ORIGINAL ARTICLE

Journal of Otorhinolaryngology and Facial Plastic Surgery 2023;9(1):1-8.
https://doi.org/10.22037/orlfps.v9i1.43125

The Geographical Distribution of Laryngeal Cancer in Iran from 2004 to 2014

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Article Info

Article Note:
Received: March, 2023
Accepted: May, 2023
Publish Online: July, 2023

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Keywords:
Laryngeal cancer;
Geographical distribution;
Malignancy.

Abstract

Background: Laryngeal cancer accounts for about 1 to 2 % of all cancers; this incidence rate depends on the geographical region and ethnicity. Due to the lack of a comprehensive epidemiological study on laryngeal cancer in recent years, we designed this study to investigate the incidence and geographical distribution of laryngeal cancer.

Aim: This study aimed to investigate the incidence and geographical distribution of laryngeal cancer in Iran from 2004 to 2014.

Methods: The data collected from the Iranian National Cancer Data System registry, all the cases of laryngeal cancer (with topography code 32 and histology of laryngeal cancer) have been retrieved and analyzed from a comprehensive cancer database during the 11 years' period. Then statistical data were analyzed by SPSS, version 16.

Results: During the 11-year study, 13,241 new cases of laryngeal cancer were recorded, of which 11454 were men (86%) and 1788 were women (14%). According to this assessment, North Khorasan, Sistan and Baluchestan, and East Azerbaijan provinces had the highest growth rate, and North Khorasan, Gilan, and Kerman provinces with the highest incidence rates of 4.44, 3.29, and 2.23 per 100,000 respectively, between 2004 and 2014.

Conclusion: According to the results of this study, the incidence rate of laryngeal cancer, especially in women, is increasing in Iran. Further studies are needed to investigate the causes of increased incidence.

Conflicts of Interest: The Authors declare no conflicts of interest.
Please cite this article as: Safavi Naeini A, Raad N, Eslami A, Emami H, Moradi A, Noori E. The Geographical Distribution of Laryngeal Cancer in Iran from 2004 to 2014J Otorhinolaryngol Facial Plast Surg 2023;9(1):1-8. https://doi.org/10.22037/orlfps.v9i1.43125

Introduction

Regulatory mechanisms controlling the natural growth, proliferation, and death of cells are commonly disrupted in all types of cancer (1). Cancer is the second leading cause of death in developed countries and the third leading cause of death in less developed countries, after cardiovascular diseases (2). Predictions suggest that global cancer-related deaths will rise by 45% in 2030, primarily due to the increasing elderly population, decreasing mortality due to infectious diseases, and rising incidence of some cancers linked to tobacco use (2). In 2012, the World Health Organization emphasized cancer prevention and improving cancer patients' quality of life. Laryngeal tumors comprise 1.5% of all cancers and 2-5% of body cancers (4). Laryngeal cancer is one of the most common malignancies in the head and neck

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region, accounting for the second most common cancer of the respiratory tract after lung cancer, with varying prevalence depending on geographical area and related risk factors (5,6). The 5-year survival rate for laryngeal cancer is over 50%, and with proper treatment, life expectancy can reach over 90% (8,9). Risk factors for laryngeal cancer include tobacco and alcohol consumption and exposure to asbestos, polycyclic aromatic hydrocarbons, and dust (10-19). This cancer comprises 2.3% of male and 0.4% of female malignancies. While previously, laryngeal cancer was 15 times more common in men than in women, the current ratio is 5 to 1 in men to women (6). The incidence rate for this cancer is 5.2 in men and 1.1 in women per 100,000 people, rising to 7.6 per 100,000 in black men, indicating a higher prevalence in the black population (20). Laryngeal cancer trends vary across different countries and over time, with some studies reporting a gradual increase in incidence, particularly in women (21). In China, the incidence rate was 1.54 cases per 100,000 people, with 20,272 new cases reported in 2010 (22). The incidence rate of laryngeal cancer in the United States between 2012 and 2016 was 3 per 100,000 people, with a recent overall decrease of 2% in cancer incidence (20). In some developed countries, head and neck cancer incidence is increasing in women and decreasing in men. Risk factors and geography influence the specific types of cancer affecting the oral cavity, larynx, hypo-larynx, and oropharynx (23). Sao Paulo reports the highest rate of laryngeal cancer in Brazil, where laryngeal tumors comprise approximately 2% of all body cancers. About 8,000 new cases are reported annually, with 3.8% in men and 0.6% in women (24). In Iran, more than 30,000 people die of cancer yearly, with over 70,000 new cases estimated annually. The incidence is expected to double in the next two decades due to aging populations, changing lifestyles, and industrial pollution (1,2). The cancer registration program in Iran has improved in recent years, with 76,159 cases registered in 1387, an increase of 92.85% from expected points (25). Given the lack of comprehensive epidemiological studies on laryngeal cancer, the authors sought to investigate laryngeal cancer's epidemiological patterns from 1383 to 1393.

