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Original Article

Cancer Incidence in Tehran Metropolis: The First Report from the Tehran Population-Based Cancer Registry, 1998 – 2001

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Background: There are no population-based data available for cancer in Tehran, a city that includes almost 10% of the Iranian population. This is the first report of cancer incidence in Tehran from a population-based cancer registry for the period of 1998 – 2001.

Methods: The cancer registry collects data on all new cases of cancer diagnosed in the resident population of Tehran metropolitan area. Data collection is active and trained abstractors visit close to 120 data sources comprising cancer diagnostic laboratories, secondary- and tertiary-care hospitals, and imaging centers to abstract cancer cases.

Results: During the period of 1998 – 2001, a total of 34,318 eligible cases were abstracted of which 24% were identified just by death certificates. The overall age-standardized rates (ASR) (adjusted to the world population structure) were 163.0 per 100,000 males and 141.8 per 100,000 females. The most frequently reported malignancies in males were stomach cancer (ASR 19.8), followed by cancers of the prostate (ASR 15.6), lung (ASR 14.9), bladder (ASR 13.3), non-Hodgkin's lymphoma (ASR 7.1), and esophagus (ASR 6.8). In females, the most frequently reported malignancies were breast cancer (ASR 31.4), followed by cancers of the stomach (ASR 10.0), lung (ASR 7.0), ovary (ASR 6.8), and esophagus (ASR 5.3).

Conclusion: The data reported by the Tehran Cancer Registry provide information on the cancer profile in Tehran metropolitan area. It clearly shows the breast and stomach, prostate, and tobacco-related cancers as major cancer in this population. The observed cancer rates indicate *that Helicobacter pylori* eradication, tobacco control measures, and early detection of breast cancer are of importance for cancer control in this population.

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Keywords: Cancer incidence • Iran • population-based cancer registry • Tehran

Introduction

Cancer registration activities in Iran date back to 1968 when the first cancer registry (called the Babol Registry) was launched as a collaborative research agreement between the International Agency for Research on Cancer (IARC) and the Institute for Health Research affiliated to the School of Public Health of Tehran University of Medical Sciences, in order to study the high incidence of esophageal cancer in Mazandaran Province. By 1971, the Babol Registry had expanded its activities to cover the entire area of the Caspian Littoral (from north of Khorasan Province to north of East Azerbaijan Province). This registry was able to generate population data from 1968 – 1979. The Babol Registry ceased its activities in 1979, and then in 1991 started to collect cancer data from local treatment and diagnostic facilities. Along with the Babol Registry, another population-based cancer registry, called the Fars Registry, was established in Fars Province (central Iran) in 1976 and its

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activities were expanded to the neighboring provinces of Bakhtaran and Khuzestan. The activities of the Fars Registry were limited to the registration of histopathologically confirmed cases referred to the pathology departments or radiotherapy facility of Shiraz University of Medical Sciences. The Fars Registry continued publishing cancer frequency data without reference to a defined population until recently.[1,2] In 1984, the national house of representatives passed a bill that mandates reporting cancer cases to the Ministry of Health and Medical Education; however, due to the lack of a functional system to enforce this regulation, no morbidity or mortality data were generated. In 1993, the Cancer Institute of Tehran University of Medical Sciences, with a grant from the Ministry of Health and Medical Education, initiated a cancer registry campaign to assist public health authorities in different regions of the country in the establishment of regional population-based cancer registries. This campaign resulted in a series of activities in different regions, including a collaborative research agreement with the IARC, to establish a population-based cancer registry covering the population residing in the Tehran metropolitan area. The established registry, called Tehran Population-Based Cancer Registry (TPCR), has been operating since then, and this paper reports the result of the first four years of the registry's activities.

