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THE IMPLICATIONS OF SMOKING IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND LUNG CANCER

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Abstract

Chronic smoking remains one of the most significant public health concerns worldwide, serving as a major risk factor for respiratory and cardiovascular diseases, as well as various types of cancer. This study explores the impact of smoking on chronic obstructive pulmonary disease (COPD) and lung cancer, focusing on aspects such as prevalence, symptom severity, and epidemiological correlations between these conditions. This study was conducted on a cohort of 164 patients monitored at the National Institute of Pneumophthisiology "Marius Nasta" in Bucharest, identifying a significant association between smoking and pulmonary disease severity.

The findings suggest that COPD may contribute to an increased risk of lung cancer, possibly due to shared pathogenic mechanisms such as chronic inflammation, oxidative stress, and tissue hypoxia. Considering the profound impact of these diseases on patients' quality of life and mortality, the study highlights the urgent need for effective preventive strategies, including smoking cessation programs, lung cancer screening, and a multidisciplinary approach to COPD management.

Keywords: *Tobacco smoking, chronic obstructive pulmonary disease, COPD, lung cancer*

Rezumat

Tabagismul rămâne una dintre cele mai importante probleme de sănătate publică la nivel mondial, servind ca un factor de risc major pentru bolile respiratorii și cardiovasculare, precum și pentru diferite tipuri de cancer. Acest studiu explorează impactul fumatului asupra bolii pulmonare obstructive cronice (BPOC) și cancerului pulmonar, concentrându-se pe aspecte precum prevalența, severitatea simptomelor și corelațiile epidemiologice dintre aceste afecțiuni.

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Acest studiu a fost realizat pe o cohortă de 164 de pacienți monitorizați la Institutul Național de Pneumoftiziologie „Marius Nasta” din București, identificând o asociere semnificativă între fumat și severitatea bolii pulmonare. Descoperirile sugerează că BPOC poate contribui la un risc crescut de cancer pulmonar, posibil din cauza mecanismelor patogene comune, cum ar fi inflamația cronică, stresul oxidativ și hipoxia tisulară. Având în vedere impactul profund al acestor boli asupra calității vieții și mortalității pacienților, studiul evidențiază nevoia urgentă de strategii preventive eficiente, inclusiv programe de renunțare la fumat, screening pentru cancerul pulmonar și o abordare multidisciplinară a managementului BPOC.

Cuvinte cheie: *fumatul de tutun, boală pulmonară obstructivă cronică, BPOC, cancer pulmonar.*

Introduction

Smoking is considered a chronic, relapsing condition, with nicotine being its primary etiological factor[1], one of the main components of tobacco. Nicotine is responsible for the persistent, voluntary exposure to the risks of smoking due to the high level of dependence it induces. Additionally, the harmful effects of smoking arise from inhaling other substances found in tobacco, including carcinogens, toxic chemicals, and carbon monoxide[2]. Some adverse health effects associated with smoking include malignant diseases in various locations, chronic conditions such as chronic obstructive pulmonary disease, cardiovascular diseases, stroke, type II diabetes, and disorders affecting the reproductive system, immune system, eyes, and periodontal health[3]. A general classification of smoking status identifies daily smokers, characterized by the use of tobacco products every day for at least three months; occasional smokers, who use tobacco but not daily; former smokers, individuals who have abstained from tobacco for at least six months; and, lastly, non-smokers, defined as those who have smoked fewer than 100 cigarettes over their lifetime[1].

The study of the implications of chronic smoking on overall health remains a priority topic of global interest, given the impact smoking has on the pathogenesis of respiratory, cardiovascular, and various malignant diseases. Extensive research on the epidemiology of smoking supports this claim by documenting the significantly high prevalence of morbidity and mortality among tobacco users.

Globally, out of a population of 8.1 billion people, 1.3 billion are smokers, resulting in a smoking prevalence of 18% worldwide in the past year. Romania ranks 18th in Europe, with a smoking prevalence of 27.9%. Up to half of tobacco users die from a smoking-related condition[4]. Smoking ranked second in 2021 among the leading risk factors influencing the global burden of disease, following elevated blood pressure[5]. Extensive studies have illustrated the involvement of smoking in the leading causes of preventable death. One indicator of smoking's influence on a population is lung cancer, with 70-90% of lung cancer deaths occurring among smokers.

