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ARAŞTIRMA / RESEARCH

Cancer incidence and survival analysis among elderly people in Bingol province

Bingöl ilinde yaşayan yaşlı bireylerde kanser insidansı ve sağkalım analizi

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Abstract

Purpose: Cancer is an important public health problem in Turkey and in the world. The aim of this study was to determine the incidence of cancer in the elderly population over the years, to evaluate the direction of change in cancer incidence, and to investigate the distribution of cancer types in the elderly population and their effect on survival.
Materials and Methods: This study was conducted in 2019. The study was conducted on the data of 596 cancer patients over 65 years of age collected between 2013 and 2016. Pearson's chi-square test, Cox regression analysis, and Kaplan-Meier survival analysis were used for data analysis.
Results: The mean age of the patients was 74 years. (394) 66.1% of the patients were male and (202) 33.9% were female. 47.7% (284) of the patients died during the follow-up period. Cancers were most commonly originated from the gastrointestinal tract. Respiratory cancers had the highest rate of mortality during the follow-up period. Cancer incidence had an increasing trend during the follow-up period. It was found that surgical treatment significantly contributed to survival and reduced mortality risk by 2.8 fold. Chemotherapy was also found to reduce mortality risk by 1.2 fold.
Conclusion: The incidence of cancer is increasing in the elderly population. Gastrointestinal cancers are the most common cancers in the elderly population, but the highest rate of mortality is observed in respiratory cancers. It can be recommended that cancer screening should be effectively performed and disseminating healthy aging strategies in the elderly population.
Keywords: Elderly, survival analysis, incidence, cancer

Öz

Amaç: Kanser ülkemizde ve dünyada önemli bir halk sağlığı sorunudur. Bu çalışma ile yaşlı nüfusta kanser vakalarının yıllara göre insidansının hesaplanması, değişim yönünün değerlendirilmesi ve kanser türlerinin yaşlı nüfustaki dağılımı ve sağkalım üstünde etkisinin incelenmesi amaçlanmıştır.
Gereç ve Yöntem: Çalışma 2019 yılında yapılmıştır. Çalışma 2013-2016 yılları arasında 65 yaş üstü 596 kanser hastasının verileri üstünde yapılmıştır. Verilerin analizinde Pearson Ki-kare testi, Cox regresyon analizi ve Kaplan-Meier yaşam analizi kullanılmıştır.
Bulgular: Hastaların %66,1'i (394) erkek, %33,9'u (202) kadındır, yaş ortalaması 74'dür. Hastaların %47,7'si (284) takip süresi içinde ölmüştür. Kanserlerin en çok köken aldığı doku sindirim sistemi 200 (%33,6), takip süresi içinde ölümün en çok görüldüğü kanser türü solunum sistemi 44 (%59,5 kanserleridir. Kanser insidansı çalışma süresi boyunca artış trendindedir. Cerrahi tedavinin sağkalım süresine anlamlı olarak katkı yaptığı, ölüm riskini 2,8 kat azalttığı bulunmuştur. Kemoterapi tedavisinin de ölüm riskini 1,2 kat azalttığı bulunmuştur.
Sonuç: Yaşlılarda kanser insidansı artmaktadır. Yaşlılarda en çok sindirim sistemi kanserleri görülürken, ölümün en fazla olduğu kanser türü solunum sistemi kanserleridir. Yaşlılarda kanser taramalarının etkin biçimde yapılması ve sağlıklı yaşlanma stratejilerinin yaygınlaştırılması önerilebilir.

Anahtar kelimeler: Yaşlı, sağkalım analizi, insidans, kanser

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INTRODUCTION

Non-communicable diseases have currently become very common, lethal and disabling diseases around the world. Cancer affects all of humankind, but there are marked differences across local, national, and regional boundaries, particularly when considering specific tumour types rather than cancer as a whole. Epidemiological data on incidence of cancer and deaths caused by cancer vary enormously in coverage and quality between countries and regions worldwide, ranging from complete coverage by national cancer registries to population-based registries covering a part of the country, hospital-based registries, or no available data at all on cancer occurrence[1].