Materials and Methods

The Tehran metropolitan area is part of Tehran Province located on the southern slopes of the Alborz Mountains at a latitude of 35° 45′ N and a longitude of 51° 25' E. The Tehran metropolitan area is divided into 22 municipal districts. The northernmost side is contiguous with the town of Shemiran, and the southernmost side with the town of Rey and Eslamshahr. A total of close to 120 general and tertiary healthcare facilities, including hospitals, day clinics, and specialized clinics provide a wide range of medical services to the residing population within the city, as well as cases referred from all over the country. Most of the hospitals have surgery units, but there are only 30 specialized cancer chemotherapy units and specialized cancer hospitals providing radiotherapy services. The population residing in the catchment area of the registry is mainly an urban population with a small portion considered to be rural (some areas of the Shemiranat includes suburban and rural areas). The population is young; more than 42% of the population is under 15 years of age and only 13% are over 50 (Figure 1). Iran has six different ethnic groups (Persian, Turk, Kord, Lur, Baluch, and Arab) scattered throughout the country. The Tehran population consists of immigrants from all over the country (all ethnic groups) who have immigrated and settled in the Tehran metropolis during the last 50 to 60 years.[3] Therefore, the majority of the population of Tehran consists of immigrants from the different ethnic groups of Iran. Although the proportion of each ethnic group has not been determined, it is fairly proportional to the total population of each ethnic group in the country, mostly Persian and Turk. The population is heterogeneous in terms of social classes. Different social classes are geographically distributed over the 22 districts of the Tehran metropolis: the upper class mainly lives in the northern part of the city and lower classes are primarily in the southern and southeastern parts of the city. Currently, the registry does not attempt to draw the distribution of cases according to districts or social classes; however, this is a potentially achievable goal in the future activities of the registry.

The registry's data collection is active. Trained data abstractors are referred to diagnostic and treatment centers and facilities to obtain information about cancer cases referred to the facility. The abstractors are all medical technologists with at least two years of academic training in the field of medical technology. In addition, each abstractor is given *ad hoc* training before she/he is sent to abstract cancer cases. Data about cancer patients are collected mainly from three sources: 1) pathology departments, 2) medical record departments in hospitals (including diagnostic imaging departments and outpatient

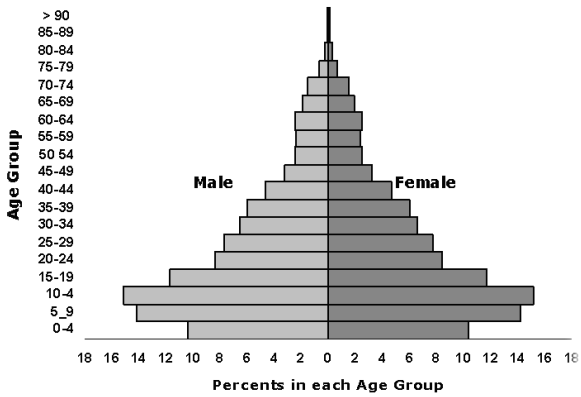

Figure 1. The population pyramid of the registry's catchment area.

clinics), and 3) Tehran Cemetery Death Certificate Records.

Generally, the abstractors visit hospitals every six months. Hospitals with few cases may be visited only once a year. To include cases reported using the death certificate records, databases of all death certificates with cancer as the cause of death (based on the ICD 9 coding system) are retrieved from the main Tehran Cemetery Office and electronically linked to the TPCR databases. Deaths due to cancer (without any record in the registry) are considered eligible incidence cases and registered as Death Certificate Only (DCO) cases.

The registry uses the ICD-O coding system. All cases are coded according to the ICD-O-2 (prior to 1999) and to the ICD-O-3 (after 1999) coding systems. The ICD-O coding of a case is done either by the pathologist issuing the original pathology diagnosis report or by a trained pathologist working with the registry. The registry pathologist controls the codes assigned by the issuing pathologist to increase the reliability of the coding practice.