Methods

The present study's statistical population comprised all individuals with positive pathological samples for laryngeal cancer from 2004 to 2014. For this cross-sectional descriptive investigation, all individuals diagnosed with laryngeal cancer in the country between 2013 and 2014 were included as samples. Firstly, the Cancer Information System in Iran was utilized to obtain a list of all patients newly diagnosed with laryngeal cancer in the country during 2004-2014, following coordination with the Ministry of Health, Treatment, and Medical Education. From this list, individuals who had received a relevant disease code in the International Classification of Diseases (ICD) during the diagnosis period were identified as study samples. Their demographic characteristics, such as age group, gender, place of residence, and cancer type, were extracted. The population census of 2015, categorized by gender, age groups, and provinces, as well as population estimates by gender, were retrieved from the Statistics Center's website. Finally, the statistical information was analyzed using SPSS version 25 software. The incidence rate of laryngeal cancer in the overall population and by gender was calculated using the following formula:

$$\frac{100000 * \text{Number of laryngeal cancer cases per year}}{\text{Population or population estimate each year}}$$

Results

Throughout an 11-year study on laryngeal cancer, 13,241 novel cases of affliction were documented. Among these cases, a significant majority, amounting to 86%, were present in

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males, while only 14% were found in females. The geographical dispersion of laryngeal cancer across different parameters, such as geographical location, age, and gender, is explicated as statistical tables and figures.

The calculation of the incidence rate of laryngeal cancer per 100,000 population per province was employed to estimate the number of occurrences of the ailment within the populace. According to the findings, North Khorasan, Gilan, and Kerman provinces displayed the highest incidence rates in the nation, with rates of 4.44, 3.29, and 2.83 per 100,000 individuals, respectively.

The provinces with the lowest incidence rates of laryngeal cancer were determined to be Sistan and Baluchestan (0.62), Zanjan (0.68), and Qom (0.75), with only minimal instances of the ailment being detected per 100,000 members of the population between the years 2004 and 2014 (Figure 1).

