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Cancer Trends and Incidence and Mortality Patterns in Turkey

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Cancer incidence and mortality rates have been increasing in Turkey as most of the developing countries. Besides socioeconomic factors, one of the most prominent attributes of developing countries is the dissimilarity of their age-dependent demographic structure. In Turkey, cancer incidence rates rise due to individual and environmental risk factors as well as due to the improvement in the registry system and to increase in access to health services. According to the data retrieved from the Ministry of Health Department of Cancer Control database cancer incidence rates increased between 2002 and 2005. Incidence rates rose from 133.78 per 100 thousand in 2002 to 173.85 per 100 thousand in 2005. Between 2002 and 2005 the average growth rate of increase for men comes about 9.7%, which is higher than 8.6% for women leading to the widening of incidence gap between man and women. First five frequent cancer types in Turkey are lung (30.13), prostate (24.33), skin (18.91), breast (17.96), stomach (9.92) cancer with an incidence of per 100 thousand. Cancer incidence growth rates for men exceed the cancer incidence growth rate for women. This gap is resulting mainly from lung cancer incidence which is much higher for men. Further extension of the nationwide cancer screening and prevention programs will result in improvement of cancer control.

Key words: cancer statistics – Turkey – cancer incidence rates – cancer mortality rates

INTRODUCTION

According to World Health Organization (WHO) data and estimations, the number of cancer-related deaths increased from 6 million in the year 2000 to 7.6 millions in 2005 and to 7.9 millions in 2007, revealing a 32% rise in the magnitude of cancer-related deaths between 2000 and 2007. Also, in the year 2007, 13% of all deaths around the world were caused by cancer.

It is observed that gradually higher proportion of the cancer-related deaths occur in developing countries. In 2007, 72% of 7.9 million deaths took place in developing countries (1). Besides socioeconomic factors, one of the most prominent attributes of developing countries is the dissimilarity of their age-dependent demographic structure. In parallel with population growth, the reversal of population pyramid and the rapid increase of the population above 65 lead to problems.

Turkey is a European country which constitutes a bridge between Europe and Asia. As of end of 2008, the level of income per capita is $13.138 US (2) and Turkey's population is 71.5 million. Considering the distribution of population by age groups it can be noticed that in 2005, 22% of the population was above 45 (3) and it is estimated that this ratio will rise to 32% in 2030 (4).

With the aging of its highly young population, which is an advantage for now, in the following years Turkey will have an older demographic structure especially displaying an increase in the ratio of the population above 45 (Table 1) (3,4). This comes forward as a situation that Turkey has to take into consideration cancer control programs in the following decades in addition to other significant risk factors affecting cancer incidences.

It appears that in 2000, 13.1% of all deaths in Turkey were due to cancer (5). Results from the Burden of Disease

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study for the year 2000 are consistent with the estimations of WHO. It can be assumed that with more appropriate and up to date estimation methods with international standards this ratio could come out higher.

In 2005 cancer incidence rate was 173.5 per 100 000 and the mortality rate was 94.62. Each year 120 thousand new cases and 70 thousand cancer-related deaths occur (6). According to WHO ratios, the number of patients is estimated to be around 270 thousand.

The ratio of total health expenditures to Gross Domestic Product was 5.7% which is below the Organization for Economic Co-operation and Development (OECD) average of 8.9% in 2005. However, Turkey is in a position where expenditures are rapidly increasing in real terms. Although the average annual increase in health expenditures was 5.3% in real terms between 2000 and 2005 for OECD countries, this rate was 7.6% for Turkey (7). Direct expenditures for cancer treatment was 1.9 billion US$ in 2005 constituting 7.5% of overall health expenditures (8). These circumstances, along with life losses and elevated costs, make cancer control programs a health priority domain for Turkey.