Results

During the first four years, 107,000 cases of cancer were registered in the TPCR. Of these, close to 18,000 cases were eliminated due to duplication (cases accessioned more than once from different facilities). Of the remaining cases, 26,006 met a combination of criteria confirming that they belonged to the population at risk (the population living in the catchment area); the rest were referral cases seeking diagnostic or treatment services in Tehran. Identifying patients from the catchment area was based on several criteria, including having a residency address or a telephone number within the area code of the catchment area, being born in Tehran, and having no residency address or telephone number outside Tehran. From the mortality report, a total of 15,853 cancer death records were retrieved from the Tehran Cemetery Database for the 1998 – 2001 period. Linking the Tehran Mortality Database and the Cancer Registry Database lead to 7,541 incidence cases in the database, which were then eliminated from the incidence calculation. The remaining 8,312 mortality cases were treated as DCOs and were included in the incidence estimation. Of the total cases, 72% were diagnosed on the basis of microscopic verification by histology or cytology; 24% of cases were registered on the basis of information from DCOs; and 4% were diagnosed on the basis of clinical, biochemical, endoscopic, or radiologic examination findings. The distribution of methods of diagnosis by major topographic site is shown in Table 1. The proportion of cases identified as DCOs exceeded 20% for poor prognosis sites such as stomach, esophagus, pancreas, and lung. Excluding the DCO cases, the proportion of ill-defined or unknown primary cases were 5.4% for males and 5.5% for females.

The total number of cases by site (ICD 10), the percentage distribution, age-specific rates, crude rate, and age-standardized rate (ASR) for males and females are given in Tables 2 and 3. The ASR for all cancers combined was 163 per 100,000 males and 142 per 100,000 females. The most frequently reported malignancies in males were stomach cancer (ICD 15) (11.4% of all cases, ASR 19.7) followed by prostate cancer (ICD 61) (8.5%, ASR 15.6), trachea and lung (ICD 33 – 34) (8.6%, ASR 14.9), bladder (ICD 67) (7.6%, ASR 13.3), non-Hodgkin's lymphoma (ICD 82 – 85, 96) (4.9%, ASR 7.1), and esophagus (ICD 16) (3.9% of all cases, ASR 6.8). The most frequently reported cancer sites in females were breast (ICD 50) (22.7% of total cases, ASR 31.4), followed by stomach (ICD 15) (6.5%, ASR 10.0), trachea and

Table 1. The percent of DCOs for major cancer sites.

Site	No. of registered incidence cases	No. of DCOs	% of DCOs
Esophagus	947	323	25.4
Stomach	1991	1161	36.8
Colon	1230	186	13.1
Trachea and lung	1272	1061	45.5
Breast	3005	667	18.2
Pancreas	302	312	51.0
Bladder	1583	219	12.2
Non-Hodgkin's lymphoma	1301	173	11.7
All sites combined	**26006**	**8312**	**24.2**

Table 2. Relative frequency (%), age-specific rates, average annual crude incidence rates, and age-standardized incidence rates (ASR) by site in women in Tehran metropolis, 1998 – 2001.

