INTRODUCTION

Cancer is a major public health problem in many countries, including Iran.\(^1\) Most of cancer cases (57%) and the mortality rate from cancer (65%) occurred in developed countries.\(^2\) After cardiovascular disease and unintentional injuries, cancer is the 3rd cause of death.\(^3\) Primary liver cancer is the 5th most common cancer and the 2nd leading cause of cancer deaths in the world.\(^2\) Hepatocellular carcinoma (HCC) is the most common histological type of the liver cancer, so that it includes about 90% of primary liver cancer and 7% of all cancers; and considering the annual incidence of 560,000 cases among men, it is the 5th and the 7th common cancer among men and women, respectively.\(^2\)

This cancer is considered one of 5 cancers with the greatest mortality rate in the world, with an increasing trend of incidence so that 85% of cases occur in developing countries with half of the deaths in China alone.\(^5\) Chronic infection of hepatitis B and C are common risk factors for over 75% of the cases and less common risk factors include aflatoxin, alcohol, fatty liver disease, obesity, smoking and diabetes.\(^5\) Results of a study performed in the southern Iran showed that chronic infection of the hepatitis B and C are predominant risk factors in majority of the patients.\(^6\) Epidemiological distribution of HCC is different in various regions of the world. Geographical regions of the world are divided into 3 zones, i.e. low, medium, and high incidence regions, for liver cancer. Highest incidence rate of the liver cancer is in Southeast Asia and sub-Saharan Africa, and is also increasing in North America and Europe.\(^7\) Differences in the geographical distribution of viral hepatitis B and C, genetic differences, life pattern, and distribution of environmental carcinogens, such as aflatoxin, have caused differences in geographical distribution, population, and time of hepatic cancer in developed and developing countries.\(^7\) However, Iran is in Middle East, an area with low incidence for liver cancer.\(^8\) Detailed information on the distribution of the cancer is not available in the country. A study conducted in the central part of Iran (Semnan) reported ASR of liver cancer of 5.8 and 3.5 per 100,000 people in men and women, respectively.\(^9\) Liver cancer is one of the most common forms of cancer around the world and its incidence has increased in the past decade.\(^10\) given that the hepatitis B virus is endemic in Iran\(^11\) and the lack of population-based epidemiological information on liver cancer in the country. This study aimed to investigate the incidence and trends of liver cancer in Iran.
METHODOLOGY

This observational study was carried out, based on existing data that all liver cancer cases with the code of C22 according to International Classification of Disease for Oncology (WHO, 2000) were obtained from the national report on cancer registry and disease management center of ministry of health in Iran. The existing data contained from 41 pathology centers of medical university in the country between 2003 and 2009. All registered cases were studied by each province. The incidence rate was calculated as per 100,000 people and ASR, using direct standardization and the standard population of World Health Organization (WHO).

The number of cases, and crude and standardized incidence rates were stratified by gender and province. Data was analyzed using Cochran-Armitage test for linear trend (in standardized incidence rates of liver cancer during 2003 - 2009), using WinPepi 2.1 software. Statistical significance was assumed if p < 0.05. All reported p-values are two-sided.

RESULTS

The findings showed that the incidence of liver cancer was increasing (Table I). The increase in the cancer incidence was observed in both genders. Rates of liver cancer increased during 2003 - 2009. In 2003, 7.79% and 6.74% in women and men, respectively, of all cancers suffered from this cancer. In 2009, it affected 27.13% and 26.53% of all cases among women and men, respectively. Based on the national report on cancer registry, of 3,584 cases of liver cancer recorded between 2003 and 2009, 2,224 and 1,360 cases were men and women, respectively. The highest incidence rate (950 cases) occurred in 2007 and the lowest rate (256 cases) was in 2003. In males, the greatest ASR was 2.03 per 100,000 people in 2008 and the minimum ASR was 0.55 per 100,000 people in 2003. In females, the ASR was 1.56 per 100,000 people in 2008; and the lowest ASR was 0.36 per 100,000 people in 2005 (Figure 1).

The Cochran-Armitage test indicated that a significant trend was seen in the standardized incidence rates of liver cancer during years studied (Chi$^2$=793.69, DF: 1, p < 0.001). According to findings, in men, the highest incidence rate was 7.89 per 100,000 in the province of Semnan in 2008, and the lowest incidence rate was 0.12 per 100,000 in the province of Markazi in 2005. In women, the maximum incidence rate was 8.83 per 100,000 in the province of Semnan in 2008, and the lowest incidence rate was in the province of Hormozgan in 2005. The greatest incidence rate was related to the provinces of Semnan and Khuzestan, where there was increasing trend, but the lowest was observed in Eastern and Northern provinces.

