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Epidemiology, Incidence and Mortality Rates of Esophageal Cancer in Iran Compared to other Regions of the World

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Background and objective: The esophageal cancer was considered as the eighth common type of cancer as well as the sixth cause of mortality across the world according to the report of International Agency of Research. The current study was aimed to evaluate the epidemiology, incidence, and mortality rates of esophageal cancer in Iran compared to other regions of the world.

Methods and materials: In the current study, the incidence and mortality rates of all cancers were extracted on behalf of the Global Cancer Project in 2012.

Results: In 2012, some 456000 new cases (3.2% of the overall) of esophageal cancer as well as 400000 cases of cancer-related mortality were registered. The incidence rates in the male (323008 cases, 4.4 cases per 100000 people) were higher than that in females (132776 cases, 2 cases per 100000 people). The incidence rate of cancer in Iran was estimated as 6.3 cases per 100000 people highlighted as the two-folds of the universal incidence rate (6.3 cases compared to 3.2 cases per 100000 people). Also, the incidence rate of esophageal cancer in Iran was higher than other regions of the world. The global rate of esophageal cancer mortality was estimated as 400169 cases (5 cases per 100000 people). The mortality rate of esophageal cancer in Iran was indicated as 7.8 cases per 100000 people highlighting the more mortality rate of esophageal cancer in Iran compared to other regions of the world.

Conclusion: As for the higher incidence and mortality rates of esophageal cancer in Iran compared to other regions of the world, it is suggested to perform the studies so as to evaluate the related-risk factors in order to decline the incidence rate of the disease.

Introduction

Preventing and controlling the noncontagious and chronic diseases superseded with contagious

diseases such as infectious diseases and malnutrition were considered as one of the most important priorities of health system. The noncontagious and chronic diseases were ranked as the most important factors in disabling and early mortality [1-2]. The cardiovascular, diabetes, hypertension, and all types of cancer were considered as the most common types of noncontagious diseases. Some one-fourth of mortalities were related to cancer [3-5].

The reports indicated that some 45% of the mortality rate in the world would be related to noncontagious diseases in the years conduced to 2015. The cancers were demonstrated as the most important noncontagious diseases burdening a heavy load on the society. In other hand, the relative controlling of contagious diseases, increasing life expectancy, life style change, increasing the environmental risk factors, genetic property, and aging were reported as the risk factors of this disease in the recent and future decades [6-10]. Despite the high rate of cancers mortality, it is estimated that more than one-third of the diseases would be preventable and the remainders treatable potentially provided with on time and early diagnosis [11-12].

The esophageal cancer was considered as the eighth common type of cancer in the world with a low survival rate among other types of cancer. Several studies reported the significant incidence rate of this cancer in the recent decades [13-14].

Esophageal cancer was defined as cancerous tissue growth in esophagus in which the cells are being divided without controlling. This type of cancer is common in Asia, Northern Iran (Gorgan, Torkman Sahra), beyond China, Asian Republicans of the Soviet Union [13-15].

The prevalence of the disease in some regions of Asia from Northern provinces of China to Caspian banks in Iran was estimated as 100 cases per 100000 people with a mortality rate of 20%. The aforementioned regions were known as esophageal cancer zone [1-16].

While most of the causes were reported unknown, smoking, drinking, and hot tea were indicated as the risk factors. Moreover, high consumption of kipper, salty nutrition such as salty cabbage, and cucumber, salty fish, mushrooms toxins, vitamin lacks, minerals, inorganic and chemical compounds and unknown factors were reported as the risk factors [17]. Dysphagia, heartburn, anorexia, weight loss, dysphonia, hidden gastrointestinal bleedings, pain, repetitious pulmonary infections were considered as the symptoms of the disease [1-17].

Gastrointestinal cancers were reported as the most common types in males as well as a second type of cancer in females after breast cancer. In this between, esophageal, stomach, and colorectal cancers were significantly paid attentions owing to the high mortality being 3, 12, and 1.5 cases per 100000 people, respectively. Esophageal squamous cell carcinoma among the upper gastrointestinal tract cancers was reported as one of the most fatal types of cancer in Iran especially in Northern-East area of Golestan province with the highest incidence rate right across the globe [1].

The current study was aimed to evaluate the epidemiology, incidence, and mortality rates of esophageal cancer in Iran compared to other regions in the world.

Materials and Methods

In the current study, the incidence and mortality rates of all cancers were extracted on behalf of the Global Cancer Project in 2012 available at fr/Default.aspx.

