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Review Article

An Epidemiological Review of Common Cancers in Iran; A Review Article

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ABSTRACT

Cancer is a critical health threat in the world. It has an ongoing increasing trend. The aim of this study was to describe the trend, most common types of cancer and the gender ratio of cancer in Iran and its provinces. We searched PubMed, Google Scholar, Scopus, and Science directs from 2000 to 2017 using Keywords including "Cancer", "Neoplasms", "Malignancy", "Tumor", "Incidence", "Epidemiology", and "Iran".The most common cancers of Iranian men were skin, stomach, bladder, prostate and colorectal cancers, respectively. The most common cancers of Iranian women were breast, skin, colorectal, stomach, and esophagus cancers, respectively. Cancer has an increasing trend in Iran. Cancer has more burden in the Northern and Northwest provinces of Iran. There was a notable diversity between the occurrences of different types of cancer between different provinces of Iran. Men were more predisposed to cancer. Iran experienced an increasing trend of cancer, like other countries. Different provinces of Iran experienced different patterns. The quality of cancer registry was different, also in many provinces, there were no strong epidemiological studies about cancer. The prevalence of some risk factors was differed in provinces.

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Introduction

Today, cancer is a major health problem and the second cause of death in the world.[1] Cancer incidence has an increasing trend worldwide and especially in developing countries.[2] Approximately 14.1 million new cases of cancer and 8.2 million deaths due to cancer were reported in 2012 worldwide.[3] It is estimated that by 2030, there would be 26.4 million persons with new cancers in the world and 17 million people will lose their lives.[1] Lung, breast, colorectal, prostate, stomach and liver cancers comprised 55% of the burden of cancer incidence worldwide in 2012.[3] Increasing life expectancy, aging and unhealthy lifestyle are important risk factors for cancers in both developed and developing countries.[4]

Cancer incidence is varied in different geographical locations. Its variation is due to different risk factors, especially different lifestyle behaviors and socioeconomic status.[5] More than 50% of cancers and approximately 70% of cancer deaths occur in underdeveloped countries.[4,6] Iran is located in the eastern Mediterranean region (according to the world health organization classification) and is a low-middle-income country.[7,8] Cancer is the third leading causes of mortality in Iran after cardiovascular disease and accidents. It has a rising trend in recent years.[5,9] It was estimated that in Iran, the annual age-standardized incidence rate of cancer is 98-110 cases with 100,000 population. Breast, prostate, gastric, hematopoietic and colorectal cancers are common cancers in Iran.[9]

Approximately 50% of cancers could be prevented by focusing on lifestyle behaviors, infections, unprotected

exposure to sunlight, and occupational exposures.[10] Designing and implementing practical preventive programs is an essential step for decreasing the burden of cancer. The cancer registry is highly important for prevention activities. In Iran, the first attempt to report cancer using organizing methods was initiated in 1956. Currently, the Ministry of Health and Medical Education has implemented population-based cancer registry programs in most cities.[11]

This review shows the trend of cancer in Iran and its provinces, separately. Also, it describes five most common types of cancer and the gender ratio.

Methods

We searched PubMed, Google Scholar, Scopus, and Science directs from 2000 to 2017 to identify publications about the epidemiology of cancer in Iran. The search was conducted using Keywords including "Cancer", "Neoplasms", "Malignancy", "Tumor", "Incidence", "Epidemiology", and "Iran". Original articles with a cross-sectional design that had used cancer registry data were included in the study. Duplicate articles were excluded. The abstract of articles was examined and finally, the full texts of eligible articles were reviewed. Most of the studies were done during 2004-2009, therefore these articles were selected for review. The five most common types of cancer, The Age-standardized incidence rate (ASR), the annual percentage change (APC), and the gender ratio (GR) were extracted from these articles.

