JBUON 2016; 21(4): 994-1004
ISSN: 1107-0625, online ISSN: 2241-6293 • www.jbuon.com
E-mail: editorial_office@jbuon.com

ORIGINAL ARTICLE

Incidence, mortality, and epidemiological aspects of cancers in Iran; differences with the world data

Zeinab Almasi[1], Abdollah Mohammadian-Hafshejani[2], Hamid Salehiniya[3, 4]

[1]Department of Epidemiology and Biostatistics, School of Public Health, Zahedan University of Health Sciences, Zahedan, Iran; [2]Social Determinants in Health Promotion Research Center, Hormozgan University of Medical Sciences, Bandar abbas, Iran; [3]Zabol University of Medical Sciences, Zabol, Iran; [4]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

Summary

Purpose: *No comprehensive study of cancer incidence and mortality exists in Iran. This study aimed to evaluate the incidence, mortality and epidemiological aspects of cancers in our country.*

Methods: *In this study, information of cancer incidence and mortality in Iran was retrieved from International Cancer Registry data and reported by numbers, crude and standardized incidence and mortality rates. Cancer incidence and mortality in Iran were mapped and compared with neighboring countries and the world.*

Results: *A total of 84,829 cancer cases occurred in Iran in 2012. Overall, 39,991 cases (47.14%) were women and 44,838 (52.85%) men with male to female ratio 1.12. There were 53,350 deaths, of which 43.55% in women and 56.44% in men. The sex ratio of mortality was 1.29. Five cancers with the highest standardized incidence rates (SIR) were breast cancer (28.1), gastric cancer (15.2), prostate cancer (12.6), colorectal cancer (11.1), and esophageal cancer (8.6). Five cancers with the highest standardized mortality rates (SMR) were gastric cancer (12.9), breast cancer (9.9), esophageal cancer (7.8), lung cancer (6.9) and colorectal cancer (6.6).*

Conclusion: *Our findings revealed that the incidence of some cancers increased compared to reports in previous years. The incidence and mortality were higher in men than in women. Common cancers should be detected early using screening tests such as colonoscopy and mammography. The tests can be especially useful in old age. Additional studies should be performed to investigate the causes of cancer incidence and mortality.*

Key words: *cancer, epidemiology, incidence, Iran, mortality*

Introduction

Iran is a country in Southwest Asia. The country is in a stage of epidemiological transition. The epidemiological and demographic transition can have an impact on the pattern of mortality in the near and far future, mainly due to the emergence of non-communicable chronic diseases, health problems, aging population and traffic accidents [1]. Cancer is a major health problem in Iran [2-5]. According to a recent report by the Ministry of Health in Iran, cancer is the third cause of death after cardiovascular diseases and accidents [6] and the second cause of death in developed countries. Studies in the United States showed that one every four deaths is attributed to cancer [7]. According to GLOBOCAN 2012, there were approximately 14.1 million new cancer cases and 8.2 cancer-related deaths [8]. Based on a report of Ministry of Health's Center for Disease Management of Iran, the 10 most common cancers among men were stomach, bladder, prostate, colon, hematopoietic system, lung, esophagus, central nervous, endocrine, lymphoma, and skin. The most common

Correspondence to: Hamid Salehiniya, PhD cand. Zabol University of Medical Sciences, Zabol, Iran and Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, Tel: +98 9357750428, Fax: +98 2188989123, E-mail: alesaleh70@yahoo.com
Received: 09/01/2016; Accepted: 21/01/2016

cancers in women included breast, skin, colon, rectum, stomach, esophagus, hematopoietic system, thyroid, ovary, and uterus. Also, skin cancer was the first and second common cancer in 2009 in men and women. The Age Standardized Incidence Rate (ASR) of cancer was 18.93 for men and 13.09 for women. Breast cancer ranks first in women (ASR=28.25), higher than the reported cases of skin cancer. Gastric cancer ranks second in men after skin cancer and fourth in women. ASR of cancer was 16.01 in men and 7.78 in women. Colorectal cancer ranks third in women (ASR=10.89) and fifth in men (ASR=11.31) and esophageal cancer ranks fifth in women (ASR=5.88) and eight in men (ASR=6.15). Prostate cancer ranks third in men (ASR=12.5), while bladder cancer fourth in men (ASR=12.59), but much less frequent in women (ASR=3.28). Lung cancer ranks seventh in men (ASR=7.09) and in women has a ASR equal to 3.38. Leukemia is sixth in men (ASR=6.42) and seventh in women (ASR=4.48). Cervical cancer with ASR 2.17 is near the tenth cancer in women [6]. The most common cancers among women in the United States are breast, lung, and colorectal. The major causes of death from cancer among women were lung, breast, and colorectal [9].

The burden of cancer has increased in developing countries with low incomes. This could be possibly attributed to the aging of the population along with making a lifestyle related to risk factors such as smoking, physical inactivity and unhealthy diet [10]. Unfortunately, only a small number of cancer control programs are being implemented based on World Health Organization's (WHO) guidelines [11]. The first objective of these actions was to develop a cancer control program consisting of early detection, effective treatment, and palliative care [1]. Valid information on the epidemiology of the disease is the first step to planning health care in each region. Population-based studies help determine the disease pattern by age, sex, race, economic and cultural conditions of the region. Therefore, the target groups that have a greater need for health care are also recognized. Morbidity and economic costs imposed by the disease are reducible with careful planning and screening [12]. Mortality rate can be a useful indicator for assessing the cancer changes over time because it is recorded almost systematically at a regional or national level [13]. Another important indicator is the incidence rate, which is obtained from population-based cancer registries. The rate shows just a part of the cancer pattern at a regional level. Information on cancer indicators and time trend analysis in specific geographical areas is necessary for successful prevention [14]. Because no comprehensive study of cancer incidence and mortality exists in Iran, this study aimed to evaluate the incidence, mortality and epidemiological aspects of prevalent cancers in the country.

Methods

This was a cross-sectional study by analyzing existing data, published by the GLOBOCAN project and available at http://globocan.iarc.fr/Default.aspx. In this project, cancer incidence and mortality from 184 countries, including Iran are calculated and recorded.

