

## Epidemiological Features and the Incidence Trend of Brain Cancers in Iran (2004–2008)

### Abstract

**Background:** The objective of this research is to consider the incidence of brain cancers in Iran during the years 2004–2008 to improve reporting, distribution of the disease. **Methods:** In this cross-section study, the study population was all brain cancer cases diagnosed in Iran between 2004 and 2008. Age-standardized rate (ASR) per 100,000 persons and crude rate were calculated using direct standardization. Data were analyzed using Statistical Package for the Social Sciences (SPSS version 16) and Microsoft Office Excel 2010. **Results:** During the period 2004–2008, the ASR and crude rate of brain cancers among males were 2.37, 2.46, 2.77, 2.84, 4.16 and 2.13, 2.11, 2.40, 2.49, 3.61, respectively, and among females the ASR and crude rates were (1.64, 1.67, 2.04, 2.17, 3.09) and (1.45, 1.45, 1.76, 1.84, 2.62), respectively. **Conclusions:** According to the study results, a significant increase in the incidence of brain cancer was observed over a 4-year period in Iran. Hence, screening and early detection programs for this type of cancer are highly recommended.

**Keywords:** Brain, cancer, epidemiology, incidence, Iran

### Introduction

In recent decades, despite the success of controlling and preventing communicable diseases, the incidence and prevalence of non-communicable diseases has been increased significantly. Meanwhile, in some countries, cancer is the second leading cause of death after cardiovascular disease.<sup>[1,2]</sup> Cancer is the third leading cause of death, in Iran, after cardiovascular disease and injury<sup>[3]</sup> and it is considered as one of the most important health problems in many developed and developing countries.<sup>[4,5]</sup> The incidence of the primary brain tumors has been increasing in the recent decades, while survival rates were low.<sup>[6]</sup> However, it is noteworthy that the factors influencing the increase of this trend can be the correct diagnosis of the brain neoplasms due to the improvement of the diagnostic modalities after the introduction of computed tomography (CT) scan and magnetic resonance imaging (MRI) in the 1970s and 1980s.<sup>[7]</sup> In 2001, the number of primary malignant brain tumors in the United States was estimated as 35,519.<sup>[8]</sup> Age-standardized incidence rate of primary malignancies has been reported 3.7 per 100,000 for men, and 2.6 per 100,000

for women.<sup>[9]</sup> Nevertheless, the incidence of malignant primary tumors is higher in developed countries (men 5.8 and women 4.1 per 100,000 people) than in underdeveloped countries (men 3 and women 2.1 per 1,000,000). Moreover, the incidence of malignant and benign tumors in the United States is 14.8 per 100,000 people.<sup>[10]</sup> An accurate estimate of the incidence will assist clinicians in allocating resources and estimating the required sample size for clinical trials planning. Given that the incidence of brain tumors has been growing in the last three decades.<sup>[11]</sup>

There is significant heterogeneity in the mortality, epidemiology, and incidence of brain tumors across regions of the world.<sup>[10,12,13]</sup> It is important to reduce the burden of the brain tumors by effective interventions. The first step in prevention program is establishing a precise cancer registry system. In Iran, cancer registry was approved, based on the International Classification of Diseases – Oncology (ICD-O), by parliament in 1984.<sup>[2,14]</sup> The objective of this research is to consider the incidence of brain cancers in Iran during the years 2004–2008 to improve reporting distribution of the disease.

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## Methods and Materials

After the approval of the institutional review board (IRB) and ethics committee (Ethical code: IR.KAUMS.REC.1399.036), in this cross-sectional study data of all cases of brain cancer diagnosed in Iran during the years 2004–2008 were collected from the cancer registry of the Ministry of Health and Medical Education through health deputy of Kashan University of Medical Sciences. Indeed, patient information on this cancer has been collected from 799 active sources of pathology at 41 universities of medical sciences across the country, the medical records department of hospitals and the death certificates registered in National Organization for civil Registration. The data were entered in the Cancer Registration Software Program based on the ICD-10 coding system developed by the Iranian Ministry of Health. After entering data in the software, all information on demographic characteristics, including age, sex, cause of death, cancer type, and location, was alphabetically sorted, and duplicates were excluded by the registry system. In calculating incidence, people who had a different residence were excluded from the study. To prevent multiple registration cases, in addition to the names and surnames, the address of residence was also checked. Age-specific incidence rates per 100,000 people have been calculated. Age-standardized incidence rates also were calculated using direct standardization and the world standard population. To calculate the age-standardized rate (ASR), first the age-specific (mortality) rates were calculated for each age group by dividing the number of deaths by the respective population, and then multiplying the resulting number by 100,000.<sup>[15,16]</sup> Finally, the ASR was obtained by adding the resulting numbers. Data were analyzed using Statistical Package for the Social Sciences (SPSS version 16.0, Chicago, IL, USA) Software Package and Microsoft Office Excel 2010.