Site	No.	%	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75+	Crude	ASR	ICD10 Codes
Oral cavity	270	1.7	0.0	0.5	0.8	1.8	3.6	5.6	12.9	24.2	1.9	2.4	C00-C08
Pharynx	104	0.7	0.0	0.3	0.4	1.3	1.9	2.2	3.7	1.5	0.7	0.9	C09-C113
Esophagus	541	3.4	0.0	0.0	0.1	1.6	5.6	19.4	40.9	46.5	3.8	5.3	C15
Stomach	1033	6.5	0.0	0.1	1.2	4.0	11.9	29.6	66.4	114.8	7.2	10.0	C16
Colon	656	4.2	0.0	0.1	1.2	4.5	11.6	19.7	33.7	40.2	4.5	6.1	C18
Rectum	377	2.4	0.0	0.1	1.3	3.0	6.1	11.0	17.8	21.8	2.6	3.4	C19-C20
Anus &anal canal	37	0.2	0.0	0.0	0.1	0.1	0.7	1.6	1.4	2.4	0.3	0.4	C21
Liver & intrahepatic bile ducts	336	2.1	0.2	0.1	0.3	1.2	3.3	8.0	21.0	44.1	2.3	3.2	C22
Gallbladder	165	1.0	0.0	0.0	0.2	0.5	1.9	4.3	12.1	17.4	1.1	1.6	C23-C24
Pancreas	263	1.7	0.0	0.0	0.1	0.5	3.6	7.3	15.7	36.3	1.8	2.6	C25
Larynx	95	0.6	0.0	0.0	0.1	0.3	2.0	2.7	4.1	10.2	0.7	0.9	C32
Trachea and lung	735	4.7	0.0	0.2	0.7	3.2	10.6	19.8	45.8	71.7	5.1	7.0	C33-C34
Bone	271	1.7	1.2	2.2	1.1	1.2	1.7	3.0	6.9	11.6	1.9	2.1	C40-C41
Malignant skin melanoma	79	0.5	0.0	0.1	0.1	0.6	0.6	1.5	4.7	10.7	0.5	0.7	C43
Other malignant skin neoplasms	619	3.9	0.0	0.2	0.6	2.4	11.5	17.8	36.0	52.8	4.3	6.0	C44
Connective &soft tissue	239	1.5	0.6	1.4	1.6	1.2	3.4	3.7	5.5	7.3	1.7	1.9	C47+49
Breast	3579	22.7	0.0	0.5	9.5	41.9	97.4	92.5	95.6	101.3	24.8	31.4	C50
Cervix uteri	514	3.3	0.0	0.0	0.8	4.6	9.8	16.8	22.3	28.6	3.6	4.8	C53
Ovary	731	4.6	0.2	1.8	2.6	4.6	13.4	21.7	28.6	29.6	5.1	6.5	C56
Other female genitals	411	2.6	0.0	0.1	0.6	3.0	8.2	14.6	20.4	13.1	2.8	3.8	C51-C52, C57-C58, C54, C55
Kidney	193	1.2	0.5	0.1	0.2	1.3	2.5	6.5	9.4	4.8	1.3	1.7	C64-C65, C66,C68
Bladder	390	2.5	0.0	0.1	0.3	0.7	3.0	12.1	24.7	57.7	2.7	3.8	C67
Brain, nervous system	577	3.7	1.8	2.3	2.6	5.6	8.7	9.1	11.6	12.1	4.0	4.5	C70-C72
Thyroid gland	361	2.3	0.1	1.2	2.5	4.6	6.5	5.8	6.3	8.7	2.5	2.8	C73
Hodgkin's disease	179	1.1	0.2	2.2	1.5	1.4	0.9	1.4	2.5	2.9	1.2	1.2	C81
Non-Hodgkin's lymphoma	574	3.6	0.6	2.1	2.3	4.1	6.7	12.3	24.1	28.1	4.0	4.8	C82-C85 & C96
Multiple myeloma& malignant plasma cell neoplasm	138	0.9	0.0	0.0	0.2	0.9	2.7	4.5	6.9	7.8	1.0	1.3	C90
Lymphoid leukemia	238	1.5	2.3	1.2	0.5	0.7	1.6	2.2	5.1	5.8	1.7	1.8	C91
Myeloid leukemia	530	3.4	1.3	2.5	2.4	3.2	6.5	7.6	14.5	33.9	3.7	4.3	C92-C94, C95
Others and unspecified* **	1538	9.8	1.4	1.5	3.7	7.0	21.0	39.5	76.8	133.7	10.7	14.0	****
All sites	15773	100	11	21	39	111	269	404	678	982	109	141.8	
All sites but skin	15154	96	11	21	39	108	257	386	642	929	105	135.8	

*** C17, C30-C31, C37-C39, C45-C46, C69, C74-C75, C26, C39, C48, and C76-C80.

lung (ICD 33 – 34) (4.7%, ASR 7.0), ovary (ICD 56) (4.6%, ASR 6.5), colon (ICD 18) (4.2%, ASR 6.1), and esophagus (ICD 16) (3.4% of all cases, ASR 5.3). Tobacco-related cancers of oral cavity and pharynx, larynx, esophagus, lung, urinary bladder and kidney, constituted 27.6% of the total male cancers, while in females they accounted for only 13.5% of cases.

The age-specific rates of the three most frequent sites among males are presented in Figure 2; the rate increases sharply and quite evenly between the ages of 50 and 75. After 75, the rate of prostate cancer continues to increase and exceeds 350 cases per 100,000 population. In females, the age-specific rates of major sites (breast, ovary, and stomach) show a different pattern (Figure 3). The rate for breast cancer increases between the ages of 35 and 55 where it comes to a plateau. The ovarian cancer rate presents a different age-specific pattern; a steady increase between the ages of 45

Table 3. Relative frequency (%), age-specific rates, average annual crude incidence rates, and age-standardized incidence rates (ASR) by site in men in Tehran metropolis, 1998 – 2001.

