Incidence and Mortality Rate of Common Gastrointestinal Cancers in South of Iran, a Population Based Study

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Abstract

Background: Considering the importance of updating information about incidence and mortality of common or fatal cancers and the need for studying the effectiveness of changes in the Iranian cancer registration system from pathological based to population based since 2007, the aim of this study was to provide updated population based information on incidence and mortality rates of esophagus, stomach, colon and rectum cancers in south of Iran , and also to provide basic data for investigating the performance of population based cancer registration system in these regions.

Methods: This study was a review of population based data of esophagus, stomach, colon and rectum cancers in Fars province during 2008-9.
We estimated Age Standardized Incidence and Mortality Rates (ASIRs and ASMRs), truncated ASIRs and ASMRs for each cancer using direct age standardization based on Iran's population and also based on the standard population of world.
Finally, considering poison distribution, we calculated standard error of incidence and mortality rates.

Results: Adjusted incidence rates of esophagus, stomach, colon and rectum cancers (per 100,000) and their standard error were 2.56(0.0092), 9.99(0.0182), 4.85(0.0127) and 1.56(0.0072) in males; and 1.60(0.0072), 4.66 (0.0123), 3.24(0.0103) and 0.93(0.0055) in females respectively. These values for ASMRs per 100000 were 0.94(0.0056), 11.54(0.0195), 2.46(0.009), 0.34(0.0033) for men, and 0.51(0.004), 4.21(0.0117), 1.54(0.0071) and 0.41(0.0037) for women.

Conclusion: Incidence and mortality rates of esophagus cancer in southern regions of Iran were less than the national average. We also clarified that stomach and colorectal cancers were the most important digestive cancers in this area.

Key words: Neoplasm; Incidence; Mortality; Iran

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Introduction

Although cancer is one of the most preventable and treatable chronic diseases, presently the epidemic of cancer is the leading cause of mortality and morbidity throughout the world [1]. Forecasts show about 150 percent increase in cancer mortality in Asia by 2020[2]. As an Asian country, Iran will experience this rise in cancer incidence and mortality while cancer is the third leading cause of mortality in Iran at this point of time[3].

Gastrointestinal cancers are one of the most common cancers in some areas of the world [4] and one of the public health concerns in general [5]. Due to high mortality rate and low survival rate, esophagus and stomach (reported 5-year survival rates for stomach cancer are 11.5 and 16.4 % for males and females respectively [6]), and also colorectal (45 and 39% 5-year survival rates in females and males respectively [7]) neoplasm are most important digestive cancers, and therefore have attracted special attention [5, 8-9].

Many studies have investigated drastic changes of epidemiology of esophagus cancer worldwide over the past two decades. This neoplasm is the eighth commonest cancer in Iranian males (5.06 percent of all cancers) and fifth in females (5.26 percent) [10]. Although the distribution of incidence and mortality of esophagus cancer is very heterogeneous in Iran, in general, annually 6500 and 5800 cases of this cancer have been reported respectively [8, 11-12].

Despite continuous reduction in incidence, the trend of stomach cancer in the United States and many countries has been increased from mid 1950s to the early 2000[12-13]; this cancer was known as the fourth commonest cancer and second leading cause of cancer mortality in the world in 2000[8, 11, 14]. Notwithstanding the decreasing incidence trend of stomach cancer in the world, its trend is rising in Iran [8]. The prevalence was 6.35 and 3.04 per 100,000 population in men and women respectively in 2007[15]. Stomach neoplasm is the most common cause of cancer mortality and the incidence ranking is third in Iran [11-12].

Colorectal cancer is the third cause of cancer mortality in the world [16-18]. The geographical distribution of colorectal cancer is heavily related to environmental factors; hence, sometimes it differs by about 20 times from one region to another [4, 19]. Based on a most up-to-date study available, prevalence of gastric neoplasm was 6.09 per 100,000 in men and 5.45 in women [20]. The epidemiology of this cancer is not completely clear in Iran, but according to lifestyle and demographic changes in the country, one can forecast a growing incidence trend [21].

Because of the importance of having up-to-date information on incidence and mortality of common or fatal cancers and the need for studying the effectiveness of changes in the Iranian cancer registration system on a pathological to population basis since 2007, the aim of the study was to provide population updates based on information on the incidence and mortality rates of esophagus, stomach, colon and rectum cancers in south of Iran and to provide basic data for investigating the performance of population based on the cancer registration system in Fars province. Fars is the most populated province in south of Iran. According to the latest Iranian national census (2006), the population and sex ratio were 4,336,878 and 1.034 [22]. Fars province with an area of 133,100 km2 (8.1 percent of all the area of Iran) [23] geographically is located at 32-27 degrees north and 56-50.5 degrees east of the Earth, and it is in southwest of Iran.