## Results

In this study, from a total of 6,957 diagnosed cancer cases, 2,805 (40.3%) cases were female and 4,152 (59.7%) cases were male. Brain cancer incidence has reached from 2.02 in 2004 to 3.64 in 2008 per 100,000 population. In addition, the incidence trends have been increased from 2004 to 2008, peaking in 2008, ASR equal to 4.16 and 3.09 per 100,000 in males and females, respectively [Table 1]. The ASR

and crude rates for brain cancer in both sexes per 100,000 populations per year were shown in Tables 1 and 2. The findings also show that ASR trend has been raised over the years. The trend of incidence rate of brain cancer in both sexes is shown in Figures 1 and 2. The highest incidence of brain cancer in both sexes was observed in the age group of 35–44 and the lowest incidence in both the sexes was observed in the age group of >85 years [Figures 1 and 2].

## Discussion

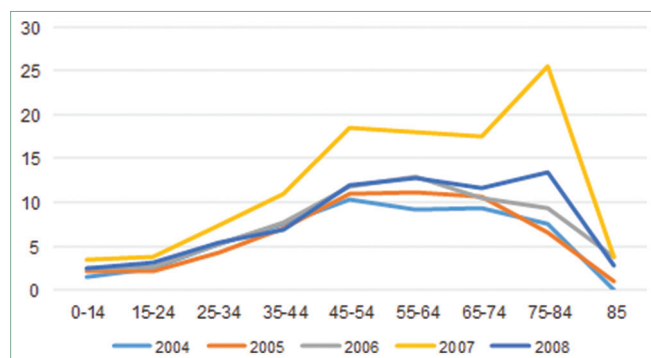
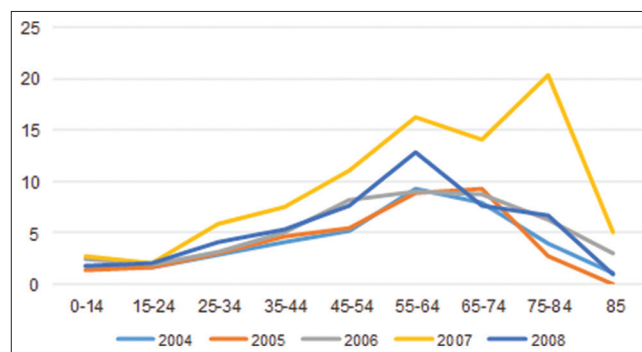
In this study, the ASR of brain cancer over a 5-year period was considered in different age groups. As expected, the incidence of brain cancer in Iran has been raised, from 2.02 in 2004 to 3.64 per 100,000 in 2008. The findings of the current study are consistent with those of Bab, Sattar, *et al.*<sup>[17]</sup> who found that over a 6-year period, the ASR of brain cancer increased from 0.47 in 2000 to 1.99 in 2005. The increase in brain cancer over these years may be due to better registration and reporting of cancer cases. Primary malignant brain tumors are nearly rare and accounted for about 2% of all cancers in adults. Approximately 4,400 people are diagnosed with new brain tumors annually in the United Kingdom, compared to more than 40,000 women with breast cancer and almost 25,000 men with prostate cancer.<sup>[8,18]</sup> In addition, a change in the cancer registration system based on a community-based approach may lead to improved reporting and increased cancer rates. In our study, young people had the lowest risk of brain cancer, and the risk of brain tumor increases with aging. It can, therefore, be assumed that the higher incidence in older age groups may be due to more exposure to environmental toxins.<sup>[8]</sup> The present findings seem to be consistent with the other researches which found that brain cancer is more common in men than in women.<sup>[19,20]</sup> Although a number of studies have shown that female hormones have protective effects against brain tumors,<sup>[21]</sup> other studies have suggested that there is an inherent difference in the sensitivity of X and Y chromosomes to tumor stimulation.<sup>[8]</sup> Developed countries have the highest number of brain tumors, which may be due to better and more accurate recording of benign tumors. Our results also accord with the earlier findings,<sup>[9]</sup> which showed that the increase in age >30 years accompanied with the higher incidence of brain tumors. The highest incidence rates were reported in North America, Australia, and Western Europe, and the lowest in Asia and Central and South America.<sup>[10]</sup> The incidence of primary brain tumors

