into Center for Disease Control and Prevention (CDC) and the responsibility for collecting and registering cancer cases was allotted to the Genetic and Cancer Bureau of CDC. In January 2000, the second report of cancer registry could register 17 765 cases in Iran [2]. The NCR is just a pathology center report [3]. The program, the method of registration and the cooperation of pathologists have been revised; the first standard report was provided in 2004 [4]; 38 468 cases were registered, this report registered 60% of new cancer cases. The second scientific report in 2005 [5] shows 47 217 cancer cases (70% of cases were registered) and the last report on 2006 [6] registered 55 855 new cases (81% of cases were registered). These completeness were estimated according to the reports on Cancer Incidence in Five Continents database which published by International Agency for Research on Cancer (IARC) [7].

history of NDR in Iran

The first NDR was conducted in four provinces of Iran with population of 4.4 millions in 1999 after successful pilot study in

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Bushehr province (South of Iran). After this experience, it was expanded to 10 provinces (with 16 millions people) in 2000, 18 provinces (36.8 millions) in 2001, 23 provinces (48 millions) in 2003 and 29 provinces (55.5 millions) in 2004 [8–12]. As there are 30 provinces in Iran, the statistics should be clarified up to date.

patients and methods

methods for National Cancer Registration

One registrar has been selected and trained from each deputy for health to register cancer cases. There are 41 Medical Universities in Iran. Deputy for health of each university is responsible for health issues of the population and all health activities are managed by these deputies. All deputies for health have been included in the NCR. Registrar would apply the national registration software which was developed by CDC. For pathologic centers, without software, the cancer records were gathered manually. The Cancer Office of CDC should provide techniques and funding supports. The data are transmitted every 3 months, by electronic file and also hard copy of 'Cancer Registry Data Collection Form'; this form is comprised of three parts: part I, regarding patient's identity characteristics in addition to the name of biopsy-taker physician, name of hospital, location of which the biopsy is taken, clinical diagnosis and date of biopsy sent to histological laboratory and demographic information of the patients includes race and residence. Part II includes the most important findings of patient's clinical history. Part III includes paraclinical findings. The information includes primary location of tumor, date of cancer diagnosis, morphology and histology and its behavior and diagnosis method. Physicians fill the form of clinical data and the official personnel fill the identity and demographic informations. Quality control has been coordinated in five main areas by Cancer Office of CDC: (i) regarding completeness of coverage; (ii) completeness of details; (iii) accuracy of data; (iv) accuracy of reports; (v) accuracy of interpretation and (vi) repeated cases are deleted from national data. Surveillance of pathology is based on the cancer record in several selected provinces to compare it with the present pathology cancer record for a general and complete evaluation and also for the accuracy of the collected data. IARC software (IARCCRGTOOLS_203) provides a way to identify inaccuracies in data coding. Accordance of The International Classification of Diseases for Oncology (ICD-OC: topography with ICD-OM: morphology) is done manually and also by considering age and sex groups (pathology file of fatal error has been revised by the

Scientific Society of Pathology of Iran and also by two masters in pathology).

Capture–recapture of data was carried out only for the national registry report in 2006. Since this process was the first experience on NCR, therefore it was restricted to the provinces with lower than 50% completeness of cancer registry report. The registrars from 11 provinces were retrained for this process, and then the data were captured again.

Some pretreatment training workshops have been established for cancer registry experts of the above provinces too. Then, some pathology centers reporting the most cases of cancers in above provinces were selected; all electronic files, sunken and books have been considered and its cancer cases were recounted according to idioms equal cancer. While reconsidering pathology reports for cancer cases extracts, all reports consisted one of the words or phrases related to cancer were registered as cancer cases.

Method for deleting repeated cases: for the lack of any classified National Identification Numbers, the process for deleting the repeated cases was completed by a manual review of the record. After editing data of each province and considering in mind that for deleting of repeated cases, similar cases should also be the same as morphology, topography, identity and demographic information; deletion of the repeated cases would be done separately in each province and finally in all over country by experienced manual reviewers. Direct adjustment method was used for computing the ASR. World population has been used as standard one.

Geographic Information System (GIS) plan (Geographic map of current cancers): the ASR of all cancers and 10 most common cancers have been mapped by using a GIS Arc View GIS 3.2a.

Population based cancer registry: five provinces have been selected according to the facilities for developing population-based cancer registry in 2006.

