



# Cancer Incidence Rates by Age and Gender in Sivas Province of Turkey, 2004–2014

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## ABSTRACT

**Objectives:** We sought to evaluate the trends in age-standardized incidence rates of cancer by gender, age, and types in the Sivas province of Turkey from 2004 to 2014.

**Methods:** Data were obtained from the Sivas Public Health Department Cancer Unit and the Cumhuriyet University Hospital Cancer Record Unit for the studied period. Data were presented as incidence rates by age, gender, and cancer site using world age-standardized incidence rate (ASR-W) per 10<sup>5</sup> populations. **Results:** Of the 13 377 registered new cases of cancer during the study period, 43.1% (5771) were female, and 56.9% (7606) were male. The ASR-W of all cancers was 205.2 per 10<sup>5</sup> in males and 168.0 per 10<sup>5</sup> in females. The ASR-W was increased for both genders over the 11-year period. The greatest incidence cancer type in males was prostate cancer (ASR-W = 35.8) followed by lung (ASR-W = 33.9), colorectal (ASR-W = 19.0), urinary (ASR-W = 18.4), and stomach (ASR-W = 17.3) cancer. Among females, thyroid (ASR-W = 37.5) was the cancer type with the greatest incidence followed by breast (ASR-W = 27.7), colorectal (ASR-W = 11.7), lymphoma (ASR-W = 10.4), and stomach (ASR-W = 10.0) cancer.

**Conclusions:** The cancer incidence rate in males has remained higher than in females from 2004 to 2014, and an increased incidence of various cancers was observed in both genders. Raising public awareness about the risk factors for cancer and the development of appropriate and effective screening programs to provide more reliable data for cancer prevention and control programs in Sivas province is necessary.

Cancer is one of the most important preventable causes of mortality and morbidity worldwide. Based on new data, alarming trends in cancer incidence rates have been reported in both developed and developing countries in recent years and, especially in developing countries, is predicted to increase by 45% in 2025.<sup>1</sup> Moreover, it is estimated that the global economic and healthcare burden of cancer will increase as much as 70% within the next two decades.<sup>2</sup>

Despite being potentially among the most preventable and treatable chronic diseases, cancer is the second leading cause of death globally and is expected to account for 13.1 million deaths per year by 2030. Approximately 70% of these cancer-related deaths are predicted to occur in developing countries.<sup>3</sup>

Due to the growing healthcare burden of cancer in developing countries, it is important to assess the incidence of cancer patterns. As in most developing

countries, there has been considerable population growth in Turkey. Life expectancy has increased, and the socioeconomic and demographic situation has also changed.<sup>1,3-5</sup>

In Turkey, the lack of population-based national cancer prevention and screening programs, and low cancer awareness remains an important problem. Definitive information about the patient including location and time characteristic of cancer is required to provide more accurate and efficient cancer control planning and program implementation. The number of researchers investigating the recent changes and incidence of common cancers in Turkey is limited. Both incidence and time-trend analysis are important in determining the cancer pattern. Therefore, this study aimed to evaluate the trends in age-standardized incidence rates of cancer incidence by gender and age, and common types of cancers in the Sivas province, Turkey, between 2004 and 2014.

## METHODS

The study population composed of all patients diagnosed with cancer in Sivas, a Middle Anatolian province, from 2004 to 2014. This retrospective study was carried out on data derived from the Sivas Public Health Department Cancer Unit and Cumhuriyet University Hospital Cancer Record Unit. After data entry, all duplicates were removed. Then, information related to characteristics, including age, gender, and cancer type were reorganized. To estimate the incidence rate, those with secondary tumors and whose residence in Sivas was less than six months were excluded.