Other smoking-related conditions that impact mortality include COPD in both sexes, laryngeal and esophageal cancer in women, and aortic aneurysm in men[6]. Furthermore, the main diseases discussed in this study, COPD and lung cancer, are among the top causes of death, ranking 4th and 9th globally in 2021[5].

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease is a long-term lung condition primarily characterized by dyspnea and cough, with or without sputum production, resulting from the progressive obstruction of the airways due to bronchitis, bronchiolitis, and/or emphysema. It is diagnosed through spirometry, where a post-bronchodilator Tiffeneau index of less than 0.7 confirms the condition. The leading environmental factor contributing to COPD development is smoking; however, other contributing factors include environmental pollution, abnormal lung development, and genetic factors, such as the SERPINA1 gene mutation, which causes α-1 antitrypsin deficiency[7].

Tobacco inhalation disrupts pulmonary homeostasis, leading to both structural and functional alterations.

Chronic smoking induces oxidative stress, airway inflammation, cellular senescence, and cell death, all of which play a role in the pathophysiology of COPD[8].

Reactive oxygen species (ROS) play physiological roles in microbial defense, mitochondrial respiration, and intercellular signaling. Oxidative stress occurs when free radical exposure exceeds the antioxidant defense system's capacity, damaging proteins, lipids, and deoxyribonucleic acid (DNA)[9]. This imbalance between oxidants and antioxidants promotes inflammation by upregulating the expression of inflammation-related genes, increasing mucus secretion, and inactivating antiproteases[8]. The lungs are especially prone to oxidative stress due to their high oxygen concentration, rich blood supply, and constant exposure to external toxins. Remarkably, cigarette smoke contains more than 10^{15} free radicals in a single inhalation[9].

When irritants, such as those found in cigarette smoke, enter the airways, they recruit and activate cells such as neutrophils, eosinophils, macrophages, lymphocytes, and epithelial cells, releasing chemotactic factors that initiate or intensify inflammation. It has been shown that inflammation in the small airways of COPD can progress for many years before symptoms appear. Although inflammation affects all areas of the airways, airflow obstruction is primarily caused by damage to the small airways. Therefore, the symptoms are preceded by bronchiolitis with small airway obstruction, peripheral distribution of goblet cells, peribronchiolar fibrosis, and thickening of the bronchial smooth muscle tissue, with emphysema possibly also developing. Additionally, the number of submucosal glands increases, and ciliated epithelial cells are replaced by goblet cells, leading to mucus hypersecretion. The involvement of the

inflammatory response in the pathogenesis of COPD has therapeutic implications for the use of inhaled corticosteroids, which have also been shown to reduce mortality[10]. Beyond localized inflammation in the lungs and airways, systemic involvement of the inflammatory response has also been documented, with elevated levels of C-reactive protein (CRP), fibrinogen, and leukocytes. This inflammation persists subtly even after smoking cessation[11].

Lung Cancer

The most common location for cancer associated with tobacco use is the lungs [13]. The risk of lung cancer is 10 to 30 times higher among smokers, while smoking cessation significantly reduces this risk over time [14]. Although nicotine is the well-known substance in cigarette smoke, it is primarily involved in addiction, and there are predominantly studies that have denied its involvement in the pathogenesis of lung cancer.

There are over 5,000 components in cigarette smoke, 73 of which are considered carcinogenic[12]. These include polycyclic aromatic hydrocarbons, tobacco-specific nitrosamines, aromatic amines, benzene, formaldehyde, and acetaldehyde, all of which have direct effects on DNA integrity. In addition to these carcinogenic substances, an important role in the etiology of lung cancer is played by the inflammatory changes in the lungs associated with the activation of nuclear factor kappa B (NF-kB) and the promotion of pulmonary growth and development[13]. Tobacco exposure leads to an increased number of somatic mutations, with the average being several thousand mutations in a bronchial cell[15].

