

## Cancer epidemiology and trends in Sistan and Baluchestan province, Iran

Hosein Rafiemanesh<sup>1</sup>, Mojtaba Mehtarpoor<sup>2</sup>, Abdollah Mohammadian-Hafshejani<sup>3</sup>  
Hamid Salehiniya<sup>\*4</sup>, Mostafa Enayatrads<sup>5</sup>, Salman Khazaei<sup>6</sup>

Received: 19 October 2014

Accepted: 2 June 2015

Published: 29 August 2015

### Abstract

**Background:** Cancer is the second leading cause of death in developing countries. In Iran, cancer is the third cause of death. The present study aimed at providing the incidence rates (crude and age-standardized) of different types of cancers in Sistan and Baluchestan province (Southeastern of Iran).

**Methods:** Data were collected retrospectively reviewing all new cancer patients registered in Cancer Registry Center of Health Deputy for Sistan and Baluchestan province. Common cancers were defined based on the number of cases and standardized incidence rates. To compute the annual percentage change (APC), joinpoint 4.1.1.1 software was applied.

**Results:** A total of 3535 cases of cancers registered during 2004-2009 were identified. Of these, 46.82% occurred in females and 53.18% in males. The most frequent cancer in women was breast cancer followed by esophagus, skin, colorectal and leukemia. The 5 most frequent cancers in men were stomach, skin, leukemia, esophagus and bladder. Joinpoint analyze showed a significant increasing trend for adjusted standard incidence rate (ASIR) for both sexes ( $p < 0.05$ ).

**Conclusion:** According to The results of the present study and comparison to previous studies for other provinces in Iran, cancer incidence in Sistan and Baluchistan is less common but trends of cancers are increasing in Sistan and Baluchestan Province. It is necessary to have a comprehensive health policy for prevention and control of this problem.

**Keywords:** Cancer, Epidemiology, Incidence, Sistan and Baluchestan, Iran.

*Cite this article as:* Rafiemanesh H, Mehtarpoor M, Mohammadian-Hafshejani A, Salehiniya H, Enayatrads M, Khazaei S. Cancer epidemiology and trends in Sistan and Baluchestan province, Iran. *Med J Islam Repub Iran* 2015 (29 August). Vol. 29:254.

### Introduction

Cancer is the unhindered growth and spread of abnormal cells (1). There may be important difference between developed and developing countries regarding epidemiology of cancers. Changing the environment and people's lifestyle caused by the present rapid advancement of industrialization in developing countries, may change

the epidemiologic patterns of various cancers in these regions (2, 3). In the past, we considered the cancers as the diseases belonged to western countries since they were uncommon in other regions, but now are frequently diagnosed in less developed or economically transitioning countries and their rates are increasing (4). In the developing world, in addition to the increasing

<sup>1</sup>. MSc student of Epidemiology, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. rafiemaneh.hosein@gmail.com

<sup>2</sup>. MSc Student in Health Care Management, Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. Mehtarpoor@yahoo.com

<sup>3</sup>. PhD student in Epidemiology, Department of Epidemiology and Biostatistics, School of Public Health, Isfahan University of Medical Sciences, Isfahan, Iran. amohamadii1361@gmail.com

<sup>4</sup>. (**Corresponding author**) Epidemiologist, Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, Iran & PhD student of Epidemiology, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. alesaleh70@yahoo.com

<sup>5</sup>. MSc in Epidemiology, Shahid Beheshti University of Medical Sciences, Tehran, Iran. mostafaenayatrads@gmail.com

