

## The First Population-Based Cancer Survey in Kerman Province of Iran

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### Abstract

**Background:** Cancer is the second most common cause of non-accidental death in Iran. Geographical, racial and habitual differences have led to the variation in the incidence of cancer in different regions of this country. This study was performed to determine the incidence of cancer in the Kerman Province, central Iran.

**Methods:** All newly diagnosed cases of cancer in the Kerman Province were recorded in a five-year period (1996-2000).

**Results:** In all, 5884 new cases (55.7% males) of cancer were found after elimination of repeated cases. Based on age-standardized incidence rates (ASR) the most common cancers in men were stomach (10.2), lung (7.1), bladder (6.7), colorectal (5.9) and non-Hodgkin's lymphoma (5.8), while in women the most common cancers were breast (16.9) colorectal (5.9), stomach (5.1), leukaemia (4.6) and non-Hodgkin's lymphoma (2.8). For all cancers, ASR was 76 for males and 68 for females.

**Conclusion:** The results indicate that upper gastrointestinal cancer, especially oesophageal cancer is very rare in central Iran in contrast to northern Iran, although these types of cancers are some of the most common cancers in the Kerman Province.

**Keywords:** Cancer, Survey, Incidence, Iran

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### Introduction

Cancer is one of the most common causes of death in the world, which its incidence and prevalence is on the rise. It has been estimated that the incidence of cancer will increase by 45% in developed countries by the year 2025 and there will be a three-fold increase in cancer incidence in developing countries as compared to the year 2000 (1). Dramatic changes in the age distribution of countries, urbanization, and lifestyle as predisposing factors for non-communicable diseases warrants special attention in terms of updating the information, especially for our knowledge of cancer. Iran as a developing country has experienced a significant increase in its population in the last decades (about two-fold increase since the 1970s) as well as changes in socioeconomic status. Recent reports indicate that cancer comprises the sec-

ond most common cause of non-accidental death in Iran just after cardiovascular diseases (2).

The first attempt to compile cancer related data in Iran began in the 1970s which presented the most valid reports on cancer incidence in Iranian population (3-9).

Unfortunately, in the last few decades a complete report on the incidence of cancer in Iran has been lacking and reports such as GLOBOCAN 2000 (10) have just estimated the incidence according to data from neighbouring countries and some dispersed information. Considering the previous studies had mostly been performed in Northern Iran, we chose Kerman Province in central Iran for our study. The aim of the current study was to collect valid data related to the epidemiology of cancer in Kerman. We also aimed at comparing this province as a region off the Asian oe-

sophageal cancer belt with the Caspian Littoral provinces in northern Iran which are located exactly in the this oesophageal cancer belt.

Since Kerman Province lies in the suburbs of deserts, there is a significant geographical difference between northern Iran and this area, and results derived from this study could be different and valuable. In addition, published reports in the 1970s could be used to trace the changes in cancer incidence in central Iran.

#### ***Geographical and demographic characteristics***

Kerman Province lies between the East geographical longitude of 54°, 21' and 59°, 34' and latitude 26°, 29' and 31°, 58' and has an area of around 133,000 km<sup>2</sup> (11). It has a hot and dry climate with hot summers and relatively cold winter seasons and limited rainfall. It has an altitude of 1491m above sea level. According to the last census performed by the statistical centre of Iran in 1996, the total population of Kerman province is 2,004,328 which constitutes 3.3% of Iran's population with a male to female ratio of 103:100 (12). The population pyramid of this province shows that 42% of the population are between the ages of 5 to 15 and only 4.3% are over the age of 65.

Most people speak Farsi with a local accent. More than 50% of men of all ages work (50.1% in urban and 55.2% in rural areas), while it is rare for women to have work outside the home (9.0% in urban and 5.4% in rural areas). Of those who work, 28.0%, 16.1% and 9.9% are farmers, industrial workers, and white collar workers, respectively (12).