Cancer is also an important public health problem as it is the second leading cause of death in Turkey and in the world. Cancer is the cause of one in every six deaths in the world and one in every five deaths in Turkey. Cancer burden is expected to increase in the future due to the increasing world population, aging of the population, and the increase in the risk factors of cancer[1]. After the first half of the 20th century, the life expectancy increased significantly and birth and death rates decreased markedly throughout the world, and demographic transformation process have moved to another stage. Demographically speaking, the world is aging[2]. The proportion of the elderly population in the total population is gradually increasing.

Considering that the incidence of cancer will also increase, it can be suggested that the prevalence of cancer will increase in the elderly population. The aim of this study was to determine the incidence of cancer in the elderly population over the years, to evaluate the change in cancer incidence, and to investigate the distribution of cancer types in the elderly population and their effect on survival.

MATERIALS AND METHODS

This retrospective study was conducted on data collected between 2013 and 2016 from 596 individuals diagnosed with cancer who were living in Bingol province located in the Turkey Nomenclature of Territorial Units for Statistics (NUTS 2) region. The study was conducted in 2019 and is a retrospective registry-based study. There was an age limitation in the study and people aged 65 and over were included in the study. Necessary permissions were obtained from the Department of Public Health of Bingöl Provincial Health Directorate and the ethics committee of Bingöl Provincial Health Directorate (Decision no: 81966737-929).

CanReg-4 is dedicated software developed by the International Cancer Research Agency specifically for cancer registry centres. Data collected from patients are entered into the Can-Reg 4 software of the Ministry of Health. The data entered into this software can be accessed through the Hospital Information Management System. The data evaluated within the scope of this study were obtained from the Ministry of Health's Death Notification System and the Hospital Information Management System (HIMS). Age, gender, and types of treatment received by the patients were obtained from the HIMS. The definitive pathological diagnosis of the patients was also obtained from the HIMS.

The follow-up periods of the patients were calculated as the time from the date of diagnosis to the date of death registered in the death notification system. The follow-up periods of survivors were calculated as the time from the date of diagnosis to the date when this study was initiated (May 21, 2019).

Histological and topographic classifications of cancer types were made according to the codes in the third edition of the International Classification of Diseases Oncology (ICD-O) book published by the World Health Organization. Topographically (the tissue from which the lesion is originating), the patients were evaluated in 41 categories. Cancers with unknown origin were classified as 'unknown'. These categories were then classified under 9 main categories based on organ systems.

Statistical analysis

SPSS Ver. 22 computer software was used for data analysis. Sociodemographic characteristics of the patients and topographic classification data were expressed as percentages. Pearson's chi-square test, Cox regression analysis, and Kaplan-Meier survival analysis (Log Rank) were used in data analysis. Age and gender variables were taken as independent variables in the Cox regression analysis. Since the information about the stages of the patients could not be obtained, these were not included in the model. In all analyses, the reference category for the gender variable was taken as female gender. The dependent variable was determined as whether or not death occurred. The model was created with the data of 596 patients diagnosed with cancer. Hazard ratios of the

independent variables included in the model were calculated. Kaplan-Meier survival analysis was performed to examine the effects of treatment modalities and originating organ system on survival. Treatment modalities were evaluated in three categories as surgery, chemotherapy, and radiotherapy. Survival analysis was performed for each treatment modality. Although there were patients who received hormone therapy and immunotherapy, they were not included in the analysis due to low sample size. Survival analysis graphs were plotted for significant independent variables. Cancer incidence rates were calculated for the years in the study period. p value < 0.05 was considered statistically significant.