The methods of estimation are country specific and the quality of the estimation depends upon the quality and on 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, an overall quality score for the incidence and mortality estimates combined is almost impossible to

establish.

However, an alphanumeric scoring system which independently describes the availability of incidence and mortality data has been established at the country level. 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.

Sources

Availability of incidence data:

A. High quality national data or high quality regional (coverage greater than 50%).

B. High quality regional (coverage between 10% and 50%).

C. High quality regional (coverage lower than 10%).

D. National data (rates).

E. Regional data (rates).

F. Frequency data.

G. No data.

Availability of mortality data:

National statistics are collated and made available by the WHO for countries with vital registration.

1. High quality complete vital registration.

2. Medium quality complete vital registration.

3. Low quality complete vital registration.

4. Incomplete or sample vital registration.

5. Other sources (cancer registries, verbal autopsy surveys etc.).

6. No data.

Estimation incidence

The methods to estimate the gender- 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)

7. One cancer registry covering part of a country is used as representative of the country profile (11 countries)

8. Age/gender specific rates for “all cancers” were partitioned using data on relative frequency of different cancers (by age and gender) (12 countries)

9. The rates are those of neighboring countries or registries in the same area (33 countries)

Estimation mortality

Depending of the degree of detail and accuracy of the national mortality data, six methods were utilized in the following order of priority:

1. Rates projected to 2012 (69 countries)

2. Most recent rates applied to 2012 population (26 countries)

1. Estimated as the weighted average of regional rates (1 country)

2. Estimated from national incidence estimates by modelling, using country-specific survival (2 countries)

3. Estimated from national incidence estimates using modelled survival (83 countries)

4. The rates are those of neighboring countries or registries in the same area (3 countries) [18].

Results

Esophageal cancer is the eighth most common cancer worldwide, with an estimated 456,000 new cases in 2012 (3.2% of the total), and the sixth most common cause of death from cancer with an estimated 400,000 deaths (4.9% of the total) (Figure 1).

Figure 1. Incidence and Mortality of All Cancer in World.

These figures include both adenocarcinoma and squamous cell carcinoma sub-types. Around 80% of the cases worldwide occur in less developed regions. Esophageal cancer incidence rates worldwide in men are more than double those in women (male: female ratio 2.4:1). In both genders there are more than 20-fold differences in incidence between the different regions of the world, with rates ranging from 0.8 per 100,000 in Western Africa to 17.0 per 100,000 in Eastern Asia in men, and 0.2 per 100,000 in Micronesia/Polynesia to 7.8 per 100,000 in Eastern Africa in women. Cancer of the esophagus has a very poor survival (overall ratio of mortality to incidence of 0.88), and the

esophageal cancer mortality closely follows the geographical patterns for incidence, with the highest mortality rates occurring in Eastern Asia (14.1 per 100,000) and Southern Africa (12.8) in men and in Eastern (7.3) and Southern Africa (6.2) in women (Figure 2, Figure 3).

Figure 2. Distribution of the Standardized Incidence Rate of Esophageal Cancer in World at 2012 (Extracted from Globocan).

Figure 3. Distribution of the Standardized Mortality Rate of Esophageal Cancer in World at 2012 (Extracted from Globocan).

In 2012, the incidence rate of esophageal cancers was estimated as 457874 cases with the ratio of 3.2 cases per 100000 people worldwide. The incidence rates in males were higher than females being 323008 vs. 132776 cases with the ratios of 4.4 and 2 cases per 100000 people, respectively. The results indicated the incidence rates of esophageal cancer in very high human development, high human development, medium human development, low human development, less developed, more developed regions, and Iran as 1.4, 1.9, 5.4, 4.9, 4.6, 1.4, and 6.3 cases per 100000 people, respectively. The incidence rate of esophageal cancer in Iran was doubled than worldwide rate (6.3 vs. 3.2 cases per 100000 people). Moreover, the esophageal cancer incidence rate in Iran was higher compared to other regions of the world (Table 1, Figure 4).