Method for National Death Registration: the death data were actively recorded from multiple resources (hospital, health centers, cemeteries, Legal Medicine Organization, the Organization for Life Registry). The process for deleting the repeated cases was the same as NCR ones. For garbage code, the data of hospital have been selected and other data have been deleted.

results

The total population of Iran was 66 485 342, 67 629 486, and it was increased to 68 856 536 people from 2003 to 2006. Looking

Table 1. Cancer registration procedure in Iran from 1986 to 2004

	Year of report					
	1986	1997	2000	2004	2005	2006
No. of total pathologic center/no. of pathologic center which the cancer records were gathered (coverage)	NA	NA	NA	625/584 (93.4%)	742/643 (86.8%)	779/769 (98.7%)
Total registered cancer cases/reported cancer cases after deletion of repeated cases and correction of data	18435 ^a	11025	17765	43014/38468	51518/47217	61031/55855
Percentage of total new cancer cases registered per total estimated cancer new cases	NA	18%	29%	60%	70%	81%
Percentage of flaws in coding forwarded cases from health deputies of medical universities of the country	NA	NA	44.3%	32.8%	31.6%	39.5%
Percentage of flaws in addresses	NA	NA	66.5%	39%	26.9%	22.1%
Percentage of flaws in names	NA	NA	0.1%	0%	0.01%	0.1%
Percentage of flaws in father names	NA	NA	55%	47.3 %	32.6%	28.3%
Percentage of flaws in age	NA	NA	5.8%	4.1%	3.2%	2.9%

^aRepeated cases were not defined in this annual report.

NA, not available.

Table 2. Age-standard incidence rate per 100 000 population in Iran according to primary site in 2003–2006