Lung cancer originates in basal epithelial cells and includes non-small cell lung cancer (NSCLC), which accounts for 85% of cases, and small cell lung cancer (SCLC), both of which are closely linked to smoking. The main types of NSCLC are adenocarcinoma in 40% of cases, large cell carcinoma in 10% of cases, and squamous cell carcinoma in the remaining 30% of patients[16].

The Triad of Mortality (Smoking – COPD – Lung Cancer)

Aside from the shared etiology of tobacco use, COPD is recognized as an independent risk factor for lung cancer, particularly for squamous cell carcinoma. This finding most likely arises from the common mechanisms in their pathogenesis, which involve the accelerated functional and morphological degradation of the lungs in smokers, genetic predisposition, oxidative stress with direct effects on DNA degradation, or indirect effects through the initiation or maintenance of inflammation, epigenetic changes, and growth factors[16].

Chronic obstructive pulmonary disease is a direct risk factor for lung cancer, primarily through its involvement in inflammation. In the pathological process leading from COPD to cancer, the exaggerated expression of NF-kB leads to the suppression of the protein 53 kilodaltons (p53) gene, while the phosphoinositide 3-kinase (PI3K) pathway drives cell proliferation and suppresses apoptosis. Additionally, the aberrant expression of growth factors involved in tissue remodeling plays a role[16]. Besides the chronic inflammation in COPD, another mechanism involved in carcinogenesis is initiated by hypoxia generated by pulmonary hyperinflation and bronchial obstruction, which activates a transcription factor known as hypoxia-inducible factor 1-alpha (HIF-α). This factor affects more than 200 genes and can inhibit apoptosis[17].

Lung cancer mortality is among the highest due to late diagnosis and limited treatment efficacy. This situation could be improved through imaging screening of COPD patients for lung cancer using computed tomography[18]. Additionally, secondary prophylaxis with targeted therapies could be used in the future to reduce the risk of lung cancer development. One such initiative would be reducing oxidative stress through the administration of vitamin E, C, or NAC (N-acetylcysteine), although further studies are needed to document their effectiveness[16].

Although the exact mechanisms through which COPD influences the development of lung cancer are not yet fully understood, it is certain that these two pathologies are frequently associated. Further analysis is needed to determine whether COPD is an individual risk factor for lung cancer or if the two pathologies are complications of the same disease, namely chronic smoking[19].

Methods

The epidemiological study presented is a descriptive, cross-sectional analysis designed to assess the association between chronic smoking and the presence of comorbidities, specifically lung cancer and chronic obstructive pulmonary disease. The study included 164 patients under medical supervision at the National Institute of Pneumophthisiology "Marius Nasta", Bucharest. Patient selection was based on medical records, and the study groups were defined according to the following inclusion criteria:

- Group 1: Patients diagnosed with lung cancer without a COPD diagnosis.
- Group 2: Patients diagnosed with COPD without an oncological diagnosis.
- Group 3: Patients diagnosed with both COPD and lung cancer.

The diagnosis of COPD in patient records was initially suspected due to symptoms of chronic bronchitis and was later confirmed through spirometry. Lung cancer was diagnosed based on medical documentation, including discharge summaries from pulmonology or oncology departments or other medical units where the diagnosis was established.

The study Objectives include:

1. Analyze demographic and clinical characteristics of patients with COPD and/or lung cancer, including sex, age, and place of residence.
2. Identify key risk factors for both diseases, with a focus on smoking and occupational exposure to respiratory hazards.
3. Assess the role of COPD as an independent risk factor for lung cancer.
4. Investigate the association between tobacco use and the prevalence of COPD and lung cancer.
5. Evaluate COPD severity in relation to

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smoking history, particularly the impact of cumulative tobacco exposure (pack-year index) on disease progression.