#### ***Health statistics of Kerman Province***

A total of 783 physicians (268 specialists) serve in different towns in the province. Rural areas have 768 active health units which are called health houses. There are also 22 therapeutic centres (3 private centres) with 3520 beds, which provide treatment services (11) and 99 pathology laboratories and 49 radiology centres. Although some patients prefer to go to other provinces, especially Tehran and Fars for treatment purposes, the primary diagnosis of all cancers takes place in Kerman Province itself. According to published data,

19% of the individuals in this province have a body mass index (BMI) of 25 to 30 and 5% have a BMI more than 30. About 24.7% of male and 0.7% of female are cigarette smokers (13).

#### **Materials and Methods**

During a period of 8 mo (Apr-Nov 2001), the survey team actively collected and compiled data for a period of 5 yr (1996-2000). Method of data collection was the same as the previous study (14). In brief, the survey team were trained to go to clinics, laboratories and census offices to check their records of cancer cases and whenever possible make a copy of the documents according to which cancer diagnosis was made. The data were collected from all hospitals and outpatient clinics including general practitioners' offices, the pathology laboratories, 30/49 of the radiology clinics, Deputy of Drug and Treatment, and Deputy of Health covering the rural areas of the whole province by means of annual health census performed by health care workers in health houses. All pathology laboratories of the province were included and their data were collected and all copies of the pathology reports were sent to the registry office. The hospital-based cancer registration of the Cancer Institute in Tehran provides the most reliable and comprehensive data in this large city. All the incident cancer cases from Kerman, recorded in the Cancer Institute were also included for the same time period (1996-2000). The collected data were summarized in a data sheet and coded using the ICD-O, 3<sup>rd</sup> edition (15). After data collection was completed, all data were alphabetically organized and duplicate cases with the same name, sex, age and place were omitted by manual and computerized linkage. Each alphabetical group was assessed manually by two individuals, on two different occasions. The data were computerized using SPSS software version 10.0 and MS EXCEL software. We calculated person-years of the population at risk by using each year method. The results are presented as the incidence of cases by site (ICD-O, 3<sup>rd</sup>), sex, age, crude, age-specific and age standardized rates

(ASR) per 100,000 person-years, using direct method of standardization to the world population. The survey was approved by the Medical Ethics committee of DDRRC.

### Results

During a 5 yr period (1996-2000), 5884 new cases of cancer were diagnosed, among which 3264 cases (55.5%) were male and 2620 cases (44.5%) were female. Diagnosis of cancer was based on histopathology in 88.1%, clinical or radiology in 8.7% and Death Certificate Only (DCO) in 3.2% of cases. The mean age for all cases at the time of first diagnosis was 53.1±21.4 yr for men and 49.5±19.3 yr for women.

Table 1 and 2 summarize the incidence of cancer as to site, age, total frequency, crude annual incidence rate and ASR in men and women.

Based on ASR, the most common cancers in men were stomach (10.2), lung (7.1), bladder (6.7), colorectal (5.9) and non-Hodgkin's lymphoma (5.8), while in women the most common cancers were breast (16.9), colorectal (5.9), stomach (5.1), leukaemia (4.6) and non-Hodgkin's lymphoma (2.8). ASR for all cancers was 76 and 68 per 100000 person-years for men and women respectively. Cancers of breast, cervix, ovary and uterus constituted 29.7% of all cancers in women.

Leukaemia and lymphoma were the most frequent cancers under the age of 25 in both sexes. The incidence of stomach and oesophageal cancer was twice more common in males than females, while the incidence of colorectal cancer was the same in both sexes.

Fig. 1 and 2 show the age specific incidence rate of the most common cancers in men and women.