Topography	ICD-O	2003–2004								2004–2005								2005–2006							
		Number		Crude rate per 100 000		Percent		ASR per 100 000		Number		Crude rate per 100 000		Percent		ASR per 100 000		Number		Crude rate per 100 000		Percent		ASR per 100 000	
		Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
All sites	C00–C80	16849	21620	52.05	63.38	100%	100%	69.60	77.71	20473	26743	62.17	77.07	100%	100%	83.42	95.43	24495	31360	72.94	88.62	100	100	98.23	110.43
Lip and oral cavity	C00–C06	264	377	0.82	1.11	1.57%	1.74%	1.18	1.36	264	386	0.80	1.11	1.29%	1.44%	1.09	1.34	303	302	0.90	0.85	1.24%	0.96%	1.25	1.08
Parotid and salivary gland	C07–C08	65	92	0.20	0.27	0.39%	0.43	0.24	0.33	73	103	0.22	0.30	0.36%	0.39%	0.27	103	93	132	0.28	0.37	0.38%	0.42%	0.36	0.45
Pharynx and tonsil	C09–C13	125	206	0.39	0.60	0.74%	0.95%	0.50	0.69	152	228	0.46	0.66	0.74%	0.85%	0.60	0.83	172	300	0.51	0.85	0.70%	0.96%	0.66	1.07
Esophagus	C15	1093	1246	3.38	3.65	6.49%	5.76%	4.93	4.64	1192	1392	3.62	4.01	5.82%	5.21%	5.41	5.05	1428	1618	4.25	4.57	5.83%	5.16%	6.25	5.83
Stomach	C16	1166	3088	3.60	9.05	6.92%	14.28%	5.20	11.37	1439	3770	4.37	10.87	7.03%	14.10%	6.42	13.74	1624	4212	4.84	11.90	6.63%	13.43%	6.89	15.21
Colon and rectum	C18–C21	1269	1490	3.92	4.37	7.53%	6.89%	5.47	5.56	1558	1849	4.73	5.33	7.61%	6.91%	6.64	6.75	1801	2255	5.36	6.37	7.35%	7.19%	7.56	8.19
Liver	C22	106	150	0.33	0.44	0.63%	0.69%	0.43	0.55	103	180	0.31	0.52	0.50%	0.67%	0.43	0.66	95	196	0.28	0.55	0.39%	0.63%	0.37	0.68
Gall-bladder	C23–C24	219	127	0.68	0.37	1.30%	0.59%	0.99	0.46	270	172	0.82	0.50	1.32%	0.64%	1.18	0.59	305	211	0.91	0.60	1.25%	0.67%	1.31	0.78
Pancreas	C25	68	99	0.21	0.29	0.40%	0.46%	0.31	0.38	87	123	0.26	0.35	0.42%	0.46%	0.39	0.45	111	162	0.33	0.46	0.45%	0.52%	0.49	0.60
Larynx	C32	57	553	0.18	1.62	0.34%	2.56%	0.26	2.21	71	714	0.22	2.06	0.35%	2.67%	0.31	2.78	95	783	0.28	2.21	0.39%	2.50%	0.43	3.04
Lung	C33–C34	281	873	0.87	2.56	1.67%	4.04%	1.23	3.28	343	1163	1.04	3.35	1.68%	4.35%	1.51	4.38	484	1303	1.44	3.68	1.98%	4.15%	2.08	4.73
Hematology system	C42	677	1057	2.09	3.10	4.02%	4.89%	2.43	3.39	946	1550	2.87	4.47	4.62%	5.80%	3.26	4.85	1068	1730	3.18	4.89	4.36%	5.52%	3.76	5.48
Skin	C44	2296	3750	7.09	10.99	13.63%	17.35%	10.05	13.89	2779	4541	8.44	13.09	13.57%	16.98%	12.01	17.00	3162	5320	9.42	15.03	12.91%	16.96%	13.44	19.56
Breast	C50	3946	85	12.19	0.25	23.42%	0.39%	15.96	0.33	4557	126	13.84	0.36	22.26%	0.47%	18.24	0.49	5981	175	17.81	0.49	24.42%	0.56%	23.65	0.66
Cervix uteri	C53	394	0	1.22	0	2.34%	0	1.64	0	466	0	1.42	0	2.28%	0	1.90	0	469	0	1.40	0	1.91%	0	1.90	0
Corpus uteri	C54	359	0	1.11	0	2.13%	0	1.59	0	482	0	1.46	0	2.35%	0	2.09	0	561	0	1.67	0	2.29%	0	2.50	0
Ovary	C56	591	0	1.83	0	3.51%	0	2.34	0	736	0	2.23	0	3.59%	0	2.88	0	793	0	2.36	0	3.24%	0	3.04	0
Prostate	C61	0	1548	0	4.54	0	7.16%	0	5.70	0	2072	0	5.97	0	7.75%	0	7.24	0	2722	0	7.69	0	8.68%	0	9.41
Testis	C62	0	359	0	1.05	0	1.66%	0	1.05	0	481	0	0.24	0	1.80%	0	1.37	0	502	0	1.42	0	1.60%	0	1.44
Kidney	C64–C65	228	367	0.70	1.08	1.35%	1.70%	0.96	1.39	260	453	0.79	1.31	1.27%	1.69%	1.10	1.76	333	569	0.99	1.61	1.36%	1.81%	1.41	2.12
Bladder	C67	482	2263	1.49	6.63	2.86%	10.47%	2.12	8.35	579	2722	1.76	7.84	2.83%	10.18%	2.49	9.90	689	3247	2.05	9.18	2.81%	10.35%	2.92	11.53
Brain and CNS	C70–C72	365	580	1.13	1.70	2.17%	2.68%	1.26	1.88	476	737	1.45	2.12	2.33%	2.76%	1.64	2.37	496	761	1.48	2.15	2.02%	2.43%	1.71	2.51
Thyroid	C73	566	252	1.75	0.74	3.36%	1.17%	2.02	0.82	796	313	2.42	0.90	3.89%	1.17%	2.80	1.06	1004	356	2.99	1.01	4.10%	1.14%	3.54	1.19
Adrenal	C74	13	6	0.04	0.02	0.08%	0.03%	0.04	0.02	27	25	0.08	0.07	0.13%	0.09%	0.10	0.09	40	45	0.12	0.13	0.16%	0.14%	0.14	0.16
Other endocrine glands	C75	4	3	0.01	0.01	0.02%	0.01%	0.01	0.01	6	3	0.02	0.01	0.03%	0.01%	0.03	0.01	2	3	0.01	0.01	0.01%	0.01%	0.01	0.01
Lymph node	C77	446	809	1.38	2.37	2.65%	3.74%	1.49	2.52	593	926	1.80	2.67	2.90%	3.46%	1.94	2.94	725	1211	2.16	3.42	2.96%	3.86%	2.31	3.74

ASR, age-standardized incidence rate; CNS, central nervous system.

