ORIGINAL ARTICLE

DOI: 10.4274/nkmj.galenos.2025.46074
Nam Kem Med J 2025;13(3):341-344

Smoking Patterns and Their Association with Histological Subtypes in Lung Cancer Patients

Akciğer Kanseri Hastalarında Sigara İçme Şekilleri ve Histolojik Alt Tiplerle İlişkileri

Nevin FAZLIOĞLU[1], Betül İNAN[2], Semira Sıla DEMİRER[2], Mehmet Kaan BELYURT[2], Celaleddin Arda BAĞ[2], Esila ARSLAN[2], Seyedehmahtab Mosanen TABATABAEI[2], Mithat FAZLIOĞLU[3]

[1]*Tekirdağ Namık Kemal University Faculty of Medicine, Department of Pulmonology, Tekirdağ, Türkiye*
[2]*Tekirdağ Namık Kemal University Faculty of Medicine, Department of General Medicine, Tekirdağ, Türkiye*
[3]*Tekirdağ Namık Kemal University Faculty of Medicine, Department of Thoracic Surgery, Tekirdağ, Türkiye*

ABSTRACT

Aim: Tobacco exposure remains the most significant risk factor in the development of lung cancer. Understanding detailed smoking characteristics in affected populations provides critical insight into disease etiology and progression. This study aimed to analyze smoking status, cumulative tobacco exposure, and their relationship with histological subtypes in a cohort of lung cancer patients.

Materials and Methods: A retrospective analysis was conducted on 539 patients diagnosed with lung cancer. Demographic data, smoking behavior (status and pack-year history), and histological classification were reviewed. Statistical comparisons assessed differences by gender and histological subtype.

Results: Active smoking was the most common status (56.4%) with substantial rates of ex-smoking (34.3%). Mean pack-year history was 49.2±1.03. Squamous cell carcinoma and small cell lung cancer were associated with heavier tobacco exposure. Adenocarcinoma was more common among never and passive smokers. Sex-based differences were significant: females had higher rates of never and passive smoking, while males had higher cumulative exposure.

Conclusion: Smoking characteristics differ markedly by gender and histological subtype in lung cancer patients. These findings underscore the need for personalized approaches to prevention, diagnosis, and public health policy.

Keywords: Lung cancer, smoking behavior, histological subtype

ÖZ

Amaç: Tütün maruziyeti, akciğer kanserinin gelişiminde en önemli risk faktörü olmaya devam etmektedir. Etkilenen popülasyonlardaki sigara içim özelliklerinin ayrıntılı olarak anlaşılması, hastalığın etiyolojisi ve ilerleyişi hakkında kritik bilgiler sunar. Bu çalışma, sigara içme durumu, kümülatif tütün maruziyeti ve bunların histolojik alt tiplerle ilişkisini analiz etmeyi amaçlamaktadır.

Gereç ve Yöntem: Akciğer kanseri tanısı almış 539 hasta retrospektif olarak analiz edilmiştir. Demografik veriler, sigara içme davranışı (içme durumu ve paket-yıl geçmişi) ile histolojik sınıflandırmalar incelenmiştir. Cinsiyete ve histolojik alt tipe göre farklılıklar istatistiksel olarak karşılaştırılmıştır.

Bulgular: Aktif sigara içimi en yaygın durumdu (%56,4) ve kayda değer oranda ex-smoker (%34,3) mevcuttu. Ortalama paket-yıl geçmişi 49,2±1,03 idi. Skuamöz hücreli karsinom ve küçük hücreli akciğer kanseri daha yoğun tütün maruziyetiyle ilişkiliydi. Adenokarsinom, sigara içmemiş ve pasif içici hastalarda daha sık görülüyordu. Cinsiyet temelli farklılıklar anlamlıydı: kadınlar daha yüksek oranda hiç sigara içmemiş veya pasif içici iken, erkekler daha yüksek kümülatif maruziyet gösterdi.