**Table 1:** Age-specific incidence rates, average annual crude incidence rates and ASR of all the cancer sites among men in Kerman, 1996-2000

Sites	No.	0-14	15-24	25-34	35-44	45-54	55-64	>=65	Crude	ASR	%
Oral cavity	46	0.0	0.0	0.2	1.0	3.9	4.0	7.8	0.9	1.4	1.4
Oropharynx	9	0.0	0.0	0.2	0.2	0.8	0.9	1.3	0.2	0.3	0.3
Nasopharynx	11	0.0	0.3	0.2	0.6	0.4	0.4	0.9	0.2	0.3	0.3
Hypopharynx	3	0.0	0.0	0.0	0.0	0.8	0.0	0.4	0.1	0.1	0.1
Esophagus	107	0.0	0.0	1.5	0.6	3.5	8.0	24.6	2.1	3.0	3.3
Stomach	337	0.0	0.1	1.1	4.1	15.1	38.3	69.4	6.6	10.2	10.3
Colon/rectum	199	0.0	0.8	0.9	4.9	11.6	21.8	28.5	3.9	5.9	6.1
Liver	51	0.0	0.1	0.2	2.1	1.9	4.4	8.6	1.0	1.5	1.6
Gallbladder, etc.	33	0.0	0.0	0.0	0.4	1.2	4.4	6.9	0.6	1.0	1.0
Pancreas	39	0.1	0.0	0.2	1.0	0.8	3.6	7.8	0.8	1.1	1.2
Larynx	121	0.0	0.0	0.3	4.1	8.5	12.0	16.8	2.4	3.6	3.7
Bronchus and lung	225	0.0	0.2	0.6	1.0	9.7	33.4	44.8	4.4	7.1	6.9
Bone	59	0.4	2.3	0.9	0.6	1.5	0.9	3.4	1.2	1.2	1.8
Connective tissue	59	0.5	0.4	1.7	1.2	1.5	3.6	4.7	1.2	1.4	1.8
Skin melanoma	38	0.1	0.2	0.2	0.6	0.4	4.4	5.2	0.7	0.9	1.2
Breast	24	0.0	0.1	0.2	1.0	1.9	2.2	1.7	0.5	0.7	0.7
Prostate	120	0.0	0.0	0.2	0.4	0.8	8.9	32.8	2.4	3.2	3.7
Testis	34	0.1	0.4	1.5	1.8	1.2	0.0	1.3	0.7	0.7	1.0
Other male genital	4	0.0	0.0	0.0	0.2	0.0	0.4	0.9	0.1	0.1	0.1
Bladder	239	0.1	0.2	1.7	1.0	8.1	19.6	53.9	4.7	6.7	7.3
Kidney, etc	39	0.6	0.3	0.0	0.4	1.2	2.7	4.3	0.8	0.9	1.2
Nervous system	117	1.5	0.5	1.7	2.1	7.3	8.9	5.6	2.3	2.9	3.6

**Table 1:** Continued...

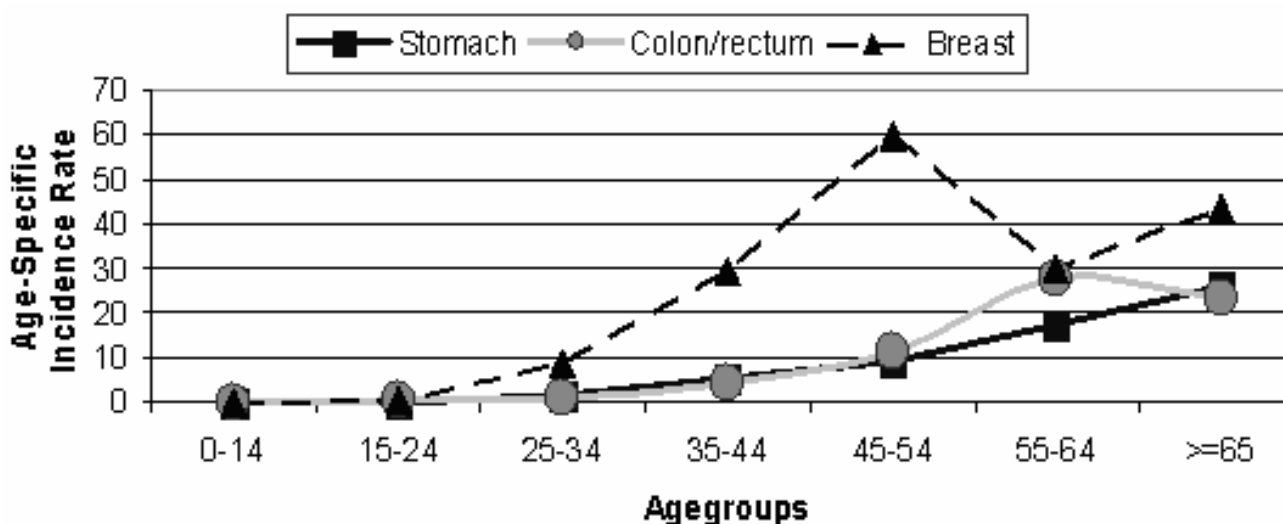
Thyroid	25	0.0	0.1	0.3	0.8	0.8	1.3	4.3	0.5	0.6	0.8
Hodgkin's disease	96	1.4	2.0	1.4	2.1	4.6	2.7	1.7	1.9	2.0	2.9
Non-Hodgkin's lymphoma	228	2.0	1.7	1.4	5.1	9.3	18.7	23.3	4.5	5.8	7.0
Leukemia	261	4.1	2.6	3.1	3.3	10.4	13.3	12.9	5.1	5.7	8.0
Multiple Myeloma	49	0.0	0.0	0.5	0.6	2.3	7.6	6.5	1.0	1.5	1.5
Others	251	1.5	2.2	2.3	7.0	7.7	12.0	35.8	4.9	6.3	7.7
Other skin	440	0.1	0.5	2.3	7.8	23.6	32.5	87.9	8.6	12.7	13.5
All sites	3264	12.7	14.8	24.3	55.6	139.9	270.1	502.7	63.9	76.0	100.0

