RESEARCH

INCIDENCE OF PRIMARY LUNG CANCERS, TUMOR TYPES, AND DISTRIBUTION OF DEMOGRAPHIC CHARACTERISTICS IN GERIATRIC PATIENTS: A 10-YEAR RETROSPECTIVE ANALYSIS OF A SINGLE CENTER

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Abstract

Introduction: The incidence and mortality rates of lung cancer have increased throughout the 20th century, especially in the elderly population. This study aimed to determine the distribution of demographic characteristics of primary lung cancers in a geriatric age group in Aydin and its vicinity, and compare them with those reported in the literature.

Materials and Methods: Overall, 1905 cases diagnosed within a 10-year period were included in the study. The cases were grouped based on their distributions of age, sex, anatomic localization, histological types, and year.

Results: The mean age was 67.7 (SD 10.8) years; 1498 (78.6%) patients belonged to the geriatric group. The male and female sex ratios were higher in the geriatric and non-geriatric groups, respectively ($p<0.001$). In middle-aged and advanced-aged males, the decrease throughout the years, especially in the second half, was significant ($p<0.001$). The female diagnosis rate was higher during the second period ($p<0.001$). The resection rate was lower, whereas the biopsy rate was higher in the advanced age group ($p<0.05$). In all groups aged ≥65 years, the incidence of squamous cell carcinoma was higher and significantly increased with age ($p<0.05$).

Conclusion: Our results emphasize the necessity of conducting detailed epidemiological studies involving hormonal, genetic, and regional factors such as indoor and outdoor air pollution, tobacco use. The insuffient treatment and toxicities experienced by elderly lung cancer patients with standard treatments are significant problems. Therefore, all elderly patients with lung cancer should be comprehensively evaluated for efficient, up-to-date treatments to reduce such problems.

Keywords: Lung Neoplasms; Epidemiology; Geriatrics; Carcinoma, Squamous Cell; Adenocarcinoma; Turkey.

INTRODUCTION

Lung cancer is the most common type of cancer worldwide, with its incidence dramatically rising throughout the 20th century, particularly in the second half. Despite recent improvements in treatment, it continues to be the most vicious cancer type. In addition, while the incidence of this cancer type increases with age, its related mortality rate also increases, especially in the elderly population (1, 2). Therefore, the diagnosis, treatment, and follow-up of cancer are essential in the elderly.

In many countries, the incidence of lung cancer increases with tobacco use, expeditious industrialization, and the aging of the population. In addition, various epidemiological studies have reported that changes in epidemiological findings are accompanied by increased lung cancer incidence and mortality rates. The most significant changes were determined in terms of geographical location, sex, age, and tumor type (3, 4). When studies relevant to this subject were reviewed, the advanced age was included in the exclusion criteria of most studies. The ratio of these cases in such studies was <10% (5). In geriatric age groups, especially in patients aged over 75 years, the lung cancer-related epidemiological data has been quite limited. Since the numbers of elderly patients participating in these studies were limited, the data remained insufficient, and this caused problems in the diagnosis and treatment approaches of elderly cancer patients (2).

A limited number of studies on primary lung cancer epidemiology have been conducted in Turkey, and there is no study determining the epidemiology of geriatric age gropus and presenting regional data. Therefore, this study aimed to present the distribution of demographic characteristics of primary lung cancers in and around Aydın, as well as compare them with those reported in the literature.

MATERIALS AND METHODS

In this study, the pathology archive records of primary lung cancers diagnosed in the Aydın Adnan Menderes University Faculty of Medicine Medical Pathology Laboratory between 2010-2019 were screened, and all data relevant to the cases were retrieved by reviewing the pathology reports archived. Thus, 1905 cases diagnosed within a 10-year period were included in the study. The data included only the primary lung tumors. Pathology reports of cases diagnosed with a metastatic tumor, more than one report of a single patient, and those that could not be diagnosed because of insufficient tissue were not included in the study. Common benign lung tumors, hamartomatous lesions, and cystic lesions were not included in the study. The number and ratios of the cases were determined, and the cases were grouped based on their distributions of age, sex, anatomic localization, histological types, and years. The lung cancer groups and their histopathological diagnoses used in this study were classified according to the World Health Organization (WHO) 2015 classification (6). Tumor classification was performed in seven main groups following the cases' current histopathological diagnoses as follows: adenocarcinoma (ADC), squamous cell carcinoma (SCC), small cell carcinoma, non-small cell carcinoma, large cell carcinoma, carcinoid tumor, and other neoplasms.