**Table 1: Crude and age-standardized incidence rate per 100,000 of brain cancer in men, in Iran (2004-2008)**

Year	Total patients	Crude Rate	95% CI	ASR	Age specific rate								
					0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	+85
2004	738	2.13	(1.96, 2.26)	2.37	1.51	2.38	5.32	7.55	10.4	9.16	9.32	7.48	0
2005	761	2.11	(2.01, 2.30)	2.46	2.17	2.07	4.19	7.06	10.94	11.12	10.73	6.49	0.93
2006	863	2.40	(2.25, 2.57)	2.77	2.45	2.65	5.21	7.75	11.77	12.89	10.48	9.3	3.71
2007	895	2.49	(2.30, 2.62)	2.84	2.42	3.12	5.43	6.85	12.02	12.72	11.63	13.5	2.79
2008	1,300	3.61	(3.42, 3.79)	4.16	3.4	3.73	7.3	11.01	18.53	18.07	17.57	25.56	3.71

**Table 2. Crude and age-standardized incidence rate per 100,000 of brain cancer in women, in Iran (2004–2008)**

Year	Total Patients	Crude Rate	95% CI	ASR	Age specific rate								
					0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	+85
2004	476	1.45	(1.28, 1.54)	1.64	1.75	1.71	2.89	4.12	5.18	9.3	7.9	3.92	1.05
2005	496	1.45	(1.25, 1.50)	1.67	1.35	1.67	3.04	4.64	5.51	8.9	9.31	2.78	0
2006	602	1.76	(1.60, 1.88)	2.04	2.41	1.92	3.16	5	8.14	9.06	8.75	6.24	3.02
2007	629	1.84	(1.65, 1.93)	2.17	1.82	2.04	4.15	5.28	7.67	12.79	7.59	6.74	1.01
2008	894	2.62	(2.46, 2.78))	3.09	2.69	2.08	5.91	7.5	11.13	16.2	14.02	20.36	5.04

**Figure 1: Age specific rates per 100000 of brain cancers in Iran in men, 2004–2008****Figure 2: Age specific rates per 100000 of brain cancers in Iran in women, 2004–2008**

in Iran is lower in both males and females compared to the developed countries, and the higher incidence of these tumors in men is consistent with other global reports.<sup>[11,18]</sup> The incidence rate of malignant cancers of the central nervous system has been considerably reported variable from 0.62 to 8.86 among women and 0.62 to 7.16 among men per 100,000 populations in different provinces of Iran. Typically, malignant brain tumors in Iran have an annual incidence of 2,058, or 3.3 per 100,000 populations. The incidence rate of primary malignant tumors among men and women were reported 3.9 and 2.8 per 100,000 people, respectively. Among these, the provinces of Tehran, Semnan, and Khuzestan have the highest incidence.<sup>[11]</sup> Brain tumors in adults are rare diseases whose survival is usually poor compared to many other cancers. Reports on their growing trend should be interpreted with caution. Although the reasons for the increasing trend of brain cancer in the last decade cannot be evaluated carefully, but considering the growing trend of risk factors, the increase of the incidence rate of these cancers can be assumed due to western-oriented lifestyle especially dietary habits.

## Conclusions

However, the most important reason for the increasing incidence rates may be the increased accuracy of cancer registrations. A comprehensive program based on global experiences for screening of cancer and early and timely treatment is recommended.

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## Conflicts of interest

There are no conflicts of interest.

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