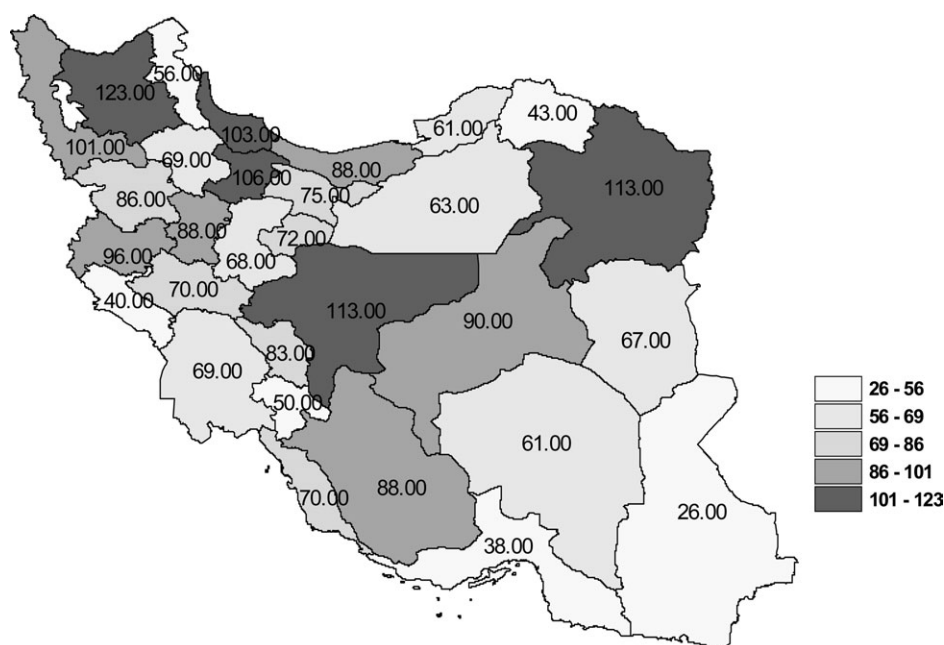


Figure 1. Age-standardized incidence rate of all cancers per 100 000 in male in Iran 2005–2006.

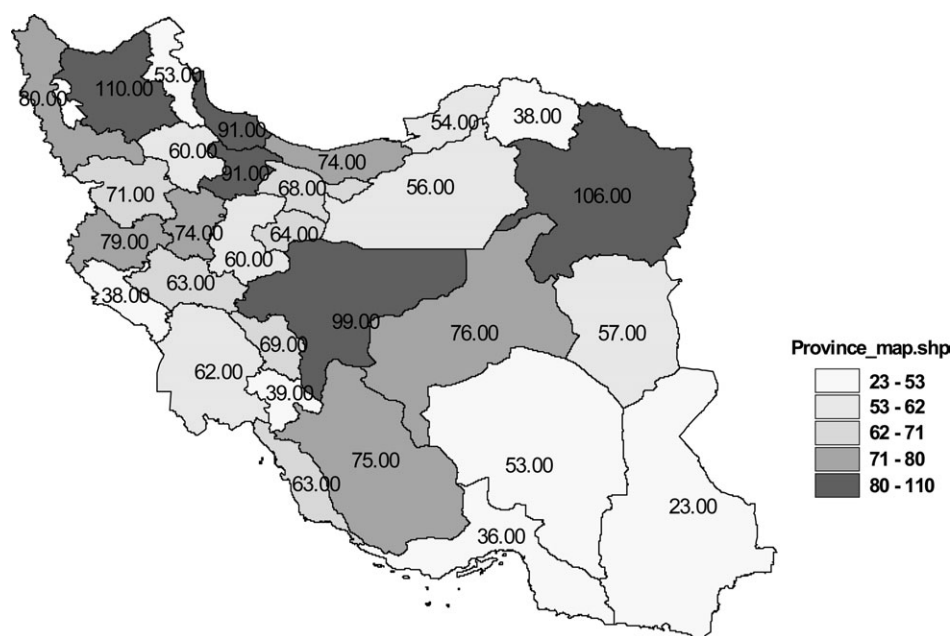


Figure 2. Age-standardized incidence rate of all cancers per 100 000 in female in Iran 2005–2006.