**Table 2:** Age-specific incidence rates, average annual crude incidence rates and ASR of all the cancer sites among women in Kerman, 1996-2000

<i>Sites</i>	No.	0-14	15-24	25-34	35-44	45-54	55-64	>=65	Crude	ASR	%
Oral cavity	31	0.1	0.0	0.5	0.4	0.8	3.0	6.6	0.6	0.9	1.2
Oropharynx	5	0.0	0.0	0.0	0.2	0.4	0.5	1.0	0.1	0.2	0.0
Nasopharynx	10	0.1	0.0	0.2	0.2	1.1	0.0	0.5	0.2	0.2	0.4
Hypopharynx	2	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.1	0.1
Esophagus	55	0.0	0.0	0.5	1.4	4.6	5.0	9.1	1.1	1.8	2.1
Stomach	152	0.0	0.0	1.5	5.6	9.1	17.1	25.9	3.1	5.1	5.8
Colon/rectum	179	0.0	0.6	1.2	4.6	11.4	27.6	23.3	3.6	5.9	6.9
Liver	25	0.1	0.2	0.2	0.6	2.3	2.5	3.0	0.5	0.8	1.0
Gallbladder, etc.	62	0.0	0.0	0.0	0.8	1.9	9.0	15.7	1.3	2.1	2.4
Pancreas	31	0.0	0.0	0.2	0.6	2.3	1.5	8.6	0.6	1.1	1.2
Larynx	16	0.0	0.0	0.0	0.2	1.9	1.5	3.6	0.3	0.6	0.6
Bronchus and lung	73	0.0	0.3	0.3	1.8	4.6	6.0	16.2	1.5	2.4	2.8
Bone	46	0.8	1.7	0.8	0.2	0.4	0.5	1.0	0.9	0.8	1.8
Connective tissue	46	0.0	0.6	0.6	1.8	2.3	3.0	5.1	0.9	1.3	1.8
Skin melanoma	26	0.1	0.0	0.0	0.6	0.4	4.5	5.1	0.5	0.9	1.0
Breast	554	0.0	0.5	8.8	29.5	59.8	29.6	43.6	11.2	16.9	21.2
Cervix	83	0.0	0.2	0.9	3.2	11.0	6.5	7.6	1.7	1.4	3.2
Uterus	46	0.0	0.1	0.8	0.4	3.0	0.0	0.0	0.0	0.7	1.7
Ovary	68	0.2	0.7	1.2	0.0	1.9	6.0	0.0	0.0	0.8	2.6
Other female genital	27	0.0	0.5	0.2	0.2	1.1	1.5	4.1	0.4	0.7	0.8
Bladder	51	0.0	0.0	0.2	0.6	3.0	7.5	7.6	1.0	1.6	1.9
Kidney, etc	22	0.4	0.2	0.2	0.2	0.4	1.0	2.0	0.4	0.5	0.8
Nervous system	86	0.7	1.3	1.2	2.6	5.3	7.0	4.1	1.7	2.3	3.3
Thyroid	86	0.1	0.5	2.1	3.6	6.9	3.0	8.1	1.7	2.4	3.3
Hodgkin's disease	44	0.4	2.0	1.2	0.0	0.4	2.0	0.0	0.9	0.9	1.7
Non-Hodgkin's lymphoma	101	0.6	1.4	1.7	1.6	3.0	7.5	14.2	2.0	2.8	3.9
Leukemia	181	2.2	3.1	2.0	2.4	7.2	12.0	14.7	3.7	4.6	6.9
Multiple Myeloma	28	0.0	0.1	0.0	0.0	0.8	6.0	5.1	0.6	1.0	1.1
Others	159	0.8	1.3	2.7	3.0	8.8	17.6	13.7	3.2	4.5	6.1
Other skin	325	0.0	0.1	3.5	4.4	24.8	31.1	58.8	6.6	10.4	12.4
All sites	2620	7.1	15.2	32.2	73.1	180.9	224.9	319.5	53.0	68.0	100.0