Statistical Analysis

The Ethics Committee of Aydın Adnan Menderes University Hospital Non-Interventional Clinical Studies approved this study (protocol # 2020/23). Data analysis was performed using IBM SPSS Statistics version 17.0 software (IBM Corporation, Armonk, NY, USA). Whether the metric discrete variables were normally or not normally was determined by Kolmogorov-Smirnov test. Categorical data were expressed as numbers (n) and percentage (%) while quantitative data are presented as the mean ± SD. The mean differences in ages between groups were compared Student's t test. Pearson's χ^2 test was used in the analysis of categorical data, unless otherwise stated. On the other hand, in all 2 x 2 contingency tables to compare categorical variables, the Continuity corrected χ^2 test was used

when one or more of the cells had an expected frequency of 5-25; otherwise, Fisher's exact test was used when one or more of the cells had an expected frequency of 5 or less. Statistical significance was set at $p < 0.05$. However, for each possible multiple comparison, the Bonferroni correction was applied to control for Type I error.

RESULTS

A total of 1905 cases diagnosed in our hospital's Medical Pathology Department during the 10-year period were included in the study. The patients' ages ranged between 17 to 97 years. The overall mean age was 67.7 (SD. 10.8) years. The mean age of females was significantly lower than that of males ($p<0.001$). Majority of cases were under 65 years of age in females and 75 years and over in males ($p<0.001$). When the periods were compared, the diagnosis rate was higher in the first period in males and in the second period in females ($p<0.001$). The rate of material sampling by resection was higher in females, while biopsy was higher in males ($p<0.001$). While the incidences of ADC, carcinoid tumor, and other neoplasms were higher in females, the incidences of SCC and small cell carcinoma were higher in males ($p<0.001$). The patients' demographic and clinical data are shown in Table 1.

When the cases were divided into two subgroups, namely the geriatric (65 years and older) and non-geriatric (under 65 years) groups, 1498 (78.6%) patients were in the geriatric group. In addition, there were significantly more male and female in the geriatric and non-geriatric groups, respectively ($p<0.001$). Furthermore, the increase in the number of cases in the non-geriatric group was significant in the 2nd period ($p<0.001$). The biopsy rate in the geriatric group was significantly higher than that in the non-geriatric group ($p<0.001$). The incidences of ADC, small cell carcinoma, large cell carcinoma, and particularly SCC, were higher in the geriatric group, whereas carcinoid tumor was more common in the non-geriatric group ($p<0.001$) (Table 2).

The distribution of cases was categorized into five different age groups. The geriatric group was evaluated in three subgroups as young-elderly (65-74 years old), mid-elderly (75-84 years old), and advanced-elderly (aged 85 years or over). The male ratio was significantly higher in the middle-aged and advanced-elderly age groups ($p<0.05$) (Figure 1). Regarding the distribution of periods according