Materials and Methods

This study was a review of population-based data available on esophagus, stomach, colon and rectum cancers from Fars: the cancer registration system (Center for Chronic Disease Surveillance, Health Vice President of Shiraz University of Medical Sciences), for the year 2008-9.

Using software techniques and repeated visual reviews, the quality of the crude data was controlled at the start of the study and when officially authorized by Health Vice President of Shiraz University of Medical Sciences (Fars Province Cancer Registry Authority). Then, the incidence number of each cancer was separated based on age groups, sex and patients' residency (rural or urban) and the mean, standard deviation (SD), median and range values of age were estimated on registration. The ASIR for each cancer was estimated with regard to 16- age group with a five-year range (the last age group was above 74 years). The incidence rates for esophagus cancer were separated for morphological types of cancer.

Direct age standardization was performed once based on Iran's population at the latest National Census (2006), and once for the standard population of the world in 2000. Because of the rarity of cancer at ages below 30[24], the truncated direct ASRs was estimated for ages above 30.

The population data used for standardization were obtained from official websites of the National Center for Statistics of Iran [22] and the United States Census Bureau [25].

The mean, SD, median and age range at death and Age Adjusted Cancer Mortality Rates (ASMRs) for each cancer and for males and females were estimated following the quality control process of cancer mortality data. The Truncated Standard Mortality Rates (TASMRs) were also estimated for ages above 30.

Finally, based on poison distribution, the standard error of adjusted incidence and mortality rates were estimated for the 2000 world standard population.

All calculation processes were performed by Excel and SPSS (Version: 11.5) software.

Results

Based on the study data, the number of esophagus cancers for females and males was 31 and 46, and for gastric cancer 94 and 194

respectively. The mean value (SD), median and range of age at incident time of esophagus cancer in females and males were 67.1 (SD: 12.41), 70, 43 and 65.61 (SD: 13.52), 66.5, 63 respectively. The values for gastric cancer were 63.7 (SD: 15.76), 67.5, 74 for females and 65.5 (SD: 15), 68.5, 91 for males.

ASRs and TASRs are shown for esophagus and gastric cancers in Tables 1 and 2 respectively.

The number of colon cancer for females and males was 73 and 95 and for rectum cancer 45 and 62 respectively. The mean value (SD), median and range of age at incident time of colon cancer in females and males were 58.56 (SD: 15.42), 57, 73 and 62.37 (SD: 15.82), 65, 72 respectively. The values for rectum cancer were 54.8 (SD: 16.1), 54, 85 for females and 61.36 (SD: 16.36), 61 for males.

ASRs and TASRs are shown for colon and rectum cancers in Tables 3 and 4 respectively.

The number of deaths from esophagus, stomach, colon and rectum cancer for females were 12, 81, 29, 7 respectively and the mean (SD) and median of age for deaths from esophagus cancer were 69.75 (SD: 12.85), 69 and for stomach cancer 65.6 (SD: 16.1), 69; the values for colon cancer 63.35 (SD: 21.79), 70, and for rectal cancer were 59.72 (SD: 15.5), 53 respectively.

Similarly, the number of deaths caused by esophagus, stomach, colon and rectum cancers in males was 14, 184, 46 and 7. The mean (SD) and median age of cancer death for esophagus cancer were 73.21 (SD: 8.8), 73 and for gastric cancer 68.6 (SD: 13.42), 71 for colon and rectal cancers, respectively, 68.83 (SD: 14.76), 73 and 54.71 (SD: 12.83), 54. The age of a female death from colon cancer and one deceased male from stomach cancer were uncertain. ASMRs and TASMRs are shown in Tables 5 and 6 respectively.

Discussion

Our study showed that the incidence rates of esophagus, stomach, colon and rectum cancers in Fars province were less than the national average incidence rates (Average national adjusted incidence rates were 7.7, 10.00 and 11.12 per 100000 persons for esophagus, stomach and colorectal cancers respectively)[11, 26].