DATA AND METHODOLOGY

The analyses were based on data retrieved from the Ministry of Health Department of Cancer Control (DoCC) Database (6). The Ministry of Health collects cancer incidence data in Turkey in two methods. The first method is passive collection being conducted since 1983 where cancer data are collected throughout the country from diagnosing physicians and from health establishments. The second method is active collection. In this system the data are collected from patient files and automated systems by trained registry staff in eight registries representing 20% of Turkey's population and then published as cancer incidence data. Cancer incidence data which has been collected with the second method since 2000 is steadily improving and reaching international standards in terms of the quality of the data collected. In this study, data collected according to the second method are used. Quality control for the cancer registry system in Turkey is conducted in line with the IARC criteria (9,10). Considering the eight provinces studied by 2004, data coverage, and histological diagnosis discrepancy for registry system is 84 and 22.3%, respectively (11).

Table 1. Distribution of population by age group for 2000 and 2005

Age group (thousand)	2000			2005		
	Female	Male	Total	Female	Male	Total
0–4	3508	3644	7152	3236	3375	6611
5–9	3329	3451	6780	3496	3627	7123
10–14	3064	3212	6276	3323	3442	6765
15–19	3240	3405	6645	3058	3199	6257
20–24	3326	3485	6811	3231	3382	6613
25–29	3076	3194	6270	3313	3457	6770
30–34	2604	2647	5251	3061	3167	6228
35–39	2276	2321	4597	2588	2622	5210
40–44	1981	2069	4050	2255	2290	4545
45–49	1658	1724	3382	1954	2026	3980
50–54	1271	1287	2558	1624	1664	3288
55–59	1075	1053	2128	1231	1213	2444
60–64	977	921	1898	1021	960	1981
65–69	795	712	1507	896	800	1696
70–74	578	480	1058	683	574	1257
75+	608	448	1056	746	552	1298
Total	33 367	34 053	67 420	35 716	36 349	72 65

Age-adjusted cancer incidence rates were estimated by the authors. The crude incidence rates for age groups, from eight counties covering 20% of the population were obtained from DoCC and this data were projected onto Turkey as a whole again on the basis of age groups. The crude rates were then standardized for age based on the age group data obtained from World and Europe populations' age groups data from United Nations Department of Economic and Social Affairs Population Division's Population Database (12). The population data used for standardization for 2005 is taken from UN database and other years between 2000 and 2005 are calculated with respect to the estimated average yearly growth rate.

Mortality data were obtained from two sources. For 2000, The Ministry of Health 'Burden of Disease' study data are used and for 2001–2006 the data are estimated by the authors based on Turkish Statistical Institute (TURKSTAT) 2000 data. Deaths not included on TURKSTAT data were calculated according to the findings of The Ministry of Health's 'Burden of Disease' study and to the study by Hoşgör (4,5,13). This total death number then was multiplied by the weight of cancer-related death sorted from TURKSTAT cause of death statistics until 2006 in annual basis and the number of cancer-related deaths and mortality rates were estimated. Turkey's 2000 and 2005 population by age group and gender were taken from the TURKSTAT 2000 census database and mid-year estimations whereas Turkey's 2008 population and its age groups were obtained from TURKSTAT address-based system. Population and its age groups until 2020 were estimated according to Hoşgör (4) projections. On the basis of 2008 data projections for subsequent years were estimated up until 2020.

RESULTS

Cancer Incidence and Mortality Trends in Turkey

In Turkey, cancer incidence rates rise due to individual and environmental risk factors as well as due to the improvement

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in the registry system and to increase in access to health services. When the incidence rates between 2002 and 2005 based on eight county data are compared-for they are standardized and comparable, the rise of the incidence rate from 133.78 per 100 thousand in 2002 to 173.85 per 100 thousand in 2005 (Figs 1 and 2) can be observed.

When the progress of the standardized cancer incidence rates by the World and Europe populations with respect to the world population is considered, it appears that the rate for 2002 of 151.80 per 100 thousand becomes 196.76 in 2005. As regards to European Population these rates occur as 260.1 per 100 thousand and 343.18 per 100 thousand, respectively. When results are standardized by age with reference to European Standard Population, incidence rates for men goes to 391.55 per 100 thousand and for women it rises up to 279.4 per 100 thousand (Table 2).