Sonuç: Sigara içim özellikleri, akciğer kanseri hastalarında cinsiyete ve histolojik alt tipe göre belirgin şekilde farklılık göstermektedir. Bu bulgular, önleme, tanı ve halk sağlığı politikalarında kişiselleştirilmiş yaklaşımların gerekliliğini vurgulamaktadır.

Anahtar Kelimeler: Akciğer kanseri, sigara içme davranışı, histolojik alt tıp

Address for Correspondence: Nevin FAZLIOĞLU MD, Tekirdağ Namık Kemal University Faculty of Medicine, Department of Pulmonology, Tekirdağ, Türkiye
E-mail: nfazlioglu@nku.edu.tr **ORCID ID:** orcid.org/0000-0001-5191-4636
Received: 01.06.2025 **Accepted:** 21.07.2025 **Publication Date:** 07.10.2025

Cite this article as: Fazlıoğlu N, Demirer SS, Belyurt MK, Bağ CA, Arslan E, Tabatabaei SM, et al. Smoking patterns and their association with histological subtypes in lung cancer patients. . Nam Kem Med J. 2025;13(3):341-344

INTRODUCTION

Lung cancer remains the leading cause of cancer-related mortality worldwide. Tobacco smoking is the most significant etiological factor, yet smoking patterns and their impact on lung cancer subtypes differ across genders. While men have traditionally shown higher smoking rates, recent shifts in social norms have led to increased female exposure both directly and passively[1-4]. Understanding how sex-specific smoking behaviors correlate with histological subtypes of lung cancer can provide valuable insights for risk stratification and targeted prevention strategies.

MATERIALS AND METHODS

Ethics approval for this study was obtained from the Non-Interventional Clinical Research Ethics Committee of Tekirdağ Namık Kemal University (desicion no: 2025.64.03.22, date: 25.03.2025). A retrospective cohort study was conducted including 539 patients diagnosed with lung cancer between 2017 and 2024. Demographic variables included age, gender, and survival status. Smoking-related variables included smoking status (never, active, passive, ex-smoker) and cumulative exposure (pack-year history). Histological classification was based on pathology reports: squamous cell carcinoma (SCC), adenocarcinoma, small cell lung cancer (SCLC), and non-SCLC not otherwise specified. Passive smoking was defined as regular exposure to cigarette smoke at home or in the workplace, as reported by the patient and documented in the anamnesis section of the medical records. The presence or absence of passive smoking was retrospectively extracted from the physician's notes. No objective quantification was available.

Statistical Analysis

Descriptive statistics were presented as means ± standard error of the mean for continuous variables and percentages for categorical data. ANOVA and chi-square tests were used to assess differences among groups. A p-value<0.05 was considered statistically significant.

RESULTS

Patient Characteristics

The study population had a mean age of 64.0±0.42 years. Males accounted for 84.8% (n=457) and females 15.2% (n=82). Mean age at diagnosis was 63.5±0.42 years, and the mean survival time following diagnosis was 11.4±1.53 months (Table 1).

Smoking Behavior by Sex

The overall smoking behavior differed significantly between the sexes. Active smoking was common in both groups (52.4% of females vs. 57.1% of males). However, females had markedly higher rates of never smoking (20.7% vs. 2.8%) and passive exposure (14.6% vs. 1.8%), while ex-smoking was more prevalent in males (38.3% vs. 12.2%) (Table 2). Mean pack-year exposure was significantly higher in males (49.92±1.09) than in females (43.19±3.23), despite the lower proportion of ex-smokers in the latter group.

Histological Subtype and Smoking Correlation

SCC was the most frequent subtype among males (38.6%) and showed the highest mean pack-year (53.01±1.75). In contrast, adenocarcinoma was slightly more common in females (36.6%) and had the lowest mean pack-year exposure (43.16±1.75) (Table 3 and 4).

ANOVA showed significant differences in mean pack-year history among subtypes (p=0.0016) (Table 4). The chi-square test confirmed a significant association between smoking status and histological subtype (p=0.0002).

DISCUSSION

This study reveals that sex differences in smoking behavior are not only statistically significant but also pathologically relevant, manifesting as distinct patterns in lung cancer histology.