Method of estimation of the age-specific incidence and mortality rates in global cancer project by the International Agency for Research on Cancer

Age-specific incidence rate estimates

The methods of estimation are country-specific and the quality of the estimation depends on the quality and the amount of the information available for each country. In theory, there are as many methods as countries, and because of the variety and the complexity of these methods, no overall quality score for the incidence and mortality estimates combined is possible to establish. However, an alphanumeric scoring system which independently describes the availability of incidence and mortality data has been established at the country level. In Iran the availability of incidence data was in high quality regional group (coverage lower than 10%) and the availability of mortality data was in the no data group. The method for estimating the incidence was based on the weighted average of the local rates, and methods for estimating the mortality was based on national incidence estimates using modelled survival.

The combined score is presented together with the estimates for each country with an aim of providing a broad indication of the robustness of the estimation. The methods to estimate the sex- and age-specific incidence rates of cancer for a specific country fall into one of the following broad categories, in priority order:

1) Rates projected to 2012 (38 countries); 2) Most recent rates applied to 2012 population (20 countries); 3) Estimated from national mortality by modelling, using incidence mortality ratios derived from recorded data in country-specific cancer registries (13 countries); 4) Estimated from national mortality estimates by modelling, using incidence mortality ratios derived from recorded data in local cancer registries in neighboring countries (9 European countries); 5) Estimated from national mortality estimates using modelled survival (32 countries); 6) Estimated as the weighted average of the local rates (16 countries-Iran is located in this category); 7) One cancer registry covering part of a

country is used as representative of the country profile (11 countries); 8) Age/sex specific rates for "all cancers" were partitioned using data on relative frequency of different cancers (by age and sex) (12 countries); 9) The rates are those of neighboring countries or registries in the same area (33 countries) [15,16].

Age-specific mortality rate estimates

Depending of the degree of detail and accuracy of the national mortality data, 6 methods have been utilized in the following order of priority:

1) Rates projected to 2012 (69 countries);
2) Most recent rates applied to 2012 population (26 countries);
3) Estimated as the weighted average of regional rates (1 country);
4) Estimated from national incidence estimates by modelling, using country-specific survival (2 countries);
5) Estimated from national incidence estimates using modelled survival (83 countries-Iran is located in this category); 6) the rates are those of neighboring countries or registries in the same area (3 countries) [15,16].

In this report, all Iranian cancer cases registered were investigated in the total population and sex. Cancer incidence and mortality in Iran were mapped and compared with neighboring countries and the world.

Results

A total of 84,829 cancer cases occurred in Iran in 2012. Overall, 39,991 cases (47.14%) were women and 44,838 (52.85%) men. The male to female ratio of incidence was 1.12. During 2012, there were 53,350 deaths, of which 23,235 (43.55%) were in women and 30,115 (56.44%) in men. The male to female death ratio from all cancers was 1.29.

Incidence rate of cancers in total population, men and women

The crude and standardized incidence rates of cancers were 112.2 and 127.7, respectively. Five cancers with the highest incidence rate based on crude and standardized incidence rates in the total population were breast cancer with 9,795 cases and crude rate of 26.3 and standardized rate of 28.1(per 100,000), stomach cancer with 9,660 cases and crude rate of 12.8 and standardized rate of 15.2 (per 100,000), prostate cancer with 4,111cases and crude rate of 10.7 and standardized rate of 12.6 (per 100,000), colorectal cancer with 7,163 cases and crude rate of 9.5 and standardized rate of 11.1 (per 100,000), and stomach cancer with 5,343 cases and crude rate of 7.1 and standardized rate of 8.6 (per 100,000) (Table 1).

Five cancers with the highest rate based on crude and standardized incidence rates in women were breast cancer with 9,795 cases and crude rate of 26.3 and standardized rate of 28.1(per 100,000), colorectal cancer with 3,352 cases and crude rate of 9 and standardized rate of 10.5 (per 100,000), stomach cancer with 3,020 cases and crude rate of 8.1 and standardized rate of 9.7 (per 100,000), esophagus cancer with 2,445 cases and crude rate of 6.6 and standardized rate of 8 (per 100,000), and lung cancer with 1,581 cases and crude rate of 4.2 and standardized rate of 5 (per 100,000); and in men were stomach cancer with 6,640 cases and crude rate of 17.3 and standardized rate of 20.6 (per 100,000), bladder cancer with 4,277 cases and crude rate of 11.2 and standardized rate of 13.2 (per 100,000), prostate cancer with 4,111 cases and crude rate of 10.7 and standardized rate of 12.6 (per 100,000), colorectal cancer with 3,811 cases and crude rate of 9.9 and standardized rate of 11.6 (per 100,000), and lung cancer with 3,307 cases and crude rate of 8.6 and standardized rate of 10.3 (per 100,000) (Tables 1,2,3 and Figure 1).

Mortality rate of cancers in the total population, men and women

The crude and standardized mortality rates of cancers were 70.6 and 81.9, respectively. Five cancers with the highest mortality rate based on crude and standardized incidence rates in the total population were stomach cancer with 8,247 cases and crude rate of 10.9 and standardized rate of 12.9 (per 100,000), breast cancer with 3,304 cases and crude rate of 8.9 and standardized rate of 9.9 (per 100,000), esophagus cancer with 4,915 cases and crude rate of 6.5 and standardized rate of 7.8 (per 100,000), lung cancer with 4,361 cases and crude rate of 5.8 and standardized rate of 6.9 (per 100,000), and colorectal cancer with 4,262 cases and crude rate of 5.6 and standardized rate of 6.6 (per 100,000) (Table 1).