According to GLOBOCAN Turkey 2002 (14) data, the crude incidence rate for all cancer types except for melanoma skin cancer is 110.3 per 100 thousand and the age-standardized rate (ASR) with world standard population is 137.3 per 100 thousand for men. The crude and the ASRs for women are estimated at 85.7 and 107.8 per 100 thousand, respectively. According to GLOBOCAN world data, on the other hand, these rates are given as 185.7 and 209.6 per 100 thousand (ASR) for men and 164.3 and 161.5 per 100 thousand (ASR) for women.

When the DoCC data are referred for 2005 (6), the incidence of 202.4 per 100 thousand for men is outstandingly higher than 144.54 per 100 thousand for women. Between 2002 and 2005 the average rate of increase for men comes about 9.7% which is higher than 8.6% for women leading to the widening of incidence gap between man and women (Fig. 3).

Considering the range of cancer types in Turkey, lung cancer comes first with an incidence of 30.13 per 100 thousand followed by prostate cancer (24.33/100 000), skin cancer (18.91/100 000), breast cancer (17.96/100 000) and stomach cancer (9.92/100 000). Incidence profiles between 2002 and 2004 are similar with lung and breast cancer holding the lead (Fig. 4).

The distribution of cancer types differ among genders. The distribution of incidences for 2005 is thus (Fig. 4):

(i) Lung cancer (52.73/100 000) is the most frequent type of cancer among men, followed by prostate cancer (24.33/100 000), skin cancer (20.00/100 000), bladder cancer (16.39/100) and stomach cancer (12.99/100 000). The incidences of five most frequent cancer types constitute 62.3% of overall cancer incidence among men. The remainder cancer types have an incidence of 76.3 per 100 thousand.

(ii) Breast cancer (36.47/100) is the most frequent type of cancer among women, followed by skin cancer (17.80/100 000), thyroid cancer (8.44/100 000) and lung cancer (7.20/100 000) and stomach cancer (6.81/100). The incidence of the five most frequent cancer types

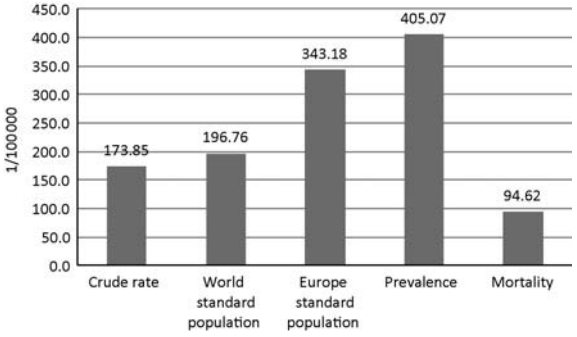


Figure 1. Total cancer incidence, prevalence and mortality in Turkey (2005).