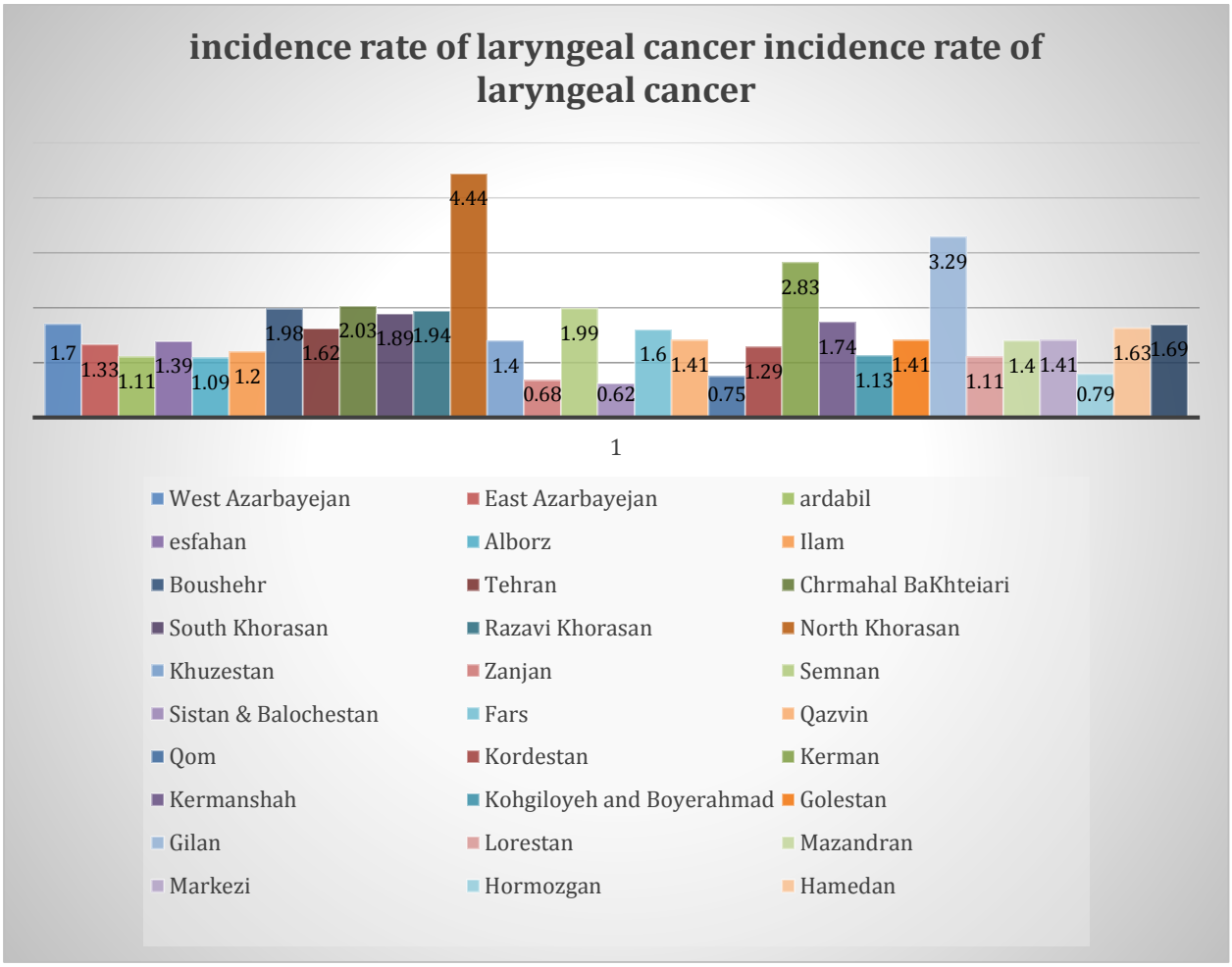

Figure 1. Mean incidence rate of laryngeal cancer by province between the years 2004 to 2014.

Between 2004 and 2014, a positive trend of incidence for laryngeal cancer was observed across all provinces, except for Qom, Kohgiluyeh and Boyer Ahmad, and Ilam, where a negative trend was observed. The mean age for laryngeal cancer was calculated separately for all provinces, with Kurdistan (65.86), Hamedan (64.38), and Gilan (64.34) demonstrating the highest mean age. At the same time, Qom (42.90), North Khorasan (48.65), and Semnan (55.55) showed the lowest mean age for laryngeal cancer (Figure 2). Our investigation revealed a higher incidence

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rate of laryngeal cancer in men than women across all provinces. The available data indicates that Sistan Baluchestan, South Khorasan, and Razavi Khorasan exhibit the highest female-to-male ratios, with rates of 29.32 versus 70.68, 21.21 versus 78.29, and 20.72 versus 79.28, respectively. On the other hand, Qom, Kohgiluyeh, Boyer Ahmad, and Zanjan display the lowest female-to-male ratios, with rates of 4.68 versus 95.32, 5.11 versus 94.89, and 6.78 versus 93.22, respectively, as illustrated in Figure-3.

