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AVOIDABLE MALIGNANT NEOPLASM MORTALITY IN TURKEY BETWEEN 2009 AND 2018

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Abstract – *Objective:* *Policies being implemented to fight against noncommunicable diseases such as managing avoidable mortality and profiling avoidable mortality are commonly used as a performance outcome of the health care system. The objective of this study is to examine avoidable causes of cancer mortality in Turkey from 2009 to 2018.*

Materials and Methods: *Data was collected from Turkish Statistical Institute official website. Avoidable, amenable, and preventable causes of cancer deaths are classified according to the 10th Revision of the International Classification of Disease codes and specific age groups compiled by the Eurostat Task Force on Satellite Lists. Trends in gender-standardized death rates were calculated, and amenable and preventable causes of cancer mortality for male and female groups were illustrated on a heatmap.*

Results: *Avoidable, amenable, and preventable causes of cancer mortality in Turkey have considerably increased from 2009 to 2018. Preventable cause of cancer mortality is more intense among the male population. Increases in death rates due to malignant neoplasm of the larynx and trachea/bronchus/lung among men and cancer of the breast among females were observed.*

Conclusions: *The increase in cancer mortality reflected the impact of implementing preventive health policy and nursing interventions. This emphasizes the need for more effective public health policies to fight with increasing cancer mortality.*

KEYWORDS: *Avoidable mortality, Amenable mortality, Preventable mortality, Malignant neoplasm, Cancer, Turkey.*

INTRODUCTION

There has been a growing interest in determining health care systems' performance between countries and in their contribution to the health of the population[1]. In the recent decades, as a result of changing in demographical and socioeconomic factors, many developing countries are experiencing a process that involves a shift in the leading causes of morbidity and mortality from infectious and parasitic diseases to noncommunicable diseases (NCDs)[2]. The World Health Organization (WHO) estimates that NCDs account for 60% (more than 35 million) deaths annually. This process, defined as the epidemiological transition, is characterized by a decline in infant mortality and fertility, an increase in life expectancy, and the changing patterns of causes of death. The epidemiological transition has paralleled the demographical and technological changes in developed countries and is still underway in developing countries[3]. Thus, mortality has become not only a main public health concern but also one of the intense approaches in measuring health care system performance.

Cancer is a noncommunicable disease that is also referred to as malignant tumor or neoplasm. An increase in cancer incidence results in unnecessary loss of life[4], making it one of the leading causes of death on the global scale[5]. The widespread of knowledge and technology to manage and treat cancer patients exist in developed countries, but there is a global health inequity between the high-income and low- and middle-income countries in terms of

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cancer mortality[6]. The burden of disease study for Turkey, which is a developing country, for the year 2017 shows that NCDs are increasing, and cancer represents a major public health concern in the country[7]. Moreover, tracheal, bronchus, and lung cancer; breast cancer; and colon and rectum cancer are the three leading types that are common in Turkey for the year 2016 according to the results of the global burden of cancer study[8].

Identifying the causes of death is essential in the presence of effective and timely medical care[9]. The concept of avoidable mortality was first introduced by Rutstein and others in 1970s who argued that in order to develop effective indicators of health care, lists of diseases that should not give rise to death or disability should be drawn up[10]. Avoidable deaths are all those defined as preventable, amenable, or both, where each death is counted only once[1,11]. Most of these deaths could be avoided by improving the quality and accessibility in health care. On one hand, death is amenable if it is in the light of medical knowledge and technology at the time of occurrence. On the other hand, death is preventable if it is in the light of understanding of the determinants of health at the time of occurrence and could be avoided by implementing and utilizing public health interventions in the broadest sense[11].