**Table 3:** Top five cancers in Kerman province compared to cancer incidence estimation for Iran by GLOBOCAN 2000 & 2002 and also the reports from Ardabil Province

Present study (1996-2000)		Ardabil study (1996-1999)		GLOBOCAN (2000)		GLOBOCAN (2002)		National pathology based cancer registry kerman province (2003)	
Male (ASR)	Female (ASR)	Male (ASR)	Female (ASR)	Male (ASR)	Female (ASR)	Male (ASR)	Female (ASR)	Male (ASR)	Female (ASR)
Stomach (10.2)	Breast (16.9)	Stomach (49.1)	Stomach (25.4)	Lung (34.9)	Breast (35.7)	Stomach (26.1)	Breast (17.1)	Stomach (6.7)	Breast (11.2)
Lung (7.1)	Colorectal (5.9)	Esophagus (15.4)	Esophagus (14.4)	Stomach (21.5)	Cervix (16.1)	Esophagus (17.6)	Esophagus (14.4)	Bladder (6.3)	Colorectal (5.9)
Bladder (6.7)	Stomach (5.1)	Lung (8.0)	Breast (7.6)	Prostate (21.2)	Colorectal (14.4)	Colorectal (8.3)	Stomach (11.1)	Lung (3.7)	Stomach (3.4)
Colorectal (5.9)	Leukemia (4.6)	Colorectal (7.9)	Colorectal (5.9)	Colorectal (19.1)	Lung (11.1)	Bladder (8.0)	Colorectal (6.5)	Prostate (2.8)	Bladder (2.1)
Non- Hodgkin's lymphoma (5.8)	Non- Hodgkin's lymphoma (2.8)	Bladder (7.6)	Lung (3.6)	Liver (15.0)	Stomach (10.4)	Leukemia (4.8)	Cervix (4.4)	Brain & nervous sys. (2.3)	Esophagus (1.9)