6. Identify the most common symptoms associated with COPD and lung cancer.
7. Examine the role of chronic inflammation as a potential shared mechanism in the pathogenesis of both conditions.
8. Analyze relevant biological parameters linked to COPD and lung cancer.
9. Assess the prevalence of common comorbidities, such as bronchiectasis, ischemic heart disease, hypertension, and diabetes mellitus, which may also have smoking as a risk factor.
10. Support the development of screening and prevention programs and promote a multidisciplinary approach to the diagnosis and management of COPD and lung cancer.

Exclusion criteria were established to ensure the validity and accuracy of the study results. Patients were excluded if they had:

- Incomplete smoking history data;
- Interstitial lung diseases that could affect lung function and influence cancer risk;
- Active or sequelae pulmonary tuberculosis, to prevent interference between tuberculosis-related lung lesions and COPD/lung cancer;
- Other obstructive pulmonary diseases (e.g., bronchial asthma), to maintain a clear distinction between COPD and similar conditions;
- Severe cardiovascular diseases (acute myocardial infarction, advanced heart failure, significant arrhythmias) that could impact clinical severity;
- Other types of cancer;
- Declined to provide informed consent.

The data collected for the study were extracted from patient records and included demographic factors (age, sex, place of residence, occupational exposure), smoking history (smoking status — ever-smoker, never-smoker), pack-years index, and clinical characteristics (COPD severity based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification, histological type of lung cancer, symptoms, weight, BMI – body mass index, and blood test results). A never-smoker is an individual who has never smoked or, at most, has experimented with smoking occasionally but never on a daily basis and has not consumed more than 100 cigarettes in total. In our study, the term ever-smoker includes both current smokers — individuals who had been smoking for at least six months at the time of questioning — and former smokers, defined as those who had completely quit smoking for at least six months. These data were entered into an Excel database and subjected to statistical analysis to generate a descriptive overview

Parameter		COPD(n, %)	LUNG CANCER(n)	BOTH(n)
Sex	M (Male)=0	74(69.15)	72(63.2)	42(73.7)
	F (Female)=1	33(30.84)	42(36.8)	15(26.3)
Age (mean±SD)		65.59±8.88	66.06±8.78	66.25±8.48
Smoking status	Never-smoker	14(13.1)	23(20.4)	6(10.5)
	Ever-smoker	93(86.9)	90(79.6)	51(89.5)
Insured status	Pensioner =0	80(74.8)	83(72.8)	45(78.9)
	Employee=1	27(25.2)	31(27.2)	12(21.1)
Medium of origin	Rural =0	32(29.9)	37(32.5)	17(29.8)
	Urban =1	75(70.1)	77(67.5)	40(70.2)
Work exposure	No=0	46(43)	54(47.4)	25(43.9)
	Yes =1	61(57)	60(52.6)	32(56.1)
Source of work exposure	Construction=0	7(11.7)	8(14.3)	5(16.1)
	Paint=1	10(16.7)	11(19.6)	8(25.8)
	Welder=2	6(10)	8(14.3)	3(9.7)
	Fuel=3	6(10)	4(7.1)	2(6.5)
	Other=4	31(51.7)	25(44.6)	13(41.9)
Term of work exposure	<15 years =0	6(15)	5(13.9)	3(15.8)
	>15 years=1	34(85)	31(86.1)	16(84.2)
Home exposure	No=0	100(93.5)	109(95.6)	53(93)
	Yes =1	7(6.5)	5(4.4)	4(7)
BMI (kg/m^2) (mean±SD)		29.44±8	26.11±6.25	27.80±6.7
Systolic blood pressure (SBP)(mmHg)		132.89±17.08	127.44±18.67	127.91±16.84
Diastolic blood pressure (DBP)(mmHg)		79.45±10	78.38±10.81	77.46±10.19
Heart rate (bpm)		84.59±14.82	88.87±15.51	85.84±15.26
Oxygen saturation SpO2 (%)		93.82±6.82	94.44±6.16	94.46±7.65

Table 1. *Socio-demographical and clinical characteristics*

of the patient cohorts. Statistical analysis was performed using IBM SPSS version 26.0. We conducted frequencies tests, independent t-test, chi-square test and correlation analyses. The results were presented as mean ± standard deviation (SD) and we considered a p-value lower than 0.05 and R values lower than 0.01 to be statistically significant.