Figure 1. Cumulative distributions of cases by gender within age groups

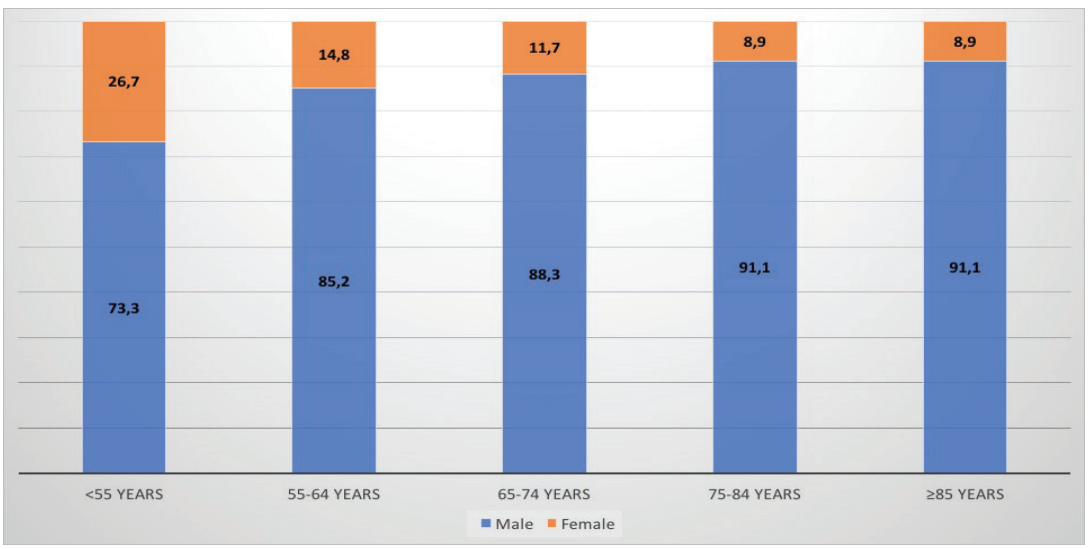


Table 1. Demographic and histopathological characteristics of the cases according to gender

	Males (%)	Females (%)	N (%)	p-value
Mean age (years)	68.1±10.6	64.5±12.1	67.7±10.8	**<0.001†**
Age intervals				**<0.001‡**
Under 55 years	66 (3.9)	24 (10.8)	90 (4.7)	
55-64 years	270 (16.0)	47 (21.1)	317 (16.6)	
65-74 years	582 (34.6)	77 (34.5)	659 (34.6)	
75-84 years	519 (30.9)	51 (22.8)	570 (29.9)	
85 years and above	245 (14.6)	24 (10.8)	269 (14.1)	
5-year Periods				**0.002†**
1st period (2010-2014)	752 (44.7)	75 (33.6)	827 (43.4)	
2nd period (2015-2019)	930 (55.3)	148 (66.4)	1078 (56.6)	
Material type				**<0.001‡**
Biopsy	1408 (83.7)	162 (72.6)	1570 (82.4)	
Resection	274 (16.3)	61 (27.4)	335 (17.6)	
Diagnosis				**<0.001‡**
Adenocarcinoma	460 (27.4)[a]	117 (52.5)[a]	577 (30.3)	
Squamous cell carcinoma	845 (50.2)[a]	51 (22.9)[a]	896 (47.0)	
Small cell carcinoma	278 (16.5)a	18 (8.1)[a]	296 (15.5)	
Non small cell carcinoma	46 (2.7)	11 (4.9)	57 (3.0)	
Large cell carcinoma	22 (1.3)	0 (0.0)	22 (1.2)	
Carcinoid tumor	16 (1.0)[a]	16 (7.1)[a]	32 (1.7)	
Other neoplasms	15 (0.9)[a]	10 (4.5)[a]	25 (1.3)	
Localization				0.686‡
Right	949 (56.4)	129 (57.8)	1078 (56.6)	
Left	733 (43.6)	94 (42.2)	827 (43.4)	
Total	1682 (88.3)	223 (11.7)	1905 (100)	

† Student's t-test, ‡ Pearson's χ^2 test, a: The difference between females and males is statistically significant (p<0.001).