**Fig. 1:** Age Specific Incidence of the major Cancers in Females

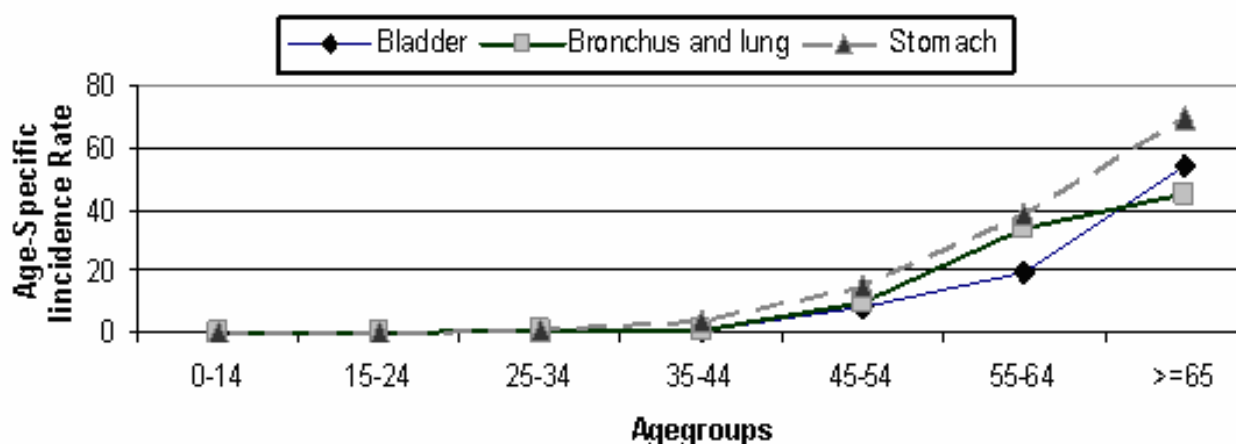


Fig. 2: Age Specific Incidence of the major cancers in males

## Discussion

This study reports the first result of a cancer survey program performed in Kerman Province during a five-year period. The well-trained survey team who had access to all patients' medical records and were monitored closely by expert pathologists and epidemiologists at the registry branch of the DDRC in Tehran, provided an ideal set up for this survey. So, this study can give the most complete and accurate estimate of cancer occurrence in central Iran up to now.

The results show that GI cancer is one of the most common cancers in this area. This finding is close to the previous reports from other parts of the country, though its incidence rate is much lower (about three-fold) than those seen in northern Iran (2, 4, 14, 16-18). This study demonstrates that GI tract cancers account for more than 21.6% of all cancers in Kerman, while upper GI cancers alone constitutes more than 9.4% of all cancers in this province. The cancer incidence rates found in this survey are remarkably different from the rates reported 30 yr ago in southern Iran (4). The first reports on cancer incidence in Iran date back to the 1970s (19), most of which have been carried out in the northern part of Iran (Caspian littoral) and only scant information on cancer incidence in southern Iran is available. Unfortunately, no cancer

registry has been established since that time. Fars Province situated in the south-west Iran is a well-equipped centre for providing medical care to which patients from neighbouring provinces, such as Kerman are referred. Two pathologic-based studies (4, 9) from Fars province in the 1970s showed that the most common cancers were cancers of stomach, lymph nodes, leukemia, lung, and bladder in men and cancers of breast, cervix, lymph node, leukaemia, and thyroid in women. According to those studies, GI cancer constituted 15% of all cancers (17.8 and 14.6 percent of total cancers in men and women respectively) and relative frequencies of oesophageal and gastric cancers were 2.3 and 5.2 percent, respectively (4,9). Our study revealed that digestive tract cancers make up 21% of all cancers (23.5 and 19.8 percent of total cancers in men and women respectively) and the respective relative frequencies of oesophageal and gastric cancer has increased to 3 and 8 percent for men and women. By comparing these rates it can be seen that there has been a significant increase in GI tract cancers in southern Iran. Improvements in diagnostic techniques have played a significant role in better diagnosing of GI cancer cases but factors such as changes in dietary habits and life-style may play an important role in the rising incidence.

Results of a study performed in Ardabil Province showed that *H. pylori* infection, known as type 1 carcinogenesis, is significantly lower (30%) in the central part of Iran as compared to those of Ardabil Province in the north-west Iran (50%) (20, 21). Furthermore, the incidence of gastric cancer in Ardabil Province is more than 49.1 and 25.4 per 100,000 person-year for women and men, respectively, which is one of the highest incidence rates worldwide (14).

Obesity, hyper-insulinemia and insulin resistance are considered as major risk factors for colorectal cancers (1); and as previously mentioned, the BMI of at least 50% of the inhabitants of the Kerman Province is more than 25. Other studies indicate that the incidence of colorectal cancer had increased in regions which had previously been considered as low-risk areas, whereas the incidence had remained stable in countries which were considered as high-risk areas (1).