The study was approved by the Ethics Committee of the National Institute of Pneumophthisiology "Marius Nasta".

Results

The study included 164 patients, categorized into three groups: patients with COPD, patients with lung cancer, and patients diagnosed with both conditions. The average age of all patients was 65.68 years, with no significant differences in mean age among the selected groups (Table 1).

Chronic Smoking

When comparing ever-smokers and never-smokers, we observed a significantly higher proportion of males among ever-smokers (72.9%), whereas females predominated among never-smokers (77.4%). Although ever-smokers had a lower average BMI (27.53 Kg/m^2 vs. 30.73 Kg/m^2), this difference was not statistically significant. Similarly, there were no notable differences in blood pressure, heart rate, or oxygen saturation in ambient air.

Although place of residence theoretically influences exposure to inhaled respiratory toxins, this factor may have been influenced by the institute's urban location, where data collection took place.

Lung cancer characteristics were also analyzed based on smoking status. Among ever-smokers, lung cancer was more frequently located centrally (62.5%), whereas in never-smokers, central and peripheral tumor locations were equally distributed. In never-smokers, the right hemithorax was the predominant site (69.56%), while in ever-smokers, there was no significant difference in tumor location relative to the midline of the thorax.

Chronic Obstructive Pulmonary Disease

The socio-demographic analysis revealed a significant gender difference in COPD prevalence, with a higher occurrence among men (74%) compared to women (33%).

The prevalence of chronic smoking among COPD patients was also assessed. Of the 107 patients with COPD, 93 were ever-smokers (86.92%), while 14 were never-smokers (13.08%) (Figure 1). The severity of COPD, assessed using GOLD stages based on forced expiratory volume in 1 second (FEV1) values, did not show statistically significant differences between ever-smokers and never-smokers ($p = 0.328$). However, ever-smokers had a higher prevalence of GOLD stage III-IV compared to never-smokers