Table 2. Demographic and histopathological characteristics of the cases according to geriatric grouping

	Geriatric group (%)	Non-geriatric group (%)	p-value
Gender			**<0.001**‡
Male	1346 (89.9)	336 (82.6)	
Female	152 (10.1)	71 (17.4)	
5-year Periods			**<0.001**‡
1st period (2010-2014)	695 (46.4)	132 (32.4)	
2nd period (2015-2019)	803 (53.6)	275 (67.6)	
Material type			**<0.001**‡
Biopsy	1250 (83.4)	320 (72.6)	
Resection	248 (16.6)	87 (21.4)	
Diagnosis			**<0.001**‡
Adenocarcinoma	438 (29.2) [a]	139 (34.2) [a]	
Squamous cell carcinoma	750 (50.1)[a]	146 (35.9)[a]	
Small cell carcinoma	224 (15) [a]	72 (17.7)[a]	
Non small cell carcinoma	43 (2.9)	14 (3.4)	
Large cell carcinoma	16 (1.1) [a]	6 (1.5) [a]	
Carcinoid tumor	13 (0.9)[a]	19 (4.7)[a]	
Other neoplasms	14 (0.9)	11 (2.7)	
Localization			0.953‡
Right	849 (56.6)	230 (56.5)	
Left	649 (43.4)	177 (43.5)	
Total	1498 (78.6)	407 (21.4)	

‡ Pearson's χ^2 test, a: The difference between the geriatric and non-geriatric groups is statistically significant ($p<0.001$).

to age groups, reductions within years and particularly the second period in the middle-aged and advanced-elderly age groups were statistically significant ($p<0.001$) (Figure 2). Furthermore, regarding the frequency distribution of males and females according to age groups and periods, the males' ages diagnosed in the second period were lower than in the first period. In other words, while the accumulation of the middle-aged and advanced-elderly age groups was in the first period, the young-elderly group's accumulation was in the second period in males. On the other hand, the age distribution of females diagnosed according to period was statistically similar ($p=0.143$). Furthermore, no statistically significant difference was present between the two periods in all age groups ($p>0.010$) in terms of the cases' sex distribution within the age groups according to period.

There was a statistically significant difference between material types according to age groups. The resection rate was decreased, and the biopsy rate was higher in the advanced-elderly group than in the other age groups ($p<0.05$). Moreover, the mid-elderly group had a lower resection rate and a higher biopsy rate than those aged <55 years ($p<0.05$).

When the histopathological diagnosis groups' distribution according to age groups was analyzed, it was determined that ADC, carcinoid tumor, and other neoplasms were more common, whereas SCC and small cell carcinoma were rarer in the non-geriatric groups ($p<0.05$). In contrast, the incidence of SCC was higher in the geriatric groups, and the increase in incidence with age was statistically significant ($p<0.05$). Small cell carcinoma was rarer in the middle-aged group ($p<0.05$). In the advanced-elderly age group, the incidence of ADC was lower ($p<0.05$). Furthermore, no statistically significant difference was present in all tumor groups regarding the cases' sex distribution according to age within the histopathological diagnosis groups ($p<0.05$) (Table 3).

There were no statistically significant differences in comparisons made regarding the histopathological diagnosis groups' prevalences according to periods within the age groups ($p>0.0014$). There were no significant differences in the prevalence of histopathological diagnoses between the first and second periods ($p>0.005$). In the 2nd period, the female ADC diagnosis rates in the 55-64 years, middle-aged, and advanced-elderly groups were significantly higher than those of males ($p=0.004$, $p<0.001$, and $p=0.003$, respectively). In the 1st period, the ratio of females diagnosed with carcinoid tumor was higher than that of males in the young-elderly age group ($p<0.001$). In the 2nd period, the ratio of females diagnosed with SCC was significantly lower than that of males in the mid-elderly group ($p<0.001$). The other pairwise comparisons among the age groups regarding diagnosis frequencies revealed no significant differences ($p>0.00125$).

