

# Cancer Incidence among the Elderly Population in the Northwest of Iran: A Population Based Study

Somi MH<sup>1</sup>, Mousavi SM<sup>1,2,3</sup>, Rezaeifar P<sup>1</sup>, Naghashi SH<sup>1</sup>

## Abstract

This article was aimed to provide an overview and a perspective on the changing impact of cancers with increasing age on three age groups. A population based cancer registry was undertaken to register all new cancers cases from March 2006 to March 2007. During one year, 2023 (41.1%) of 4922 patients with cancer were  $\geq 65$  years. The five most common cancers (excluding skin cancer) were stomach, bladder, esophagus, prostate and lung in males and esophagus, stomach, breast, colorectal cancer and bladder in females.

Taking into account the increasing life expectancy in Iran, establishment and implementation of national cancer control program should be of priority for health policy makers in this country.

**Keywords:** geriatric, cancer, incidence, Iran

1. Liver and Gastrointestinal Diseases Research Center (LGDR), Tabriz University of Medical Sciences

2. Department of Community Medicine, Tabriz University of Medical Sciences

3. Cancer Research Center of Cancer Institute, Tehran University of Medical Sciences

Corresponding Author:

Parisa Rezaeifar

Email: prezaeifar@gmail.com

Tel: +98-411-3367473

Fax: +98-411-3367499

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## Introduction

The incidence and prevalence of cancers differs by age and is categorized to four age groups including children (below the age of 15), young adults (15 to 44), middle age (45 to 64) and the elderly (65 and older). Cancer in the older people has become an increasingly common problem in the world due to the ageing of the population; the sharp increase in the life expectancy and the presence of the changes in the clinical behavior of certain neoplasms with age [1-2].

Over 60% of all cancers are diagnosed after the age of 65, and the risk of cancer development in persons over 65 years of age is ten to eleven times higher than those observed in the people younger than 65. It is estimated that by 2030, 70% of patients with cancer will be over 65. More than 67% of cancer deaths occur in older groups [3, 4].

Cancers occurring between the ages of 15 and 30 years account for just 2% of all invasive cancers which is much less common than cancer in older age groups. But the diagnosis of cancer at younger ages (15-29 years old) carries a more favorable prognosis, on the average, compared to a cancer diagnosis at other ages [5].

According to statistics issued by Iranian Ministry of Health, cancer is the third most common known cause

of death, after cardiovascular diseases and accidents. In this area, cancer is the second cause of death after cardiovascular diseases [6].

Liver & Gastrointestinal Diseases Research Center (LGDR) Population Based Cancer Registry is located in Tabriz, the center of the East Azerbaijan province, Northwest of Iran. The population of this province is about 3,603,456 according to the census of 2006, mostly from Azeri ethnic background. The majority of population of East Azerbaijan falls into the 15 – 64 age group (69.73% including 56.06% for the 15-44 age group and 13.66% for the 45-64 age group), whilst 5.2% are 65 years and over [7]. Looking 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 rises to the highest number before 2050 [8].

In brief, the long-term impact of decline in the fertility and reduction in the size of family would lead to a decrease in the population of children (0-14 years old) which in turn would push up the population in the working age group (current status of Iran) and this, depending on the decline in fertility and mortality rates and the increase in life

expectancy, leads to an increasing population of the elderly after a while.

The estimated mortality rate for cancer was 41.1 and 65 per 100,000 for female and male in 2004 [9].

Due to the young population of this area who will age in a few years and a demand for epidemiologic studies on cancers, especially on geriatric population, this article was aimed to provide an overview using demographic and epidemiologic data derived from the LGDRC cancer registry on cancers in the elderly and to gain a perspective on the changing impact of cancer with increasing age. We compared these results with those for young adults (15 to 44) and middle ages (45 to 64).

## Material and Methods

The survey team of LGDRC, some general practitioners and specialists in medical records, reviewed and collected all records of cancer cases respectively from March 2006 until March 2007 (one official year in Iran). The consecutive cancer patients from all referral and valid pathology laboratories, hospitals and outpatient public and private clinics, diagnostic and clinic laboratories, radiotherapy and chemotherapy centers and death certificates of East Azerbaijan province were considered as the "study population".