at the population pyramid in Iran, the children population (0–14 years old) decreased from 44.5% in 1976 to 25.1% in 2006 while the persons aged 65 and over increased from 3.5% to 5.2% in 2006 and moreover it is expected that the aged population will rise to highest number before 2050 [13]. Table 1 shows some indexes and history of NCR from 1986 to 2006. NCR program was developed and >98.7% of pathologic centers would send the data of cancers, and 55 855 cancer cases of cancer were registered after deleting the repeated cases from March 2005 to March 2006. This program could

recapture 3027 new cases in 11 provinces in this year. The ASR for cancers by sex are shown in Tables 2 and 4. The ASR of cancers was >98 and 110 per 100 000 among females and males in Iran. The crude sex ratio of cancer (male to female) was 1.28 and the standard ratio was 1.12; 56% of cases were males. The most common cancer among Iranian women was breast cancer (24 per 100 000) and among Iranian men was stomach cancer (15 per 100 000) besides skin cancer. Other most common cancers were colorectal (8 per 100 000), stomach (7 per 100 000) and esophagus (6 per 100 000) in

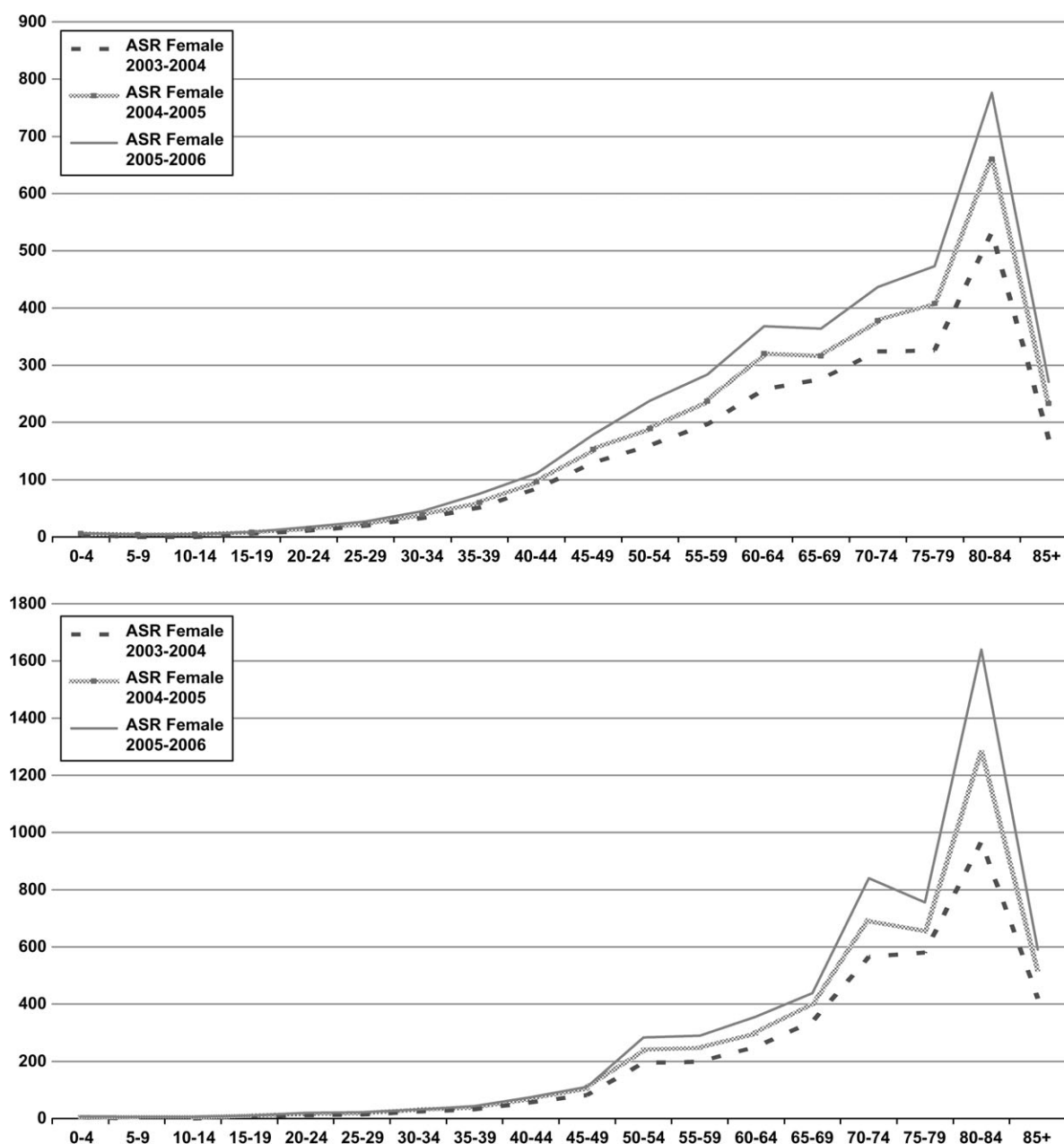


Figure 3. The age-standardized incidence rate of cancer per 100 000 population in female and male in 2003–2006.

females. Bladder (12 per 100 000), prostate (9 per 100 000), colorectal (8 per 100 000) and esophagus (6 per 100 000) were common cancers among males. The ASR of cancer in the north is more than in the south of Iran (Figures 1 and 2). Figure 3 plots the ASR of all cancers for women and men, respectively. The population-based cancer registry in five provinces found that 65%, 22.1% and 11.5% of total registered cancer cases were gathered from pathologic centers, other resources and death certificates, respectively. The maximum ASR was seen in Esfahan (136 per 100 000 in women and 153 per 100 000 in men). Because the data of NDR for 2004 were the most completed one, the summary of this report is shown in Table 3.

conclusion and discussion