Table1. Age adjusted esophagus cancer incidence rates per 100,000, Fars Iran 2008-9

Sex	Morphological type	Based on Iran latest census population,2006				adjusted rate based on 2000 world population		
		Region		Non truncated	Truncated	Non truncated		Truncated
		urban	rural			Rate	SE	
Male	Adenocarcinoma	0.831	0.8	0.78	1.87	1.4	0.0068	2.58
	Squamous cell carcinoma	0.91	1.26	1.02	2.57	1.02	0.0058	3.21
	Total	1.74	2.06	1.80	4.44	2.56	0.0092	5.79
Female	Adenocarcinoma	0.638	0.06	0.55	1.37	1.15	0.0062	1.31
	Squamous cell carcinoma	0.81	0.37	0.89	2.21	0.58	0.0044	2.29
Total for female		1.45	0.43	1.44	3.358	1.60	0.0072	3.6
Total		1.59	1.26	1.63	4.01	2.08	0.0058	4.68

Table 2. Age adjusted stomach cancer incidence rate per 100,000, Fars Iran 2008-9

Sex	Based on Iran latest census population,1385				adjusted rate Based on 2000 world population		
	Region		Non truncated	Truncated	Non truncated		Truncated
	urban	rural			Rate	SE	
Male	6.95	7.79	7.01	17.49	9.99	0.0182	22.71
Female	4.15	1.63	4.49	10.79	4.66	0.0123	10.27
Total	5.58	4.76	5.77	14.15	7.30	0.011	16.35

Considering the range of incidence rates of these cancers in the country based on the available studies [3, 11, 27,28], the values of Fars province based on our study will be located on the lower bound of this range. Considering the high incidence rates of esophagus and stomach cancers in north of Iran, the finding seems reasonable. And for colorectal cancer, a study [29] confirms higher colorectal cancer incidence rate compared with ASIRs of the southern parts of the country. Contrary to results of the study, the National Cancer Center reported lower values for northern regions; hence, based on this report, Fars has a higher rate for colorectal cancer than north of the country. In brief, the study emphasized that Fars province is one of the lowest risk regions of Iran for esophagus, stomach, colon and rectum cancers.

Comparing the incidence rates of Kerman province [11,30,31], Fars's south eastern neighbor, with the results of our study, it can be indicated that the values for esophagus, stomach, colon and rectum cancers do not differ in these provinces. However, as stated by Haghdoost et al. [30] several points deserve attention for a better interpretation:

1) Confidence intervals of incidence rates in

Table 3. Age adjusted Colon cancer incidence rate per 100,000, Fars Iran 2008-9

Sex	Adjusted Based on Iran latest census population,2006				Adjusted Based on 2000 world population		
	Region		Non truncated	Truncated	Non truncated		Truncated
	urban	rural			rate	SE	
Male	4.69	1.68	3.496	8.61	4.853	0.0127	10.98
Female	3.85	0.23	2.949	7.07	3.24	0.0103	7.12
Total	4.28	0.962	3.23	7.85	2.572	0.0082	9.02

Table 4. Age adjusted rectum cancer incidence rate per 100,000, Fars Iran, 2008-9

Sex	Adjusted Based on Iran latest census population,2006				Adjusted Based on 2000 world population		
	Region		Non truncated	Truncated	Non truncated		Truncated
	urban	rural			rate	SE	
Male	1.08	1.332	1.16	2.82	1.56	0.0072	3.44
Female	0.8	0.3	0.83	2.05	0.93	0.0055	2.08
Total	0.942	0.826	0.997	2.44	1.24	0.0045	2.75

Table 5. Age adjusted cancer mortality rate per 100,000 in Fars province, Iran 2008-9

Cancer	Adjusted Mortality Rate*		Adjusted Mortality Rate**			
	Male	Female	Male		Female	
			Rate	SE	Rate	SE
Esophagus	0.64	0.49	0.94	0.0056	0.51	0.004
Stomach	7.86	4.00	11.54	0.0195	4.21	0.0117
Colon	1.69	1.46	2.46	0.009	1.54	0.0071
Rectum	0.27	0.38	0.34	0.0033	0.41	0.0037

*based on Iran population in mid year 1385
** based on world population year 2000

Table 6. Age truncated adjusted cancer mortality rate per 100,000 in Fars province, Iran 2008-9

Cancer	Truncated Adjusted Mortality Rate*		Truncated Adjusted Mortality Rate**	
	Male	Female	Male	Female
Esophagus	1.62	1.22	1.73	1.64
Stomach	19.87	9.55	21.22	11.42
Colon	4.28	3.69	5.65	3.36
Rectum	0.68	0.95	0.71	1.05

*based on Iran population in mid year 1385

** based on world population year 2000

Haghdoost et al.

2) Haghdoost et al. and national cancer registry reports were based on pathological and lab data;

3) Sajjadi et al. reported population-based data [31].