<sup>6</sup>. MSc. student of Epidemiology, Department of Epidemiology & Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran. salman.khazaei61@gmail.com

trends, the future burden of cancers is likely to be exasperated by the expected increases in life expectancy and aging and growth of the population (5). Also this is predicted that The percentage of cases diagnosed in less developed countries will increase from about 56% in 2008 to more than 60% in 2030 (6). It is also estimated that cancer will go beyond ischemic heart disease as the main cause of death worldwide (7). Today, in countries with Western lifestyle, nearly half of the deaths are because of cardiovascular diseases, and one-fourth of deaths are due to cancers. Public health is influenced by cancer as a serious problem in today's world (8). Cancer and related lifestyle diseases are increasing across Asia and already responsible for half of the disease-associated mortality in the vast majority of the countries (9). About 7.6 million cancer deaths occurred throughout the world in 2008, and about 60% of cancer deaths occur in low-income and middle-income countries and this number is prone to increase in the future. It is estimated that more than a quarter of a million people will die yearly in the Eastern Mediterranean Region (EMRO) alone. Iran is member of the EMRO. The most common cancers in the EMRO are breast cancer in females, and lung and bladder cancers in males(10). Age specific incidence rate for all cancer in world is 205.4 (per 100000 population) and mortality rate is 126.3 per 100000 population in 2012; this rate is respectively 174.1 and 126.3 in the Asia and also is 134.7 and 90.4 in Iran(11).

In Iran located in epidemiologic transition, cancer is the third cause of death after coronary heart disease, accidents and other factors (12-14). Incidence of cancer is increasing in developing countries because of aging and cancer associated lifestyle such as smoking, physical inactivity, obesity, and stress. The estimates predict that the number of new cases of cancer from 10 million per year in 2000 will rise to 15 million in 2020, and approximately 60% occurs in developing countries (15). Iran has experienced an increase in population in the



Fig. 1. Geographic situation of Sistan and Baluchestan, Iran

last decades as well as changes in lifestyle and socioeconomic status. Incidence rate of cancer is 98-100 per 100,000 populations in Iran (12). The geographic differences in the incidence of specific cancers have been previously reported; hence it is of great importance to illuminate the epidemiology of neoplastic disease in different regions (12, 16).

The present study aimed at providing the incidence rates (crude and age-standardized) of different types of cancers in Sistan and Baluchestan province, located in south-east Iran, and to compare these rates with that of other regions throughout the country and the world. To the best of our knowledge, this is the first population-based research assessing the incidence of different cancers in Sistan and Baluchestan province, Sistan and Baluchestan province is one of the 31 provinces of Iran, located in the south-east of the country (Fig. 1) as one of the largest provinces of Iran with an area of 181,785 km<sup>2</sup> and 70,188 sq mi(17). According to the 2011 census, the total population of Sistan and Baluchestan province was about 2,534,327 people, and the male/female ratio was 1,268,748:1,265,579. Given that, the main goal of this study was to describe the distribution of cancer incidence rate and 6 year trends (2004-2009) in order to provide evidence for plan primary preventive and control plans.

## Methods

### Data collection and analysis

This analytic study was done based on longitudinal national registry of cancer (NCR) program in Iran. Data used in this study was obtained from NCR, and Disease Control and Prevention (CDC) report of Iran Ministry of Health and Medical Education from 2004 to 2009 for Sistan and Baluchestan (18). Cancer registry system has been designed and implemented in Iran since 1986 and the first report was published in 1986. Data were collected retrospectively reviewing all new cancer patients registered in Cancer Registry Center of Health Deputy for Sistan and Baluchestan during a 6-year period (2004 - 2009). Data were included demographic characteristics like age, sex residency, date of diagnosis which were coded based on International Classification of Diseases for Oncology (ICD-O)(19). After referring data to NCR, the data were modified based on the recorded patients' addresses; so that Sistan and Baluchestan patients' data recorded in other provinces of Iran were aggregated into this province data; duplicated cases and non-resident patients were also removed.

### Statistical analysis

We calculated Age-Standardized Incidence Rate (ASIR) (per 100,000 persons) using direct standardized method and world standard population (20). To describe incidence time trends, we used Joinpoint Regression Program, Version 4.1.1.1. The analysis included logarithmic transformation of the rates, maximum number of one joinpoints, and minimum of 6 years between zero joinpoints. All other program

parameters were set to default values. The test of significance was based on the Monte Carlo Permutation method (i.e., it finds "the best fit" line). Joinpoint regression analysis involves fitting a series of joined straight lines on a log scale to the trends. In this test 0 joinpoint is null hypothesis and 1 joinpoint the alternate hypothesis. The aim of this approach is to identify possible joinpoints where a significant change in the trend occurs. The final model selected was the most parsimonious of these, with the estimated annual percent change (APC) based on the trend within each segment and estimated annual average percent change (AAPC) for full model trend. In describing trends, the terms "significant increase" or "significant decrease" signify that the slope of the trend was statistically significant ( $p < 0.05$ ). All statistical tests were two sided.