This is the first national report of cancer incidence and mortality in Iran. The quality and quantity trends of NCR based on pathology reports had been developed and established during recent years. Pathology identification of cancer cases is limited because there might not be biopsy for liver, pancreas, lungs, ovary cancers, retinoblastoma and central nervous system tumors. The benefit of this method is that it is cost effective, practical and can be established easily in countries with limited resources. Mortality reports were not recorded in the NCR, but in the population-based cancer, which studies five provinces, it was considered and also the NDR registered it. The cases known for death certificate

Table 3. Cancer mortality in Iran in 2004–2005

Topography	No. of deaths in 29 provinces			Estimation deaths due to cancer for country			Estimation for cancer mortality rate per 100 000		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Stomach	1820	3547	5368	2792	5301	8106	8.4	15.5	12.0
Lung	806	2124	2930	1244	3219	4475	3.7	9.4	6.6
Liver	793	1299	2093	1235	1939	3178	3.7	5.7	4.7
Leukemia	2581	1410	3735	1405	2108	3515	4.2	6.1	5.2
Brain, menange and other parts of central nervous system	532	666	1198	819	1004	1824	2.5	2.9	2.7
Colon	286	447	733	450	680	1131	1.3	1.8	1.5
Esophagus	524	795	1319	818	1210	2030	2.4	3.5	3.0
Prostate	0	1001	1001	0	1550	1557	0.0	4.5	2.3
Breast	727	24	751	1099	38	1132	3.3	0.1	1.7
Larynx	223	482	705	326	704	1032	1.0	2.0	1.5
Bladder	98	372	470	157	579	738	0.5	1.7	1.0
Lymphoma and Hodgkin	104	197	301	167	291	459	0.5	0.8	0.7
Pancreas	121	189	310	190	284	475	0.6	0.8	0.7
Skin	83	159	242	130	256	386	0.4	0.7	0.6
Lip and oral cavity	48	73	121	74	106	181	0.2	0.3	0.2
Kidney	77	142	219	119	213	333	0.4	0.6	0.5
Cervix	218	0	218	326	0	325	1.0	0.0	0.5
Multiple myeloma	27	51	78	42	74	116	0.1	0.2	0.2
Other section of Uterus	146	0	146	229	0	228	0.7	0.0	0.3
Ovary	129	0	129	205	0	204	0.6	0.0	0.3
Small intestine	254	440	694	377	623	1001	1.1	1.8	1.5
Bone and cartilage	91	177	268	137	270	408	0.4	0.8	0.6
Testis	0	21	21	0	34	34	0.0	0.1	0.1
Thyroid	47	41	88	71	59	130	0.2	0.2	0.2
Adrenal	4	6	10	6	9	16	0.0	0.0	0.0
Other endocrine system	38	48	86	52	73	125	0.2	0.2	0.2
Other malignancies	565	825	1391	877	1223	2103	2.6	3.6	3.1
Total	10342	14536	24625	13347	21847	35242	41.1	65.0	53.3