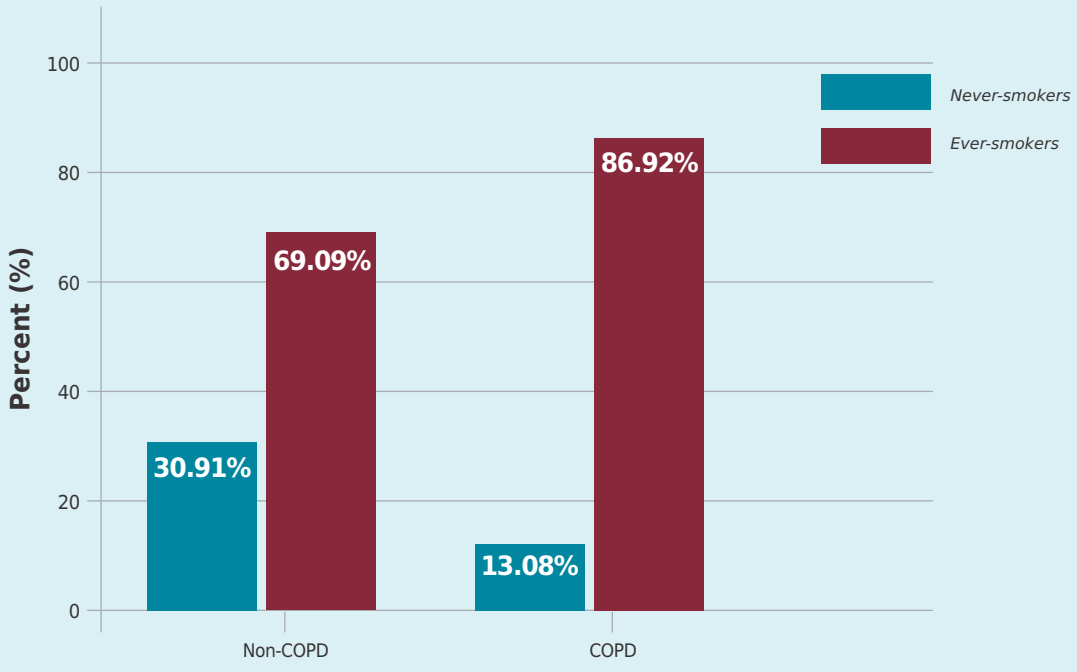

Figure 1. *Prevalence of chronic smoking based on COPD diagnosis*

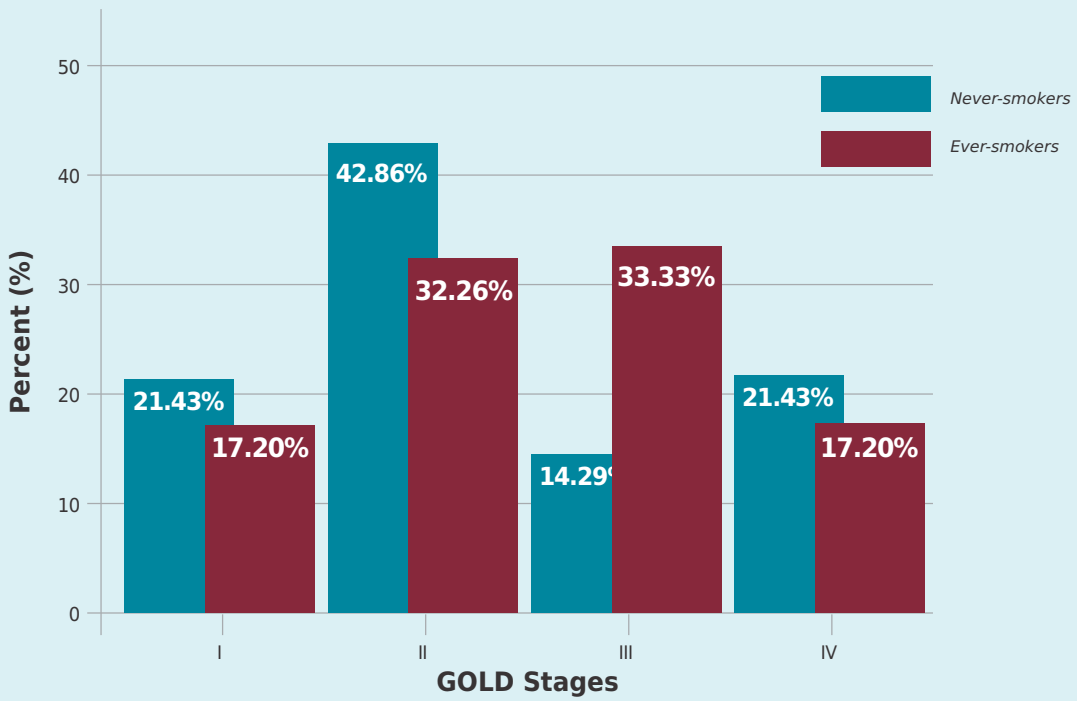

Figure 2. *Distribution of smoking prevalence by GOLD stages*

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(Figure 2). A higher risk of severe symptoms and frequent exacerbations was observed primarily among ever-smokers, with 53.76% classified in risk group E, compared to 50% of never-smokers. However, this difference was not statistically significant ($p = 0.579$). The BMI was significantly higher ($p = 0.006$) in patients with COPD (29.44 ± 8.00 kg/m²) compared to those with lung cancer only (24.18 ± 5.20 kg/m²).

The most common symptoms across patients with COPD were dyspnea, dry or productive cough, hemoptysis, wheezing (Table 2). The most frequently observed comorbidities included bronchiectasis, ischemic heart disease, high blood pressure, heart failure, and diabetes mellitus, all of which are significantly influenced by smoking as a major risk factor (Table 3).

Lung Cancer

Of the included patients, 69.5% were diagnosed with lung cancer, the majority being ever-smokers (79.8%). Among them, most had a pack-year history of more than 20 (92.04%). The average pack-year index was slightly lower in patients with COPD only compared to those with both COPD and lung cancer (40.45 vs. 42.19), but this difference was not statistically significant.