Five cancers with the highest rate based on crude and standardized incidence rates in women were breast cancer with 3,304 cases and crude rate of 8.9 and standardized rate of 9.9 (per 100,000), stomach cancer with 2,582 cases and crude rate of 6.9 and standardized rate of 8.3 (per 100,000), esophagus cancer with 2,253 cases and crude rate of 6 and standardized rate of 7.4 (per 100,000), colorectal cancer with 1,995 cases and crude rate of 5.4 and standardized rate of 6.3 (per 100,000), and lung cancer with 1,411 cases and crude rate

Table 1. Estimates of incidence and mortality from cancer in Iran in 2012

Incidence					*Mortality*				
Cancer	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*	*Cancer*	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*
All cancers excl. non-melanoma skin cancer	84829	112.2	127.7	13.08	All cancers excl. non-melanoma skin cancer	53350	70.6	81.9	8.60
Breast	9795	26.3	28.1	2.90	Stomach	8247	10.9	12.9	1.44
Stomach	9660	12.8	15.2	1.76	Breast	3304	8.9	9.9	1.08
Prostate	4111	10.7	12.6	1.39	Oesophagus	4915	6.5	7.8	0.92
Colorectum	7163	9.5	11.1	1.27	Lung	4361	5.8	6.9	0.79
Oesophagus	5343	7.1	8.6	1.01	Colorectum	4262	5.6	6.6	0.76
Bladder	5343	7.1	8.3	0.94	Prostate	2297	6.0	6.2	0.49
Lung	4888	6.5	7.7	0.88	Leukaemia	3064	4.1	4.6	0.47
Leukaemia	3926	5.2	5.8	0.55	Bladder	2280	3.0	3.5	0.37
Ovary	1637	4.4	4.8	0.51	Ovary	1076	2.9	3.4	0.40
Non-Hodgkin lymphoma	3257	4.3	4.7	0.50	Non-Hodgkin lymphoma	1987	2.6	3.0	0.33
Brain, nervous system	3057	4.0	4.2	0.42	Brain, nervous system	1844	2.4	2.7	0.28
Cervix uteri	947	2.5	2.8	0.31	Liver	1492	2.0	2.3	0.26
Thyroid	2025	2.7	2.7	0.26	Pancreas	1096	1.4	1.8	0.21
Kidney	1641	2.2	2.6	0.28	Kidney	1071	1.4	1.7	0.19
Liver	1567	2.1	2.5	0.28	Multiple myeloma	766	1.0	1.3	0.16
Corpus uteri	795	2.1	2.5	0.28	Cervix uteri	370	1.0	1.2	0.14
Larynx	1381	1.8	2.2	0.27	Gallbladder	707	0.9	1.1	0.13
Lip, oral cavity	1380	1.8	2.0	0.22	Thyroid	610	0.8	0.9	0.10
Pancreas	1138	1.5	1.8	0.22	Larynx	550	0.7	0.9	0.11
Testis	721	1.9	1.7	0.13	Hodgkin lymphoma	491	0.6	0.7	0.07
Multiple myeloma	984	1.3	1.6	0.20	Testis	269	0.7	0.7	0.06
Hodgkin lymphoma	1057	1.4	1.3	0.11	Lip, oral cavity	449	0.6	0.7	0.07
Gallbladder	753	1.0	1.2	0.14	Corpus uteri	196	0.5	0.6	0.08
Melanoma of skin	531	0.7	0.8	0.08	Nasopharynx	214	0.3	0.3	0.04
Nasopharynx	418	0.6	0.6	0.07	Melanoma of skin	208	0.3	0.3	0.03
Other pharynx	217	0.3	0.3	0.04	Other pharynx	152	0.2	0.2	0.03
Kaposi sarcoma	93	0.1	0.1	0.01	Kaposi sarcoma	44	0.1	0.1	0.00

of 3.8 and standardized rate of 4.5 (per 100,000); and in men were stomach cancer with 5,665 cases and crude rate of 14.8 and standardized rate of 17.3 (per 100,000), lung cancer with 2,950 cases and crude rate of 7.7 and standardized rate of 9.1 (per 100,000), esophagus cancer with 2,662 cases and crude rate of 6.9 and standardized rate of 8.2 (per 100,000), colorectal cancer with 2,267 cases and crude rate of 5.9 and standardized rate of 6.9 (per 100,000), and prostate cancer with 2,297 cases and crude rate of 6 and standardized rate of 6.2 (per 100,000) (Tables 1,2,3 and Figure 1).

Iran is categorized as a country with low incidence of cancers (in the category of 101.3-137.5). Considering mortality rate, the country is known for its low death rate (in the category of 73.3-89.7 per 100,000) (Figures 2,3). Epidemiologic studies indicated that Iran is one of the most common

Table 2. Estimates of incidence and mortality from cancer in Iranian women in 2012

Incidence					*Mortality*				
Cancer	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*	*Cancer*	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*
All cancers excl. non-melanoma skin cancer	39991	107.2	120.1	12.24	All cancers excl. non-melanoma skin cancer	23235	62.3	72.7	7.81
Bladder	1066	2.9	3.4	0.37	Breast	3304	8.9	9.9	1.08
Brain, nervous system	1358	3.6	3.8	0.38	Stomach	2582	6.9	8.3	0.94
Breast	9795	26.3	28.1	2.90	Oesophagus	2253	6.0	7.4	0.88
Cervix uteri	947	2.5	2.8	0.31	Colorectum	1995	5.4	6.3	0.74
Colorectum	3352	9.0	10.5	1.22	Lung	1411	3.8	4.5	0.52
Corpus uteri	795	2.1	2.5	0.28	Leukaemia	1242	3.3	3.8	0.37
Gallbladder	425	1.1	1.4	0.17	Ovary	1076	2.9	3.4	0.40
Hodgkin lymphoma	444	1.2	1.1	0.09	Brain, nervous system	823	2.2	2.5	0.26
Kaposi sarcoma	30	0.1	0.1	0.00	Non-Hodgkin lymphoma	771	2.1	2.4	0.27
Kidney	660	1.8	2.1	0.22	Liver	645	1.7	2.0	0.22
Larynx	188	0.5	0.6	0.07	Pancreas	488	1.3	1.6	0.18
Leukaemia	1588	4.3	4.7	0.44	Bladder	453	1.2	1.4	0.14
Lip, oral cavity	617	1.7	1.8	0.20	Kidney	432	1.2	1.4	0.15
Liver	678	1.8	2.1	0.23	Thyroid	429	1.2	1.4	0.16
Lung	1581	4.2	5.0	0.57	Gallbladder	401	1.1	1.3	0.16
Melanoma of skin	236	0.6	0.7	0.08	Cervix uteri	370	1.0	1.2	0.14
Multiple myeloma	377	1.0	1.2	0.15	Multiple myeloma	292	0.8	1.0	0.12
Nasopharynx	140	0.4	0.4	0.05	Corpus uteri	196	0.5	0.6	0.08
Non-Hodgkin lymphoma	1259	3.4	3.8	0.41	Lip, oral cavity	200	0.5	0.6	0.07
Oesophagus	2445	6.6	8.0	0.97	Hodgkin lymphoma	205	0.5	0.6	0.06
Other pharynx	94	0.3	0.3	0.03	Melanoma of skin	92	0.2	0.3	0.03
Ovary	1637	4.4	4.8	0.51	Larynx	75	0.2	0.2	0.03
Pancreas	503	1.3	1.6	0.18	Nasopharynx	72	0.2	0.2	0.03
Stomach	3020	8.1	9.7	1.14	Other pharynx	67	0.2	0.2	0.03
Thyroid	1512	4.1	4.0	0.38	Kaposi sarcoma	14	0.0	0.0	0.00

sites of occurrence of cancer in the world, especially for stomach cancer (Figure 4).