Population	Sexes		Incidenc			Mortality	
		Number	%	ASIR	Number	%	ASIR
World	Both sexes	455784	3.2	5.9	400169	4.9	5
	Male	323008	4.4	9	281217	6	7.7
	Female	132776	2	3.1	118952	3.4	2.7
Very High human development	Both sexes	83396	1.4	3.8	67941	2.6	2.9
	Male	65636	2.1	6.7	53220	3.7	5.2
	Female	17760	0.7	1.3	14721	1.3	1
High human development	Both sexes	40941	1.9	3.4	35081	2.8	2.9
	Male	28768	2.7	5.5	24914	3.7	4.8
	Female	12173	1.1	1.8	10167	1.8	1.4
Medium human development	Both sexes	285109	5.4	8	254452	7	7.1
	Male	201425	7.1	11.8	178098	8.1	10.5
	Female	83684	3.5	4.4	76354	5.2	3.9
Low human development	Both sexes	46227	4.9	6.2	42602	6.2	5.8
	Male	27094	6.7	7.6	24914	7.7	7.1
	Female	19133	3.5	4.9	17688	4.8	4.6
Less Developed region	Both sexes	369640	4.6	7	328821	6.2	6.2
	Male	255260	6.1	10.1	225118	7.4	9
	Female	114380	3	4.1	103703	4.6	3.6
More Developed region	Both sexes	86144	1.4	3.6	71348	2.5	2.9
	Male	67748	2.1	6.4	56099	3.5	5.2

	Female	18396	0.7	1.2	15249	1.2	0.9
Iran	Both sexes	5343	6.3	8.3	4915	9.2	7.8
	Male	2898	6.5	9	2662	8.8	8.3
	Female	2445	6.1	8	2253	9.7	7.4

Table 1. Incidence and Mortality of Esophagus Cancer in Iran and other Parts of the World in All Group Age by Sexes.

Figure 4. Incidence and Mortality of Esophageal Cancer in Iran and other Parts of the World.

The mortality rate of esophageal cancer was estimated as 400169 cases with the ratio of 5 cases per 100000 people worldwide. The mortality rate in males was higher than females being 281217 and 118952 cases with the ratios of 7.7 cases vs. 2.7 cases per 100000 people, respectively. The results indicated the mortality rates of esophageal cancer in very high human development, high human development, and medium human development, low human development, less developed, more developed regions and Iran as 2.9, 2.9, 7.1, 6.2, 6.2, 2.5 and 7.8 cases per 100000 people, respectively. Moreover, the esophageal cancer mortality rate in Iran was higher compared to other regions of the world (Table 1, Figure 4).

Discussion

Cancer was considered as one of the most important mortality causes in the developing countries with the increasing incidence rate through changing the life style toward the western life style [19]. In 2017, May, the World Health Organization (WHO) emphasized a complex of actions in order to improve and accessibility increase to prophylaxis, early diagnosis, quick and available treatment as well as cancer ameliorating cares. The estimates indicated the increasing rate of cancer incidence as 45% till 2030 [20].

In 2001, more than 300000 cases of esophageal cancer were reported worldwide [21]. The regions' geographical diversity with the high incidence rates >3 cases per 100000 people in western countries differs from the Central Asia with the incidence rate of 140 cases per 100000 people annually [22]. The highest rate of esophageal cancer was reported in China, Northern-East of Iran, Southern-East of the United States and South regions of Africa [23]. The reports indicated the increasing incidence rate of esophageal cancer in the 3 decades ago [24]. The incidence rate of esophageal cancer was more observed in the developing countries than the developed countries [25]. The National Institute of cancer, US and International Agency of Cancer Research held an international workshop in 2016, September [25].

The recent reports indicated that the cancers were the second cause of mortality after the cardiovascular diseases in Iran. Some 38% of these cancers were related to gastrointestinal system [26]. In Iran, the esophageal cancer was reported as the second commonest type of cancer among the males and the females with the ratios of 17.6 and 14.4 cases per 100000 people, respectively being higher than the universal average [16]. The impressive factors were not understood in the hazardous regions of Iran and China such as Golestan and Linxan. It is sounded that factors including poor nutrition, low consumption of fruits and vegetables as well as drinking the beverages in the high temperature were considered as the risk factors of increasing rate of incidence [27-29].

In 2012, some 450000 people were diagnosed with esophageal cancer (3.2% of the overall cancers) with a mortality rate of 400000 cases worldwide (4.9% of the overall cancers). This report shows

the increasing incidence rate in the last decade. It is expected that the incidence rate would quickly be increased.