Data were collected and coded using ICD-O-3. The final data was checked and repeated cases with the same name, age and sex were excluded. Inhabitants of other provinces and cases without valid information about the site of cancer were excluded as well. During one year, 4922 new onset cases were registered and among them, 2023 (41.1%) patients were  $\geq 65$  years.

Diagnosis of cancer was based on histopathology (MV percentage) in 74.6%, and Death Certificate Only (DCO %) in 4.8% of cases.

Cases were divided into 5-year age groups. The results are presented as total cases over the 65 years, crude rate, age specific incidence rates and age-adjusted standardized incidence rates (ASR) per 100,000 for the geriatric males and females ( $\geq 65$  years) in different sites (ICD-O-3), using the direct method of standardization to the world standard population [10]. Also in this article, for understanding the perspective of the changing impact of cancers with increasing age in our population, we compared the age-adjusted standardized incidence rates (ASR) per 100,000 for ten most common cancers in both genders among three age groups of young adults (15 to 44), middle ages (45 to 64) and the elderly (65 and older).

## Results

During one year, 4922 new onset cases were detected in the East Azerbaijan province including 994 (20.2%) young adults, 1632 (33.2%) middle age patients and 2023 (41.1%) elderly (over the 65 years old).

The age group of 65 and over accounted for 68.1% of all cancers diagnosed among males and 31.8% of them diagnosed in females while in the young adult and middle age group, it accounted for 43.5% and 51.7% for males and 56.5% and 48.3% for females, respectively.

Total number of cancer cases, age -specific incidence rates, crude rates and annual ASR ( $\geq 65$ ) per 100000 geriatric males and females based on world standard population is shown in tables 1 and 2.

The five top cancers, based on calculated ASRs for the population over the age of 65 years, were Stomach (222.30), Bladder (126.79), Esophagus (101.86), Prostate (78.54) and Lung & Bronchus (69.54) in males and Esophagus (83.13), Stomach (80.81), Breast (47.63), Colorectal cancer (43.51) and Bladder (34.56) in females. Nasal cavity and middle ear cancers, Anal cancer, Sarcoma Kaposi and Vaginal cancer was not recorded in geriatric males or females. Moreover, one case of Mesothelioma and one case of Vulvar cancer were recorded only in geriatric females.

Also, we calculated ASR and compared it for some common cancers in the young adult, middle age and elderly groups which are pointed up in table 3, separately for males and females.

The breast cancer incidence rises steadily from 15 years of age, peaks and stabilizes between 40 and 70. By the age 80, its incidence drops but increases once more after the age of 80. In addition, we found that the breast cancer is the most common cause of cancer in middle-aged patients (58.73) and young adults (17.45).

Figure 1 shows the Standard Incidence Ratio for sex. In all age groups, the male to female ratio is over 1 except for the age group of 25-44. It might be due to the high cancer rate of females in these age groups such as breast cancer.

The age-specific incidence rate for top five cancers (non-skin tumors) in males and females are shown in figures 2 and 3.

Annual ASR per 100000 for old patients ( $\geq 65$ ) in comparison with ASR for young adults and middle age patients based on World standard population in males and females is defined in table 3.

**Table 1:** Total number of cancer cases, age -specific incidence rates, crude rates and annual ASR per 100000 geriatric males ( $\geq 65$ ) in East Azerbaijan, 2006-2007.