Site	No.	%	0–14	15–24	25–34	35-44	45–54	55–64	65–74	75+	Crude	ASR	ICD10 Codes
Oral cavity	299	1.6	0.0	0.1	0.6	0.9	4.3	7.8	15.0	28.1	2.0	2.6	C00-C08
Pharynx	213	1.1	0.0	0.3	0.6	1.8	4.1	6.0	7.0	4.9	1.4	1.7	C9-C13
Esophagus	729	3.9	0.0	0.0	0.5	2.2	6.2	17.2	48.5	96.1	4.8	6.8	C15
Stomach	2119	11.4	0.0	0.3	1.4	5.6	18.6	52.0	145.2	267.7	14.0	19.7	C16
Colon	760	4.1	0.0	0.2	1.2	4.1	11.5	19.0	39.6	61.0	5.0	6.7	C18
Rectum	498	2.7	0.0	0.0	1.1	3.2	7.3	13.8	21.6	39.4	3.3	4.3	C19-C21
Liver &intrahepatic bile ducts	416	2.2	0.1	0.2	0.3	1.3	4.8	9.7	26.7	45.9	2.7	3.8	C22
Gallbladder	122	0.7	0.0	0.0	0.0	0.3	2.2	2.6	7.8	12.4	0.8	1.1	C23-C24
Pancreas	351	1.9	0.0	0.0	0.1	0.5	3.5	10.8	22.6	42.6	2.3	3.3	C25
Larynx	580	3.1	0.1	0.0	0.0	1.4	8.6	18.9	35.8	45.3	3.8	5.3	C32
Trachea and lung	1598	8.6	0.0	0.3	0.7	3.7	14.3	42.4	104.1	205.1	10.5	14.9	C33-C34
Bone	364	2.0	1.3	3.3	1.6	1.2	2.7	4.3	7.4	14.0	2.4	2.6	C40-C41
Malignant melanoma of skin	100	0.5	0.0	0.0	0.2	0.6	1.1	1.9	5.1	10.8	0.7	0.9	C43
Other malignant neoplasms of skin	1138	6.1	0.2	0.2	0.9	3.7	15.8	33.3	58.2	119.3	7.5	10.4	C44
Connective and soft tissue	346	1.9	0.7	2.0	1.7	2.2	3.6	5.3	8.5	10.3	2.3	2.5	C47+49
Prostate	1570	8.5	0.0	0.0	0.0	0.3	2.9	25.6	117.1	365.5	10.3	15.6	C61
Other male genitals	292	1.6	0.3	1.3	4.5	3.1	2.1	1.7	2.3	1.6	1.9	1.8	C62, C60, C62, C63
Kideny	358	1.9	0.4	0.1	0.0	1.2	5.7	9.8	20.3	22.1	2.4	3.2	C64-C66 & C68
Bladder	1412	7.6	0.0	0.3	0.7	3.6	12.5	32.5	90.8	207.8	9.3	13.3	C67
Brain, nervous system	807	4.4	2.3	2.5	4.3	6.0	9.2	14.0	19.7	18.4	5.3	6.0	C70-C72
Thyroid gland	134	0.7	0.0	0.4	1.0	0.8	2.2	2.8	3.4	5.4	0.9	1.0	C73
Hodgkin's disease	312	1.7	0.8	2.4	2.3	2.8	2.7	3.3	2.8	4.3	2.1	2.1	C81
Non-Hodgkin's lymphoma	900	4.9	1.6	2.8	3.4	5.3	9.6	16.5	29.6	58.8	5.9	7.1	C82-C85 & C96
Multiple myeloma & plasma cell neoplasm	191	1.0	0.0	0.1	0.0	0.9	2.6	6.7	11.0	9.2	1.3	1.7	C90
Lymphoid leukemia	386	2.1	3.4	2.4	0.5	1.0	2.3	4.0	7.4	9.7	2.5	2.8	C91
Myeloid leukemia	712	3.8	1.3	3.1	3.0	4.1	5.8	10.1	22.2	61.5	4.7	5.6	C92-C95
Others and unspecified	1838	9.9	1.4	1.7	2.9	9.0	21.8	41.3	92.1	171.7	12.1	15.9	***
All sites	18545	100	14	24	33	71	188	413	972	1939	122	163.0	
All sites but skin	17407	94	14	24	32	67	172	380	914	1820	115	152.5	

*** C17, C30-C31, C37-C39, C45-C46, C69, C74-C75, C26, C39, C48, and C76-C80.

and 75 years with a sharp increase after 60. The stomach cancer age-specific rate increases with age and tends to plateau at older age.