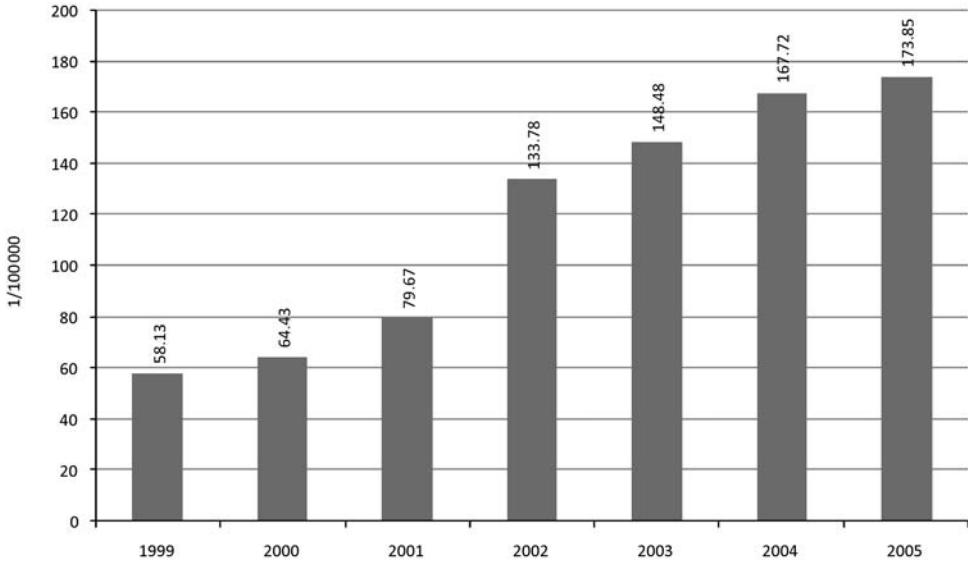


Figure 2. Total cancer incidence rate (crude) in Turkey (1999–2005).

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Table 2. Crude and age-standardized incidence rates in turkey (1/100 000) (2002–2005)

Years	Crude rate			Age-standardized rate (WSP)			Age-standardized rate (ESP)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2002	154.15	113.03	133.78	174.47	127.68	151.80	293.89	214.71	260.10
2003	168.69	127.92	148.48	191.16	144.78	168.72	325.02	244.92	291.32
2004	194.25	140.75	167.72	219.64	159.35	190.38	374.81	269.50	329.41
2005	202.74	144.54	173.85	227.98	163.53	196.76	391.55	279.40	343.18

WSP, World standard population; ES: Europe standard population.

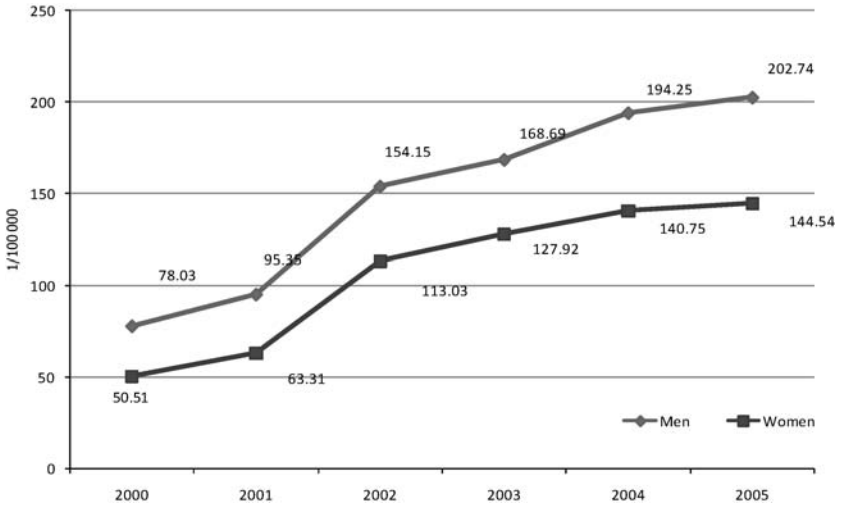


Figure 3. Total cancer incidence rate (crude) in Turkey by male and female (2000–2005).

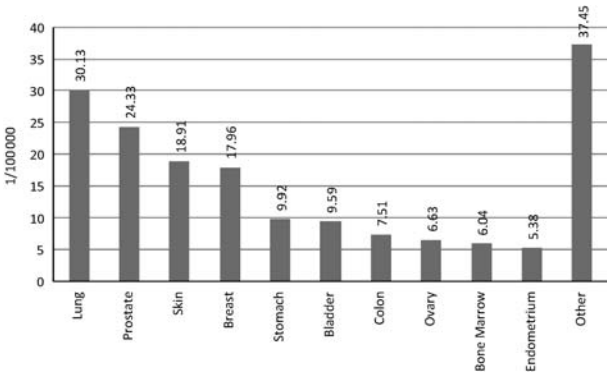


Figure 4. The most frequent 10 cancers in Turkey (2005).

constitute 52.5% of overall cancer incidence among women. The remainder of cancer types has an incidence of 68.63 per 100 thousand. Cervical cancer comes 10th with an incidence of 5.32 per 100 thousand.