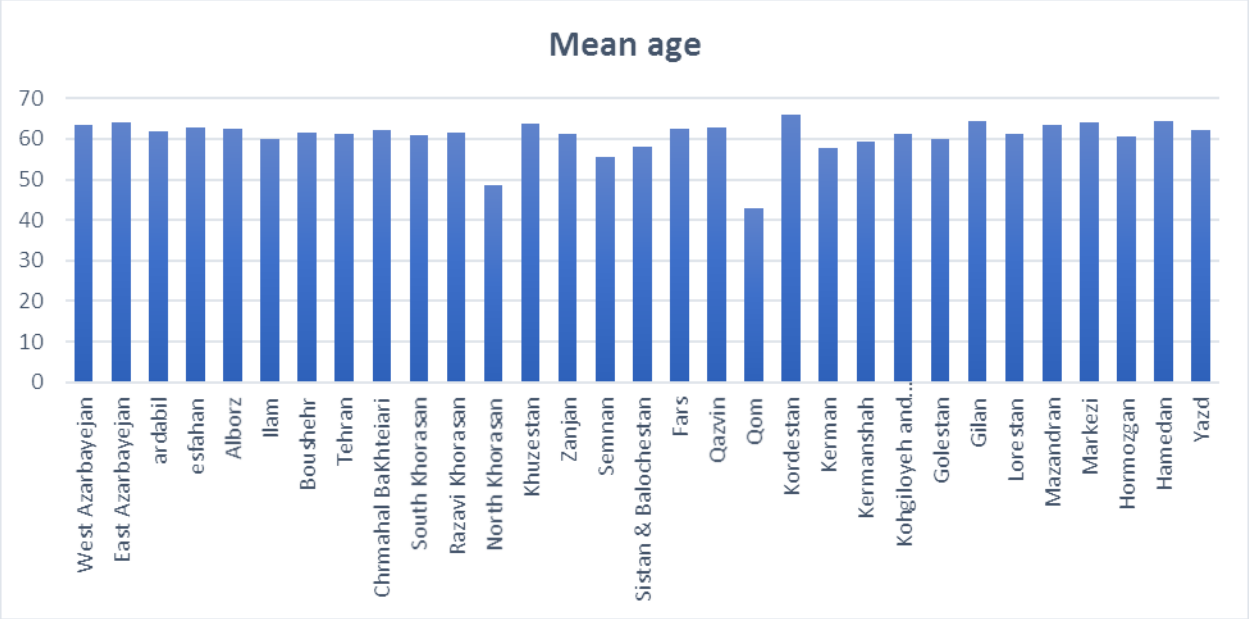

Figure 2. The mean age of Laryngeal Cancer by Province between 2004 to 2014.

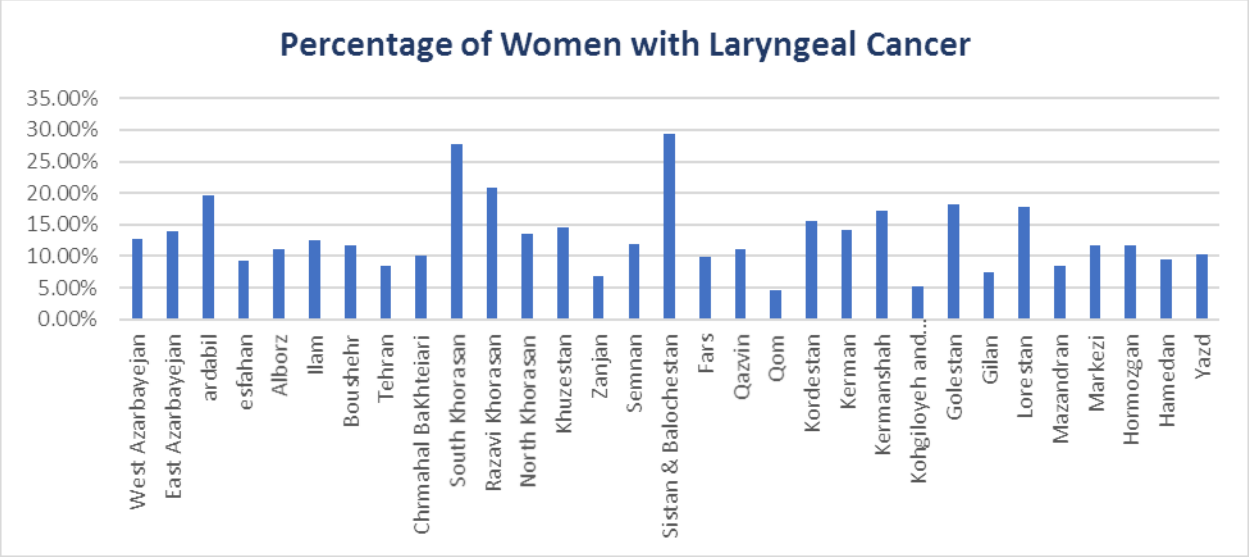

Figure 3. Mean Percentage of Women with Laryngeal Cancer by province between 2004 to 2014.