Discussion

Recognition of the combination of all cancers is highly difficult because of the diversity of the nature of malignancies [17]. In this study, the incidence and mortality of the most prevalent cancers were examined in 2012. Cancer is one of the main causes of death in the world. It is estimated that 45% of cancer cases occur in developing countries [18]. In 2004, the number of cancer cases in Iran was 74,067, of whom 55.58% were men and 41.44% women [18-21]. In this study, the sex ratio of incidence and mortality from all cancers were 1.12 and 1.29, respectively. The incidence and mortality rates were lower in women than in men. Women are more sensitive than men to get health care, so that with the appearance of the first symptoms of disease refer for screening, diagnosis and treatment, therefore the probability of detection and treatment of disease in early stages is higher than in men, and the incidence and mortality are also lower than in men [19].Early detection and timely treatment reduce mortality and incidence of cancer in women than in men. Studies in European countries reported increasing and decreasing trends of cancer for women and men, respectively [22-24]. A study in Isfahan (a central city of Iran) predicted increasing trend for women and men by 2015 [14]. In 2009, of 567,628 cancer patients 243,716 died in the United States.

Cancer is the second cause of death after cardiovascular diseases in the United States, and the third leading cause of death in Iran [25]. Our find-

Table 3. Estimates of incidence and mortality from cancer in Iranian men in 2012

Incidence					*Mortality*				
Cancer	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*	*Cancer*	*N*	*Crude rate*	*ASR (W)*	*Cumulative risk*
All cancers excl. non-melanoma skin cancer	44838	117.0	134.7	13.92	All cancers excl. non-melanoma skin cancer	30115	78.6	90.4	9.38
Stomach	6640	17.3	20.6	2.38	Stomach	5665	14.8	17.3	1.93
Bladder	4277	11.2	13.2	1.51	Lung	2950	7.7	9.1	1.05
Prostate	4111	10.7	12.6	1.39	Oesophagus	2662	6.9	8.2	0.95
Colorectum	3811	9.9	11.6	1.32	Colorectum	2267	5.9	6.9	0.79
Lung	3307	8.6	10.3	1.19	Prostate	2297	6.0	6.2	0.49
Oesophagus	2898	7.6	9.0	1.06	Bladder	1827	4.8	5.5	0.59
Leukaemia	2338	6.1	6.9	0.66	Leukaemia	1822	4.8	5.4	0.56
Non-Hodgkin lymphoma	1998	5.2	5.7	0.59	Non-Hodgkin lymphoma	1216	3.2	3.6	0.39
Brain, nervous system	1699	4.4	4.6	0.45	Brain, nervous system	1021	2.7	3.0	0.31
Larynx	1193	3.1	3.8	0.47	Liver	847	2.2	2.6	0.30
Kidney	981	2.6	3.0	0.34	Kidney	639	1.7	2.0	0.23
Liver	889	2.3	2.8	0.33	Pancreas	608	1.6	2.0	0.25
Lip, oral cavity	763	2.0	2.2	0.24	Multiple myeloma	474	1.2	1.6	0.20
Pancreas	635	1.7	2.1	0.26	Larynx	475	1.2	1.5	0.19
Multiple myeloma	607	1.6	2.0	0.25	Gallbladder	306	0.8	0.9	0.11
Testis	721	1.9	1.7	0.13	Hodgkin lymphoma	286	0.7	0.8	0.08
Hodgkin lymphoma	613	1.6	1.6	0.13	Lip, oral cavity	249	0.6	0.7	0.08
Thyroid	513	1.3	1.4	0.14	Testis	269	0.7	0.7	0.06
Gallbladder	328	0.9	1.0	0.12	Thyroid	181	0.5	0.5	0.05
Melanoma of skin	295	0.8	0.9	0.09	Nasopharynx	142	0.4	0.4	0.05
Nasopharynx	278	0.7	0.8	0.09	Melanoma of skin	116	0.3	0.3	0.03
Other pharynx	123	0.3	0.4	0.04	Other pharynx	85	0.2	0.3	0.03
Kaposi sarcoma	63	0.2	0.2	0.02	Kaposi sarcoma	30	0.1	0.1	0.01

ings showed that during 2012 the crude and ASR were 112.2 and 127.7 per 100,000, respectively. A study conducted in Kerman (one of the southern cities of Iran) reported that the annual incidence of common cancers in men and women was 12.1 and 11.7, respectively [18]. Another study in Iran indicated that the annual incidence of cancer about 12.4 per 100,000 [19]. It is estimated that cancer incidence will increase nearly 2.5 times in men and 2.85 times in women during the next 5 years [18].