## Results

During 6 years (2004 -2009) in Sistan and Baluchestan province, a total of 3535 cases of cancers have been registered. Of these, 46.82% (1655 cases) occurred in females and 53.18% (1880 cases) in males. Cancer incidence sex ratio (male to female) for this study is 1.13. Most frequent Cancer cases within this period time were reported in 2009, including 379 females and 430 males (Table 1).

ASIR shows an increasing trend for the both sexes during 2004 - 2009; ASIR has increased from 22.20 to 35.29 in females and from 18.95 to 35.99 in males (Fig. 2).

In this study, for adjusted ASIR trend, 0 joinpoint (Full model) and 1 joinpoint were selected model for male and female, respectively.

Joinpoint analyze showed a significant

Table1. Frequency and ASIR of cancers by sex in Sistan and Baluchestan during 2004 to 2009

Year	Male		Female		Total		M:F
	Count	ASIR	Count	ASIR	Count	ASIR	
2004	172	18.95	163	22.20	335	20.57	1.05
2005	267	29.80	210	25.08	477	27.44	1.27
2006	324	32.83	276	30.55	600	31.69	1.17
2007	345	34.81	316	34.31	661	34.56	1.09
2008	342	34.74	311	33.65	653	34.20	1.10
2009	430	35.99	379	35.29	809	35.64	1.13

ASIR: Age-standardized incidence rate (per 100,000 persons)

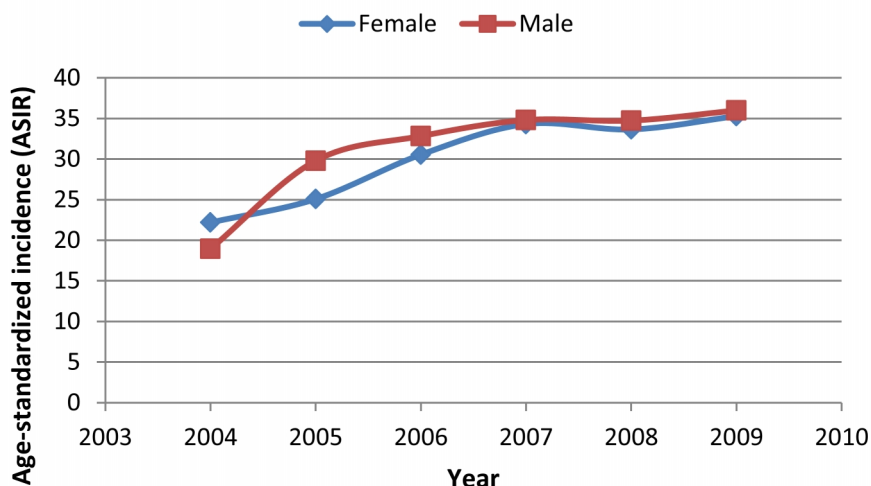


Fig. 2. ASIR trend of cancers in Sistan and Baluchestan by sex between 2004 and 2009

increasing trend for adjusted ASIR for both sexes ( $p < 0.05$ ). Average annual percent change (AAPC) for men was 11.2 and for women 9.5 (Table 2).

The most common cancers in both sexes were as follows: skin (10.35%), esophagus (8.43%), breast (8.06%), stomach (7.98%) and leukemia (6.93%), respectively. The average ASIR and frequency of cases within the years 2003 to 2009 revealed the five most common cancers in females and males; so these five cancers consisted of 47.43% and 43.99% of all female and male cancers, respectively (Table 3).