Table 1. General characteristics of the study population

Characteristic	Value
Mean age	64.0±0.42
Sex	
Male	457 (84.8)
Female	82 (15.2)
Smoking status	
Never smokers	30 (5.6)
Active smokers	304 (56.4)
Passive smokers	20 (3.7)
Ex-smokers	185 (34.3)
The mean pack-year history	49.2±1.03
Histology	
SCC	197 (36.5)
Adenocarcinoma	164 (30.4)
SCLC	108 (20.0)
NSCLC (NOS)	69 (12.8)
Survival status	
Ex	300 (55.7)
Alive	239 (44.3)
Mean age at diagnosis	63.5±0.42
Mean survival time after diagnosis	11.4±1.53

ANOVA test was performed. A statistically significant difference in mean pack-year history was observed among histological subtypes (p=0.0016). NSCLC (NOS): Non-small cell lung cancer-not otherwise specified, SCC: Squamous cell carcinoma, SCLC: Small cell lung cancer

Table 2. Smoking status and pack-year history by sex

Sex	Never smoker (%)	Active smoker (%)	Passive smoker (%)	Ex-smoker (%)	Mean pack-years	SD	N
Female	20.7	52.4	14.6	12.2	43.19	3.23	53
Male	2.8	57.1	1.8	38.3	49.92	1.09	436

SD: Standard deviation, N: Number

Tablo 3. Cinsiyete göre histolojik alt tip dağılımı

Sex	Adenocarcinoma	NSCLC (NOS)	SCC	SCLC
Female	36.6	13.4	25.6	24.4
Male	29.4	12.7	38.6	19.3

NSCLC (NOS): Non-small cell lung cancer-not otherwise specified, SCC: Squamous cell carcinoma, SCLC: Small cell lung cancer

Table 4. Mean pack-year history by histological subtype

Histology	Mean pack-years	SD	N
Adenocarcinoma	43.16	1.75	138
NSCLC (NOS)	49.21	3.02	63
SCC	53.01	1.75	187
SCLC	50.36	2.16	101

ANOVA test was performed. A statistically significant difference in mean pack-year history was observed among histological subtypes (p=0.0016). NSCLC (NOS): Non-small cell lung cancer-not otherwise specified, SCC: Squamous cell carcinoma, SCLC: Small cell lung cancer, SD: Standard deviation

Women, although demonstrating markedly lower rates of active smoking compared to men, show significantly elevated levels of passive smoke exposure. This discrepancy suggests that indirect tobacco exposure may play a more pronounced etiological role in the female population than previously assumed[5]. Of particular concern is the disproportionately high incidence of SCLC among female patients a histological subtype recognized for its aggressive clinical course and poor prognosis. This observation raises the possibility that even non-direct smoking exposure may be sufficient to trigger the development of high-grade malignancies, particularly in biologically susceptible individuals.

Furthermore, the relatively higher prevalence of adenocarcinoma in women corresponds with findings from prior studies, which have consistently linked this histological subtype to lighter or indirect smoking habits. This pattern has led researchers to hypothesize that adenocarcinoma may arise through different carcinogenic pathways than SCC, including possible interactions with hormonal influences, such as estrogen receptors, or genetic predispositions unique to female patients[6-9].

In contrast, the data underscore that men, who have higher rates of both current and former smoking, also demonstrate significantly greater cumulative tobacco exposure as measured in pack-years. This increased exposure is paralleled by the predominance of SCC among male patients a subtype long known to be closely associated with heavy and prolonged smoking. The dose-response relationship observed here reinforces the carcinogenic potency of long-term tobacco consumption, particularly in the development of central airway tumors such as SCC[10-12].

Taken together, these findings highlight the critical importance of incorporating gender-specific smoking patterns into predictive models of lung cancer risk[7-9,13]. Public health policies and clinical screening protocols should not only continue to target active smoking but also increase focus on mitigating passive smoke exposure, particularly in women. In the era of personalized medicine, such stratified approaches could enhance both early detection and prevention efforts by tailoring them to the unique risk profiles shaped by gender and tobacco exposure dynamics.