Our study revealed that the 5 cancers with the highest incidence rates based on crude and ASR in the total population during 2012 were breast, stomach, prostate, colorectal, and esophagus. The first 5 cancers in women were breast, colorectal, stomach, esophageal and lung and in men stomach, bladder, prostate, colorectal, and lung. During 2012, 53,350 cancer deaths were registered. The crude and standardized mortality rates were 70.6 and 81.9, respectively. Stomach, breast, esophagus, lung, and colorectal cancers were the 5 with the highest mortality rates in the total population. The highest mortality rate of cancer was related to breast, stomach, esophagus, colorectal, and lung cancers in women and stomach, lung, esophagus, colorectal, and prostate cancers in men. It was reported that the most common cancers in both sexes in Iran included skin, breast, stomach, colorectal, bladder, and prostate cancers, but the 10 most common cancers in Kerman in both sexes were skin, breast, bladder, stomach, leukemia, colorectal, lung, lymphoma, larynx and prostate [19]. Another study determined that the most common cancers were stomach, esophagus, colorectal, bladder, and leukemia in men and breast, esophagus, stomach, colorectal, and cervix in women [1]. Based on the report of centers for disease control and prevention (CDC), the most common cancers in American

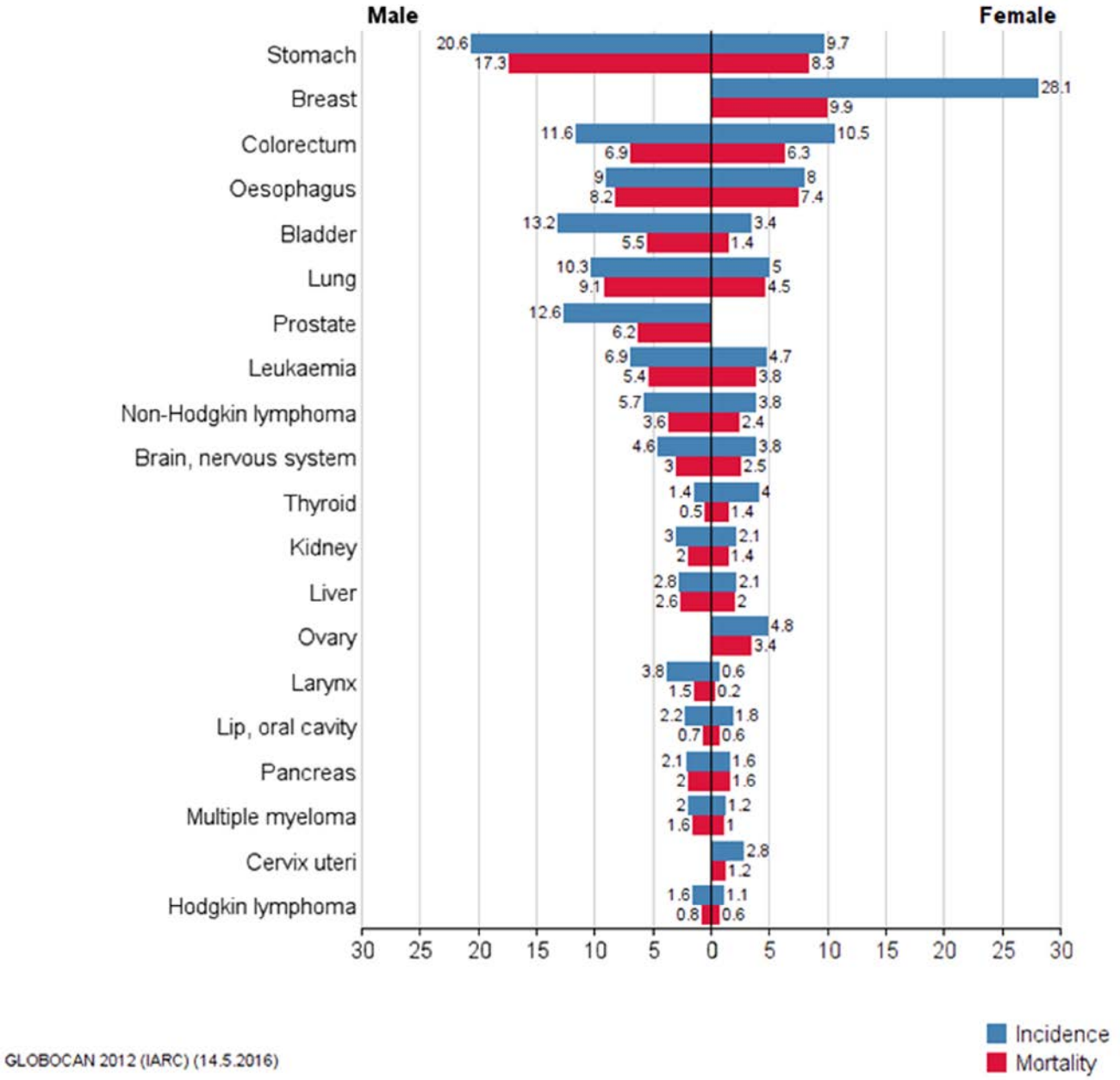

Figure 1. Standardized rates of cancer incidence and mortality in Iran in 2012.

women were lung, breast, and colorectal [26]. A research in one of the northern cities of Iran suggested that the most common cancers among men were stomach, skin, esophagus, bladder, prostate, colon and rectum, the hematopoietic system, the lymphatic system, testes, and connective tissues, while in women the 10 most common cancers were breast, stomach, esophagus, colon and rectum, the hematopoietic system, skin, the lymphatic system, cervix, ovaries, and thyroid [1]. The 10 most common cancers among women living in one of the central provinces in Iran were breast, skin, stomach, colorectal, lung, uterus, bladder, lymphoma, thyroid, and esophagus and in men skin, bladder, stomach, lung, prostate, colorectal, esophagus, lymphoma, testes, and gallbladder [27]. The 4 most common cancers in the province of Semnan (one of the central provinces in Iran) were stomach, colon, esophagus and liver respectively, in both sexes. In females, they were breast, uterine, ovarian, stomach, and skin. The most common tumors in young people included brain, leukemia and bone. The most common cancers in Iranian women were breast, colorectal, stomach, and esophagus and in Iranian men gastric cancer was first and then bladder, prostate, colorectal and esophagus [6].