Reliable and valid mortality statistics are essential for better classification of deaths and for monitoring the community's health condition as well as determining the priorities of health policy[3]. Obviously, large differences exist between countries in cancer incidence, deaths, and related disability. Ensuring that there is universal access to cancer care is required for health equity in order to fulfill the global commitments for NCDs and cancer control[8]. Although definition and classification of causes of deaths have been developed and served for international use by the WHO, this concept was still considered meaningful and commonly used by western European countries. In this regard, the primary causes of amenable mortality were ischemic heart disease, cerebrovascular diseases, and colorectal cancer that accounted for 42.2%, 19.5%, and 11.1%, respectively, of overall amenable mortality among European countries[1]. Turkey is also one of the developing countries with an increasing cancer mortality trend[7].

To the best of our existing knowledge, there is a lack of understanding about amenable and preventable causes of cancer deaths in Turkey. To fill this void, this study aims to assess the changes in avoidable cancer mortality in Turkey from 2009 to 2018. Amenable cancer mortality between 2009 and 2018 was compared to highlight differences possibly associated with health care and political system changes, socioeconomic characteristics, and lifestyle factors.

MATERIALS AND METHODS

Data on avoidable cancer (malignant neoplasm) mortality from 2009 to 2018 were gathered from the Turkish Statistical Institute (TurkStat) to obtain the official death statistics. Data are given according to gender, between 2009 and 2018; malignant neoplasms are coded using the 10th Revision of the International Classification of Diseases (ICD-10)[12-13]. Seventeen avoidable malignant neoplasms were presented and analyzed in this study. As mentioned above, avoidable mortality has been analyzed using the following two categories: causes of deaths amenable to health care (treatable) and causes of deaths that could be avoided through public health and prevention interventions (preventable). The international comparability of cancer mortality data can be affected by the differences in medical training and practices as well as in death certification across different countries[14]. Amenable and preventable mortality is classified according to the list of ICD-10 codes and specific age groups compiled by the Eurostat Task Force on Satellite Lists[15]. The specific causes or disease conditions and their corresponding codes in the ICD-10 are illustrated in Table 1. Researchers argue that the upper age limit for avoidable malignant neoplasm mortality should be extended to at least to 74 years of age. Gender-standardized mortality rates are calculated by dividing the total number of amenable and preventable cancer deaths by the total population of each gender[16].

RESULTS

Amenable and preventable cancer mortality in Turkey is presented with numbers in Table 2 from 2009 to 2018, with intervals of 2 year. Seventeen different types of malignant neoplasms are presented in this table for males and females. Causes of amenable and preventable malignant neoplasms are categorized using the Eurostat death classification. In this table, NIs refers to that particular disease or condition that is not counted into the specific type of avoidable malignant neoplasm. Clearly, it is seen that the number of deaths from malignant neoplasm increased from 2009 to 2018. Moreover, the number of preventable causes of malignant neoplasm of the larynx and trachea/bronchus/lung, and stomach is high among men. Supportive findings obtained from Organization for Economic Co-operation and Development (OECD) Health at a Glance 2015 shows that, mortality due to cancer is consistently higher among men than among women in all countries[14]. The gender gap is particularly wide in Korea, Turkey, Estonia, Spain, and Portugal, with rates among men more than twice compared with those among women. This gender gap can be explained partly by

TABLE 1. Amenable and preventable mortality from cancer deaths.

Cancer	*ICD10*[a]	*Amenable**	*Preventable**	*Age Group*
Malignant neoplasm of lip, oral cavity, pharynx	C00-C14		✓	0-74 y
Malignant neoplasm of oesophagus	C15		✓	0-74 y
Malignant neoplasm of stomach	C16		✓	0-74 y
Malignant neoplasm of colon	C18	✓	✓	0-74 y
Malignant neoplasm of rectum and anus	C19-C21	✓	✓	0-74 y
Malignant neoplasm liver and the intrahepatic bile ducts	C22		✓	0-74 y
Malignant neoplasm of pancreas	C25	✓		0-74 y
Malignant neoplasm of larynx and trachea/bronchus/lung	C32-C34		✓	0-74 y
Malignant melanoma of skin	C43	✓	✓	0-74 y
Malignant neoplasm of breast	C50	✓	✓	0-74 y
Malignant neoplasm of cervix uteri	C53	✓	✓	0-74 y
Malignant neoplasm of other parts of uterus	C54-C55	✓		0-74 y
Malignant neoplasm of ovary	C56	✓		0-74 y
Malignant neoplasm of prostate	C61	✓		0-74 y
Malignant neoplasm of kidney	C64	✓		0-74 y
Malignant neoplasm of bladder	C67	✓		0-74 y
Malignant neoplasm of lymphoid/haematopoietic tissue	C81-C96	✓		0-74 y