Most Common Types of Cancers in the Iranian Population

The most common cancers of Iranian men were skin, stomach, bladder, prostate and colorectal, respectively (Table 1). A review article showed that skin, stomach, esophagus, colon-rectum, and bladder cancers, and leukemia were the most common type of cancer in Iranian men during 2000-2009 years.[12] From 2002 to 2011, five common cancers in Iranian men (except skin cancer) were gastric (ASR:17.06), prostate (ASR:13.79), bladder (ASR:11.80), colorectal (ASR:11.27), and esophageal cancers (ASR:5.57), respectively.[13] The results of GLobocan-2012 showed that among all cancers excluding non-melanoma skin cancers, in Iran, the stomach (ASR: 20.6), bladder (ASR: 13.2), prostate (ASR: 12.6) and colorectal (ASR: 11.6) cancers were the most common cancers in men. In the world, lung (ASR: 34.2), prostate (ASR: 31.1), colorectal (ASR: 20.6) and stomach (ASR: 17.4) were in the top list of common men's cancers in 2012.[14,15] In Eastern Mediterranean and North Africa, the most common cancers in men were lung (ASR: 27.1), prostate (ASR: 19.7), bladder (ASR: 17.2), colorectal (ASR: 13.2), and liver cancers (ASR: 11.1), respectively.[15]

The most common cancers of Iranian women were breast, skin, colorectal, stomach, and esophagus respectively (Table 2). A review article demonstrated that the most common cancers in Iranian women were breast (ASR:17.1), esophagus (ASR:14.4), stomach (ASR:11.1), colon-rectum (ASR:6.5) and cervix uteri cancers (ASR:4.5).[12] In 2002-2010, The most common cancers (except skin cancer) were breast (ASR: 30.2), colorectal (ASR: 10.3), stomach (ASR: 8.9), esophageal (ASR: 5.6), and thyroid cancers (ASR: 4.5) in Iranian women.[13] The results of GLobocan-2012 showed that among all cancers excluding non-melanoma skin cancers, in Iran, breast (ASR: 28.1), colorectal (ASR: 10.5), stomach (ASR: 9.7) and esophagus (ASR: 8) cancers were the most common

Table 1: Most common cancers in Iranian men during 2004-2009 according to the ASR per 100000 population

Population	Cancer type	2004	2005	2006	2007	2008	2009	Ref.
Yazd								[53]
	Skin	-	17.4	14.3	12.3	20.7	19.5	
	Bladder	-	10	10.2	12.6	9.8	15.9	
	Colorectal	-	6.1	6.9	7.9	9.6	9.9	
	Stomach	-	7.2	8.2	7.5	9.4	8.5	
	Prostate	-	5.7	5.9	6.3	10.4	12.4	
Kerman								[54]
	Skin	11.63	10.85	13.45	13.07	15.73	14.53	
	Bladder	7.73	9.71	9.41	11.17	13.20	14.66	
	Stomach	9.13	7.23	8.16	6.65	10.09	11.19	
	Leukemia	5.53	4.55	8.60	7.84	6.22	8.74	
	Lung and Bronchus	5.85	4.47	3.93	5.35	7.92	10.11	
Qom								[6,55]
	Skin	17.79	14.43	14.32	13.01	14.19	-	
	Stomach	12.30	13.64	15.86	14.36	13.87	-	
	Colorectal	7.62	6.97	8.40	10.79	10.12	-	
	Bladder	10.46	7.30	6.82	9.49	9.80	-	
	Prostate	6.60	4.78	5.69	8.00	8.85	-	
Iran								[55]
	Skin	19.1	20.2	20.9	22.6	-	18.9	
	Stomach	14.9	15.2	15.9	19.2	-	16	
	Bladder	11.3	11.7	13	14.4	-	12.6	
	Prostate	9.2	9.6	10.9	12.8	-	12.6	
	Colorectal	8	9	9.6	12.7	-	11.3	

Table 2: Most common cancers in Iranian women during 2004-2009 according to the ASR per 100000 population