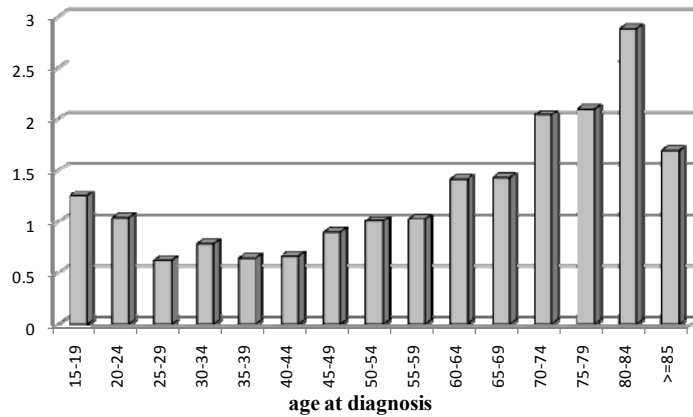
Primary site	ICD-O-3 Recode	Total count ( $\geq 65$ )	65-69	70-74	75-79	80-84	$\geq 85$	Crude rate ( $\geq 65$ )	% ( $\geq 65$ )	ASR (World) ( $\geq 65$ )
All sites		1376	817.93	1250.27	1245.17	1574.28	1249.73	1148.90	100	1087.36
Oral cavity & Pharynx	20010-20100	23	10.22	32.54	8.30	26.46	21.93	19.20	1.67	18.32
Esophagus	21010	136	66.46	130.18	124.52	191.82	65.78	113.55	9.88	101.86
Stomach	21020	281	161.03	268.50	249.03	310.89	263.10	234.62	20.42	222.30
Small intestine	21030	6	2.56	5.42	0.00	13.23	0.00	4.17	0.44	3.59
Colon & Rectum	21041-49,21051-52	78	56.23	86.79	58.11	59.53	21.93	65.13	5.67	63.02
Liver & Intrahepatic bile duct	21071-72	18	20.45	18.98	4.15	13.23	21.93	15.86	1.31	17.29
Gallbladder & Other Biliary	21080,21090	13	7.67	13.56	8.30	13.23	21.93	10.85	0.94	10.86
Pancreas	21100	21	23.00	16.27	12.45	13.23	0.00	16.70	1.53	17.23
Other digestive organs	21130	4	2.56	5.42	4.15	0.00	0.00	3.34	0.29	3.24
Larynx	22020	30	20.45	29.83	24.90	19.84	43.85	25.05	2.18	25.39
Lung & Bronchus	22030	92	43.45	92.21	103.76	92.60	43.85	76.82	6.69	69.54
Bones & Joints	23000	2	0.00	3.05	4.86	0.00	0.00	1.85	0.15	1.56
Soft tissue including Heart	24000	9	12.78	2.71	4.15	13.23	0.00	7.51	0.65	7.79
Melanoma	25010	10	7.67	5.42	4.15	13.23	43.85	8.35	0.73	9.51
Breast	26000	7	12.78	2.71	0.00	0.00	21.93	5.84	0.51	7.82
Prostate	28010	102	35.78	73.23	124.52	145.52	197.33	85.17	7.41	78.54
Testis	28020	3	5.11	0.00	0.00	6.61	0.00	2.50	0.22	2.66
Bladder	29010	162	89.46	119.33	182.63	198.44	197.33	135.26	11.77	126.79
Kidney & Renal pelvis	29020	15	20.45	8.14	8.30	13.23	0.00	12.52	1.09	13.22
Ureter	29030	3	2.56	5.42	0.00	0.00	0.00	2.50	0.22	2.65
Eye & Orbit	30000	5	0.00	10.85	4.15	0.00	0.00	4.17	0.36	3.69
Brain & Other Nervous System	31010,31040	12	5.11	18.98	12.45	0.00	0.00	10.02	0.87	9.39
Thyroid	32010	4	0.00	8.14	4.15	0.00	0.00	3.34	0.29	2.92
Hodgkin	33011-12	3	5.11	0.00	0.00	0.00	21.93	2.50	0.22	3.76
Non-Hodgkin Lymphoma	33041-42	28	25.56	27.12	12.45	33.07	0.00	23.38	2.03	22.84
Myeloma	34000	18	15.34	16.27	12.45	13.23	21.93	15.03	1.31	15.51
Lymphocytic Leukemia	35011-13	27	23.00	24.41	16.60	26.46	21.93	22.54	1.96	22.66
Myeloid & Monocytic Leukemia	35021,35031,35022-23	14								10.23
			7.67	8.14	29.05	6.61	0.00	11.69	1.02	
Other leukemia	35041,35043	5	2.56	5.42	8.30	0.00	0.00	4.17	0.36	3.83
Miscellaneous	37000	39	28.12	32.55	29.05	59.53	0.00	32.56	2.83	29.75

**Table 2:** Total number of cancer cases, age -specific incidence rates, crude rates and annual ASR per 100000 geriatric females ( $\geq 65$ ) in East Azerbaijan, 2006-2007.

