REVIEW ARTICLE

Thyroid Cancer in the World: An Epidemiological Review

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Abstract

Background: Thyroid cancer is the most common malignancy of the endocrine glands at any age and sex. The present study was designed to comprehensively identify the epidemiological status of thyroid cancer using the results of similar studies.

Methods: The present study was an epidemiological review study. Studies on the epidemiology of thyroid cancer between March 2020 and April 2020 were searched by two researchers at four Latin scientific databases (Google Scholar, PubMed / Medline, Scopus, ISI Web of Science). Persian and Latin articles about the epidemiology of thyroid cancer were included in the study.

Results: The incidence of thyroid cancer is increasing worldwide; however, this type of cancer has a good survival rate. The most important risk factors for thyroid cancer include Ionizing radiation, diet, female gender, age, genetic background and race and ethnicity.

Conclusion: The incidence of thyroid cancer in the world is increasing. Therefore, preventive and protective measures to reduce the risk factors of this cancer are recommended to reduce the incidence of the disease.

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Introduction

Today, cancer is one of the major health problems in Iran and other parts of the world.[1] Currently, cancer is the second leading cause of death worldwide, with more than 9 million deaths in 2018.[2] Thyroid tumors account for only 1 to 1.5 percent of all malignant tumors in humans,[3] however, thyroid cancer is the most common malignancy of the endocrine glands at any age and sex.[4, 5] The incidence of thyroid cancer has increased faster than any other malignancy in recent years, and the incidence has increased in both sexes and in all races.[6, 7] Histologically, different types of thyroid cancer can be divided into differentiated carcinomas (DTC), anaplastic thyroid carcinoma (ATC), and medullary thyroid carcinoma (MTC). 90% of thyroid cancers are related to DTC subgroups.[8] DTCs grow from the thyroid follicle cells to produce hormones and colloids. They are mostly divided into papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC).[3] According to recent data, thyroid cancer is the fifth most common cancer in women worldwide[9] and in Italy; it is the second most common cancer among women under the age of 45.[10] In 2012, about 230,000 new cases of thyroid cancer in women and 70,000 new cases of thyroid cancer in the world were estimated and in this time Age-Standardized Rate (ASR) was estimated at 6.1 for women and 1.9 for men per 100,000 people.[11]

In most countries, the incidence of thyroid cancer has increased significantly over the past few decades[11] and if that trend continues, thyroid cancer may rise to the fourth leading cause of death in the United States in 2030.[12] However, the incidence of thyroid cancer has decreased in a number of countries, such as Norway and Sweden.[13]

The annual incidence of thyroid cancer varies greatly from place to place;[14] there is a difference of more than 10 times in the incidence of thyroid cancer in women around the world, with the highest rates in

the South and North America, Italy, Japan and the Pacific Islands.[11] In contrast to the incidence of thyroid cancer, deaths is steadily declining in most parts of the world.[15, 16]

According to the Iranian Cancer Institute, thyroid cancer accounts for 1.8 percent of all cancers and 76.1 percent of endocrine cancers. The mean age of Iranian patients was 43 years and the ratio of women to men was 1.8 to 1. Thyroid cancer is the seventh most common cancer in women in Iran, the fourteenth in men, and the eleventh most common in both sexes.[6, 17, 18]

Since few studies have been conducted in recent years in the field of comprehensive identification of epidemiology of thyroid cancer in Iran and the world, the present study was designed to comprehensively identify the epidemiological status of thyroid cancer using the results of similar studies.

Methods

The present study was an epidemiological review study. Studies on the epidemiology of thyroid cancer between March 2020 and April 2020 were searched by two researchers at four Latin scientific databases (Google Scholar, PubMed / Medline, Scopus, ISI Web of Science). Selected keywords for search included "cancer", "neoplasm", "tumor", "thyroid", and "epidemiology". The articles were retrieved using advanced search and using AND and OR operators. The two researchers examined the extracted articles and included Persian and Latin articles that referred to the epidemiology of thyroid cancer. Summaries of articles published in congresses and conferences were excluded from the study. Also, articles that did not have a full text were excluded. Initially, about 118 articles were obtained, and after applying the criteria for leaving the study and reporting the results, 43 articles were finally evaluated.