Cancer cases were divided into the following 19 types: lung, laryngeal, central nervous system and brain, skin, bone, testis, prostate, gynecological (cervix, endometrium, and ovary), stomach, colorectal, leukemia, lymphoma, breast, liver, bladder, thyroid, and urinary. World age-standardized incidence rates (ASR-W), which were obtained using the world standard population, were calculated for each of the six age groups (0–29, 30–39, 40–49, 50–59, 60–69 and  $\geq 70$ ) by gender.<sup>6</sup>

Data analysis was performed using SPSS Statistics (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp) based on age-standardized incidence rates in both genders. Age-standardized incidence rates were also directly calculated according to the world standard population. Descriptive statistics and linear regression analysis were performed to determine the trends in age-standardized incidence rates of cancer incidence. The significance level was considered as  $p < 0.050$ .

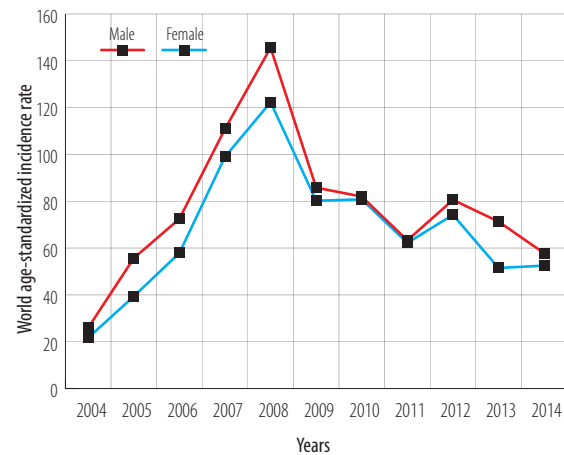
## RESULTS

A total of 13 377 patients were diagnosed with cancer, 7606 (56.9%) males and 5771 (43.1%) females with a mean age of  $57.1 \pm 16.6$  ( $59.5 \pm 6.0$  years for males and  $54.0 \pm 8.3$  years for females). The total number of cancer cases was 407 in 2004, and that number increased to 969 cases in 2014.

Table 1 and Figure 1 provide the ASR-W for all cancer cases over the 11-year study period for both genders. According to the ASR-W, the gender ratio (male-to-female) for all cancer cases was 1.2. The ASR-W of common cancer in males and females increased more than two-fold. The highest ASR-W for both genders was observed in 2008 (ASR-W = 145.6 for males and 122.3 for females). The

**Table 1:** World age-standardized incidence rate for all cancer cases by gender in Sivas, Turkey, from 2004 to 2014.

Year	Male	Female	Male/Female
2004	26.0	21.7	1.2
2005	55.7	39.4	1.4
2006	72.5	57.9	1.3
2007	110.9	99.0	1.1
2008	145.6	122.3	1.2
2009	85.8	80.2	1.1
2010	82.0	80.8	1.0
2011	63.3	62.2	1.0
2012	80.6	74.2	1.0
2013	71.3	51.5	1.4
2014	57.8	52.5	1.1
Mean	74.4	67.4	1.2

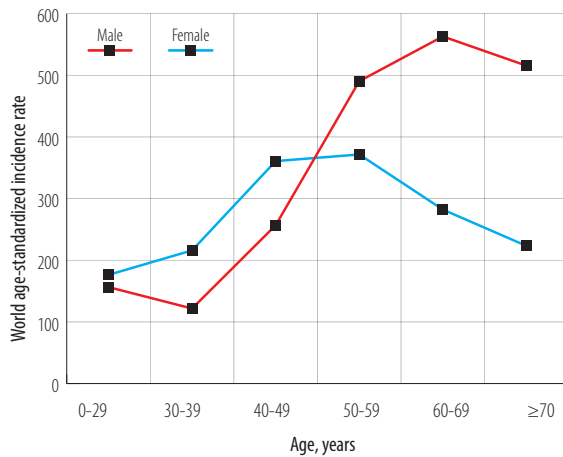


**Figure 1:** Trend of world age-standardized incidence rate of all cancer cases by gender from 2004 to 2014 in Sivas, Turkey.