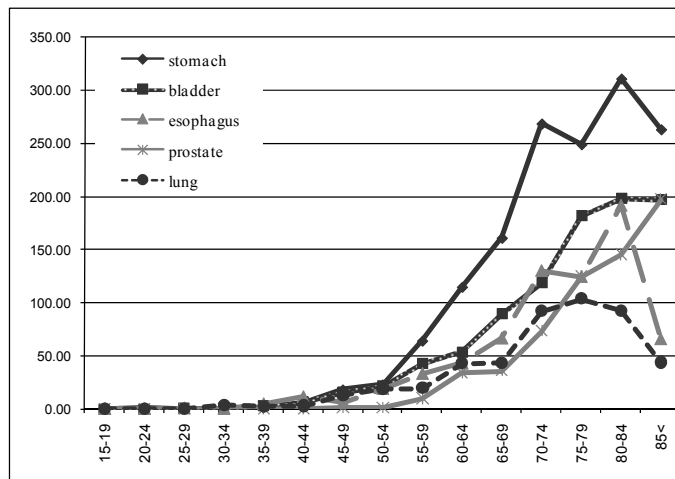
Primary site	ICD-O-3 Recode	Total count ( $\geq 65$ )	65-69	70-74	75-79	80-84	$\geq 85$	Crude rate ( $\geq 65$ )	% ( $\geq 65$ )	ASR(World) ( $\geq 65$ )
All sites		642	573.78	612.88	593.27	545.68	958.36	593.69	100	597.58
Oral cavity & Pharynx	20010-20100	23	16.24	24.39	34.04	7.80	19.99	21.27	3.58	20.78
Esophagus	21010	92	81.20	60.98	111.85	109.14	99.96	85.08	14.33	83.13
Stomach	21020	87	70.37	88.43	82.67	70.16	119.95	80.45	13.55	80.81
Small intestine	21030	4	2.71	3.05	9.73	0.00	0.00	3.70	0.62	3.42
Colon & Rectum	21041-49,21051-52	47	40.60	64.03	29.18	31.18	19.99	43.46	7.32	43.51
Liver & Intrahepatic bile duct	21071-72	12	5.41	9.15	19.45	15.59	19.99	11.10	1.87	10.25
Gallbladder & Other Biliary	21080,21090	12	15.34	5.42	12.45	6.61	0.00	10.02	1.87	10.37
Pancreas	21100	12	16.24	6.10	14.59	7.80	0.00	11.10	1.87	11.34
Other digestive organs	21130	4	2.71	0.00	4.86	0.00	39.98	3.70	0.62	4.71
Larynx	22020	2	2.71	3.05	0.00	0.00	0.00	1.85	0.31	2.03
Lung & Bronchus	22030	25	18.95	30.49	14.59	23.39	39.98	23.12	3.89	23.44
Bones & Joints	23000	2	0.00	6.10	0.00	0.00	0.00	0.00	0.31	1.74
Soft tissue	24000	7	8.12	3.05	14.59	0.00	0.00	6.47	1.09	6.44
Melanoma	25010	5	2.71	6.10	0.00	0.00	39.98	4.62	0.78	5.76
Breast	26000	47	67.66	39.64	19.45	23.39	39.98	43.46	7.32	47.63
Cervix Uteri	27010	12	10.83	21.34	0.00	7.80	0.00	11.10	1.87	11.29
Corpus & Uterus, NOS	27020-27030	8	2.71	9.15	14.59	7.80	0.00	7.40	1.25	6.41
Ovary	27040	15	13.53	18.29	9.73	15.59	0.00	13.87	2.34	13.53
Bladder	29010	33	37.89	27.44	19.45	7.80	99.96	30.52	5.14	34.56
Kidney & Renal pelvis	29020	5	0.00	9.15	4.86	7.80	0.00	4.62	0.78	3.86
Ureter	29030	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eye & Orbit	30000	1	0.00	3.05	0.00	0.00	0.00	0.00	0.16	0.00
Brain & Other Nervous System	31010,31040	4	13.53	3.05	9.73	0.00	0.00	7.40	0.62	8.06
Thyroid	32010	10	10.83	9.15	9.73	0.00	19.99	9.25	1.56	10.07
Hodgkin	33011-12	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Hodgkin Lymphoma	33041-42	18	24.36	21.34	4.86	7.80	0.00	16.65	2.80	17.79
Myeloma	34000	6	8.12	3.05	9.73	0.00	0.00	5.55	0.93	5.74
Lymphocytic Leukemia	35011-13	3	0.00	3.05	9.73	0.00	0.00	2.77	0.47	2.26
Myeloid & Monocytic Leukemia	35021,35031,35022-23	5		2.71	3.05	9.73	0.00	19.99	4.62	0.78
Other leukemia	35041,35043	1	0.00	0.00	0.00	7.80	0.00	0.92	0.16	0.55
Miscellaneous	37000	31	37.98	21.34	24.31	31.18	19.99	28.67	4.83	29.46