[a]:ICD10 introduced in Turkey in 2007. *: The list of preventable and amenable deaths was created by using a list of ICD codes and specific age groups compiled by the Eurostat Task Force on Satellite Lists (final report issued in June 2014). The complete list of ICD codes listed as follows: https://ec.europa.eu/eurostat/cache/metadata/Annexes/hlth_cdeath_esms_an4.pdf. Accessed on: 26.5.2019.

the greater prevalence of risk factors among men, notably smoking rates. Breast cancer, which is both amenable and preventable, is high among women[14]. Due to increasing in individual and environmental risk factors as well as the improvement in the registry system, cancers, and cancer-related mortality have been observed to be one of the most prevalent in Turkey.

Figure 1 presents avoidable standardized death rates per 100.000 population from malignant neoplasms based on the total population. It is observed that avoidable death rates increased from 2009 to 2018. Malignant neoplasms of the larynx and trachea/bronchus/lung are the leading causes of death represented by the color brown. It is followed by a high standardized death rate of stomach cancer, represented by the color gray.

Figure 2 presents a heatmap of gender-standardized amenable and preventable death rates per 100.000 population from malignant neoplasms from 2009 to 2018 in Turkey. In this heatmap, light colors are attributable to low number of death rates from malignant neoplasms, whereas dark colors represent high number of deaths. Obviously, preventable causes of malignant neoplasms are more intense for both of male and female groups. Deaths due to larynx and trachea/bronchus/lung cancer gradually increased among men from 2009 to 2018. After that, it can be observed that stomach and colon cancers are high among men. Breast cancer is mostly concentrated among females, and the color of the heatmap became darker from 2013 to 2018. Pancreas cancer is high among men between 2013 to 2018. The magnitude of intensity is high among men for amenable causes of prostate cancer between 2013 and 2018. The density of amenable lymphoid/hematopoietic tissue cancers are high among men. It is safe to conclude that preventable causes of larynx and trachea/bronchus/lung cancers among men and amenable and preventable causes of breast cancer among females are characterized by a high level of gender-standardized death rates in Turkey.

DISCUSSION

Cancer is the most frequent cause of death globally. This is the second leading cause of mortality in OECD countries after cardiovascular diseases, accounting for 25% of all deaths in 2013, which increased from 15% in 1960[14]. Nevertheless, large differences exist in cancer incidence, deaths, and associated disability between countries[16]. Providing universal access to cancer care as well as monitoring deaths due to cancers are necessary for health equity in order to fulfill the global commitments for NCDs and cancer control[8]. Moreover, reliable and valid mortality statistics are essential in monitoring the community's health condition and determining the priorities of health policy[3]. Additionally, determining the causes of death is vital for timely detection and classification of diseases and essential to provide treatment recommendation[17].

TABLE 2. Avoidable, amenable, and preventable cancer mortality in Turkey (2009-2018) (number)