Data for cancer types in 2005 show clearly gender-based differentiations, cancer type order and weights. Thus, although the incidence of five most frequent cancer types constitute 62.3% of overall cancer incidence among men, among women this ratio comes around to 52.5%.

The distribution of new cases by age groups on the basis of 2005 data for Turkey is thus:

(i) The population of 60 years of age or older constitute 49.8% of total new cases. New cases in this age group make up 41.7% of cases in women and 55.7% in men.
(ii) The population of 50 years of age or older constitute 72.8% of total new cases. New cases in this age group make up 64.3% of cases in women and 79% in men.
(iii) The population of 40 years of age or older constitute 87.5% of total new cases. New cases in this age group make up 83.4% of cases in women and 90.6% in men.

These results clearly state that the most cancer cases are observed above 40 years of age in Turkey. Cancer evidently occurs in younger ages in women than men. Twenty percent of cancer cases in women occur below 40 (Fig. 5).

The number of cancer patients in Turkey is estimated to be ~270 000 using incidence and prevalence ratios used in various studied by WHO (1). Average life time of the cancer patients in Turkey is expected to increase at a proportionally

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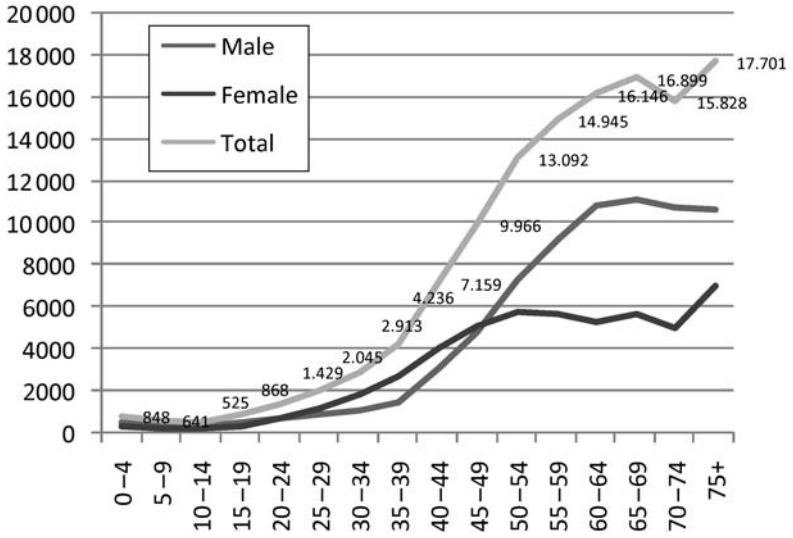


Figure 5. Cancer incidence (crude) in Turkey by age group (2005).

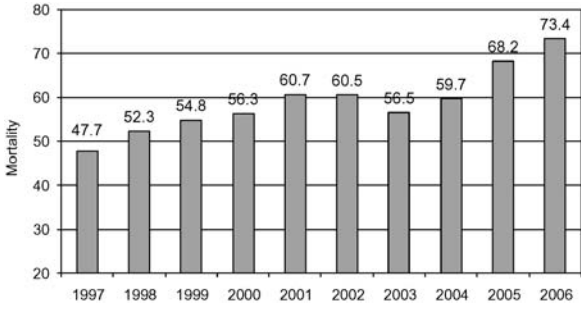


Figure 6. Cancer mortality in Turkey (2000–2006).

higher rate than the number of new cancer cases in Turkey due to demographic transition, early diagnosis and more effective treatment methods. In the Burden of Disease 2000 study cancer mortality in Turkey was estimated to be 56.3 thousand (5). Accordingly cancer is the second highest cause of death making up 13.1% of all deaths (5).When revised by Yılmaz and Yazıhan (8), TURKSTAT death statistics reveal mortality rate of 94.62 per 100 thousand for 2005 and total life loss count of 68.2 thousand (Fig. 6).