**Table 3:** Annual ASR per 100000 for old patients ( $\geq 65$ ) in comparison with ASR for young adults and middle age patients based on World standard population by sex

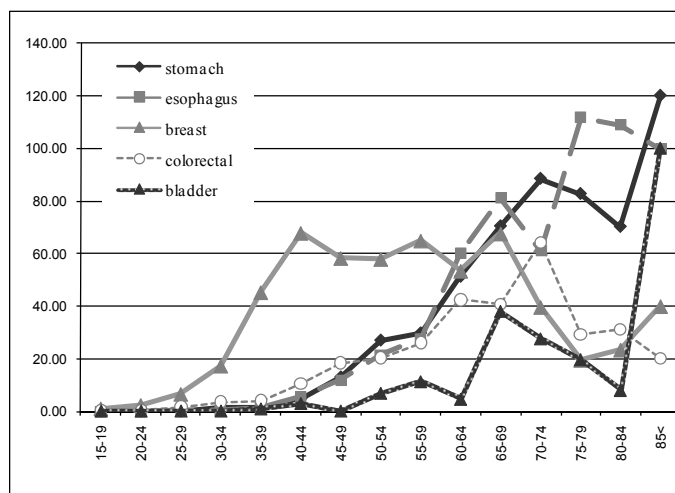
Primary site	ICD-O-3 Recode	Male					Female				
		Crude incidence rate (15-44)	Crude incidence rate (45-64)	Crude incidence rate ( $\geq 65$ )	Incidence ratio $\geq 65/ 15-44$	Incidence ratio $\geq 65/ 45-64$	Crude incidence rate (15-44)	Crude incidence rate (45-64)	Crude incidence rate ( $\geq 65$ )	Incidence ratio $\geq 65/ 15-44$	Incidence ratio $\geq 65/ 45-64$
All sites		41.96	320.03	1148.90	<b>3.59</b>	<b>27.38</b>	56.60	295.54	593.69	<b>2.01</b>	<b>10.49</b>
Esophagus	21010	1.85	21.28	113.55	<b>5.33</b>	<b>61.38</b>	1.01	25.98	85.08	<b>3.27</b>	<b>84.24</b>
Stomach	21020	1.17	44.85	234.62	<b>5.23</b>	<b>200.53</b>	0.91	26.73	80.45	<b>3.01</b>	<b>88.40</b>
Colon & Rectum	21041-49,21051-52	2.23	28.89	65.13	<b>2.25</b>	<b>29.20</b>	2.64	24.47	43.46	<b>1.78</b>	<b>14.46</b>
Lung & Bronchus	22030	1.07	20.90	76.82	<b>3.67</b>	<b>71.79</b>	1.32	7.15	23.12	<b>3.23</b>	<b>17.51</b>
Breast	26000	0.29	3.04	5.84	<b>1.92</b>	<b>20.14</b>	17.45	58.73	43.46	<b>0.74</b>	<b>2.49</b>
Prostate	28010	0.00	8.36	85.17	<b>10.19</b>	-	-	-	-	-	-
Bladder	29010	1.36	29.27	135.26	<b>4.62</b>	<b>99.45</b>	0.41	4.89	30.52	<b>6.24</b>	<b>74.44</b>