Years	2009-2010					2011-2012					2013-2014					2015-2016					2017-2018				
Disease/condition	**AM**		**PM**		**AV**	**AM**		**PM**		**AV**	**AM**		**PM**		**AV**	**AM**		**PM**		**AV**	**AM**		**PM**		**AV**
Gender	**M**	**F**	**M**	**F**		**M**	**F**	**M**	**F**		**M**	**F**	**M**	**F**		**M**	**F**	**M**	**F**		**M**	**F**	**M**	**F**	
MN of lip, oral cavity, pharynx	NI	NI	922	430	1352	NI	NI	944	488	1432	NI	NI	1091	578	1669	NI	NI	1202	569	1771	NI	NI	1134	607	1741
MN of oesophagus	NI	NI	754	556	1310	NI	NI	827	597	1424	NI	NI	985	659	1644	NI	NI	966	708	1674	NI	NI	1012	682	1694
MN of stomach	NI	NI	6827	3707	10534	NI	NI	7500	4000	11500	NI	NI	8853	4654	13507	NI	NI	8954	4662	13617	NI	NI	8836	4495	13331
MN of colon	4288	3440	4288	3440	7728	5027	3918	5027	3918	8945	6128	4540	6128	4540	10668	6704	4853	6704	4853	11557	7164	5254	7164	5254	12419
MN of rectum and anus	1243	876	1243	876	2119	1414	949	1414	949	2363	1508	1092	1508	1092	2600	1551	989	1551	989	2540	1560	1036	1560	1036	2596
MN of liver and the intrahepatic bile ducts	NI	NI	2812	1518	4330	NI	NI	3204	1707	4911	NI	NI	3691	2032	5723	NI	NI	4000	2303	6303	NI	NI	4068	2273	6 341
MN of pancreas	3677	2476	NI	NI	6153	4172	3001	NI	NI	7173	5082	3653	NI	NI	8735	5471	3888	NI	NI	9359	5722	4209	NI	NI	9931
MN of larynx and trachea/bronchus/lung	NI	NI	32478	5277	37755	NI	NI	35821	6064	41885	NI	NI	40436	6778	47214	NI	NI	41553	7441	48994	NI	NI	42122	7756	49878
Malignant melanoma of skin	397	305	397	305	702	418	312	418	312	730	594	412	594	412	1006	592	404	592	404	996	588	435	588	435	1023
MN of breast	151	5407	151	5407	5558	142	5980	142	5980	6122	139	7304	139	7304	7443	194	7857	194	7857	8051	132	8321	132	8321	8453
MN of cervix uteri	-	848	-	848	848	-	854	-	854	854	-	1000	-	1000	1000	-	997	-	997	997	-	1004	-	1004	1004
MN of other parts of uterus	-	1276	NI	NI	1276	-	1382	NI	NI	1382	-	1734	NI	NI	1734	-	1882	NI	NI	1882	-	1967	NI	NI	1967
MN of ovary	-	2156	NI	NI	2156	-	2409	NI	NI	2409	-	2810	NI	NI	2810	-	3005	NI	NI	3005	-	3219	NI	NI	3219
MN of prostate	5597	-	NI	NI	5597	5926	-	NI	NI	5926	7138	-	NI	NI	7138	7110	-	NI	NI	7110	7271	-	NI	NI	7271
MN of kidney	1063	536	NI	NI	1599	1159	557	NI	NI	1716	1428	670	NI	NI	2098	1477	669	NI	NI	2146	1534	692	NI	NI	2226
MN of bladder	2487	480	NI	NI	2967	2666	597	NI	NI	3263	3362	681	NI	NI	4043	3608	704	NI	NI	4312	3870	785	NI	NI	4655
MN of lymphoid/ haematopoietic tissue	6086	4252	NI	NI	10338	6287	4609	NI	NI	10896	7337	5210	NI	NI	12547	7522	5315	NI	NI	12837	7666	5453	NI	NI	13120

Abbreviations: AM: amenable mortality; **PM:** preventable mortality; **AV:** avoidable mortality; **MN:** multiple neoplasm; **M:** male; **F:** female; **NI:** indicates that the particular disease/condition is not counted into the particular avoidable type (i.e. amenable or preventable).