The ASR of major cancer sites in males and females from another population-based cancer registry in Iran[4] (Ardabil) as well as neighboring countries of Pakistan,[5] Turkey,[6] and Kuwait are given in Tables 4 and 5. Among males, after Ardabil, Tehran Registry reports the highest incidence of stomach cancer among the neighboring countries. A moderate incidence of breast and low incidence of cervix cancer in Tehran is similar to those of Kuwait and Turkey. Among other major sites, except prostate and bladder that are higher in Tehran, other cancer sites are similar in terms of magnitude of reported incidence.

Discussion

Cancer incidence data from a well-defined population of Iran are reported. In this context, it is important to consider the quality of data in terms of completeness and validity. The high proportions of DCO cases in our data indicate a certain degree of problems with data quality and possibly a certain degree of under-ascertainment as well. DCO shows that no information about the methods used to diagnose the cancer was available. A high proportion of DCO's in our registry is similar to the registries of short duration activities in developing countries[7,8] and normally this proportion declines as the registration methods further stabilize in coming years. We observed a low proportion of ill-defined or unknown primary sites in our data compared with registries that report theirs such as Kolkata, India.[7] This may be due to the widely available diagnostic facilities in Tehran or sensitivity on the part of clinicians to establish an accurate diagnosis.

Stomach cancer is the most frequent cancer in males and second to breast in the female population in Tehran. Iran has the highest rate of stomach cancer among the countries of the Middle

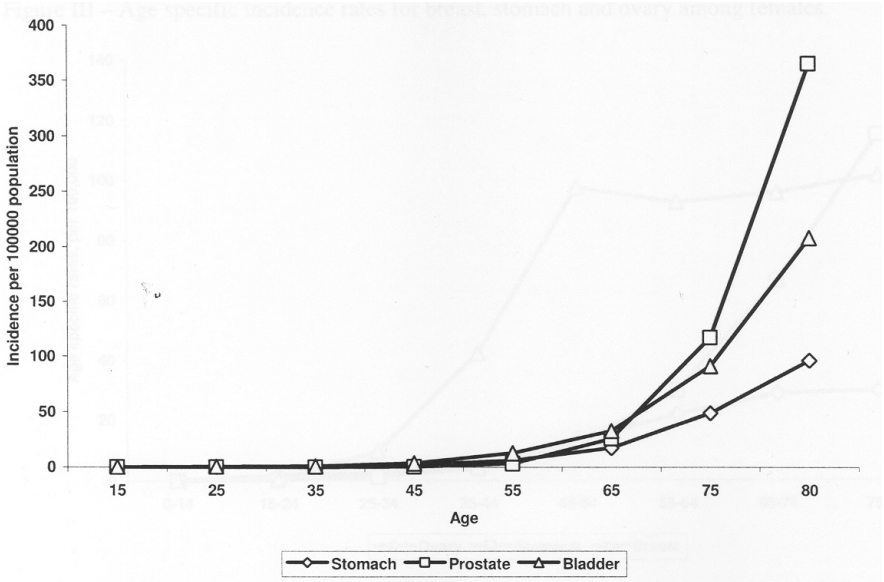

Figure 2. Age specific cancer incidence rates for the stomach, prostate and bladder among males.

East (Tables 4 and 5) that report population-based cancer registry data. *H. pylori* infection is considered to be an important carcinogen. The prevalence of *H. pylori* in Iran was reported to be 90% among the general population.[9] Infection occurs in childhood so that by the age of two years,[10] close to 98% are infected indicating a long and lasting chronic exposure to the infection. The variation in gastric cancer mortality and morbidity suggests that they are influenced largely by environmental factors rather than genetic background; intake of salted food,[11] nitrates,[12] and smoking are associated with risk of gastric cancer.[13] Which factor contributes more to the high incidence of gastric cancer in our population needs further epidemiologic studies and is an important area of research for future studies.