Another research reported that the most common cancers among men and women were esophageal and breast cancers, respectively [23]. The consumption of hot tea, opium, alcohol, and lack

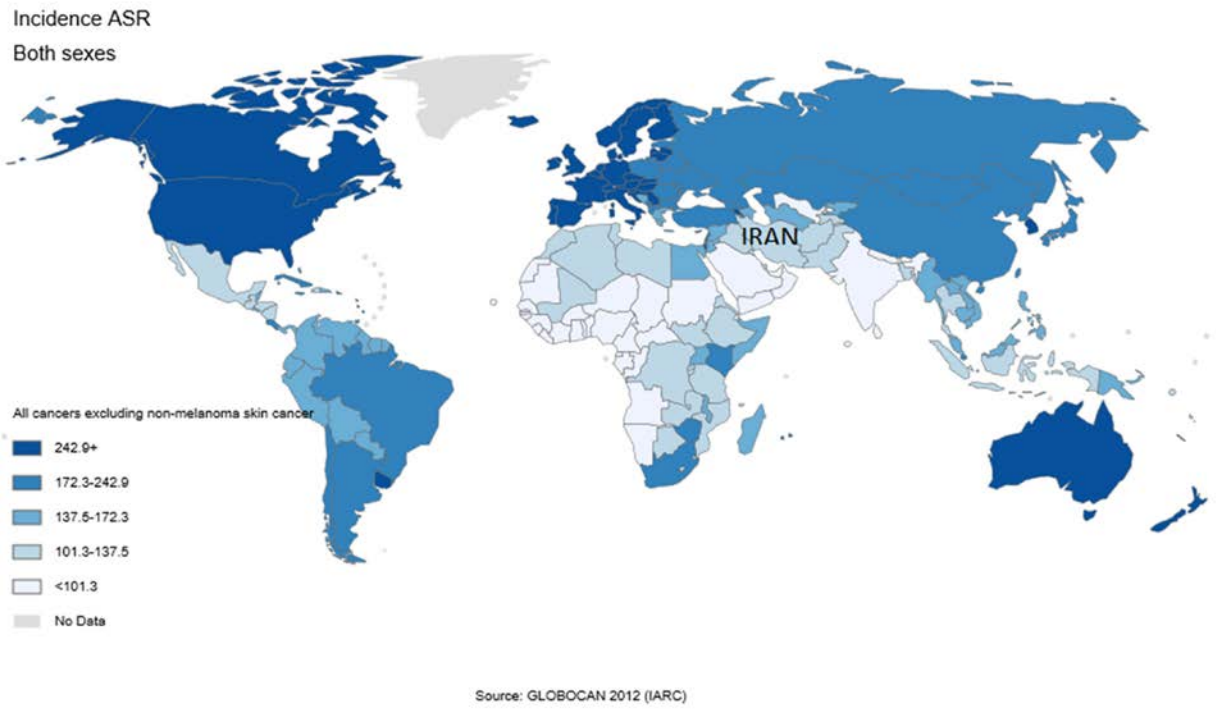

Figure 2. Age-standardized incidence rates in the world. Source: Globocan

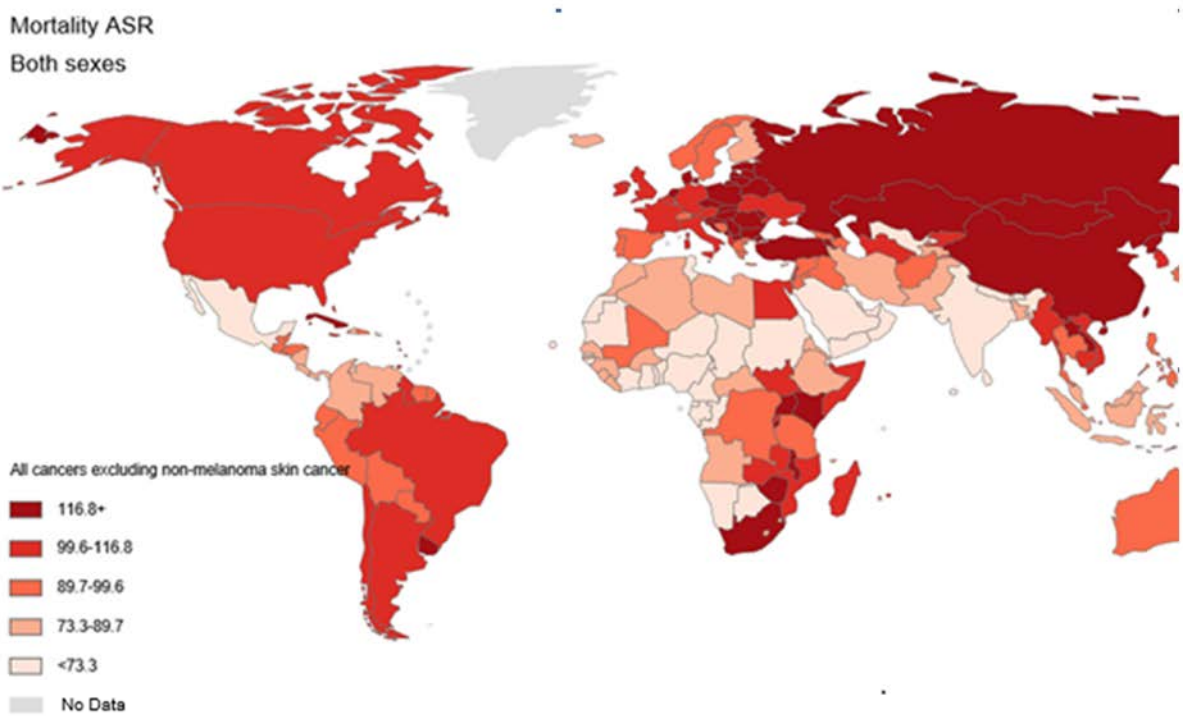

Figure 3. Age-standardized mortality rates in the world. Source: Globocan

of oral hygiene may be reasons for the first rank of esophageal cancer in men. North East and North of Iran are located in the esophageal cancer belt. The belt passes through a part of China and Central Asia. In these areas, the incidence of esophageal cancer is more than in the rest of the world. Hot tea is one of the main causes of esophageal cancer in Iran [28].