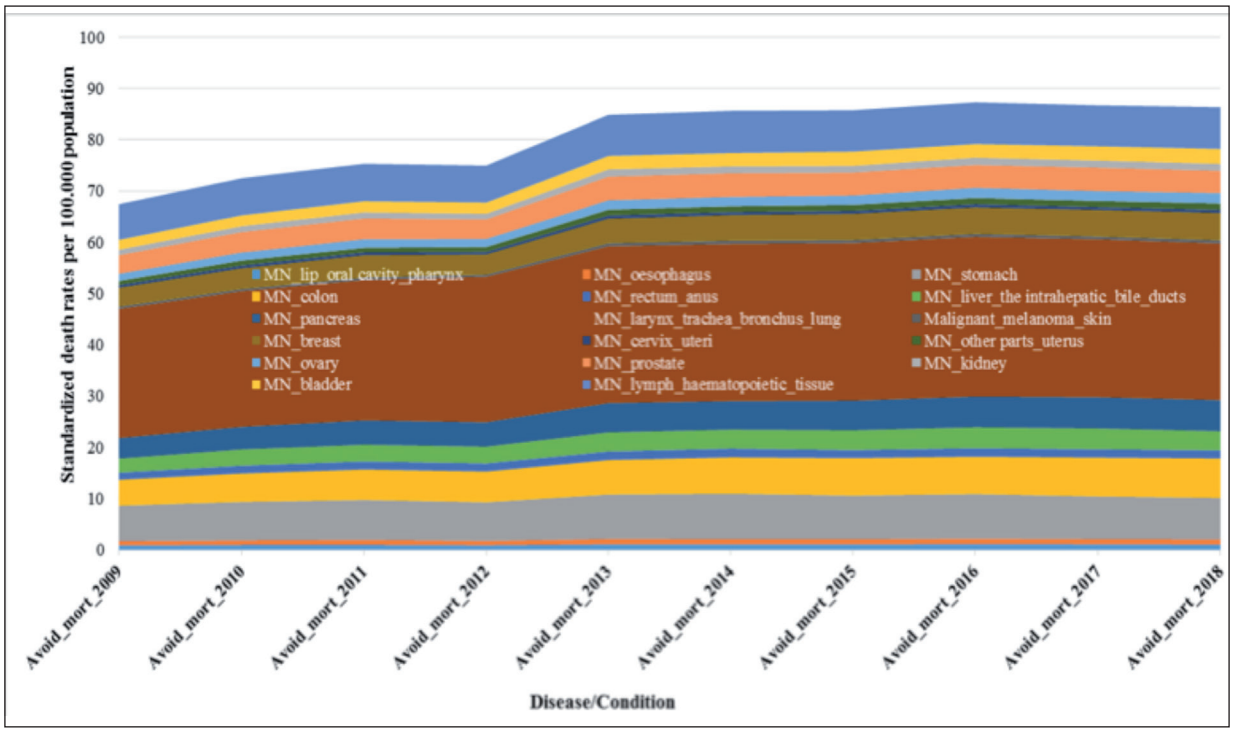

Fig. 1. Standardized avoidable deaths rates (per 100.000 population) from malignant neoplasms from 2009 to 2018 in Turkey.

Despite the fact that the concept of avoidable mortality is well-known since 1970s[10] and a number of country applications exist in the literature[17-19], there is limited information available about avoidable causes of death classification in Turkey. This study intends to detect the difference of cancers mortality by concentrating on amenable and preventable causes of cancer deaths.

Turkey has experienced significant changes that have, directly and indirectly, affected the health care system since 2003[20]. In the recent years, the degree of disease transformation has become more obvious, and NCDs has become a significant threat to the Turkish population[21]. However, knowledge deficit on amenable and preventable causes of death is stark in Turkey.