In 2012, the incidence rate of esophageal cancers was estimated as 45784 cases with the ratio of 3.2 cases per 100000 people worldwide. The incidence rates in males were higher than females being 323008 vs. 132776 cases with the ratios of 4.4 and 2 cases per 100000 people, respectively. The results indicated the incidence rates of esophageal cancer in very high human development, high human development, medium human development, low human development, less developed, more developed regions, and Iran as 1.4, 1.9, 5.4, 4.9, 4.6, 1.4, and 6.3 cases per 100000 people, respectively. The incidence rate of esophageal cancer in Iran was doubled than worldwide rate (6.3 vs. 3.2 cases per 100000 people). Moreover, the esophageal cancer incidence rate in Iran was higher compared to other regions of the world.

In 2008, some 47016 new cases of esophageal cancer with the mortality rate of 14280 cases were registered in the United States [30]. The time process in esophageal cancer is too different. For instance, while the incidence rate of esophageal squamous cell carcinoma in some Asian countries like Taiwan was increased [31], it was continuously decreased in North America and Europe owing to the low consumption of Alcohol and smoking [32, 33].

More than 80% of the esophageal cancer related- mortality was observed in the developing countries [25]. In 2012, the mortality rate of esophageal cancers was estimated as 400169 cases with the ratio of 5 cases per 100000 people worldwide. The mortality rates in males were higher than females being 281217 vs. 118952 cases with the ratios of 7.7 and 2.7 cases per 100000 people, respectively. The results indicated the mortality rates of esophageal cancer in very high human development, high human development, and medium human development, low human development, less developed, more developed regions and Iran as 2.9, 2.9, 7.1, 6.2, 6.2, 2.5 and 7.8 cases per 100000 people, respectively. The esophageal cancer mortality rate in Iran was higher compared to other regions of the world.

Obesity, smoking, meat, alcohols and hubble-bubble, snuff, opioids, hot tea, low consumption of vegetables, fruits and poor socio-economic condition were considered as the risk factors of esophageal cancer [15, 34]. Tobacco usage, over-drinking, poor nutrition regimens of vegetables and fruits, low socio-economic condition in the United States and other western countries were related to esophageal cancer [20]. Alcohol and tobacco usage were not considered as the risk factors of esophageal cancer in Iran and China [35]. More studies in cancer causes might help to determine the other potential factors providing the necessary information so as to enhance their growth.

Nitrosamine

Recently, the Nitrosamines were reported as the most stable factors of esophageal cancer. Nitrosamine and precursors compounds are available in conserves, vegetables, and salted fish [36-37].

Smoking and alcohol consumption

The primary risk factors of squamous cell carcinoma in the western countries were considered as smoking and alcohol consumption applying some 90% of the overall cases. Smoking and alcohol consumption were reported as the esophageal cancer risk factors in the United States, Western Europe, and other regions of the world. Smoking and alcohol consumptions interfere with each other might increase the relative risk more than 100 folds.

The risk of esophageal cancer in smokers is 5 degree higher than non-smokers [38].There is a

direct correlation between number of cigarettes, smoking duration, and smoking with esophageal risk factor [39-41].

Obesity

Obesity was reported as one of the most stable and consolidated risk factors of esophageal adenocarcinoma. The prevalence of esophageal adenocarcinoma was increased by increasing the rate of obesity in western countries. However, some of the studies report the paradox results. Increasing adipose following the obesity, affect the tumor's growth [42-44].

Nutrition

In a study performed in Sweden, an inverse correlation was reported between the regimen fibers consumption with digestive system adenocarcinoma. A study performed in the United States reported the nutrition contenting vitamins, fruits, and vegetables as a supportive factor against esophageal cancer incidence [36]. Malnutrition including low consumption of vitamins such as A, C, and E ones as well as riboflavin, zinc, selenium, and low consumption of fresh fruits and vegetables might play a role in increasing the disease's incidence [40-45]. In conclusion, as for the higher incidence and mortality rates of esophageal cancer in Iran compared to other regions of the world, it is suggested to perform the studies so as to evaluate the related-risk factors in order to decline the incidence rate of the disease. The prophylactic actions to prevent the esophageal cancer are including keeping the healthy body weight, discontinue of smoking, low consumption of alcohol, and increasing the physical activity. In addition, a healthy regimen full of fresh fruits and vegetables might decrease the personal risk. More studies so as to diagnose the primary prophylactic actions in high risk regions (e.g., Northern regions of Iran, and Central Asia) are necessary to be performed.

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Statement of Transparency and Principals:

• Author declares no conflict of interest

• Study was approved by Research Ethic Committee

of author affiliated Institute.

• Study's data is available upon a reasonable request.

• All authors have contributed to implementation of this research.

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