DISCUSSION

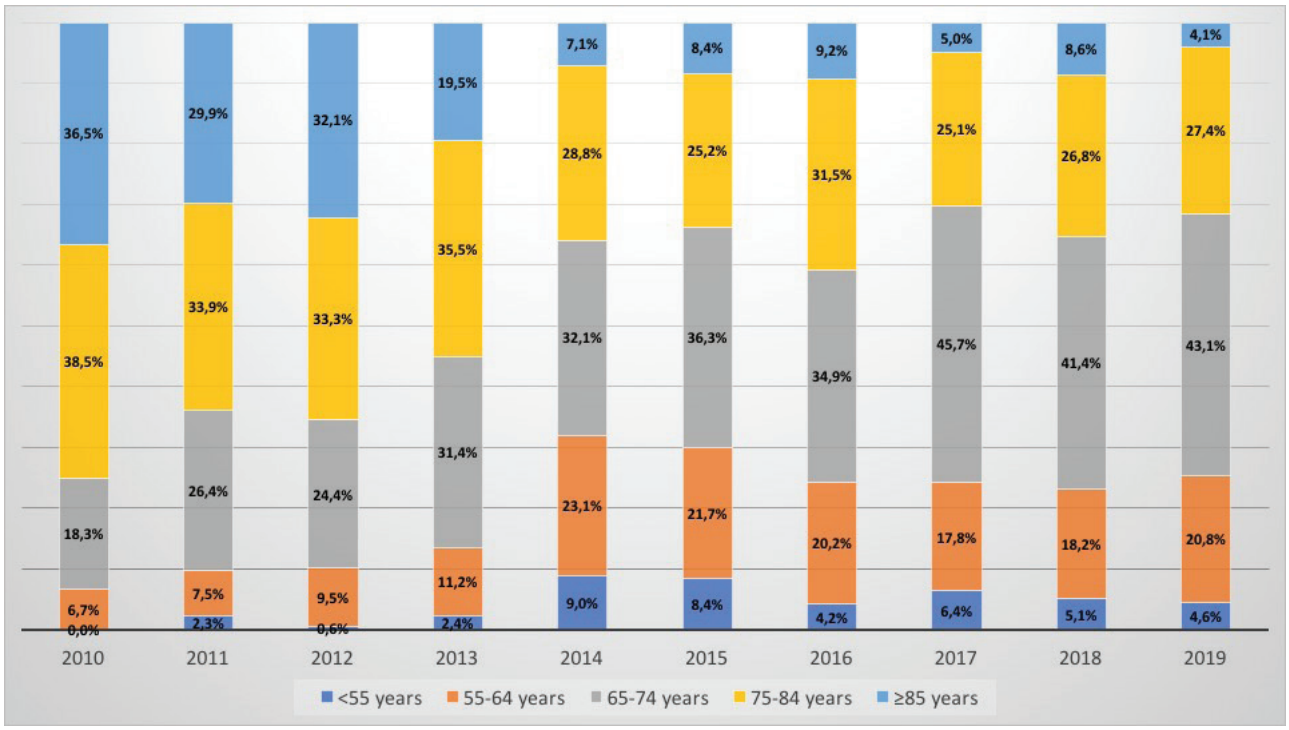
Life expectancy has dramatically improved in the last century, and with evidence, the population has been considered to shift to advanced ages worldwide (7). For example, the life expectancy, which was 49 years on average in the 1900s, is 78.7 years in this century (8). The population aged Sixty-five years of age and older are generally considered the geriatric. Since the elderly population and thus the number of individuals living to advanced ages have begun to increase, it was necessary to divide the elderly group into various sub-groups. The World Health Organization (WHO) divided the entire group over 65 years of age into three sub-groups as "young-elderly (65-74 years of age)", "mid-elderly (75-84 years of age)", and "advanced-elderly (85 years of age and over)" (9). More than 20% of the population are considered to be aged 65 years or older in the second half of this century (8). In our country, the Turkish Cancer Statistics data presented by the Turkish General Directorate of Public Health in 2016 reported that the ratio of the group