Discussion

The findings of our 11-year survey, spanning from 2004 to 2014, revealed that the mean incidence rate of laryngeal cancer was 1.69 cases per 100,000 individuals. The incidence rate of laryngeal cancer was at its lowest in 2004 and peaked in 2014. Zhang et al. (22) conducted a study in China. They reported a

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crude incidence rate of 1.54 cases per 100,000 individuals in 2010, which was lower than the incidence rate observed in our study in 2010 (1.7 cases per 100,000 individuals). Bobdey et al. (26) conducted a review study in India and reported a range of minimum and maximum incidence rates of laryngeal cancer as 1.26 and 8.18 per 100,000 individuals, respectively. Jazvins et al. (21) conducted a study in Lithuania in 1978, which showed that the incidence rate of laryngeal cancer was 10.73 cases per 1,000 men and 0.26 cases per 1,000 women. In 2001, this rate increased to 11.6 points per 10,000 men and 0.6 cases per 10,000 women. The incidence rate of laryngeal cancer in Jazvins' study was much higher than ours.

According to the data obtained from our study, the incidence rate of laryngeal cancer in Iran in 2013 was 1.88 times higher than that in 2004. This upward trend in the incidence rate of laryngeal cancer persisted throughout the study period, except for a one percent decrease observed in 2016, which could be attributed to registration errors in statistics. Shibani et al. (32) also showed that the incidence rates of laryngeal and nasopharyngeal cancers doubled from 1972 to 1995 compared to 1939 to 1972, while the rates of lip, tongue, salivary gland, oral cavity, and oropharynx cancers decreased by 2 to 4 times, indicating an increasing trend of laryngeal cancer in Iran. Our study confirms the continuation of this trend. This pattern change may be attributed to improvements in oral hygiene and diet. In contrast, the increase in laryngeal cancer may be attributed to the rising consumption of cigarettes, opium, and alcohol. Based on the positive trend of the incidence rate of laryngeal cancer from 2004 to 2014, it is predicted that the incidence rate of laryngeal cancer will reach nearly 4 cases per 100,000 individuals in 2023.

The results of our study revealed that from 1983 to 1993, 13,241 cases of laryngeal cancer were recorded, out of which 1,788 were women (14%) and 11,454 were men (86%). The number of documented cases among men was 6.4 times higher than that among women. In Tawab et al.'s study (27), 93.9% of the participants were men. The study by Zhang et al. (22) found that the incidence rate of laryngeal cancer in men was 5.58 times that of women in 2010. In our research conducted in 2010, we observed a slightly lower ratio of 5.52. As other studies have shown, laryngeal cancer is more prevalent in men than in women. However, our findings highlight a striking 300% increase in the incidence rate of laryngeal cancer in women, compared to a 168% increase in men. This trend has persisted over 11 years and warrants further investigation into the societal risk factors contributing to the rise in incidence rates, particularly among women in Iran.

Tobacco use is the most well-established risk factor for laryngeal cancer. Numerous case-control and cohort studies in various regions confirm a direct relationship between tobacco consumption and laryngeal cancer (37-37). Recent studies have demonstrated increased smoking among the Iranian population, particularly among women (38, 39). This could explain the threefold increase in incidence rates of laryngeal cancer in women observed in our study. In addition to tobacco, alcohol consumption has been identified as a risk factor for laryngeal cancer in Western studies (40,41). Meanwhile, indoor air pollution is a more significant risk factor in developing countries. A limited number of studies have also shown that consuming fruits and vegetables may reduce the risk of developing laryngeal cancer (42-46).

Our study analyzed data from 2004 to 2014 and found that the average age of laryngeal cancer patients in Iran was 61.96 years over the past 11 years, consistent with other studies (47). The disease appears more common in the sixth and seventh decades of life than in different age groups. Additionally, we found that the provinces of North Khorasan, Gilan, and

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Kerman had the highest incidence rates of laryngeal cancer in Iran between 2004 and 2014, with rates of 4.44, 3.29, and 2.83 per hundred thousand people, respectively. Conversely, the provinces of Sistan and Baluchistan, Zanjan, and Qom had the lowest incidence rates, with rates of 0.62, 0.68, and 0.75 per hundred thousand people, respectively. The varying incidence rates of laryngeal cancer in different provinces could be explained by cultural and climatic factors, which warrants further investigation into the potential risk factors.

Conclusion

This study showed that the incidence of Larnax cancer is increasing in Iranian provinces, and further investigations are needed to identify related risk factors.

Acknowledgements

We have thanked the National Cancer Control Department for providing the statistical information.

Conflicts of Interest

The authors declare no conflicts of interest.

Financial Support

The authors declared that there was no funding support for this study.

Ethical Statement

This study was ethically approved by ethical committee of Shahid Beheshti University of Medical Sciences (date of approval: May, 7, 2019).

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