Based on the above comparison for about 7 million people livingin south of Iran and considering the comparison of the incidence rates from our study with that of other southern provinces, according to the National Cancer Registration Report [11], the point needing emphasis is the low risk level of southern provinces of the country which is similar to that of Fars province.

Another finding of our study was related to the mean age of cancer incidence. Although the statistical tests for comparing the mean incidence age in females and males is not mentioned in the study findings, according to the mean and standard deviation values, it can be concluded that the average age of diagnosis or incidence for males and females does not have a statistically significant difference. The results are in accordance with the findings of other studies [32-34]. However, the calculated average incidence age in our study was different from the previously reported value for Fars [35]. This result may be due to small number of cancer cases in our study or due to lack of earlier studies. There are more consistent studies [32-34] which can justify the shortage in the earlier studies. However, these findings could be indicative of increased average incidence age of cancer in the country, although this is unexpected because of improved cancer care system and lifestyle approaching that of the west. The mean and median of diagnosis age in our study also made a difference of about 10 years with values reported by Yavari et al. [36]. It should be noted that Yavari et al. had collected their study data over 30 years and combined them when they calculated the mean of incidence age; hence, the epidemiological transition process to the country deserves further attention to interpret the results of the study. Consistency of this study and other recent studies increase the possibility of incrementing the age of cancer incidence or probably the incompetency in reporting two decades ago.

Also reviewed in this study were the mortality rates and age for cancer causing death. It is clearly implicit from a comparison of age at death with age at cancer registry that early survival rates of gastric and esophagus cancers are low in this region. Although this relative similarity may be due to death at the end of the survival time after early diagnosis at a younger age, better understanding can be achieved by referring to the cancer survival studies in Fars province [37-38].

Considering the report on the national cancer mortality rates (the values were 3, 9.67, and 2.54 per 100000 persons for esophagus, stomach and colorectal cancer respectively) [3, 39], our findings showed that the ASMRs of esophagus cancer in Fars were less than the average national mortality rates, and larger than in cases of stomach and colorectal cancers. These cancers had higher ASMRs in both females and males. Hence, these findings are beyond random variation and seem to be real.

A comparison of ASRs with TASRs and ASMRs with TASMRs clarified that in all the cases, the value of truncated rates increased at least two times. This finding can be explained by considering the rarity of incidence and mortality of esophagus, stomach, colon and rectum cancers at ages below 30. A different pattern was detected for incidence of adenocarcinoma type of esophagus cancer in females. This may be due to a uniform age distribution of incidence of adenocarcinoma type of esophagus cancer.

Another noticeable finding was a relatively high rate of adenocarcinoma of esophagus cancer compared with the squamous cell carcinoma morphologic type. This finding was also achieved by Haghdoost et al. [30].

The tendency is to compare cancer rates of Fars province with those of the international and other regional rates. For this purpose, work started with the rates in Thailand in the year 2007, as an Asian country (southeast of Asia). The reported rates of esophagus, stomach and colorectal cancers for this region are 8, 3.5 and 4 per 100000 respectively [40]. The values are higher than our findings for Fars, except for stomach cancer.

Comparison of the incidence rates of esophagus, stomach and colorectal cancers in south of Iran with those of the United States in 2007[41] showed that the incidence rates in Fars were lower than those in the United States for males. These lower rates can be justified by considering the quality of cancer registration system, lifestyle and underreporting in Fars in the past years compared with those of the United States. However, 30-40 percent underreporting of cancer incidence and mortality rates especially in the case of colorectal cancer must be taken into consideration for the developing countries [16].

In contrast, the incidence rate of CRC in the United States [41] was higher than the value in

south of Iran, and the incidence rate of gastric cancer in females was the same in the two countries.

Comparison of mortality rates between the two regions clarified the fact that esophagus and CRC mortality rates in the United States [41-43] were higher than south of Iran while gastric cancer ASMR in this area was higher than the United States. The running analytical studies which compare causal factors of gastric cancer between regions seem to be reasonable.

Conclusion

Incidence and mortality rates of esophagus cancer in the southern regions of Iran were less than the national average. It was also clarified that stomach and colorectal cancers were the most important digestive cancers in this region, causing higher mortality rates than the average national cancer mortality. The average age of cancer diagnosis has increased all over Iran. Esophagus, stomach, colon and rectum cancers are found in ages above 30 in south of Iran.

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Conflict of Interest

The authors declare that they have no competing interests.

Authors' Contribution

HMV was responsible for the study design, data preparation, management and analysis and also for the drafting of the manuscript and its submission. JH supervised the study design and conduction, also for writing of this report draft. ARR supervised the study for statistical analysis. MF supervised the study for cancer registration methodology and data preparation.

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