City	Cancer type	2004	2005	2006	2007	2008	2009	Ref.
Yazd								53
	Breast	-	16.4	21	16.7	15.6	23.6	
	Skin	-	16.3	11.2	14.4	12.9	11.7	
	Colorectal	-	5.2	5.1	7.5	10.4	6	
	Leukemia	-	3.9	4.6	3.8	5.1	5.2	
	Stomach	-	3.3	4.8	4.2	4.6	4.3	
Kerman								54
	Breast	14.68	12.59	18.03	15.77	16.40	23.01	
	Skin	10.73	7.32	11.98	13.80	14.62	13.23	
	Colorectal	5.43	4.34	5.47	5.11	4.83	8.58	
	Leukemia	3.45	3.73	5.34	4.61	3.67	7.30	
	Thyroid Gland	2.89	3.28	3.61	3.77	4.61	5.50	
Qom								6
	Breast	17.07	14.15	20.41	24.36	24.8	-	
	Skin	11.34	9.63	8.08	10.63	9.07	-	
	Colorectal	5.75	4.35	3.71	7.34	8.86	-	
	Stomach	3.99	4.87	6.24	4.79	7.96	-	
	Esophagus	4.94	4.99	4.29	6.28	4.49	-	
Iran								55
	Breast	23.2	25.1	27.1	33.2	-	28.2	
	Skin	13.2	13.8	14.5	15.8	-	13.1	
	Colorectal	7.4	8.2	8.8	11.1	-	10.9	
	Stomach	6.1	6.6	7.4	10	-	7.8	
	Esophagus	6.1	6.1	6.1	.8	-	5.8	

cancers in women. In the world, breast (ASR: 43.3), colorectal (ASR: 14.3), cervix (ASR: 14) and lung (ASR: 13.6) cancers were in the top list of common women's cancers in 2012.[14,15]

By comparing the ASR of cancers between Iran and other countries we found that the incidence of cancer in Iran is not far from expectation. The world health organizations' cancer report in 2014 showed that comparing other countries, Iran is not in a critical situation according to the incidence of cancers.[15]

Diversity of Cancer Types in Different Provinces of Iran

In this review, the order and priority of the different type of cancers were varied between provinces of Iran but the five most common cancers were similar except in Kerman (Tables 1, 2). Among different types of cancers, gastrointestinal (GI) cancers were common in Iranian men and women. One study showed that GI cancers were prevalent in Iran and Golestan province has the most prevalence of GI cancers in Iran.[16] A review article discussed that gastric cancer was more prevalent in northern and northwestern (including Ardabil, Semnan, Golestan, East Azerbaijan and Tehran) areas of Iran but it is not common in Kerman. Unhealthy diet (a diet with inadequate amount of fruits, fresh vegetables, sea foods, fibers and high amount of fat, salt and sugar), smoking, alcohol consumption, being overweight, and obesity (general or abdominal obesity), Deficit of micronutrients and some infectious disease (especially H-pylori and HPV infections), having low socio-economic status are important preventable risk factors for GI cancers.[17-20] The prevalence of these risk factors is varied between different regions of Iran.[21]

Also, bladder and prostate cancers were two common cancers in Iran. Unhealthy diet, underlying disease, inadequate physical activity, tobacco smoking, opium consumption and chemical occupational exposures are important preventable risk factors for bladder and prostate cancern.[22] Lifestyle is a major changeable risk factor for all cancers in Iran. The results of studies among Iranian children and adults showed that they consume salty foods and they have a low intake of vegetables and fruits.[23-26] A meta- analysis showed that the prevalence of smoking among Iranian men was 19.8% and it was varied from 10.78% In Ilam to 32.4% in Hamadan.[27]