Breast cancer is the most common malignancy in women, because of world age-specific incidence of 38.9 and includes a quarter of cancer cases worldwide [29]. In our study, breast cancer was the most common cancer among women and the leading cause of death from cancer. Age-specific

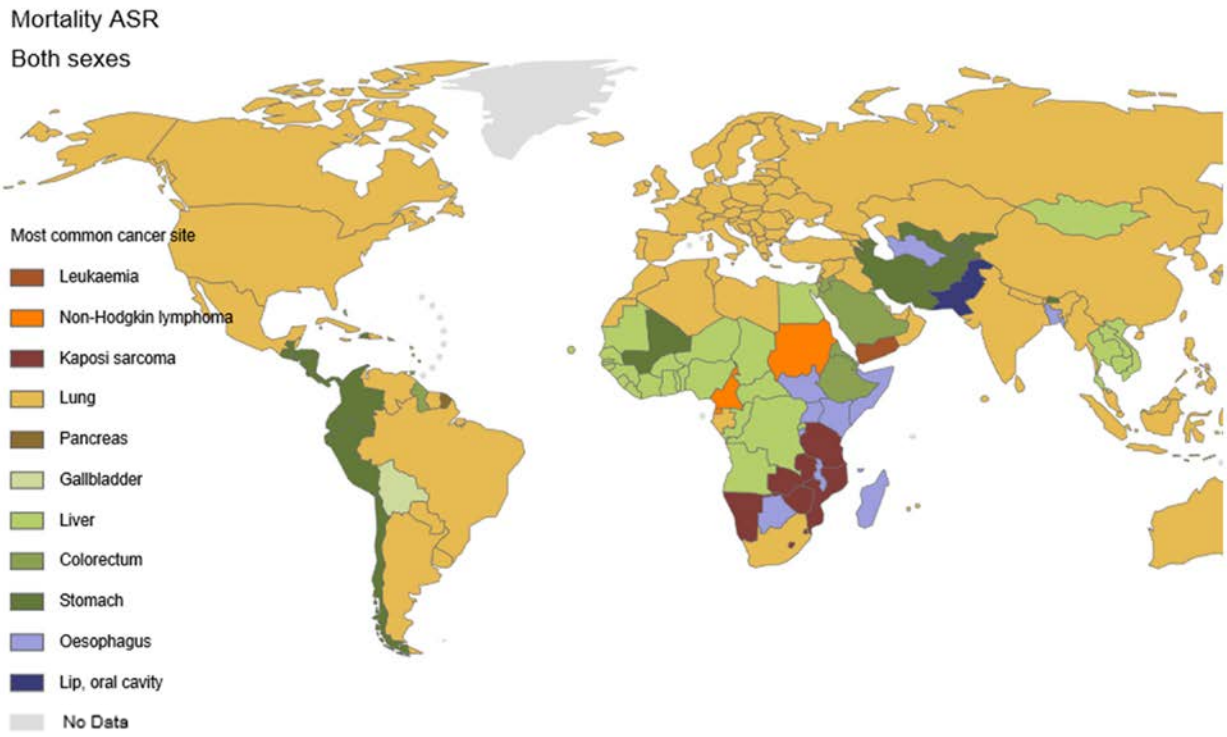

Figure 4. The most common areas (countries) of mortality from different kinds of cancer. Iran is among the areas (countries) with high mortality from gastric cancer. Source: Globocan

incidence and mortality rates for breast cancer were 28.1 and 9.9, respectively.

Breast cancer ranks first in women [18-20,30-32]. The incidence of breast cancer in Asian countries is moderate, but with increasing trend [31-33]. Risk factors of cancer in developing countries and Iran are hormonal changes in women, increasing age, age at the birth of the first child, breastfeeding, having an unhealthy lifestyle such as the high-fat diet and obesity [14]. Gastric cancer is one of the important cancers of the digestive tract and the third most common neoplasia in both sexes. It is the fourth most common cancer in women and the second in men [19]. The highest incidence of this cancer was seen in East Asia, West Europe, and South America and the lowest in North America and Africa [34]. The highest rate of breast cancer was registered in North and Northwest provinces of Iran, the lowest rate in the Southern provinces, and moderate in Central and Western provinces [1]. Unlike other studies, gastric cancer was the second most common cancer in both sexes with age-specific incidence 15.2 in our study. It was also first men and third in women [18,19,35].

In the classification of the most common cancers in the overall population prostate cancer ranks fifth, but in men this cancer is second [36,37]. In our study, prostate cancer in the classification of the most common cancers in the overall population and in men ranked third with age-specific incidence rate 12.6. The incidence is high in China, India, and other Asian countries [38] and it ranks sixth in mortality in Asia [39]. Colorectal cancer is one of the most common cancers in North America, Europe and Australia, while Africa, Central Asia, and South America are low-risk areas. Colorectal cancer is the second most common cancer in England [40]. In this study it was the fourth most common cancer in both sexes with age-specific incidence rate of 11.1. It was also the second and the fourth in women and men, respectively.

Esophageal cancer is the eighth most common cancer and sixth in mortality worldwide. Age specific incidence of this cancer is different, lower than 1.4 in West Africa to more than 20 per 100,000 in South Africa and East Asia. Iran is a country with moderate risk for esophageal cancer. Age-specific incidence rates for men and women were 7. In some parts of the country, the rate was higher. In our study with age-specific incidence of 8.6, it was fifth among both sexes and women.

Conclusion

Our findings revealed that the incidence of some cancers increased compared with reports

in previous years. Incidence and mortality were higher in men than in women. Common cancers are detected early using screening tests such as colonoscopy, mammography, etc. The tests can be especially useful in old age. Additional studies are needed to investigate the causes of cancer incidence and mortality.

Conflict of interests

The authors declare no confict of interests.