Table 3. Demographic and histopathological characteristics of the age groups

	<55 years (n=90)	55-64 years (n=317)	65-74 years (n=659)	75-84 years (n=570)	≥85 years (n=269)	p-value †
Gender						**<0.001**
Male	66 (73.3%)	270 (85.2%)[a]	582 (88.3%)[a]	519 (91.1%) [a,b]	245 (91.1%) [a,b]	
Female	24 (26.7%)	47 (14.8%)[a]	77 (11.7%)[a]	51 (8.9%)[a,b]	24 (8.9%)[a,b]	
5-year Periods						**<0.001**
1st period (2010-2014)	28 (31.1%)	104 (32.8%)	227 (34.4%)	276 (48.4%) [a,b,c]	192 (71.4%) [a,b,c,d]	
2nd period (2015-2019)	62 (68.9%)	213 (67.2%)	432 (65.6%)	294 (51.6%) [a,b,c]	77 (28.6%) [a,b,c,d]	
Material type						**<0.001**
Biopsy	65 (72.2%)	255 (80.4%)	529 (80.3%)	477 (83.7%)[a]	244 (90.7%) [a,b,c,d]	
Resection	25 (27.8%)	62 (19.6%)	130 (19.7%)	93 (16.3%)[a]	25 (9.3%) [a,b,c,d]	
Histopathological Diagnosis						**<0.001**
Adenocarcinoma	41 (45.6%)	98 (30.9%)[a]	209 (31.7%)[a]	165 (28.9%)[a]	64 (23.8%)[a,c]	
Squamous cell carcinoma	21 (23.3%)	125 (39.4%)[a]	315 (47.8%) [a,b]	289 (50.7%) [a,b]	146 (54.3%) [a,b]	
Small cell carcinoma	9 (10.0%)	63 (19.9%)[a]	99 (15.0%)	80 (14.0%)[b]	45 (16.7%)	
Non small cell carcinoma	3 (3.3%)	11 (3.5%)	16 (2.4%)	17 (3.0%)	10 (3.7%)	
Large cell carcinoma	0 (0.0%)	6 (1.9%)	7 (1.1%)	6 (1.1%)	3 (1.1%)	
Carcinoid tumor	10 (11.1%)	9 (2.8%)[a]	7 (1.1%)[a]	6 (1.1%)[a]	0 (0.0%)[a,b]	
Other neoplasms	6 (6.7%)	5 (1.6%)[a]	6 (0.9%)[a]	7 (1.2%)[a]	1 (0.4%)[a]	
Localization						0.947
Right	50 (55.6%)	180 (56.8%)	366 (55.5%)	330 (57.9%)	152 (56.5%)	
Left	40 (44.4%)	137 (43.2%)	293 (44.5%)	240 (42.1%)	117 (43.5%)	

† Pearson's $\chi 2$ test, a: The difference with the <55 age group is statistically significant ($p<0.05$), b: The difference with the 55-64 age group is statistically significant ($p<0.05$), c: The difference with the 65-74 age group is statistically significant ($p<0.001$) d: The difference with the 75-84 age group is statistically significant ($p<0.01$).

Figure 2. Cumulative distribution of the cases by age groups within the years of diagnosis



aged 65 years and over increased to 8.3%. This ratio is predicted to increase to 10.2% by 2023 and to 20.8% by 2050 (10).

Cancer is becoming a more common problem because of the prolonged life expectancy of the general population and the better diagnostic and therapeutic management of numerous cancers (11). More than half of all cancers in the USA are diagnosed in individuals aged 65 and over, and the incidence of most malignancies increases with age to at least up to 85 years (8). Lung cancer is a disease with an increasing incidence with age, and its incidence in the elderly population has been increasing with the prolongation of life expectancy (2). In developed countries, the average age of the disease is 70 years, and approximately two-thirds (68%) of the cases are over 65 years of age (12). In adition, 14% of lung cancer cases are diagnosed in patients aged 75 years and over. These ratios are expected to increase in the next 20 years (12, 13). Although studies conducted in previous years have revealed that the average age of lung cancer was lower, recent epidemiological studies have determined that it increased due to the age of starting smoking and its consumption in our country (14). In a study evaluating the lung cancer cases in 20 years from 1988 to 2007 in our country, the patients' average age at the time of diagnosis was determined as 60 years. This result was ten years younger than that of the American patients. On the other hand, when average ages were compared over a 5-year period, the average age increased from 64 to 70 years (11). Our study presented the 10-year data of our regional case series, approximately three-thirds (78.6%) of which were geriatric patients, and the mean age was 67.7 years. Approximately 30% of this ratio were in mid-elderly and 14% in advanced-elderly age groups. With the increasing geriatric popula-