**Figure 1:** Male to Female incidence ratio based on age at the time of diagnosis for all sites of cancers



**Figure 2:** The age standardized incidence rate for top five cancers in males



**Figure 3:** The age standardized incidence rate for top five cancers in females

## Discussion

To investigate the changing impact of cancers with increasing age and to facilitate comparisons of sets of age-specific epidemiological and demographic rates across populations with different age compositions, it is useful to calculate summary health statistics which remove the effects of variations in age structure. The changing demographic structure of the population emphasizes the current cancer incidence imperative for the elderly.

Cancer patients aged  $\geq 65$  years ought to receive special attention as a target group for efforts along the cancer control spectrum of early detection, diagnosis, pretreatment evaluation, treatment, and care. Based on National Center for Health Statistics (NCHS) reports, approximately 50% of cancers occur in the population aged 65 and older; by the year 2020, if the expansion of the older population continues at the present rate, 60% of all malignancies are expected to be in this group of people [11]. Moreover, the incidence of cancer increases with age in both men and women up to 85 years of age [12-14].

In developed countries, two thirds to three quarters of malignancies in men and women occur in the elderly. In the studies from European countries, prostate, lung and colon cancers in men and breast, colon and lung cancers in women constituted the highest incidences of cancers in the patients over the age of 65 and made up around half of all diagnosed cancers [15].

Colorectal cancer is one of the most common cancers worldwide, especially in the elderly population [16]. In Western countries, only 2–8% of all colorectal cancers occur in young (<40 year-old) patients [17-21]. In contrast, several studies have shown that 15–35% of colorectal cancers in Middle-Eastern countries occur in <40 year-old subjects [22-24]. A study which compared the age-specific rates between Iran and the US showed similar rates for colorectal cancer in young (<40 years) Iranians and Americans, but much lower rates in older ( $\geq 40$ ) Iranians [25]. In the present study, we noticed that colorectal cancer incidence rate in the elderly population is not as high as other gastrointestinal cancers and its incidence in this group is nearly two times higher than middle-aged patients. It might be due to geographic differences. Some authors have suggested that a difference in genetic susceptibility to cancer could explain the widely different proportions of colorectal cancer between Middle-Eastern and Western countries.

Stomach cancer is one of the most common cancers worldwide. The incidence of stomach cancer has been decreasing in most industrialized countries over the recent decades. In spite of this favorable trend, a large geographical variability in incidence rates still persists. In a study which compared stomach cancer incidence between four very distinct areas in four continents, it was shown that Japan (Osaka) had the largest proportion of younger patient with almost 70% of the patients aged younger than 70 years, while USA (Iowa) had the smallest proportion with 41% aged younger than 70 years. The ASR in Japan was ten times higher than USA [26]. At present in the United States, the disease rarely occurs before the age of 40 years, but its incidence increases steadily thereafter and peaks in the seventh decade. It is reported that the incidence of gastric cancer in old age is 4 to 5 times higher than middle age patients. The disease remains approximately twice as common in men as in women. The marked decline in the incidence of gastric cancer in the United States and other industrialized countries suggests that environmental exposures, which can vary over time, play an important part in the pathogenesis of the disease [27-28]. Founded on published data from Iran and this region such as the present study, the incidence rates of stomach cancer in Iran are high, well above the world average, especially in the population over the age of 65 years [29-31].