References

1. Radmard AR. Five common cancers in Iran. Arch Iran Med 2010;13:143-146.
2. Mousavi SM, Gouya MM, Ramazani R, Davanlou M, Hajsadeghi N, Seddighi Z. Cancer incidence and mortality in Iran. Ann Oncol 2009;20:556-563.
3. Almasi Z, Rafiemanesh H, Salehiniya H. Epidemiology characteristics and trends of incidence and morphology of stomach cancer in Iran. Asian Pac J Cancer Prev 2015;16:2757-2761.
4. Zahedi A, Rafiemanesh H, Enayatrad M, Ghoncheh M, Salehiniya H. Incidence, Trends and Epidemiology of Cancers in North West of Iran. Asian Pac J Cancer Prev 2015;16:7189-7193.
5. Razi S, Rafiemanesh H, Ghoncheh M, Khani Y, Salehiniya H. Changing Trends of Types of Skin Cancer in Iran. Asian Pac J Cancer Prev 2015;16:4955-4958.
6. Dahlui M, Ramli S, Bulgiba AM. Breast cancer prevention and control programs in Malaysia. Asian Pac J Cancer Prev 2011;12:1631-1634.
7. Asif HM, Sultana S, Akhtar N, Rehman JU, Rehman RU. Prevalence, Risk Factors and Disease Knowledge of Breast Cancer in Pakistan. Asian Pac J Cancer Prev. 2014;15:4411-4416.
8. Cheng X-BS, Duan G-C. Incidence, survival and prevalence of esophageal and gastric cancer in Linzhou city from 2003 to 2009. Asian Pac Cancer Prev 2013;14:6031-6034.
9. Wu L-Z, Han R-Q, Zhou J-Y et al. Incidence and mortality of female breast cancer in Jiangsu, China. Asian Pac J Cancer Prev 2014;15:2727-2732.
10. Mousavi S, Alamolhoda A, Gouya M, Lickiss N. Implementation of Comprehensive National Cancer Control Program in Iran: an experience in a developing country. Ann Oncol 2008;19:398-400.
11. Yaw YH, Shariff ZM, Kandiah M et al. Diet and physical activity in relation to weight change among breast cancer patients. Asian Pac J Cancer Prev 2014;15:39-44.
12. Ravakhah K. Death certificates are not reliable: revivification of the autopsy. South Med J 2006;99:728-734.
13. Moradpour F, Fatemi Z. Estimation of the projections of the incidence rates, mortality and prevalence due to common cancer site in Isfahan, Iran. Asian Pac J Cancer Prev 2013;14:3581-3585.
14. Hutchins-Wolfbrandt A, Mistry AM. Dietary turmeric potentially reduces the risk of cancer. Asian Pac J Cancer Prev 2011;12:3169-3173.
15. Ferlay J, Soerjomataram I, Dikshit R et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer 2015;136:E359-E386.
16. Ferlay J, Shin H, Bray F, Forman D, Mathers C, Parkin D. Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 10 [Internet]. International Agency for Research on Cancer 2010.
17. Amoori N, Mirzaei M, Cheraghi M. Incidence of Cancers in Kuzestan Province of Iran: Trend from 2004 to 2008. Asian Pac J Cancer Prev 2014;15:8345-8349.
18. Keyghobadi N, Rafiemanesh H, Mohammadian-Hafshejani A, Enayatrad M, Salehiniya H. Epidemiology and Trend of Cancers in the Province of Kerman: Southeast of Iran. Asian Pac J Cancer Prev 2015;16:1409-1413.
19. Nejad FN, Daryasari RR, Ghafari F. Epidemiology of cancer in Mazandaran province 2006. J Mazandaran Univ Med Sci 2009;19:61-65.
20. Moore MA, Yoo K-Y, Tuncer M, Sobue T. Overview of players and information in the cancer epidemiology and control world in Asia. Asian Pac J Cancer Prev 2010;11(Suppl 2):1-10.
21. Grande E, Inghelmann R, Francisci S et al. Regional estimates of all cancer malignancies in Italy. Tumori 2007;93:345-351.
22. Møller H, Fairley L, Coupland V et al. The future burden of cancer in England: incidence and numbers of new patients in 2020. Br J Cancer 2007;96:1484-1488.
23. Sánchez M, Payer T, De Angelis R, Larrañaga N, Capocaccia R, Martinez C. Cancer incidence and mortality in Spain: estimates and projections for the period 1981-2012. Ann Oncol 2010;21:iii30-36.
24. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013. CA: Cancer J Clin 2013;63:11-30.
25. Group UCSW. United States cancer statistics: 1999–2010 incidence and mortality web-based report. Atlanta (GA): Department of Health and Human Services, Centers for Disease Control and Prevention, and National Cancer Institute, 2014.
26. Mohaghegh F, Hamta A, Shariatzade MA. The study of cancer incidence and cancer registration in Markazi province between 2001-2006 and comparison with national statistics, Iran. Arak Univers Med Sci J 2008;11:84-93.
27. Nikfarjam Z, Massoudi, T, Salehi M et al. Demographic Survey of Four Thousand Patients with 10 Common

Cancers in North Eastern Iran over the Past Three Decades. Asian Pac J Cancer Prev 2014;15:10193-10198.

28. Pimhanam C, Sangrajrang S, Ekpanyaskul C. Tobacco Smoke Exposure and Breast Cancer Risk in Thai Urban Females. Asian Pac J Cancer Prev 2014;15:7407.
29. World Health Organization. World Health Statistics 2010: World Health Organization, 2010.
30. Youlden DR, Cramb SM, Yip CH, Baade PD. Incidence and mortality of female breast cancer in the Asia-Pacific region. Cancer Biol Med 2014;11:101-115.
31. Vakili M, Pirdehghan A, Adimi M, Sadeghian M, Akhondi M. Epidemiology and Trend of Cancer in Yazd, a Central Province of Iran, 2005-2009. J Res Health Sci 2014;14:210-213.
32. Afsharfard A, Mozaffar M, Orang E, Tahmasbpour E. Trends in epidemiology, clinical and histopathological characteristics of breast cancer in Iran: results of a 17 year study. Asian Pac J Cancer Prev 2013;14:6905-6911.
33. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA: Cancer J Clin 2011;61:69-90.
34. Fateh M, Emamian MH. Cancer Incidence and Trend Analysis in Shahroud, Iran, 2000-2010. Iran J Cancer Prev 2013;6:85-95.
35. Van Dong H, Lee AH, Nga NH, Quang N, Le V, Chuyen CW. Epidemiology and Prevention of Prostate Cancer in Vietnam. Asian Pac J Cancer Prev 2014;15:9747-9751.
36. Segnan N, Patnick J, von Karsa L, Cancer IAfRo and Organization WH. European guidelines for quality assurance in colorectal cancer screening and diagnosis. Publications Office of the European Union, 2010.
37. Center MM, Jemal A, Lortet-Tieulent J et al. International variation in prostate cancer incidence and mortality rates. Eur Urol 2012;61:1079-1092.
38. Crawford E, Black L, Eaddy M, Kruep E. A retrospective analysis illustrating the substantial clinical and economic burden of prostate cancer. Prostate Cancer Prostatic Diseases 2010;13:162-167.
39. Roya N, Abbas B. Colorectal cancer trends in Kerman province, the largest province in Iran, with forecasting until 2016. Asian Pac J Cancer Prev 2013;14:791-793.
40. Globocan I. Cancer Incidence and Mortality Worldwide in 2008. Lyon: International Agency for Research on Cancer, WHO, 2008.