The incidence of esophageal cancer is moderately high in Tehran population. Iran is located in the esophageal cancer belt of Asia[14,15] and the Iranian Turkmen living in the eastern part of the Caspian Littoral experience a high rate of esophageal cancer; as high 100 cases per 100,000 population.[16,17] There is some indication that in recent years, the incidence has declined in high-risk areas as well as low-risk areas of other parts of Iran.[17–19] Several studies addressing the etiology of esophageal cancer in the high-risk population of ethnic Turkmen have indicated that dietary factors (low consumption of fruits and vegetables), poor hygiene, as well as consumption of opium byproducts are possible risk factors contributing to

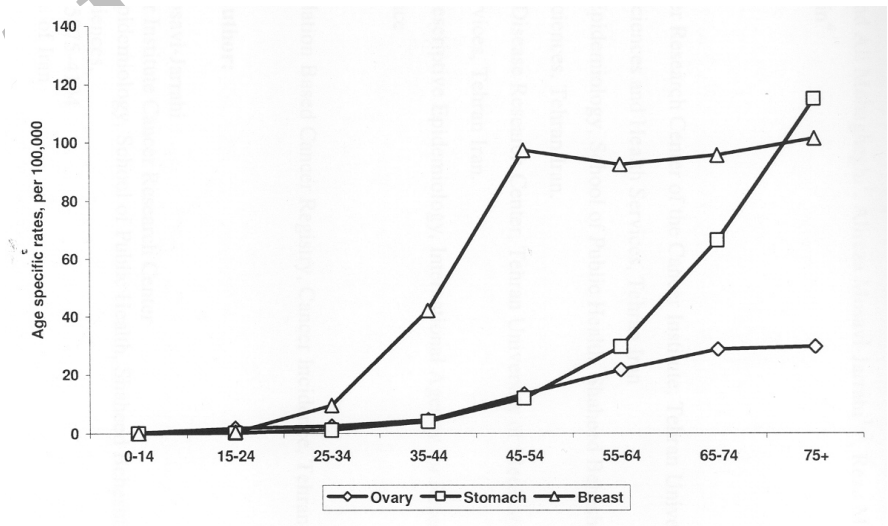

Figure 3. Age specific cancer incidence rates for the breast, stomach and ovary among females.

Table 4. Age-standardized incidence rates of major cancer sites in females in Iran and neighboring countries.

Site	Ardabil, Iran	Tehran, Iran	Karachi, Pakistan	Izmir, Turkey	Dubai, Kuwait
Esophagus	14.4	5.3	6.5	0.4	2.5
Stomach	25.4	10	2.8	0.8	4.8
Bronchus and lung	3.6	7	2.9	5.1	9.2
Breast	7.6	31.4	51.7	24.4	32.8
Cervix	0.4	4.8	6.5	5.4	7.6
Bladder	1.8	3.8	0.8	1.5	2.5
Non-Hodgkin's lymphoma	1.0	4.8	3.6	2.6	7.1
Lymphoid leukemia	1.4	1.8	1.2	1.7	1.3
Myeloid leukemia	0.7	3.7	2.5	1.5	2.7
All sites	**96.3**	**109.0**	**163.2**	**94**	**125.4**

the high incidence.[20–23] The TPCR covers a low-risk population in terms of esophageal cancer risk in the country. While there are ample studies of the esophageal cancer etiology in the high-risk population, no particular attention has been paid to low-risk populations. Generally, smoking and alcohol consumption are reported as major risk factors for esophageal cancer in developed countries. In our population, the prevalence of alcohol consumption is extremely low and an unlikely cause of the present rate of esophagus cancer in Tehran. The smoking prevalence[24] is close to 24% in males and very low in females (close to 3%); however, the incidence of esophageal cancer in females is similar to the incidence in males indicating that smoking is not a major contributing factor (at least among females) in the etiology of esophageal cancer in Tehran.