Table 1. Topographic distribution of all lesions

		Male	**Female**		
Main system	Tissue origin of the lesion	n/colon%	n/colon%	Total %	p
Digestive system organs	Mouth	19/4.8	7/3.5	33.6	
	Pharyngeal	4/1.0	3/1.5		
	Esophagus	5/1.3	2/1.0		
	Stomach	49/12.4	24/11.9		
	Intestinal	2/0.5	0/0.0		
	Large intestine	22/5.6	24/11.9		
	Rectosigmoid junction	1/0.3	1/0.5		
	Anus-rectum	9/2.3	6/3.0		
	Liver	13/3.3	5/2.5		
	Gallbladder and paths	1/0.3	3/1.5		
	Pancreas	0/0.0	0/0.0		
	Other digestive organs	0/0.0	0/0.0		
Respiratory system	Nasal cavity	0/0.0	1/0.5	12.4	
	Larynx	6/1.5	1/0.5		
	Bronchopulmonary	55/14.0	8/4.0		
	Pleura	2/0.5	1/0.5		
Muscle-bone-soft tissue-skin	Bone-joint	0/0.0	0/0.0	14.9	
	Skin	55/14.0	30/14.9		
	Peripheral nervous system	0/0.0	0/0.0		
	Peritoneum	0/0.0	0/0.0		
	Soft connective tissue	2/0.5	0/0.0		
Female genitalia and breast	Breast	7/1.8	21/10.4	6.7	
	Vulva	0/0.0	1/0.5		
	Cervix-uterus	0/0.0	3/1.5		
	Uterine-ovary	0/0.0	8/4.0		
Male genital	Penis	0/0.0	0/0.0	9.7	
	Prostate	58/14.7	0/0.0		<0.001
	Testis	0/0.0	0/0.0		
Urinary system	Kidney	9/2.3	2/1.0	7.9	
	Bladder	33/8.4	3/1.5		
Central nervous system	Eye	0/0.0	1/0.5	2.3	
	Meninges	0/0.0	4/2.0		
	Brain	2/0.5	8/4.0		
	Spinal cord-cranial nerves	0/0.0	0/0.0		
Blood-lymphatic system and thyroid	Thyroid	4/1.0	8/4.0	8.9	
	Hematopoietic system	16/4.1	11/5.4		
	Lymph nodes	10/2.5	4/2.0		
Unknown	Undefined	4/1.0	1/0.5	3.5	
	Unknown	6/1.5	9/4.5		
Total (n/row%)		394/66.1	202/33.9	596/100.0	

RESULTS

Between 2013 and 2016, 596 people over 65 years of age were diagnosed with malignancy. 66.1% of the patients were male and 33.9% were female. The mean age of the patients was 74.13 ± 6.90 years (min: 65-max: 107). It was observed that 47.7% of the patients died during the follow-up period and 52.3% survived. The topographic distribution of the tissue of origin of the malignant lesions according to gender in 596 patients is presented in Table 1.

When cancer burden was evaluated for both genders, it was found that gastrointestinal cancers had the highest burden among all cancer types. When we looked at the distribution of cancer cases by gender, approximately 66% of cancers occurring in people over 65 years of age were seen in men and only 34% were seen in women. The most common cancer types in men were prostate, lung, skin, and gastric cancer in descending order. The most common cancer types in women were skin, colon, breast, and gastric cancer in descending order. When cancer incidence rates were analysed by years, an increasing trend was observed. In 2013, the incidence rate for both genders and all age groups was 5.7 per 1,000 people. This rate was 7.5 per 1,000 people in 2014, 11.2 per 1,000 people in 2015, and 11.1 per 1,000 people in 2016 (Graph 1). The incidence rates by gender for the years 2013-2016 are presented in Figure 1.

Table 2 shows the results of the Cox regression analysis, which was modelled to predict mortality and included the gender and age variables of the patients. It was found that the regression model established to predict mortality risk by including age and gender variables had a good model fit. Mortality risk was found to be 1.4 times higher in men with cancer over 65 years of age. The results of survival analysis according to treatment modalities are presented in Table 3.