Esophageal cancer was the eighth most common cancer worldwide in 2002 (4.2% of the total), and the sixth most common cause of death from cancer (5.7% of the total) [32]. It displays unique epidemiologic features which distinguish it from all other malignancies. It shows marked geographic variation internationally [33]. A high-risk area known as the "esophageal cancer belt" ranges from north part of Iran all the way to north central China. In an analysis of cancer incidence in five continents, database demonstrated that the age specific incidence rate increased in young adults in high incidence regions, and there was a steady increase thereafter with increasing age [34,35]. A study on the incidence rate of esophageal cancer from USA showed the highest age-adjusted incidence rate at old age (age 65 to 74) and its incidence was two times greater than younger group [36].

The incidence of some malignancies bears a different relationship with age; for example, prostate cancer is one of the most common cancers in old males worldwide but it ranks fourth in our region. In US, National Cancer Institute (NCI) has reported that the incidence of prostate cancer increases from the age of 30 [5]; while in the present study, its

incidences increases 15 years later at the age of 45. The low incidence of prostate cancer in our region compared to European and American countries might be due to lack of screening programs for this cancer.

Data from the Surveillance Epidemiology and End Results (SEER) Program indicate that there is an increase in the average incidence of breast cancer per million females per year across the adolescent and young adult age groups, which is 1.3 in the 15- to 19-year-olds, 12.1 in the 20- to 24-year-olds, and 81.1 in 25- to 29-year-olds [5]. The breast cancer is the most common cause of cancer deaths in women over 65 years of age and its incidence increases up to the age of 80, plateaus until the age of 85, and declines thereafter [13]. In this study, we found that the ASR for breast cancer in three age groups were lower than other reports from other parts of the world and even from other provinces of Iran [15,28, 37]. Possible explanations include differences in diet, body size, physical activity and reproductive patterns and also lack of any national screening programs for this cancer.

In western countries, lung cancer is a disease of the elderly population and ranks as the second most common malignant neoplasm after prostate and breast cancers [15,28]; however, other studies from Iran show that lung cancer is not more common as other countries and the comparison of ASR between males and females is evidence for the fact lung cancer is uncommon in females compared to males. Its low incidence in this area could be due to the tobacco smoking pattern in the last decades since the prevalence of smoking in Iranian males over the age of 15 was 12.9% and 22% in 1980 and 2004, respectively, and the fact that it is a very unusual habit in females and young ages (less than 0.5% and 3% in 1980 and 2004, respectively) [38-40].

The highest bladder cancer incidence rates are generally found in industrially developed countries, particularly in North America and Western Europe, and in areas associated with endemic schistosomiasis in Africa and the Middle East. However, in general, the world incidence rates show comparatively low variations compared to other cancers [32]. Based on England cancer registration, few cases occur under the age of 50, but thereafter the rates rise with age to reach a peak in the oldest age-groups when rates in elderly men are more than three times higher than in elderly women [41]. In the present study, the sex ratio (83.1% males & 16.9% females) for geriatric population was around 5. These differences could be due to exposure to environmental and industrial

carcinogens and tobacco smoking and opium addiction which are more frequent in males.

The low incidence rate of cervical cancer in Iran in comparison with other developing countries can be partly explained by a very strong dependence of Iranian women on family-based traditions, religious beliefs, and almost having no extramarital sexual relationship, but this pattern might be changed and we expect that it will grow up in the future.

## Conclusion

Cancer incidence year in most of the published articles is too old to make a comparison with this study (2006-2007) and is a limitation. The high percentage of DCO in this study might be due to under-recording from some cemeteries and unknown incidence date because of the first year of cancer registry in this province. Generally, the incidence of cancer in Iran was the lowest among developing countries especially in the geriatric population. Lack of national screening programs, incomplete cancer registry, and missed or undiagnosed cases might be the main issues which need more attention by health policy makers. Cancer in older people is a common problem with an increasing trend. Poor functional performance, depression, cognitive impairment, nutritional status, insufficient social support and comorbidity are the main causes for less specific attention. But life expectancy and overage quality of life are increasing as well as the demand for high quality care even for patients in their seventies or older. Thus, it is recommended to emphasize the increasing need for research in prevention, screening, treatment and palliative care for cancer and to implement national cancer control programs, especially for the elderly.

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