The ASIR showed an increasing trend for cancers in Sistan and Baluchestan; so that the breast cancer rate in females was 1.96

in 2004 and increased to 5.37 in 2009. Also, ASIR of esophageal cancer and colorectal cancer in females were 2.08 and 1.77 in 2004, which increased to 4.01 and 3.04 in 2009, respectively. The rate of most common cancers in males increased from 0.37 in 2004 to 1.33 in 2009. The incidence rates (per 100 000 person-year) of cancers were 2.75, 2.22, 1.35, 1.21 and 1.24 in 2004 for stomach, skin, leukemia, esophagus and bladder cancer, respectively. However, these rates have increased to 4.48, 3.05, 2.31, 2.82 and 2.27 respectively in 2009. In 2004 compared to 2009, among the five most common cancers, breast cancer had most increasing rate with incremental coefficient of 1.74 for ASIR in fe-

Table 2. Joinpoint analyses of cancers incidence in Sistan and Baluchestan during 2004 to 2009

	Full Range (2004-2009)		Trend 1 (2004-2006)		Trend 2 (2006-2009)	
	AAPC*	95% CI	APC**	95% CI	APC**	95% CI
Male	11.2 <sup>^</sup>	0.4 to 23.3				
Female	9.5 <sup>^</sup>	5.4 to 14.8	15.8	-12.2 to 52.6	0.7	-42 to 75.1

\*.APC (Annual Percent Change) and \*\*.AAPC (Average Annual Percent Change)

<sup>^</sup>.APC or AAPC is significantly different from zero at alpha = 0.05

Table 3. Five common cancers by sex, Sistan and Baluchestan, 2004-2009

	Rank	1	2	3	4	5
Women	Cancer	Breast	Esophagus	Skin	Colorectal	Leukemia
	Total Number	274	163	153	102	93
	Mean ASR	4.77	3.14	2.95	1.91	1.53
Men	Cancer	Stomach	Skin	Leukemia	Esophagus	Bladder
	Total Number	208	213	152	135	119
	Mean ASR	3.72	3.46	2.24	2.20	2.15
Both Sex	Cancer	Skin	Esophagus	Breast	Stomach	Leukemia
	Total Number	366	298	285	282	245

ASIR: Age-standardized incidence rate (per 100,000 persons)

males and lung cancer with incremental coefficient of 1.33 for ASIR in males .

### Discussion

In this study, the sex ratio (male to female) for incidence of cancer was 1.13. The high rate of cancer incidence among Iranian males has also been reported for other provinces of Iran. In a study carried out in Qom, of all cancer cases, 58% were male and 42% female (21). In a study by Kousha et al on epidemiology of cancers in the East Azerbaijan province, this ratio (male to female) was 1.38 (22). In a study by Norouzi Nejad et al carried out in Mazandaran province on epidemiology of cancers, this ratio was 1.2. To this regard, it should be noted that in the all mentioned studies, population sex ratio was not equal (23). The present study showed a significant increasing trend for the cancer rates in Sistan and Baluchestan province that is consistent with other studies in the region and the country.

This study showed a significant increasing trend with the average annual percentage change (AAPC) 11.2 in men and 9.5 in women, respectively, this increase is similar to other studies conducted in other Iranian provinces. A study in Kerman province six-year trend of cancer incidence by Joinpoint was studied and a significant increasing trend in annual percentage changes (APC) was revealed (12.1 in women and 7.11 in men) (14).

In a study conducted in Yazd, Vakili et al reported that increasing trends of cancers for males and females were significant from 2005 to 2009. In the Vakili's study the age-standardized incidence rate in females increased from 84.6 to 94.8 and this rate increased from 85.9 to 113.8 for males (13). Mokarian's study carried out to investigate the epidemiology and cancer trends in Isfahan province during 2005 to 2010 showed an increasing incidence rate so that ASIR in 2005 was 107 and changed to 124.9 in 2010 (24). The standardized incidence rates in Sistan and Baluchestan province during 2004 to 2009, increased from 18.95 to 35.99 for males and 22.20 to 35.29

for females. A part of this increase was as a result of improvement in cancer registration in Iran. Cancer Registry System in Iran was pathology based and 80% of cancers were recorded in the best of circumstances. Cancer registry system in Iran changed to population based since 2009, so this method caused an increase of cancer registration (25).