Leukemia and lung and bronchus cancers were among five common cancers in Kerman instead of prostate and colorectal cancers in men (Table 3). Other study showed that the incidence of colorectal cancer in Kerman was low. The ASR for colorectal cancer was 5.47 and 3.36 for women and men in 100,000 population in 2002, respectively; and it was lower than the average rate of colorectal cancer in Iran.[28] Opium was a major independent risk factor for lung cancer and it had an interaction with cigarette smoking.[29] Also, opium was a risk factor for bladder cancer[22,30,31] and a risk factor for GI cancers, especially gastric cancer.[32-34] There is an association between opium addiction and changes in the hematological parameters, especially when addiction was associated with cigarettes smoking.[35] In the other hand, only 3.92% of Iranian patients with colorectal cancer reported opium addiction. There was not a significant association between colorectal cancer and opium addiction.[36] The prevalence of opium use in Kerman was approximately 10.6% in 2009-2011; that 5.6% of them was addicted and 5% used opium

Table 3: The ASR per 100000 population in different provinces of Iran during 2004-2009

City	2004	2005	2006	2007	2008	2009	2004-2009	Ref.
Total ASR								
Yazd	-	85.2	86.1	92.6	102.2	104.7		53
Shahroud	92.5	73.8	78.4	93.7	207.7	150.8		1
Gilan	73.22	111.48	103.81	121.07	137.39	124.8		56
Mazandaran	91.4	97.73	108.75	100.02	143.98	130.73		56
Golestan	74.36	72.72	90.14	87.7	93.59	91.45		56
Male Total ASR								
Yazd	108	106	113	117	159	159		53
Kerman	74.93	71.43	85.85	79.2	104.22	131.61		54
Shahroud	101.8	74.3	87.1	113.2	229.9	152.1	114.8	1
Gilan	85.13	118.17	112.32	130.25	149.16	142.68		56
Mazandaran	105.48	106.91	112.91	100.1	146.28	142.87		56
Golestan	78.63	75.1	98.89	89.95	97.35	100.36		56
Iran	95.43	108.10	117.27	121.62	148.75	132.19	125.6	57,55
Female Total ASR								
Yazd	100	110	113	120	168	173		53
Kerman	72.69	61.79	82.72	78.88	91.94	128.26		54
Shahroud	82.7	73.2	70.1	73.4	185.4	148.8	95.4	1
Gilan	61.31	104.78	95.3	111.88	125.61	106.92		56
Mazandaran	77.32	88.54	104.59	99.93	141.67	118.59		56
Golestan	70.09	70.33	81.39	85.44	89.83	82.53		56
Iran	83.42	96.18	102.43	109.18	135.80	123.55	113.46	57,55

occasionally. It is estimated that 2.8% to 9% of Iranian adults are used opium.[37] The prevalence of opium use in Kerman is very high, therefore, the prevalence of cancers that are related to the opium consumption is high. To tackle cancer in this province opium addiction and other lifestyle behaviors needs to be controlled and prevented.

In women, leukemia was among the five most common cancers in Yazd and Kerman. Also in Kerman, thyroid cancer was the fifth most common cancers in women. Thyroid cancer has lifestyle risk factors like other cancers. It also has some specific risk factors including exposure to X-ray radiation and iodine intake. Some studies demonstrated that there is a significant association between the concentration of urine iodine and the risk of thyroid cancer. Iodine deficiency is a risk factor for follicular thyroid cancer and high level of iodine supplementary intake is associated with papillary carcinoma of the thyroid.[38,39]

Cancer Trend and Its Diversity in Iran

As an overview in Table 3, the ASR was higher in North cities than central ones. In most studies, the highest incidence of cancer was observed in 2008. In all studies, cancer has an increasing trend in Iran during study years (2004-2009) in both women and men. According to the APC, all cities of Iran experienced an increasing trend of cancer during the study period. The minimum and maximum of APC were reported in Golestan and Hamadan, respectively. In all cities, the APC was higher in women than men except Golestan. The most difference between men and women was in Qom that the APC was 2.3 in men and 8.08 in women (Table 4).