The breast has now become the most frequent cancer site among the urban women in Iran and the number of cases is increasing annually, due both to the aging of the population and an increase in age-specific incidence. The etiology of breast cancers in Iran has not been widely studied. The usual risk factors of nulliparity, early menarche, late age at marriage, and late age at first pregnancy are considered as important risk factors for breast cancer. Cancer mortality data indicate higher mortality in urban than in rural women.[25] This urban/rural difference could be due to differences in lifestyle factors. Western dietary influences and the changed lifestyles of urban women could be one of the major causes of the slowly rising incidence of breast cancer in Iran. Early detection linked with adequate treatment is important in the control of breast cancer and a recent study has indicated that an early detection effort campaign by the authorities in Iran has resulted in down-staging of breast cancer cases at diagnosis.[26,27]

A low incidence of lymphomas and leukemias was observed in our population, as it is seen in most Asian populations. The age distribution of Hodgkin's disease in Tehran corresponds to the pattern described for developing countries,[5–8] with a high rate in male children, low incidence in the third decade, and a second peak in the older age group. Among leukemias, myeloid leukemias are more prevalent than lymphoid leukemias, as observed in most Asian registries.[5,6] Tobacco-associated head and neck cancers (tongue, mouth, oropharynx, hypopharynx, and larynx) constituted about 22% of total male and 8% of total female

Table 5. Age-standardized incidence rates of major cancer sites in males in Iran and neighboring countries.

Site	Ardabil, Iran	Tehran, Iran	Karachi, Pakistan	Izmir, Turkey	Dubai, Kuwait
Esophagus	15.4	6.8	6.4	1.6	1.7
Stomach	49.1	19.7	3.9	7.1	4.1
Colon and rectum	7.9	11	5.1	6.2	–
Bronchus and lung	7.9	14.9	20.3	61.6	20.3
Prostate	3.4	15.6	5.4	5.6	7.6
Bladder	7.6	13.3	8.9	11	7.0
Non-Hodgkin's lymphoma	2.6	7.1	5.1	3.4	5.5
Lymphoid leukemia	0.7	2..8	1.1	2.3	1.3
Myeloid leukemia	0.7	5.6	2	3.3	2.3
All sites	**132**	**163**	**136.7**	**157.5**	**131.4**

cancers in Tehran. A relatively high incidence of lung cancer in females and to some extent in males in Tehran population may be due to misclassification of metastatic cases with other primaries as the lung is a common site of mortal metastases of other primaries (especially that a high proportion DCOs were reported for lung cancers). Tobacco in our population is mainly used in the form of cigarette and water-pipe smoking. The national survey of chronic disease risk factors in Tehran reported that 24% of adult men and 3% of women were ever-smokers.[24] Studies on smoking habits in Iran indicate an increased prevalence during the last ten years as well as a lower starting age; therefore, smoking-related cancers may increase if proper intervention is not applied to the high-risk population.

The low incidence of cervix cancer, a cancer associated with sexual and reproductive factors and oncogenic subtypes of human papillomavirus, is the pattern observed in Muslim countries in west Asia.[28] The ASR in Tehran is similar to those in Kuwait, Turkey, and Pakistan (Tables 4 and 5).

Prostate cancer incidence in Tehran population was relatively high compared with the rates in neighboring countries. The incidence of prostate cancer is typically high in developed countries of North America and Europe, [28,29] but relatively low in Asia. Older age (over 65) is the strongest risk factor in high incidence areas. The age-specific incidences in our data correspond to this fact as high rates are seen in age over 60 (Figure 2). The incidence of prostate cancer is most easily influenced by screening and ''incidental'' diagnosis (histologic examination of prostatectomy specimens), and the wide availability of such procedures in Tehran may contribute to the high incidences seen in this population.

In conclusion, the patterns observed from the analysis of the Tehran Cancer Registry data, despite certain limitations in quality, provide comprehensive information on cancer occurrence and valuable leads to cancer control in this population. Tobacco control measures are important to control lung and the upper aerodigestive tract cancers. Early detection of breast cancer should be encouraged in women through health education, prompting early diagnosis. These first results from TPCR provide a useful guide to direct and evaluate a cancer control program in the covered population.

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