In a study that investigated world pattern and mortality rate of cancer, Jemal et al showed an increasing rates of cancers for Asian countries (7). Other studies for the trend of gastric cancer in Iran showed a significant increasing trend in APC; 11.7 for women and 9.18 for men (3).

In Talaiezadeh's study that investigated cancer incidence rate in Khuzestan province between 2002 and 2009, top 5 highest ASIRs in males were skin (16), bladder (10.7), prostate (7.64), stomach (7.17) and colorectal (6.32); in females, these were breast (26.4), skin (13.6), colorectal (7.52), stomach (4.31) and bladder(4.07), respectively (26). In a study by Vakili et al in Yazd (2005 - 2009), it was indicated that the most prevalent cancers were skin, bladder, colorectal, stomach and prostate in males and breast, skin, colorectal, gastric and leukemia in females (13). The present study was based on the average ASIR during 2004 and 2009, and showed the most frequent cancers were gastric (3.72), skin (3.46), leukemia (2.24), esophagus (2.20) and bladder cancer (2.15) and the most common cancers in females were breast cancer (4.77), esophagus (3.14), skin (2.95), colorectal (1.91) and leukemia (1.53) .

A study of cancer facts and Figures in 2014 estimated that the most frequent cancers in were prostate, lung, colorectal, bladder, and skin and in males, and breast, lung, colorectal, uterine corpus and thyroid in females, respectively (1). According to studies, the ASIR in 2008 for the South-Central Asia region, was 104.6 and by sex was 110.8 for males and 99.7 for females (15). According to the results of current study, ASIR for Sistan and Baluchestan

province in 2008 is 34.20 for both males and females (34.74 in males and 35.65 in females).

According to the results of the present study and comparison to previous studies in other provinces, cancer incidence in Sistan and Baluchistan is less common. The ASIR in Sistan and Baluchistan in 2004 was 20.57 and increased to 35.64 in 2009. In the study of Yazd province, ASIR was 85.20 in 2005 and 104.7 in 2009. This rate in the East Azerbaijan province in 2006 was 133.20 for both males and females and 148.96 in males and 108.10 in females (22).

Differences in the types and incidence rate of cancers in different geographic areas is the result of multiple factors. Several studies have identified at least 500 different types of cancer-causing agents, of which 5% to 10% are genetic factors and 90% to 95% environmental factors and lifestyle of people (27). Therefore in this study, lower incidence rates in various types of cancers in Sistan and Baluchestan can be attributed to the mentioned reasons.

One of the main limitation of this study is the data collected from the Cancer Registry of Ministry of Health which are limited to the type of cancer, incidence, sex and age. Another limitation was lack of information related to subjects' lifestyle and their education, occupation and socio-economic status.