Regarding occupational exposure to respiratory hazards, 54.3% of the patients had been exposed to occupational risk factors. A statistically significant difference was observed when comparing patients with lung cancer to those with COPD only, in terms of workplace environment and type of exposure ($p = 0.047$).

Patients with lung cancer had significantly lower body weight than those with COPD only ($p = 0.038$), a finding that correlates with BMI, which was lower in lung cancer patients (26.11 ± 6.25 kg/m²) compared to those without lung cancer (30.48 ± 8.65 kg/m²). This difference was statistically significant ($p = 0.009$). A clinically significant difference ($p = 0.010$) was identified in symptom presentation, as hemoptysis was reported more frequently among lung cancer patients (36%) compared to those with COPD only (16%). Additionally, weight loss was more common in lung cancer patients (49.12%) compared to those with COPD only (12%).

Biological data analysis revealed a statistically significant association between inflammatory syndrome and lung cancer. While only 56% of COPD patients exhibited inflammatory syndrome, systemic inflammation was present in 85% of patients with lung cancer, with or without COPD.

A significant difference was also observed in platelet count analysis, with thrombocytosis identified in 30.63% of lung cancer patients. In contrast, none of the COPD-only patients had elevated platelet levels. This suggests that COPD patients may have a higher risk of hematologic disorders, which are important

Parameter		Frequency (n, %)
Dyspnoea	no=0 yes=1	21(19.8) 85(80.2)
Cough	no=0 yes=1	12(27.3) 32(72.7)
Expectoration	no=0 yes=1	48(44.9) 59(55.1)
Hemoptysis	no=0 yes=1	81(75.7) 26(24.3)
Wheezing	no=0 yes=1	97(90.7) 10(9.3)

Table 2. *Symptoms of COPD patients*

Parameter		Frequency (n, %)
Bronchiectasis	no=0 yes=1	65(60.7) 42(39.3)
Coronary artery disease (CAD)	no=0 yes=1	85(79.4) 22(20.6)
High blood pressure (HBP)	no=0 yes=1	32(29.9) 75(70.1)
Heart failure (HF)	no=0 yes=1	81(75.7) 26(24.3)
Diabetes mellitus	no=0 yes=1	83(77.6) 24(22.4)
Pulmonary hypertension	no=0 yes=1	87(81.3) 20(18.7)
History of COVID	no=0 yes=1	92(86) 15(14)

Table 3. *Comorbidities of COPD patients*

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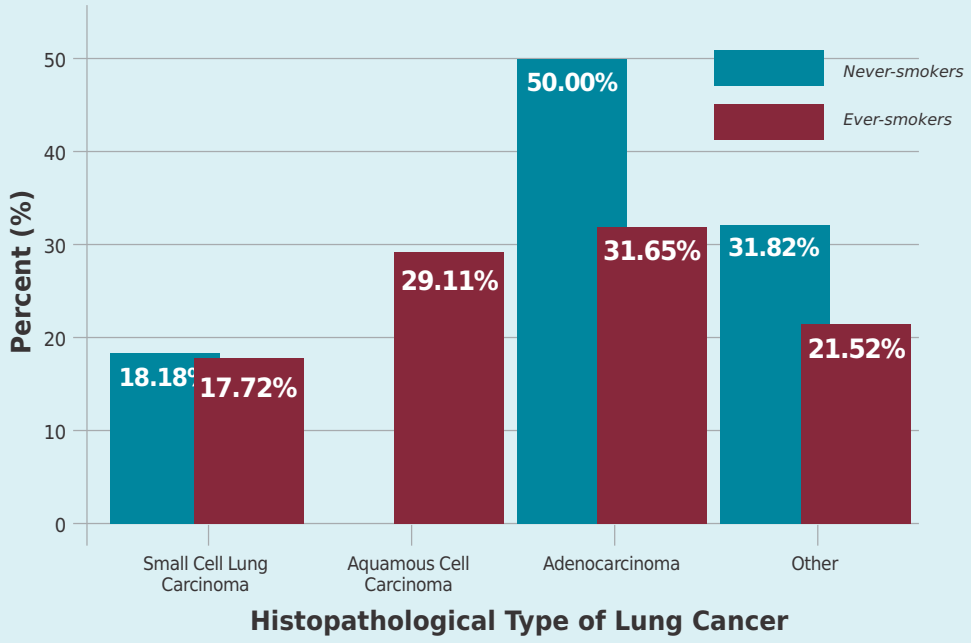

Figure 2. *Distribution of smoking prevalence by GOLD stages*

markers of systemic inflammation and cardiovascular risk in this population.