Table 4. Population-based cancer registry report in five provinces of Iran in 2005–2006

Province	Population in 2005–2006	Records from pathologic centers		Records from other resources		Death certificate only		Total registered cases of cancer	Age-standardized rate all sites	
		n	%	n	%	n	%		Female	Male
Ardebil	1 260 000	415	38.04	216	19.8	369	23.82	1091	97.87	126.50
Esfahan	4 008 234	3772	74.92	1164	23.12	99	1.97	5035	135.56	153.22
Kerman	2 001 874	1186	63.73	671	36.06	4	0.21	1861	94.37	102.40
Golestan	1 622 879	1165	67.34	319	18.44	222	12.83	1730	126.62	145.88
Lorestan	1 736 179	880	54.02	142	8.72	607	37.26	1629	108.28	131.33
Total	10 629 166	7418	65.38	2512	22.14	1301	11.47	11346	NA	

NA, not applicable.

were very different among provinces in population-based cancer registry, and therefore, these registry completeness were very different; it might be due to the first experience on this method, lack of an computerized system for death registry and unique identification number and the beginner registrars.

NCR did not provide the staging of tumors. The data of NCR and NDR had some discrepancies; breast, liver and lungs are

some examples. It might be due to incorrect registry of death causes.

Age distribution of all cancers as shown in Figure 3 represent that by increasing the ages, the incidence rate increases logarithmic, the incidence rate of the age group 75–79 is two times more than the age group 80–84 and after that it decreases significantly. The precipitous fall in age standard incidence rates after 80 years may be due to limited health care among

older persons in Iran. This may also be a survivorship effect. However, this shows some health disparities or neglected for this age group probably.

There are no national programs for screening of prostate, colorectal or breast cancer; therefore, the incidence rate of these cancers might be more than these registered data.

According to the population-based studies in the north of Iran, the ASR for all cancers in males and females were 132–156 and 96–136 per 100 000 among males and females, respectively [14–16]; the details are shown in Table 4. This difference with the NCR might be due to the method of registry and difference to the site (only north of Iran).

The incidence of all cancer in Iran is compared with those published especially in Asia: the ASR for cancer from 1998 to 2002 in Pakistan was 96–134.2 and 91–100.3 per 100.000 in males and females [17, 18]. These report shows the ASR is close to Iranian one but the most common malignancies in males were different between two nations, in which lymphoma and oral cavity were the most common cancers in Pakistan. The ASR of all cancers in Jordan was 112.5 per 100 000 for males and 112.6 per 100 000 for females in 2004 [19]; among male, the colorectal cancer was reported the most common cancers that is different from NCR in Iran. The other reports in Arab countries show the difference between ASR from 90 to 180 among males and 90 to 160 among females [20]. There are five population-based cancer registries in Thailand in different regions of the country. The ASR was 149.2 and 125.0 per 100 000 populations in men and women, respectively [21]. At the relatively isolated Nanao Island in South China Sea, during 1995–2004, the annual average ASR of malignant tumors was 208.2 per 100 000 [22].

The overall incidence rate of childhood cancer in Tehran was 176 per 1 000 000 children under 15 years of age [23]; NCR reported 15.9 and 18.8 per million in females and males, respectively, and this underreporting might be due to many childhood hematologist oncologists diagnose the cancers without sending the specimens to pathologic centers. International patterns of childhood cancer incidence are well documented but equivalent information relating to adolescents is scarce. An article synthesized international data about adolescents from population-based cancer registries. Total incidence ranged from 95 to 255 per million person-years in the series studied [24].

As the final note, it should be defined; the prevalence of cancer risk factors is high in Iran and its trend is growing up [25] and because of increasing life expectancy and increase in the numbers of old-aged people, it is expected that in the future, the numbers of cancer cases will rise rapidly in Iran. Development, establishment and implement of Comprehensive National Cancer Control Program [26] should be the first priorities for health policy makers; or else, in the two future decades the incidence rates of cancer will be increased dramatically, and the health system could not response the demands regarding diagnosis, treatment and palliation. Fortunately, it would be defined, based on the data of NCR; the Comprehensive National Cancer Control Program has been developed and implemented in five provinces as a pilot for national level in early 2007 [27].

funding

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