tion worldwide, lung cancer will continue to be a significant public health issue. When the distribution of cases' ages of diagnosis over time was evaluated and the data from two 5-year periods were compared, the middle-aged and advanced-elderly age groups were tended to accumulate in the 1st period. In contrast, a shift towards the young-elderly group was observed in the 2nd period. The cause of this finding was the decrease observed in the ages of the males diagnosed, with such a difference not seen in the females. Thus, there is a need for epidemiological studies related to the decrease observed in terms of age at diagnosis, particularly in males over the years, while also evaluating environmental, regional, and genetic characteristics, primarily tobacco use.

In lung cancer-related studies, gender ratios have changed, and male cases have been diagnosed in higher proportions over time. However, in recent years, the incidence of lung cancer has increased in females compared to that in males worldwide (15). Based on the GLOBOCAN 2018 data, lung cancer was the first (22.1%) cancer type in males and the third (5.4%) in females (16). In our country, males are predominant, consistent with the literature, and an increase of female sex has been observed over the years. Lung cancer was the first (22.5%) in males and fifth (4.3%) in females according to the 2011 cancer registry data, whereas it was still the first (20.3%) in males but has rose to the third most common cancer (7.4%) in females in the data of 2016 registry. Regarding the geriatric patient rates, lung cancer was the second most common disease (19.1%) in males and the fourth (5.6%) in females in the 2011 registry data, whereas it become the most common disease in males (20.3%) and the third most common disease in females (7.4%) in the 2016 cancer registry data (10, 17). In our study, a male predominance was observed with a ratio of 88.3%, which was consistent with the literature and our country's data. However, when the mean ages were analyzed according to the sex, the mean age of females was lower than males. This situation is mainly associated with the tumor type, and ADC as well as carcinoid tumors, which are more common in the non-geriatric and young-elderly groups, which were further found to be more common in females in our study. There was a male predominance (approximately 90%) in the geriatric group. When the two periods were compared, there was a significant increase in the number of diagnosed females in the second period, which is consistent with the literature and our country's data. The increase in the non-geriatric group observed in the second period might be considered to be related to the increased number of female patients in the second period. Detailed epidemiological studies involving hormonal and genetic factors besides tobacco use and regional factors such as indoor and outdoor air pollution are required to explain the increasing lung cancer incidence in females over the years.

When the distribution of lung cancer types in the population is analyzed, SCC is the most common histological type in Asian countries such as Korea and China, whereas ADC is most common in the USA and Japan (3, 6). Regarding the distribution of lung cancer subtypes according to sex, ADC has replaced SCC in the last ten years and has become the most commonly diagnosed lung cancer type in both sexes (18). However, various studies have reported that ADC incidence was higher in females and SCC incidence higher in males (15, 18). In adition, even though the lung cancer type can change according to population and sex, it can also change with age. For example, while SCC changed from 27% in patients under 65 years to 38% in those aged over 75 years, ADC decreased from 61% to 50% (19). The most common lung cancer types were SCC (43.5%) and ADC (35.2%) in our country's 2011 cancer registry data, whereas in 2016, ADC (47.1%) surpassed SCC (35.2%) (10, 17). In our study, SCC was the most common cancer type, followed by ADC and small cell carcinoma. Regarding the distribution of histopathological diagnoses according to sex, the most

common cancer types were ADC and carcinoid tumor in females and SCC and smallcell carcinoma in males. The most common lung cancer type was SCC in the geriatric age group, which is consistent with the literature, with the incidence of this tumor increasing with age. On the other hand, the ADC ratio decreased with age, and most of the ADC cases diagnosed in middle-aged and advanced-elderly age groups were females. SCC is most commonly associated with smoking. The cause of the propensity of females to ADC has not yet been identified; however, various genetic, biological, and hormonal factors have been speculated to play roles. Various studies have suggested that females were more sensitive to carcinogenic effects than males (20, 21). Another claim relates the development of the condition to hormonal status, with estrogen suggested to affect the molecular and biological characteristics of lung cancer, which could explain the differences between the two genders (21).