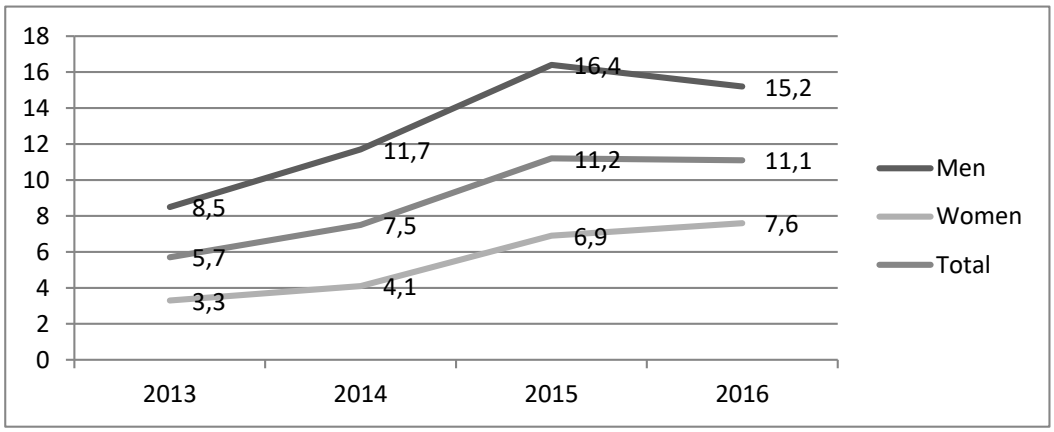

Figure 1. Incidence rates according to gender (per thousand)

Table 2. Cox regression analysis results

Variable	B	p	H.R.	CI (95%)
Age	0.019	0.051	1.019	1.000-1.038
Sex	0.335	0.020	1.397	1.053-1.854

Table 3. Results of Kaplan Meier survival analysis

Treatment modality	**Time (day) X±S.D.**	**CI (95%) Lower-upper limit**	**p**
Chemotherapy +	1327.72±120.14	1092.23-1563.20	0.071
Chemotherapy -	1141.46±72.77	998.82-1284.10	
Surgical +	1634.93±60.72	1515.92-1753.95	<0.001
Surgical -	982.52±79.28	827.13-1137.92	
Radiotherapy +	1274.81±96.18	1086.28-1463.34	0.397
Radiotherapy -	1143.78±79.57	987.82-1299.74	

Survival analysis revealed that the long-term survival of the patients who underwent surgical treatment was significantly longer. Radiotherapy and chemotherapy did not make a significant difference in survival. The relative mortality risks by treatment modalities are presented in Table 4.

Mortality risk increased 1.2 times in patients who did not receive chemotherapy and 2.8 times in patients who did not undergo surgery. Survival analysis graphs according to chemotherapy and surgical treatments are presented below (Figures 2 and 3).

When mortality rate was examined according to the organ systems, it was found that cancers of the respiratory system had the highest mortality rate, and cancers originating from muscle-bone-skin-soft tissue had the lowest mortality rate (Table 5).

The mean survival time was 1,513 days for all groups. When survival was analysed according to organ systems, a significant difference was found between the groups in terms of survival. The lowest survival time was found in cancers of the respiratory system (Table 6).

Table 4. Relative risks according to treatment modality

	Relative risk	CI 95%	p
No Chemotherapy / Chemotherapy	1.224	1.002-1.494	0.043
No Surgical / Surgical	2.847	2.362-3.410	<0.001
No Radiotherapy / Radiotherapy	0.960	0.794-1.161	0.674

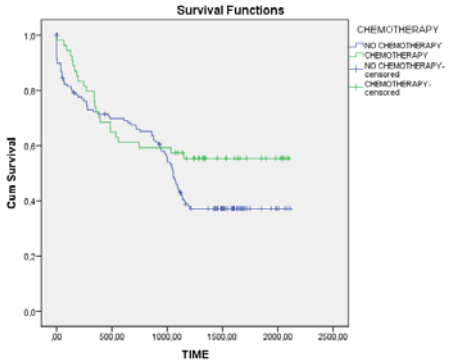

Figure 2. Survival analysis according to chemotherapy status

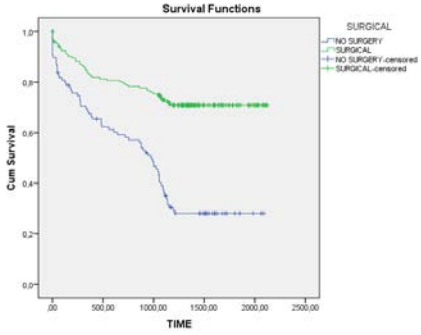

Figure 3. Survival analysis according to surgery status

Table 5. Final status of patients according to organ systems

	Alive	**Dead**	
Main system	**n / row%**	**n / row%**	**p**
Digestive system organs	92 / 46.0	108 / 54.0	
Respiratory system	30 / 40.5	44 / 59.5	
Muscle-bone-soft tissue-skin	62 / 69.7	27 / 30.3	
Female genitalia and breast	24 / 60.0	16 / 40.0	**0.009**
Male genital	30 / 51.7	28 / 48.3	
Urinary system	23 / 48.9	24 / 51.1	
Central nervous system	8 / 57.1	6 / 42.9	
Blood-lymphatic system and thyroid	30 / 56.6	23 / 43.4	
Unknown	13 / 61.9	8 / 38.1	