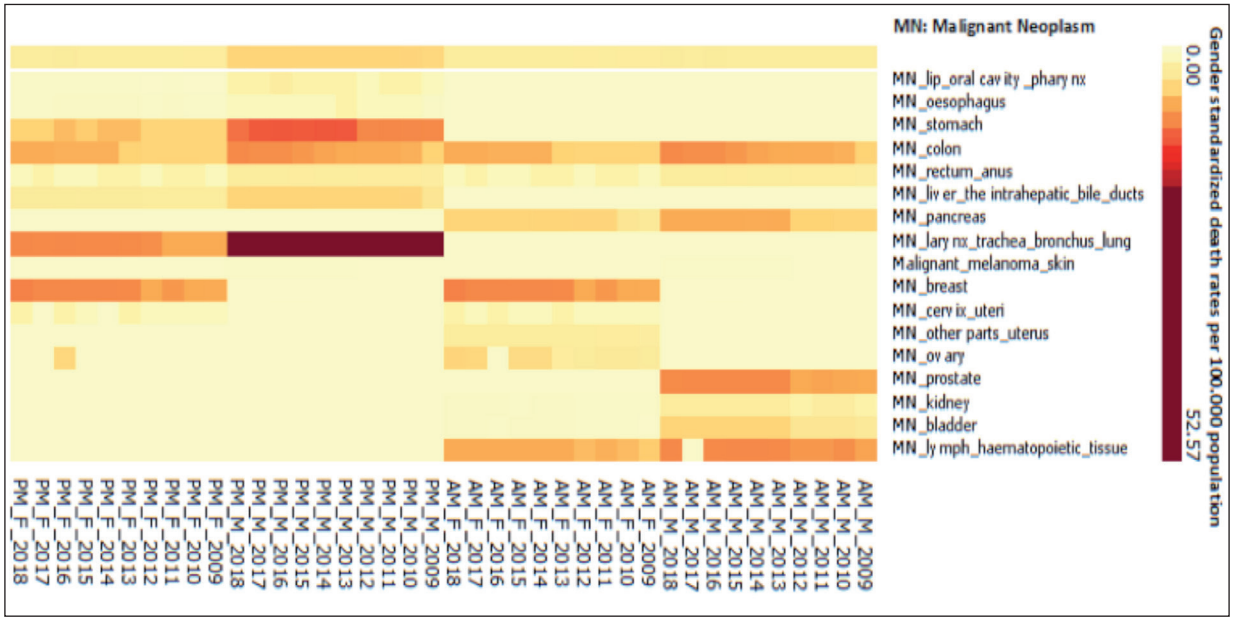

Fig. 2. Gender-standardized amenable and preventable death rates per 100.000 population from malignant neoplasms between 2009 and 2018 in Turkey. *Abbreviations:* MN: Malignant neoplasm; AM: amenable mortality; PM: preventable mortality; M: male; F: female.

As in other countries, cancer is one of the leading NCDs in Turkey[22]. Projection values of age-standardized rates for Turkey between 2013 and 2023 indicate that the cancer load gradually increases as aging decreases. A complete and efficient control of the disease would be possible through a dynamic, multidirectional, scientific, multidisciplinary, and cost-efficient program[23]. Lung cancer is the major cause of cancer deaths among men, and breast cancer is high among women[8]. In this regard, continuous monitoring of cancer care and prevention and ensuring universal access to care are required for health equity in order to fulfill the global commitments for NCDs and cancer control[24]. Despite important warnings, there is a dearth of knowledge, and both methodological approaches and data are lacking in the field of classification of death causes attributable to cancers.

The present interrogation contributes to the existing knowledge about causes of cancer deaths in Turkey in three principal ways. First, preventable causes of cancer deaths are more intense than amenable causes of cancer deaths between 2009 and 2018 in Turkey. Second, preventable causes of larynx and trachea/bronchus/lung cancer deaths are concentrated more on the male population. Third, preventable and amenable causes of mortality of breast cancer are prevalent among women. This study provides a simplified picture of density of preventable and amenable causes of malignant neoplasms in Turkey. The contribution of this study focuses on emphasizing the increasing trend of cancer mortality and firstly visualizes distinct causes of cancer mortality as amenable and preventable. Moreover, this study strongly emphasizes the intensity of cancer deaths among men.