Results

Risk Factors

Ionizing Radiation

Exposure of the body, especially the neck and thyroid gland, to ionizing radiation (X-rays or gamma rays) is a serious and well-known risk factor for thyroid cancer. The thyroid gland is exposed to ionizing radiation more than other tissues due to its position in the body.[3, 9, 19] The thyroid is very active at a young age. Children exposed to radiation often get PTC.[9, 20] Among these risk factors for thyroid cancer, exposure to ionizing radiation appears to be the most important factor for strong papillary thyroid cancer. The thyroid gland is very sensitive to the carcinogenic effects of nuclear radiation, diagnostic radiography, nuclear drugs, radiation therapy, and cosmic rays during flight.[21] After the Fukushima nuclear disaster in 2011, compressed ultrasound screening programs over four years showed that the prevalence of thyroid cancer among screened adolescents under the age of 18 was about 30 times higher than the national average.[22] There has also been a significant increase in thyroid cancer among the general population, including children, following the catastrophic Chernobyl disaster in the former Soviet Union.[19]

Obesity

In recent years, with the dramatic increase in obesity, the incidence of thyroid cancer has also increased[23] and, in general, many studies recognize obesity as an important risk factor for thyroid cancer.[24, 25] In a study by Kitahara et al., a positive and significant association was observed between the increase of weight and Body Mass Index (BMI) with the risk of thyroid cancer.[26] A meta-analysis study also showed an association between BMI and the risk of thyroid cancer; the study found that the prevalence of thyroid cancer varies from country to country, and that the effect of BMI on the development of thyroid cancer in Asians may be different for non-Asians. Overall, the result of this study show that being overweight and obese was associated with an increased risk of thyroid cancer.[27]

A study of meta-analysis by Ma et al. found that obese men and women were significantly more likely to develop thyroid cancer than non-obese individuals. In histological sub-group analyses, an increased risk of papillary thyroid cancer, thyroid follicular cancer, and thyroid implant cancer was observed in obese individuals; however, obesity was associated with a reduced risk of modular thyroid cancer.[28]

Age and Sex

Age and sex are among the factors that cannot be corrected. A study by Al-lawati et al. found that women were almost four times more likely than men to develop thyroid cancer.[24] In another study, women were three times more likely to have thyroid cancer than men.[29] In general, several studies have shown that women are more likely than men to have thyroid cancer.[21, 30, 31] Thyroid cancer is generally much more in women than in men and has been on the rise in recent decades.[32, 33] A study by Raposo et al. in Portugal found that the incidence of thyroid cancer in Portuguese women was higher than the global and European estimates.[34] The peak incidence occurred in men between the ages of 80-84 and in women between the ages of 50-54. Regarding the age of the onset of the disease, it can be said that thyroid cancer has occurred in only about 10% of people younger than 30 years and over 75 years in the study of Cossu et al., and more than half of the patients were between 45-74 years.[29]

Diet

Research by Knobel et al. showed that severe iodine deficiency was associated with an increased risk of follicular thyroid cancer, while high iodine intake was associated with an increased risk of Papillary thyroid cancer.[35] Another study found that the risk of developing papillary cancer in areas with iodine deficiency was lower than that in areas with enough iodine.[36] Another study found that papillary thyroid cancer was more common in Iceland (a region with high iodine consumption) compared with northeastern Scotland (a region with low iodine intake).[37] However, the results of a study showed that there was no difference between people who eat a lot of fish (has a high iodine), and people who did not eat a lot of fish had thyroid cancer.[38] Findings from a study by Memon et al. show that eating more than 2 servings of fresh fish a week prevents thyroid cancer, but the risk of developing thyroid cancer is increased by eating processed, canned or frozen fish. The authors stated that the high risk associated with processed fish may be due to higher iodine levels in processed fish or altered iodine uptake due to additives or processing. In the same study, no link was found between thyroid cancer and oyster consumption.[39] A study also found that eating foods high in nitrate increased the risk of thyroid cancer.[40] One of the factors associated with thyroid cancer is drinking coffee. According to various studies, drinking coffee a day reduces the risk of thyroid cancer.[41]

Race and Ethnicity

In a study by Yu et al. that surveyed the prevalence of thyroid cancer in different races from 1992 to 2004, the annual percentage change (APC) in different races and ethnicities varied significantly. In this study, the prevalence of thyroid cancer was 5.6 percent for non-Hispanic whites, 4.3 percent for blacks, 1.5 percent for Asians, 2.8 percent for Spanish whites, and 1.1 percent for Native Americans.[42] According to another study that studied the age-standardized incidence of thyroid cancer in different races and ethnicities, whites had the highest increase in thyroid cancer (5.6 percent per year), blacks (4.8 percent per year), and natives Americans / Alaska (3.2% per year), and Asian islands (2.3% per year).[43] Another study found that although the lowest rate of thyroid cancer was observed in blacks, the highest rate of papillary thyroid cancer occurred in black women.[44]