## References

1. Society AC. American Cancer Society. Cancer Facts & Figures 2014. Atlanta: American Cancer Society. 2014.
2. Sobin LH. Cancer in Afghanistan. *Cancer* 1969;23(3):678-88.
3. Almasi Z, Rafiemanesh H, Salehiniya H. Epidemiology characteristics and trends of incidence and morphology of stomach cancer in Iran. *Asian Pacific journal of cancer prevention* : APJCP 2015;16(7):2757-61.
4. Society AC. American Cancer Society. Cancer Facts & Figures 2007. Atlanta: American Cancer Society. 2007.
5. Thun MJ, DeLancey JO, Center MM, Jemal A, Ward EM. The global burden of cancer: priorities for prevention. *Carcinogenesis* 2010;31(1):100-10.
6. Ferlay J, Shin H, Bray F, Forman D, Mathers C, Parkin D. GLOBOCAN 2008, cancer incidence and mortality worldwide: IARC CancerBase No. 10. Lyon, France: International Agency for Research on Cancer 2010;2010:29.
7. Jemal A, Center MM, DeSantis C, Ward EM. Global patterns of cancer incidence and mortality rates and trends. *Cancer Epidemiology Biomarkers & Prevention* 2010;19(8):1893-907.
8. Ghanadi K, Anbari K, Obeidavi Z, Pournia Y. Characteristics of Colorectal Cancer in Khorramabad, Iran during 2013. *Middle East journal of digestive diseases* 2014;6(2):81.
9. Moore MA, Yoo KY, 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.
10. World Health Organization (WHO). <http://www.who.int/health-topics/cancer/index.html>. 2014.
11. Ferlay JSI, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, et al. GLOBOCAN 2012 v1.0. Cancer Incidence and Mortality Worldwide: IARC CancerBase No 11 [Internet] Lyon, France: International Agency for Research on Cancer; 2013 Available from: <http://globocan.iarc.fr>, accessed on day/month/year 2012.
12. Mousavi SM, Gouya MM, Ramazani R, Davanlou M, Hajsadeghi N, Seddighi Z. Cancer incidence and mortality in Iran. *Annals of Oncology* 2009;20(3):556-63.
13. Vakili M, Pirdehghan A, Adimi M, Sadeghian M, Akhondi M. Epidemiology and Trend of Cancer in Yazd, a Central Province of Iran, 2005-2009. *Journal of Research in Health Sciences* 2014;14(2).
14. Razi S, Rafiemanesh H, Ghoncheh M, Khani Y, Salehiniya H. Changing Trends of Types of Skin Cancer in Iran. *Asian Pacific journal of cancer prevention* : APJCP 2015;16(12):4955-8.
15. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA: a cancer journal for clinicians* 2011;61(2):69-90.
16. Keyghobadi N, Rafiemanesh H, Mohammadian-Hafshejani A, Enayatrads M, Salehiniya H. Epidemiology and Trend of Cancers in the Province of Kerman: Southeast of Iran. *Asian Pacific Journal of Cancer Prevention* 2015; 16(4):1409-13.
17. Wikipedia. Sistan and Baluchestan Province 2015. Available from: [https://en.wikipedia.org/wiki/Sistan\\_and\\_Baluchestan\\_Province](https://en.wikipedia.org/wiki/Sistan_and_Baluchestan_Province).
18. Eatemad K, Gooya MM, Ramazani R, et al (2008). Iranian Annual National Cancer Registration Report. Ministry of Health and Medical Education, Center for Disease Control and Prevention (In Persian).
19. AG. F. International classification of diseases for oncology: ICD-O. Geneva: WHO. 2000.
20. Santos SI. Cancer epidemiology, principles and methods. *Cancer epidemiology, principles and methods.* 1999.

21. Diantai ZV, Abedini Z, Tehran HA, Mohamadgholizade L. Epidemiology of cancer in Qom, Iran 2008-2011. *Payesh, Journal of The Iranian Institute For Health Sciences Research* 1393;13(2):155-63.
22. Ahmad K, Mostafa F, Sevil H, Leila A, Mahrad G, Mehran SF. Epidemiologic Assessment of Cancer Disease in East Azerbaijan 2007. *Medical Journal of Tabriz University of Medical Sciences & Health Services* 2010;32(4):74-9.
23. Iran SCo. Internet :<http://www.amar.org.ir/Default.aspx?tabid=260>. 2014.
24. Mokarian F, Ramezani MA, Heydari K, Tabatabaeian M, Tavazohi H. Epidemiology and trend of cancer in Isfahan 2005-2010. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences* 2011;16(9):1228.
25. Iranian Annual Cancer Registration Report 2009. Ministry of Health and Medical Education, Health Deputy Center for Disease Control and Prevention[In Persian]. 2009 -2010.
26. Talaiezhadeh A, Tabesh H, Sattari A, Ebrahimi S. Cancer Incidence in Southwest of Iran: First Report from Khuzestan Population-Based Cancer Registry, 2002-2009. *Asian Pacific Journal of Cancer Prevention* 2013;14(12):7517-22.
27. Zolfaghari M, Bahramnezhad F, Parsa Yekta Z, Kazemnejad A, Monjamed Z. The Life Style Risk Factors of Tehran Citizens Associated with Cancer Prevention. *J Shahid Sadoughi Univ Med Sci* 2013;21(1):28 - 36.