One study that was conducted in Iran during 2003-2009 years showed that there was an increasing trend of cancer in Iran. The highest incidence of malignancy was seen in the Northern and the northwest provinces. The south and southeast provinces had the lowest incidence of cancer. The highest incidence rate was reported in 2008. In both men and women, the highest incidence rate of cancer was observed in Semnan province and the lowest was observed in Kohkilooyeh and Boyer Ahmad province.[40] In Iran, from 2002 to 2010 the average APC of all cancers had increased by 11.6% and 11.9%in women and men, respectively.[13] One study evaluated the trend of gastrointestinal cancers in Iran during 2001-2010. All gastrointestinal cancers have an increasing trend. In men

Table 4: The annual percentage change in cancer incidence in different provinces of Iran during 2004-2008

City	Male	Female	Total	Ref.
	APC (95% CI)			
Kerman	11.7 (3.2, 20.9)	12.1 (2, 23.1)		54
Qom	2.3 (-8.2, 13.9)	8.08 (5.1, 11.1)		6
Hamadan	14.2 (12.3, 16.1)	18 (5.2, 32.2)		4
Shahroud	-	-	12.4 (5.2, 20.1)	1
Gilan	10.3 (3.4, 17.7)	10.5 (-2.4, 25)	10.3 (0.8, 20.8)	56
Mazandaran	6.9 (-1.2, 15.6)	10.5 (2.4, 19.3)	8.5 (1.4, 16.2)	56
Golestan	5.6 (0.1, 11.4)	4.7 (0.3, 9.2)	5.2 (0.3, 10.8)	56