**Table 2:** World age-standardized incidence rate for all cancer cases by gender and age in Sivas, Turkey.

Age group, years	Male	Female	Male/Female
0–29	156.4	176.3	0.9
30–39	121.7	216.0	0.6
40–49	256.8	360.8	0.7
50–59	490.4	371.6	1.3
60–69	563.0	282.2	2.0
$\geq 70$	515.6	223.3	2.3

overall ASR-W was higher among males than females, and this difference was statistically significant ( $p < 0.050$ ).



**Figure 2:** World age-standardized incidence rate of all cancer cases by gender and age groups in Sivas, Turkey, from 2004 to 2014.

**Table 3:** World age-standardized incidence rate for different cancer types by gender in Sivas, Turkey, from 2004 to 2014.

Cancer types	Male	Female
Lung	33.9	9.8
Laryngeal	16.0	6.1
CNS and brain	9.8	9.2
Skin	11.4	9.8
Bone	1.3	0.7
Testis	3.4	-
Prostate	35.8	-
Endometrium	-	5.5
Cervix	-	5.5
Ovary	-	3.5
Stomach	17.3	10.0
Colorectal	19.0	11.7
Leukemia	13.9	7.3
Lymphoma	10.9	10.4
Breast	0.0	27.7
Bladder	3.6	4.4
Liver	2.3	1.1
Thyroid	8.2	37.5
Urinary	18.4	7.6
All cancers	205.2	168.0

CNS: central nervous system.

The ASR-W for all cancer types by age groups for both genders is demonstrated in Table 2 and Figure 2. ASR-W was higher among females aged 49 years or younger [Table 2]. While this was not statistically significant ( $p > 0.050$ ), this rate was significantly higher in male aged 50 years or over ( $p < 0.050$ ).

The ASR-W was 205.2 in male and 168.0 in female for the time period studied [Table 3]. Prostate cancer (ASR-W = 35.8) was the most common cancer type for males followed by lung (ASR-W = 33.9), colorectal (ASR-W = 19.0), urinary (ASR-W = 18.4), and stomach (ASR-W = 17.3). Thyroid (ASR-W = 37.5) was the most common type of cancer for females followed by breast (ASR-W = 27.7), colorectal (ASR-W = 11.7), lymphoma (ASR-W = 10.4), and stomach (ASR-W = 10.0).

Our study showed that ASR-W of the most commonly diagnosed cancers differs by gender and age. In males, the ASR-W increased with increasing age and reached a peak among those aged 60–69 years. Among females, we saw a sharp decrease in the ASR-W of thyroid and lymphoma cancers in those aged 30–39 years. This rate was sharply increased for thyroid and breast cancer in the 40–49 age group.

## DISCUSSION

We investigate the incidence and trend of common cancers in the Sivas province by gender from 2004 to 2014. Over the 11-year study period, cancer cases exhibit some interesting incidence and trends. First, all cancer cases that showed a sharp increase in 2008 among both females and males tended to decrease after 2008. Secondly, data analysis showed an interesting pattern regarding a few cancer types in our study. Prostate and thyroid cancers were the most common cancers in males and females, respectively. The second most common cancers were lung cancer in males and breast cancer in females, while stomach, colorectal, urinary (only in male), and lymphoma (only in females) were the only cancers that were ranked in the top five most incident cancers for the study period.

Our study findings show that the proportion of common cancer cases in males was higher than in females (56.9% vs. 43.1%). These findings were similar to the results from Europe, where the incidence of various cancers was higher in males than females (57% vs. 43%).<sup>7</sup>

An increased peak in cancer cases was observed in both sexes in 2008, which can be attributed to the improvement in the cancer registry system in the country and the increase in access to health services in the same year.<sup>8</sup> The improvement in the registry system in Sivas province also accounts for the sharp

increases in the incidence rates of cancer during the study period, especially in 2008. Conclusively, cancer was most frequently diagnosed in both genders in 2008.