The optimal diagnostic and therapeutic management of elderly lung cancer patients remains controversial. Studies have shown that the probability of elderly patients' getting referred to medical oncologists, treatment with chemotherapeutics, and undergoing surgery for lung cancer is lower than that in young patients (22). In addition, the surgical resection rate of geriatric patients following biopsy is lower than that in young patients. However, when the literature is reviewed, the incidence of early stage and resectable tumors increases with age. For example, while the resectability rate was 15.3% under 55 years of age, it was reported to increase to 25% in patients aged > 75 years (7, 14). Moreover, while the incidence of stage I disease was 79% in patients aged < 65 years, it increased to 87% in patients aged > 75 years (23). In our study, the resection rate was significantly higher in the non-geriatric group, particularly in females, whereas the biopsy rate was higher in the geriatric group, particularly in males. In contrast, the resection rate was the lowest in the advanced elderly group (9.3%) among all geriatric age groups. Thus, every age group require different assessments, because is not the only consideration when deciding to perform surgical resection. Therefore, inadequate treatment due to age is a significant problem. However, surgery without proper assessment causes significant increases in morbidity and mortality. However, deciding whether to operate on elderly patients is extremely difficult, because this group is underrepresented in clinical studies (24). Although lung cancer is a type of advanced-age cancer, when studies on this subject are reviewed, it is seen that the age of 70 years is among the exclusion criteria in most studies. The ratio of such cases in these studies was less than 10% (2, 5). As a result, in the elderly, especially in middle-aged and advanced-elderly cases, it is challenging to act based on evidence for lung cancer management. Elderly patients represent a heterogeneous group. When deciding on suitability for surgery, the patient's physiological status rather than chronological age is important. Even though the treatment-related toxicity rates are higher, fit elderly patients can frequently tolerate surgical resection appropriate for their tumor stages and radiochemotherapy, with outcomes similar to those of young patients (22). For this reason, the performance and comorbidities of the patient should be taken into account, and a detailed geriatric assessment should be performed in addition to the cardiac and pulmonary risk assessment (14). Such an approach to determine which treatment strategy to be used may reduce toxicity and treatment failures (22).

CONCLUSION

Our study determined that lung cancer incidence increased with age and was more common in males, which is consistent with the literature. Moreover, the number of females with lung cancer has increased in our region over the years. The shift in the incidence of lung cancer in males from the middle-aged and advanced elderly age groups to the

young-elderly group over the years was remarkable. SCC is the most common cancer type in the geriatric age group and males, and its incidence increases with age. ADC and carcinoid tumors are the most common types of cancer in females. An increasing number of studies conducted in recent years have drawn attention to the increasing incidence of lung cancer related to tobacco use, air pollution, environmental as well as genetic factors. Among these factors, the primary cause of lung cancer is tobacco use, and in patients not using tobacco, exposure to a pathogenic environment might play a significant role in the pathogenesis of lung cancer. Our results emphasize the necessity of detailed epidemiological studies involving hormonal and genetic factors in addition to regional factors such as indoor and outdoor pollution, primarily tobacco use. Inadequate treatment of elderly lung cancer patients than young patients or exposure to high toxicities with standard treatments are significant problems. To reduce such problems, all elderly patients with lung cancer should undergo a thorough geriatric assessment for the most suitable and effective treatment without considering age.

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Competing interest

The authors have no conflicts of interest to declare.

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