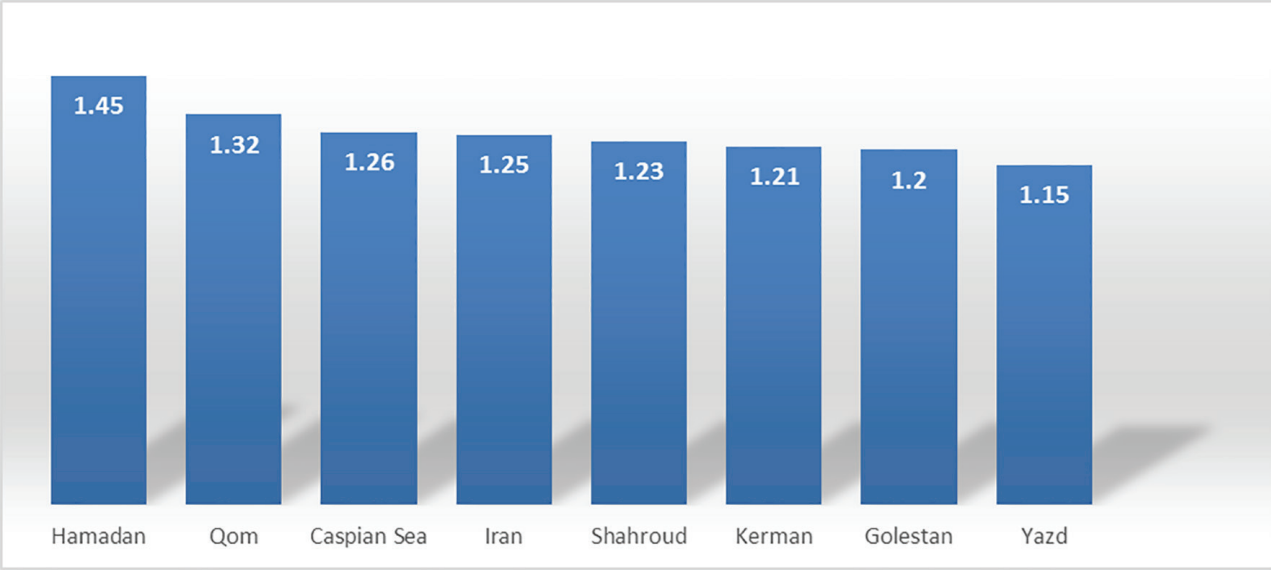

Figure 1: Gender ratio of cancer in Iran during 2004-2008

the APC was 16.7 (95% CI: 14.6-18.8), 20(95% CI: 15.6-24.6) and 12 (95% CI: 6.6-17.7) for gastric, colorectal and esophagus cancers, respectively. Also, in female the APC was 16.2 (95% CI: 7.7-25.4), 20(95% CI: 18.8-21.3) and 11.2 (95% CI: 6.2-16.5) for gastric, colorectal and esophagus cancers, respectively.[17] A global research showed that cancer has an increasing trend worldwide (33% increase in the cancer incidence during 2005-2015). Iran experienced approximately 10% increase in the cancer incidence, like some other countries. It seems that 16.4% of cancer increase is due to an aging population, 12.6% is due to population growth and 4.1% is due to increasing age-specific incidence rates, worldwide.[41] In Iran, the rising trend of cancer is explained by the true increase and the change in the cancer registry program efficacy. A significant difference in cancer incidence between various provinces is due to different cancer registration and also different lifestyle and other risk factors.[40,42]

Another study evaluated the quality of cancer registration in Iran in 2004-2006, conducted that cancer has an increasing trend in Iran but it has increasing, decreasing or fluctuated pattern in different cities. There were no reliable and consistent results of cancer registry in different cities of Iran.[43] A study that evaluated the quality of cancer registry in Iran from 2008 to 2010 reported that the completeness of cancer registry in Iran was 54.2%.It was 44.2% and 59.7% in 2008 and 2010, respectively.[44] One study using capture-recapture method conducted that only 31% of known cancers in Kohkilooyeh and Boyer Ahmad province were registered in the cancer registry system in 2007-2009.[45] Different studies in 2003-2005 and 2009 years showed that the sensitivity of cancer registry in Shiraz is approximately 58%.[46,47] In 2004-2006 the sensitivity of cancer registry in Golestan province was 88.9%.[48] A capture-recapture method in Germany in 1970-1985 showed the sensitivity of cancer registry was ranged from 95.5 to 96.9%.[49] Policy-makers should design and implement a comprehensive national monitoring system to improving the quality of cancer registry system and consistency of cancer registry in different provinces of Iran.

Gender Ratio of Cancer in Iran

According to the Figure 1, in all cities, the incidence of cancer was higher in men than women (GR: 1.25). The maximum gender ratio was reported in Hamadan (GR: 1.45) and the minimum was reported in Yazd (GR: 1.15). A study in the United States showed that during 2004-2008, the gender ratio was 1.33 for all cancers. Except for a breast cancer, only the gender ratio of the gall bladder, anus, and thyroid cancers were less than 1.0.[50] The gender ratio of cancer was 1.35 in China, in 2008.[51] WHO reported that 53% of total cancers were incident in men in 2012, worldwide.[15] The mechanism of this difference was not known clearly, but it seems that genetic, socioeconomic factors, lifestyle behaviors, and the difference in symptom awareness and screening opportunities have an important role.[52]

This review demonstrated the holistic overview of cancer trend and diversity in provinces of Iran. The studies duration year was approximately old because to the best of our knowledge, there was not any additional new studies about the epidemiology of common cancers in different provinces of Iran. Conducting qualitative and quantitavie studies about the neglected aspects of cancer research emphasing on the regional incidence and common cancers is necessary.

Conclusion

Cancer growing is a critical point, in the worldwide and especially in developing countries. Iran Like other countries experienced an increasing trend in cancer prevalence. Skin, breast, GI, Bladder, and prostate cancers are most common in Iran. There are some differences in cancer occurrence in different provinces of Iran. Population aging is a basic risk factor but unhealthy lifestyle and occupational exposure are two

main preventable risk factors. The cancer registry is the main stone of cancer prevention programs. Governments should emphasize in the accuracy and completeness of cancer registry in Iran.

Conflict of Interest: None declared.

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