DISCUSSION

Cancer is the second highest cause of death in Turkey (5). Cancer incidence rates for 2005 are 173.85 per 100 thousand in Turkey. Even though this is below those of many countries, it is expected to increase significantly in the following decades due to the aging of the population and individual and environmental risk factors.

Although having started institutionalizing by the 1940s, cancer registry studies were set in with the inclusion of cancer in compulsory notifiable diseases in 1982. Between 1991 and 2000, 29 provinces carried out passive cancer registry albeit no reliable data were collected. By the year 2000 active registry system was adopted in eight provinces representing the 20% of the population and selected centers' personnel were trained through a comprehensive program for 2 years.

Among active Cancer Registries in Turkey, first Izmir Cancer Registry received membership in WHO/IARC/IACR (World Health Organization, International Cancer Research Agency, International Association of Cancer Registries) in 1995, and in ENCR (European Network of Cancer Registries) in 1997 through its international publications. In year 2004, with the official membership of Turkey, it became involved with the United Cancer Registry Project executed within the framework of MECC (Middle East Cancer Consortium) (9,10).

In year 2002, WHO IARC have made use of Izmir cancer registry data for Globocan, hence certifying the quality of data from that province. Intensive work on the amelioration of the registry system especially on personnel trainings generated significant improvement. Turkey became an official member of the MECC in 2004. Activities took a form of cooperation with MECC in 2004.

In the light of these efforts, data from Ankara, Antalya, Samsun, Erzurum, Trabzon, İzmir, Edirne and Eskisehir (eight provinces) were made suitable for active registry. Such activities came to fruition and data from Izmir and Antalya registries were referred to in the book 'Cancer Incidences in Five Continents' (10).

In Turkey, active registry system operates by investigating patient files and recording cancer cases in registry forms in accordance with IARC and MECC standards. The improvement in registry system also accounts for the sharp increases in incidence rates between 1999 and 2005, especially in 2002.

Cancer mortality statistics were estimated based on TURKSTAT data (13) and Burden of Disease Study (5). The increase of mortality rates between 2000 and 2003 are also due to the improvement of the registry system and to the

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increasing positive responses to cancer control programs. Registry system became more settled and reliable over the years.

According to WHO estimates cancer incidence rates will almost double by 2030 (1). Seventy-five percent of this rise will occur in underdeveloped and developing countries which only posses 5% of the resources allocated for cancer worldwide. This makes the prioritization of prevention and early diagnosis in cancer control programs an imperative.

In Turkey, cancer control programs aim to reduce the consumption of cigarettes and other tobacco products and reinforce healthy nutrition habits by means of education. Besides the reduction of cancer incidences by primary prevention measures it is also aimed to reduce the mortality rates by early diagnosis. Especially cervical and breast screening programs were launched as part of a national program and now are being expanded in 81 counties. Besides breast and cervical cancer screenings, colorectal and stomach cancer screening programs which became more of an issue for Turkey are also introduced in a more restricted area.

Cancer control programs gathered pace owing to the adopted regulations in 2000. The regulation on the early diagnosis centers was adopted the same year, in 2004 national standards on breast cancer screening were set and in 2005 free cervical and breast cancer screenings were introduced (9,11). The success of these screening programs came in view as an increase in the breast cancer incidences. This is the consequence of ability to detect indiscernible, early stage breast cancer cases by screening. Cancer incidences became more realistic as the programs became more widespread and settled. Again, in the study of Yazıhan and Yılmaz (15) estimated breast cancer incidences and prevalences are above the official data.

The increase of cancer incidences is much faster in men than women and widening the gap between incidence among men and women further. In Turkey lung cancer is the most frequent among men and breast cancer is the most frequent among women. Among women all cancer types distributes almost evenly whereas the five prominent cancer types have the major share in men.