Study Limitations

This study is limited by its retrospective design and reliance on medical records for smoking history, which may introduce recall bias. The relatively small female sample size also restricts the power of gender-based comparisons. Additionally, passive smoking exposure was not objectively measured, and potential confounders such as occupational and environmental factors were not accounted for.

CONCLUSION

Sex plays a critical role in shaping smoking exposure patterns and their oncological consequences. Recognition of these differences is crucial for developing more precise screening and prevention strategies in lung cancer care. Future studies should explore biological underpinnings and psychosocial determinants influencing gender disparities in lung carcinogenesis.

Ethics

Ethics Committee Approval: Ethics approval for this study was obtained from the Non-Interventional Clinical Research Ethics Committee of Tekirdağ Namık Kemal University (desicion no: 2025.64.03.22, date: 25.03.2025).

Informed Consent: A retrospective cohort study was conducted including 539 patients diagnosed with lung cancer between 2017 and 2024.

Footnotes

Concept: N.F., B.İ., M.K.B., E.A., M.F., Design: N.F., S.S.D., M.K.B., S.M.T., M.F., Data Collection or Processing: N.F., B.İ., S.S.D., M.K.B., C.A.B., E.A., S.M.T., Analysis or Interpretation: N.F., C.A.B., E.A., S.M.T., M.F., Literature Search: N.F., B.İ., S.S.D., M.K.B., E.A., Writing: N.F., B.İ., C.A.B., M.F.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. CA Cancer J Clin. 2023;73:17-48.
2. Wakelee HA, Chang ET, Gomez SL, Keegan TH, Feskanich D, Clarke CA, et al. Lung cancer incidence in never smokers. J Clin Oncol. 2007;25:472-8.
3. Couraud S, Zalcman G, Milleron B, Morin F, Souquet PJ. Lung cancer in never smokers--a review. Eur J Cancer. 2012;48:1299-311.
4. Thun MJ, Henley SJ, Burns D, Jemal A, Shanks TG, Calle EE. Lung cancer death rates in lifelong nonsmokers. J Natl Cancer Inst. 2006;98:691-9.
5. Wang YT, Hu KR, Zhao J, Ai FL, Shi YL, Wang XW, et al. The association between exposure to second-hand smoke and disease in the chinese population: a systematic review and meta-analysis. Biomed Environ Sci. 2023;36:24-37.
6. Hsu LH, Chu NM, Liu CC, Tsai SY, You DL, Ko JS, et al. Sex-associated differences in non-small cell lung cancer in the new era: is gender an independent prognostic factor? Lung Cancer. 2009;66:262-7.
7. Patel JD. Lung cancer in women. J Clin Oncol. 2005;23:3212-8.
8. Siegfried JM. Women and lung cancer: does oestrogen play a role? Lancet Oncol. 2001;2:506-13.
9. Risch HA, Howe GR, Jain M, Burch JD, Holowaty EJ, Miller AB. Are female smokers at higher risk for lung cancer than male smokers? A case-control analysis by histologic type. Am J Epidemiol. 1993;138:281-93.
10. Hecht SS. Tobacco carcinogens, their biomarkers and tobacco-induced cancer. Nat Rev Cancer. 2003;3:733-44.
11. Wyss A, Hashibe M, Chuang SC, Lee YC, Zhang ZF, Yu GP, et al. Cigarette, cigar, and pipe smoking and the risk of head and neck cancers: pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. Am J Epidemiol. 2013;178:679-90.
12. Pesch B, Kendzia B, Gustavsson P, Jöckel KH, Johnen G, Pohlabeln H, et al. Cigarette smoking and lung cancer--relative risk estimates for the major histological types from a pooled analysis of case-control studies. Int J Cancer. 2012;131:1210-9.
13. LoMastro A, Maki RG. Sex and gender differences in cancer risk and treatment. J Clin Oncol. 2019;37:2446-54.