DISCUSSION

Liver cancer is one of the most common cancers in the world. According to Globocan in 2012, this type of cancer is one of the most common leading causes of cancer-related deaths (9.1% of all deaths) in the world. Data from cancer registry showed that 3,584 cases of liver cancer had been recorded between 2003 and 2009. Therefore, it was not among the 10 most common cancers.

However, comparing ASR of liver cancer, it indicated that there was a significant increasing trend for this type of cancer in Iran between 2003 and 2009. In another study, the ASR of liver cancer between 2001 and 2008 also showed an increase of 3.7 times in the province of Fars. According to findings from a study during 1999 to 2006, the ASR of liver cancer was increasing to 0.2 and 0.7 per 100,000 in all over Iran and Kerman (a Southern

![Figure 1: Trends in the age-standardized incidence rate (per 100,000 population) of liver cancer, 2003-2009.](image)

Table I: The incidence and frequency of liver cancer, 2003-2009.

<table>
<thead>
<tr>
<th>Years</th>
<th>N (% of total liver cancer during 2003-2009)</th>
<th>CIR</th>
<th>ASR</th>
<th>M:F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>2003</td>
<td>106 (7.79)</td>
<td>150 (6.74)</td>
<td>0.33</td>
<td>0.44</td>
</tr>
<tr>
<td>2004</td>
<td>103 (7.57)</td>
<td>180 (8.1)</td>
<td>0.33</td>
<td>0.52</td>
</tr>
<tr>
<td>2005</td>
<td>95 (6.99)</td>
<td>197 (8.86)</td>
<td>0.28</td>
<td>0.55</td>
</tr>
<tr>
<td>2006</td>
<td>166 (12.21)</td>
<td>270 (12.14)</td>
<td>0.49</td>
<td>0.75</td>
</tr>
<tr>
<td>2007</td>
<td>145 (10.66)</td>
<td>263 (11.83)</td>
<td>0.42</td>
<td>0.73</td>
</tr>
<tr>
<td>2008</td>
<td>376 (27.65)</td>
<td>574 (25.81)</td>
<td>1.10</td>
<td>1.59</td>
</tr>
<tr>
<td>2009</td>
<td>369 (27.13)</td>
<td>590 (26.53)</td>
<td>1.08</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>1360 (100)</td>
<td>2224 (100)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CIR: Crude Incidence Rate; ASR: Age Standardized Incidence Rate
province in Iran), respectively.12 Based on Globocan in 2002, the ASR of liver cancer in the world was 5.8 and 15.7 per 100,000 in women and men, respectively.13 The rate was 6 and 16 cases per 100,000 in 2006 in women and men, respectively.14 Hence, there was an increasing trend in the incidence of liver cancer in the world.

Liver cancer is the 2nd common cancer in male in developing countries.14 These findings are similar to other regions of the world.7,14-17 Male to female ratio was higher for men than women for this cancer, similar to other studies.8,9,18,19 This may be due to more exposure to risk factors, such as hepatitis B, alcohol and tobacco consumption, and non-modifiable factors, in men.7 Yuan et al. also determined a relationship between high level of testosterone in men and the risk of liver cancer.20 This study showed that provinces like Semnan, Khuzestan, Ardebil, and Fars had the highest incidence of the cancer. Another study also indicated that this cancer was 4th common cancer in Semnan (incidence rate: 2.8%).21

A study conducted in Ardebil determined the ASR of 3.7 and 2.6 per 100,000 in men and women, respectively.22 Another study revealed that risk of the cancer in both men and women in Iran is higher than other provinces in 2006.12 It is suggested that liver cancer is the most common of digestive cancers and the 2nd cause from digestive cancers (19.5% of all cancer deaths) in Tehran.23 Northern, central, and western regions of Iran are considered low and moderate prevalence areas, and southern regions are high prevalence areas.19 The increase of prevalence may be due to increasing mean age, geographical and population distribution,1 and improving health and cancer registry in Iran.24 Incidence of HCC is more common among men than women and enhances as age increases. In high risk areas, the highest incidence rate occurs in people above 50 years. Similar to American and European countries, the greatest incidence rate was above 70 years.25 The present findings showed that the incidence of liver cancer increased in both genders with increasing age and the highest incidence was observed in the 8th decade of life. Another study stated that the highest incidence occurred in Iran above 60 years and in Fars above 70 years, while a lower mean age was reported in Kerman.12 In this study, the incidence of liver cancer was increasing in the country, especially in males and higher age groups. As a result, vaccination and earlier screening is required for high risk population.

**CONCLUSION**

The incidence of liver cancer is increasing in Iran. Therefore, the plan for the control and prevention of this cancer must be a high priority for health policy makers.

**REFERENCES**

cancer survey in Kerman province of Iran. *Iran J Public Health* 2007; 36:26-34.