In terms of age groups it is observed that 85% of cancer cases occur in people above 40 in Turkey. This ratio falls to 80% for women. Even though the incidences are lower, cancer can be seen in women at younger ages than men.

Lung cancer is the most common cause of cancer death worldwide and there is no effective and available screening. In most populations, tobacco smoking accounts for 80% or more lung cancers (16,17).

The geographical and temporal patterns of lung cancer incidence are to a large extent determined by consumption of tobacco. An increase in tobacco consumption is paralleled some 20–30 years later by an increase in the incidence of lung cancer; similarly, a decrease in consumption is followed by a decrease in incidence (17).

Turkey takes place in the first 10 countries in proportion of the smoker population in the world (17). On the basis of the WHO 2008 study adult prevalence of the tobacco smoking is 34.6% which is relatively very high comparing WHO member states. At the same time prevalence of the tobacco smoking is considerably differs by gender. Male adult prevalence of tobacco smoking (52.0%) is almost three times higher than the female adult prevalence of tobacco smoking (17.3%). In a parallel, cigarette consumption has been exceeding 100 billion sticks in a year since second part of the 90s (17,18).

When tobacco users are examined by age group, mostly individuals in 25–34 (40.3%) and 35–44 (39.6%) age groups declared that they smoked daily or less than daily. When this ratio looked by gender for 25–34 age group males is 58% and for females is 22.4%. In 35–44 age group the figure is 58.4% for males and 20.5% for females (18).

Percentage level of male prevalence of tobacco smoking in Turkey is at the 5 rank in WHO Member States (Europe) after Russian Federation, Belarus, Ukraine and Greece. This clearly explains both why the lung cancer is the highest one in all cancer types and much more widespread among the males.

Cancers of the lung, stomach, colon and rectum, liver and esophagus are associated with the highest incidence worldwide, in addition to sex-specific malignancies of the female breast, uterine cervix and prostate (19). Parkin et al. estimated that there were 10.9 million new cases, 6.7 million deaths and 24.6 million persons living with cancer (within 5 years of diagnosis) in the year 2002 (20).

Cervical cancer is the seventh in frequency overall, but the second most common cancer among women worldwide, with an estimated 500 000 new cases and 274 000 deaths in the year 2002 (21). In general terms, it is much more common in developing countries, where 83% of cases occur and where cervical cancer accounts for 15% of female cancers (20). In 2006 in Europe, there were an estimated 3 191 600 incident cases of cancer diagnosed. Breast cancer is the most common form of cancer diagnosed in European women, and accounting for 429 900 cases (28.9% of total), followed by colorectal cancer (195 400, 13.1%) and by cancer of the uterus (149 300, 10%) (22). Cancer pattern in women shows difference in Turkey. Even though breast cancer is still first rank cancer in Turkish women cervical cancer prevalence is lower than European countries and worldwide (6).

Cervical cancer etiopathogenesis is to a large extent triggered by human papilloma virus (HPV). HPV which is an important factor in the increase of cervical cancer cases is more prevalent especially in developing countries (23). Data shows that HPV prevalence is lower in Turkey (24,25) which is consistent with the fact that cervical cancer incidences are also lower. In Turkey, cervical cancer is in the 10th rank considering the 10 most frequent cancer types in women in 2005. The main causes for the low HPV and cervical cancer incidences are the family structure and living style in Turkey.

In conclusion, we expect that cancer incidence in Turkey will increase in next decades mainly due to the ageing of population and to other individual and environmental risk

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factors. Expected rise in cancer incidence and prevalence require well designed and efficient cancer control programs as implemented in best practice country cases. In this context, existing programs must be improved and realized through well devised planning and budgeting strategies in order to enhance the average survival and quality of the life for cancer patients. Besides, reducing the financial burden of cancer treatment costs which comes along with the increase in cancer incidences and prevalence manifests and underline the need in Turkey for an efficient long term cancer control strategy.

Conflict of interest statement

None declared.

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