To the best of our existing knowledge, this study firstly illustrates that preventable causes of cancer deaths are more intense, especially among the male population. The emphasis on high intensity of preventable causes of cancer deaths is essential to ascertain great interest of health policy makers. Thus, this study attracts attention of health policy makers and planners to determine appropriate control, monitoring, planning, and implementation strategies to fight against increasing cancer mortality. The concept of avoidable mortality paves the way to make a clear distinction between treatable and manageable causes of death. This will allow better management of cancer mortality. Amenable care refers to the outcome of medical care (medical care indicators), and preventable care represents indicators that are mainly reflecting the effect of national health policy (health policy indicators)[25]. Improving the quality of cancer care and evolving oncology nursing practices to fight against increasing cases of cancer are essential. Moreover, early diagnosis of lung cancer is vital to fight against this disease[26]. It is advisable for health policy makers in Turkey to focus on early diagnosis of cancer and improve integration and collaboration of oncology nursing with all other professional health care disciplines. Increasing trend in cancer mortality in Turkey highlights the need for health professionals to be aware of the concept of avoidable mortality.

The results of this study illustrate that avoidable cancer death rates increased in Turkey from 2013 to 2018. This increasing trend indicates a caution is required because this trend conceals an increase in both deaths that are "treatable" and those deaths considered "preventable." These findings have policy implications regarding the appropriateness of cancer care and suggest the need to encourage public health policy to combat with cancer. Developed countries' experiences indicate that the quality of oncology nursing care and underlining specificities of the care received are essential in fighting against cancer[27]. Obviously, this study emphasizes that avoidable cancer mortality in Turkey were greater for causes that are preventable through primary prevention and public health intervention than those that are amenable through improved medical care. These findings open up new channels for cancer care policy advice and are likely to reshuffle the cancer management policy process. This means that a substantial strengthening of policies is needed to address the consequences of unhealthy lifestyle factors in Turkey.

On the other hand, Turkey experienced significant modernization in health care system and has made considerable progress since 2003 with health transformation program[20]. While the process of health transformation in Turkey has made considerable improvement, increase in chronic diseases such as cancer draws much attention to public health. Despite the demonstrable improvements that are experienced in health outcomes[28], this study highlights that there exists high grounds for complacency on broader cancer care policy. Moreover, geographical differences are apparent in terms of health status in Turkey[29]. Thus, it is strongly advisable for future studies to map the geographical distribution and identify avoidable factors that affect geographical disparities for vital chronic diseases such as cancer.

Furthermore, in Turkey, there is a considerable gap between males and females in terms of lung cancer. Lung cancer incidence is higher among men[30]. This study contributes to the existing knowledge by emphasizing the intensity of preventable larynx and trachea/bronchus/lung cancer death rate for the male population. Further extension of the nationwide cancer screening and prevention programs is necessary for cancer control improvement. Moreover, no specific indicator list of cancer mortality

amenable to health care exists in Turkey nowadays. The results of this study simply suggest possible inadequacy of the health care system, and further studies are required to concentrate more on potential causes of avoidable cancer mortality. Although the quality of mortality data is improving in Turkey, some uncertainties remain due to the differences in coding practice related to the cause of death. It should be in accordance with a widely accepted list to allow international comparability of mortality amenable to health care among the countries, taking into account national specifies and priorities, and to overcome data limitations in Turkey. The study results highlight that interventions to enhance the quality of nursing care and more involvement of family caregivers into the cancer care processes are essential for improving public health interventions to prevent cancer in Turkey.

CONCLUSIONS

To conclude, this study shows that there is an increase in avoidable cancer mortality in Turkey. Preventable causes of cancer mortality among men necessitate more caution to fight against cancer mortality. Health professionals should be aware of the concept of amenable and preventable cancer mortality to better manage and control cancer. Constant and balanced medical care and public health intervention policies are necessary to combat increasing cancer mortality.

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Conflict of Interest:
The authors declare that they have no conflicts of interest.

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