According to the World Health Organization, estimations of cancer incidence rates will almost double by 2030, and most rises (75%) are predicted to occur in non-developed countries.<sup>9</sup> As indicated by the Ministry of Health Department of Cancer Control database in Turkey, cancer incidence rates increased from 133.78 per 10<sup>5</sup> in 2002 to 173.85 per 10<sup>5</sup> in 2005. Also, the age-adjusted cancer rates for males and females in 2012 were reported as 277.7 per 10<sup>5</sup> and 188.2 per 10<sup>5</sup>, respectively.<sup>10</sup> Similar to these reports, a serious increase in the cancer incidence rate was observed in this study. The value of ASR-W in our study was 205.2 per 10<sup>5</sup> for males and 168.0 per 10<sup>5</sup> for females, which was lower than the value of ASR-W in Turkey and in central and eastern Europe (260.0 in males and 193.5 in females per 10<sup>5</sup>), but higher than the value of ASR-W in Western Asia (192.8 in males and 150.2 in females), yet similar to the world value.<sup>11</sup> The increased ASR-W in males and females between 2004 and 2014 may be explained as the result of changes in environmental factors (e.g., electromagnetic waves, radiation, chemicals, compounds in cosmetics, insecticides and pesticides, food additives, pharmaceutical drugs) and changes in lifestyle, including increasing consumption of fatty foods and fast foods, tobacco smoking, sedentary lifestyle as well as rapidly growing elderly population.<sup>12,13</sup> All of these lifestyle changes have been repeatedly shown to increase the incidence of cancer.<sup>14-17</sup>

Unlike previous reports in which the most common type of cancer in Turkey was lung cancer in males (60.4 per 10<sup>5</sup>) and breast cancer in females (46.8 per 10<sup>5</sup>),<sup>18,19</sup> we found prostate and thyroid cancer ranked first both in males and females, respectively. This difference might be due to the different time, geographical population shifts, or the improvement in the cancer registry system.<sup>8</sup>

Our study indicated that thyroid cancer was the first most common cancer in females. This high incidence of thyroid cancer in females (ASR-W = 37.5) compared to males (ASR-W = 8.2) requires further investigations to determine whether these findings were the result of the greater use of diagnostic imaging, leading to more frequent detection of smaller, asymptomatic tumors,<sup>20</sup> since

radiation exposure of the thyroid gland (especially during childhood and adolescence) is recognized as a risk factor for the development of thyroid cancer.<sup>21</sup> In recent years, various studies have shown that there has been a significant increase in the incidence of thyroid cancer. A recent study from Cyprus reported a higher rate for thyroid cancer in females and showed that the incidence has doubled in just one decade.<sup>22</sup> A similar pattern of increase has also been reported in western European countries.<sup>23</sup>

Similar to the incidence rate in developed countries, prostate cancer is the first most common cancer among males in our study while being the second most common cancer worldwide and in Turkey.<sup>24</sup> This evidence suggests an increase in the incidence of prostate cancer in developing countries in the future.<sup>25</sup> Although the main cause of this cancer (and similarly of other types of cancer) is yet unknown,<sup>26</sup> there are various effective factors associated with the development and progression of prostate cancer. For example, occupational or environmental risk factors, smoking, nutrition, lifestyle, and demographic factors, including older age, socioeconomic situation, and genetic susceptibility are the most responsible risk factors in prostate cancer.<sup>27,28</sup> However, the effects of western lifestyle and behavior, as well as genetic predisposition, on the incidence of prostate cancer and their relationship with macroeconomic determinants should be cautiously interpreted.

## CONCLUSION

The cancer incidence rate among males has remained higher than females from 2004 to 2014 in the Sivas province, Turkey, and an increasing trend of incidences of various cancers was observed in both genders. Compared to previous studies, the differences in the most common type of cancer in both genders and cancer incidence rates in this study can be due to the changes in the environment, lifestyle, and the aging population. It is necessary to raise public awareness about the risk factors and develop appropriate and effective screening programs to provide more reliable data for prevention and control programs in Sivas province.

### Disclosure

The authors declared no conflicts of interest. No funding was received for this study.



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