Table 6. Survival times according to organ systems

	Time (day)	CI %95		p
Main system	X±S.D.	Lower limit	Upper limit	
Digestive system organs	1325.44±46.08	1235.12	1415.77	
Respiratory system	1021.51±76.43	871.70	1171.33	
Muscle-bone-soft tissue-skin	1720.00±45.76	1630.30	1809.71	
Female genitalia and breast	1722.12±53.16	1617.92	1826.32	
Male genital	1568.30±81.03	1409.48	1727.13	<0.001
Urinary system	1689.14±67.41	1557.01	1821.28	
Central nervous system	1668.90±96.58	1479.48	1858.21	
Blood-lymphatic system and thyroid	1620.04±45.89	1530.09	1709.99	
Unknown	1536.16±143.54	1254.82	1817.50	
Overall	1513.56±21.83	1470.76	1556.36	

Survival curves according to organ systems are presented in Graph 4.

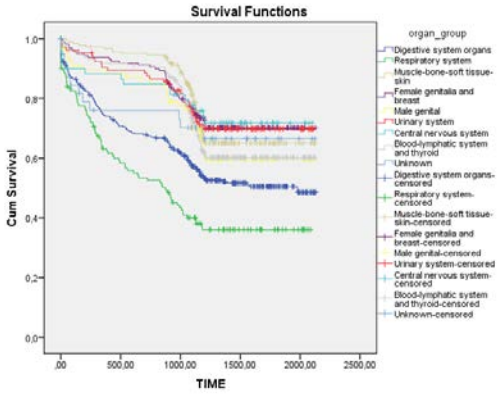

Figure 4. Survival according to organ systems.

DISCUSSION

Non-communicable diseases are responsible for the majority of deaths around the globe. Most of these deaths are caused by cancer. Cancer is seen as the single most important obstacle in the path of increasing life expectancy in the 21st century. According to 2015 World Health Organization data, cancer is the first or second cause of deaths before the age of 70 in 91 out of 172 countries, while it ranks third or fourth in 22 countries. Cancer incidence and mortality rate are rapidly increasing worldwide[2].

The reasons for the increase are complex but it appears to be the result of aging and growing of population. In a study conducted by Bray et al. reporting cancer incidence and mortality in 185 countries, 18.1 million new cancer cases (17 million non-melanoma skin cancer excluded) and 9.6 million cancer-related deaths (9.5 million non-melanoma skin cancer excluded) were reported in 2018[3].

According to 2016 data of American Cancer Society, approximately 1.7 million new cancer cases and 600 thousand cancer-related deaths occurred in 2016 in the USA. When we look at the topographic distribution of cancer types in the same study, we can see that the most common cancers for both genders were gastrointestinal cancers. When mortality rates of cancer types are examined, it is seen that respiratory cancers have the highest mortality rate. The most common types of cancer in people over 65 years of age are lung, colorectal, prostate, pancreas, and bladder cancers[4]. In our study, gastrointestinal tract was the most common origin of cancer in both genders. Respiratory cancers are associated with the highest mortality rate. When we look at 2015 Turkey Cancer Statistics data, lung, prostate, bladder, colorectal, and gastric cancer have the highest prevalence rates in men over the age of 70, while breast, colorectal, lung, stomach, and non-Hodgkin's lymphoma have the highest prevalence rates in women. Cancer incidence rates are increasing in both genders[5]. In our study, cancer types with highest prevalence rates in men over the age of 65 were prostate, lung, skin, gastric, and bladder cancers. In women, these were skin, gastric, colon, breast, and hematopoietic system cancers.