Genetics

Family history is one of the strongest unchangeable risk factors for thyroid cancer.[24] A study found that positive family abnormalities were observed in about 3% of people with thyroid cancer.[3]

Incidence

Thyroid cancer accounted for 2.1 percent of all cancer cases in 2012. Globally, the age standardized incidence rate of thyroid cancer was about 4.2 (1.9 in men and 6.1 in women) per 100,000 people in 2012; in comparison to 1997 it was about 2 times.[21] The incidence of thyroid cancer is on the rise around the world, a significant portion of which is due to increased diagnoses.[31] According to a study by Davies et al., the incidence of thyroid cancer in the United States has more than doubled over the past 30 years, and 87% of this increase was due to the diagnosis of small papillary cancers.[30] Another study found that the incidence of thyroid cancer in the United States was about three times that in the past three decades (from 4.3 per 100,000 in 1980 to 12.9 per 100,000 in 2008). This study also confirmed the hypothesis that an increase in incidence may only be a manifestation of a better diagnosis.[45] According to a study in South Korea between 1999 and 2014, the incidence of thyroid cancer increased from 6.3 in 1999 to 43.3 in 2014 per 100,000 people, which was much higher than the global average.[46] According to the study conducted by Safavi et al., the incidence of thyroid cancer is increasing in most of the provinces of Iran and the highest annual incidence has been seen in the two provinces of Chaharmahal and Bakhtiari and Isfahan.[47] In a study by Farzadfar et al., the average incidence of thyroid cancer in Iran in 2010 was 7.8 per 100,000 people. It was shown that the provinces of Tehran, Isfahan, Yazd and Qazvin had the highest rates. The lowest rates were in the provinces of South Khorasan, Bushehr, Sistan and Baluchestan, Ilam, Ardabil, Kohgiluyeh, Boyer-Ahmad and Hormozgan.[6]

Survival Rate and Mortality

Survival is one of the most important indicators of evaluating the quality of cancer control and treatment programs.[46] In a study by Ellison et al., a 5-year net survival rate for thyroid cancer between 2010 and 2014 was 98% to 85% which reduced with increase in age.[47] The specific mortality rate for thyroid cancer in both 1973 and 2002 was approximately 0.5 per 100,000 deaths.[42] According to Liu et al.'s study, the overall 5-year survival rate by gender and subgroups was relatively stable over time, from 90.2 percent in 1997 to 92.4 percent in 2010. It has also been reported that patients with thyroid cancer have a favorable prognosis and their 10-year survival rate is estimated at more than 90%.[21] Mortality from thyroid cancer worldwide varies from 0.2 to 1.2 in men and from 0.4 to 2.8 in women per 100,000 people. In general, despite the regional and geographical differences, the mortality rate for thyroid cancer in the population is not more than one percent.[3] In another study in Iran, the five-year survival rates for both men and women were similar, and according to descriptive epidemiology, Iranian patients experienced high survival rates.[48] Also in another study, the standard mortality rate for thyroid cancer in both sexes was

0.5, and in men and women worldwide 0.6 and 0.4 per 100,000, respectively.[49]

Discussion

In the present study, the epidemiology of thyroid cancer was investigated. Despite the increased incidence of thyroid cancer in over the past 30 years, deaths from thyroid cancer have remained stable.[42] It seems that increasing diagnostic methods and increasing the accuracy of these methods play an important role in the early diagnosis of people with thyroid cancer. There are several risk factors for this cancer. After the Fukushima nuclear disaster in 2011, compressed ultrasound screening programs over four years showed that the prevalence of thyroid cancer among screened adolescents under the age of 18 was about 30 times higher than the national average.[50] In general, many studies recognize obesity as an important risk factor for thyroid cancer.[26, 51] In general, several studies have shown that women are more likely than men to have thyroid cancer.[21, 41, 42] Although the present study tried to show most of the risk factors for thyroid cancer, however, it seems that there are many risk factors that have not been discovered yet.

One of the major limitations of this study was the inaccessibility of the full text of many articles.

Conclusion

Thyroid cancer is the most common cancer of the endocrine system. Its incidence is increasing worldwide; however, this cancer has a good survival rate. The most important risk factors for thyroid cancer include Ionizing radiation, diet, female gender, age, genetic background and race and ethnicity. Some of the risk factors for this cancer can be corrected and some are unchangeable. Therefore, periodic checkups are recommended for people who are at higher risk for this cancer. On the other hand, in the field of lifestyle modification, it is recommended that people should eat healthy and appropriate foods.

Conflict of Interest: None declared.

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