Decrease in the number of pregnancies, increased age at first delivery and use of oral contraceptives (OCPs) could be the possible factors which have a major role in the increase in breast cancer incidence rate by 60% in comparison with the rates reported by Haghghi, et al (4). However, under-reporting should also be considered in the previous study, especially when a higher frequency of breast cancer was reported in another study at that time (9). The significant decrease in cancer of cervix can be explained by marriage at older ages and decreased number of pregnancies. Indeed, during the last two decades, fertility rates have decreased from 6.5 in 1970s to 2.9 in 2001 in Iran due to the national programs on raising the public awareness of family planning importance (22).

This study showed that liver cancer is rare in this province. Lower frequency of hepatitis B infection in this province (1.2% in Kerman versus 1.7% in Iran as a whole), which is known as one of the main risk factors for liver cancer, may be associated with this low rate, though further investigations are needed.

While it is estimated that bladder cancer is the eighth most common cancer among men in de-

veloping countries (1), our study showed that bladder cancer is in third place in central Iran. Cigarette smoking, environmental or occupational exposures are major risk factors for bladder cancer. It has also been demonstrated that occupations associated with increased risk of bladder cancer include those in dye, textile, chemical, and rubber industries (23). Sixteen percent of men living in this province are factory workers. In addition some reports has shown the positive association of opium addiction and bladder cancer in Iran (24, 25). However, further investigations are required to find the reason for the high incidence of bladder cancer in this area.

Although cervical and lung cancers are on the list of the five most common cancers for females in the developing regions of the world (1), this was not the case in Kerman. The low incidence rate of cervical cancer in central Iran in comparison with other developing countries can be partly explained by a very strong dependence of Iranian women on family-based traditions and almost having no extramarital sexual relationship, very rare prevalence of sexually transmitted diseases and a very low rate of tobacco use among women. In the same way, the low incidence of lung cancer among women in this area could be due to the very uncommon habit of cigarette smoking in females.

According to this study and the previous study conducted in Ardabil Province, it is concluded that cancer incidence rates in these two provinces vary considerably. Therefore, predicting the cancer incidence rate in a certain region, using the data from neighbouring regions even within a specified country may lead to a wrong estimation (Table 3). In addition, we have showed the result of a national pathology-based cancer registration for Kerman Province (2003) in the same table that supported the quality of our data collection method.

According to GLOBOCAN 2000, cancers of the prostate, liver and oesophagus had lower ASR values among males in Kerman and ASR was also lower for cervical, lungs, and ovarian cancers in women. On the other hand, ASR was significantly

higher for skin, lymphatic systems and blood cancers. As compared to Ardabil, the frequency of oesophageal cancer was much lower in Kerman. GLOBOCAN 2000 estimation of cancer incidence in Iran was based on data derived to some extent from few small studies in Iran and mostly from information on other countries of South-Western Asia probably without considering the fact that a great racial, geographical, nutritional and cultural differences exist in different regions of Iran. A clear example of these differences is the findings about cancer incidence rates in Ardabil and Kerman provinces. Of course, GLOBOCAN 2002 is based on the data obtained from cancer registries in Iran which provide the most reliable information (26). It can be the reason for the remarkable changes in the top five cancers reported in GLOBOCAN 2002 compared to the previous version.

One limitation of our study results from the retrospective nature of the survey in the setting of poor quality of keeping medical records in medical centres especially in private ones. In addition, some of the medical centres did not use the ICD coding system at the time of diagnostic procedures, making it impossible to classify all cancer cases perfectly. The alphabetical organization of data used to eliminate the cases with similar names may have resulted in 7-12% of doubles. Although the team did their best to find all new cancer patients, it is probable that we have underestimated some types of tumours. Therefore, these results should be assumed as the minimum incidence of cancer in Kerman province. This study showed that upper GI cancer is one of the most common cancers in central Iran, but the incidence rate is only about one third of those reported in northern Iran which is located in the Asian Oesophageal Cancer Belt.

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The authors declare that they have no conflict of Interests.

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