The incidence of cancer increases with growing elderly population. Performance status and accompanying conditions affect cancer treatment in the elderly[6]. Age-related physiological changes alter the pharmacokinetic properties of drugs and the efficacy of treatments[7,8]. In their cancer statistics report, the American Cancer Society stated that 5-

year survival in all types of cancer has increased by 20% in the white race and by 23% in the black race in the last 30 years. In another study, it has been stated that the improvements in survival since 1990 are mostly seen in the prevalent cancer types and affect people aged 50-64 years[9]. This discrepancy may be due to the administration of different therapies in elderly patients or low efficacy and the use of new therapies. In our study, 6-year survival rate of cancer patients over the age of 65 for all types of cancer was 52%. It was found that surgical treatment and chemotherapy increased survival in elderly cancer patients, mortality risk was 1.2 times higher in patients who did not receive chemotherapy and 2.8 times higher in patients who did not undergo surgery.

Although survival from various cancer types has increased, the improvement is slower for lung and pancreatic cancers; 5-year survival is currently 18% for lung cancer and 8% for pancreas[10]. In our study, cancer types with the highest mortality rate during the follow-up period were respiratory and gastrointestinal cancers. Davidoff et al. investigated the effect of chemotherapy on survival in elderly patients with non-small cell lung cancer and found that administration of chemotherapy increased the 1-year survival rate by 11.6% and reduced mortality risk by 1.8 fold. Adding platinum to any chemotherapy regimen increases 1-year survival by 19%[11]. In our study, it was found that administration of chemotherapy reduced mortality risk by 1.2 fold. In a Korean study, it was observed that cancer incidence rates in the population have increased but the 5-year survival rates have also increased (from 41% to 70%). In the same study, the 5-year survival rate was 62.2% in men and 78.2% in women[12]. In our study, mortality risk was found to be 1.4 times higher in men older than 65 years. This can be explained by the higher incidence of highly mortal cancers in men. In another study, 2-year survival rate was found to be 32% in elderly patients with lung cancer. In the same study, a group of patients received radiotherapy only, while the other group received radiotherapy combined with chemotherapy. It was found that chemotherapy had no effect on survival in patients with high comorbidity scores, and chemotherapy was superior to radiotherapy in patients with low comorbidity scores[13]. n a study on elderly men with prostate cancer, patients were divided into two groups. One group of patients underwent surgery, radiotherapy and hormone therapy, and the other group constituted the non-interventional observational group. After 12 years of follow-up, 37% of the observational group and 23% of the intervention group died. The 5-year and 10-year survival rates of the treatment group were significantly higher compared to those of the observational group[14]. In another study, mortality risk in cancer patients undergoing radical prostatectomy was found to be 6.9 times lower during a 15-year follow-up period[15]. In a study investigating the effect of chemotherapy (5-fluorouracil) on mortality risk in elderly patients with colon cancer, it was found that mortality risk decreased in people receiving the treatment (HR: 0.66)[16]. In a population-based study, the effect of treatment choice on survival was investigated in elderly patients with breast cancer. Women over the age of 75 received either only surgery or hormonal treatment following surgery. The 10-year survival rate was 32% in these women. It was shown that the stage is influential on survival in patients, but age-appropriate selection of treatment has not effect on survival[17]. In a study investigating the effect of surgery on survival of elderly patients with rectal cancer, preoperative radiotherapy followed by total mesorectal excision increased the 5-year survival rate from 60% to 70% in patients younger than 75 years. In patients older than 75 years, there has been no such improvement in survival over years. In these patients, 5-year survival remained at 40%[18]. A survival analysis study conducted on elderly cancer patients in the European region showed that the most important factors for survival were stage and age at the time of diagnosis. Younger patients have longer survival. Delayed diagnosis, delayed access to treatment, presence of comorbidities, and other psychosocial factors are important elements of prognosis in elderly patients[19]. According to the results of a study evaluating the effect of age and surgery type on long-term survival in elderly lung cancer patients, it was shown that survival decreased with age and lobectomy increased survival in younger patients (<65), but surgical treatment had not effect on long-term survival in older patients (>65)[20]. In our study, it was shown that the survival was significantly longer in elderly cancer patients who underwent any type of surgical intervention and mortality risk was decreased in patients who underwent surgery.

The performing the study from the records, the presence of regional data, the small sample size, lack of cancer stage information are thought as the limitation of our study.

In conclusion, the incidence of cancer in the elderly population has increased over the years. Effective

screening programs and disseminating healthy aging strategies are recommended for early diagnosis and treatment of cancer in the elderly population.

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