A comparative analysis of anemia prevalence among patients with and without lung cancer provided valuable insights into the disease's impact on hematologic status. Among the study participants, 53% of lung cancer patients were diagnosed with anemia, while 47% did not present this condition. In contrast, among COPD-only patients, 62% did not have anemia. The statistical significance of this finding ($p = 0.039$) suggests a strong association between lung cancer and anemia, highlighting the importance of identifying this comorbidity to improve both patient quality of life and prognosis. The histological distribution of lung cancer showed significant differences between ever-smokers and never-smokers. Adenocarcinoma was the most common subtype among never-smokers, with a prevalence of 50% in this group. Among ever-smokers, both adenocarcinoma (31.65%) and squamous cell carcinoma (29.11%) were predominant (Figure 3).

A total of 71.74% of lung cancer patients who

also had COPD had a centrally located tumor. In contrast, among patients with lung cancer only (without a COPD diagnosis), central and peripheral tumor locations were equally distributed. This difference was statistically significant ($p = 0.026$).

The most common symptoms across all three patient groups were dyspnea, dry or productive cough, hemoptysis, wheezing, chest pain, weight loss, loss of appetite, and fatigue. The most frequently observed comorbidities included bronchiectasis, ischemic heart disease, heart failure, hypertension, and diabetes mellitus, all of which are significantly influenced by smoking as a major risk factor.

Discussion

The findings of this study highlight the complex relationships between chronic obstructive pulmonary disease, lung cancer, and associated risk factors, primarily chronic smoking and occupational exposure to respiratory hazards.

The average age at which both diseases — where smoking is the primary risk factor — tend to develop is approximately 65 years. This finding aligns with previous studies [20-24], reinforcing the importance of screening for individuals at high risk of lung cancer. The American Cancer Society recommends low-dose computed tomography (LDCT) screening for individuals aged 50 to 80 who are current or former smokers with a pack-year history of more than 20[25].

In this study, chronic smoking was more prevalent among males, with only minor differences compared to previous findings [24, 26-28].

COPD diagnosis was also more common among men, likely due to the higher smoking rates in this group, as noted earlier[29, 30]. The prevalence of chronic smoking among COPD patients was close to 90%, confirming its significant role in disease progression. Although no statistically significant differences were found in COPD severity based on smoking status, ever-smokers were more frequently classified in GOLD stages III-IV. This suggests the negative impact of smoking on disease progression and underscores the potential benefits of early intervention — particularly through smoking cessation — in reducing the disease burden.

The average pack-year index was slightly lower in patients with COPD alone compared to those with both COPD and lung cancer (40.45 vs. 42.19), but this difference was not statistically significant.

Although cumulative smoking exposure was lower among patients with COPD alone compared to those with both COPD and lung cancer, the difference was not significant enough to suggest an increased likelihood of lung cancer diagnosis in COPD patients with a higher pack-year index.

Beyond recognizing smoking as a major risk factor for lung cancer, an important aspect of this study is the association between lung cancer and occupational exposure to respiratory hazards. The significant differences in occupational exposure and the types of substances involved suggest that workplace exposure to various toxic agents — such as paint, heavy metals, and fuels — plays a crucial role in lung cancer risk. This finding indicates that exposure to hazardous substances in work environments can contribute to lung damage and the development of lung cancer, even in the absence of smoking. These findings have significant implications for workplace safety policies, emphasizing the need for stricter preventive measures to protect workers exposed to respiratory hazards.

BMI analysis revealed a significant difference between patients with COPD alone and those

with lung cancer, with oncology patients having a lower BMI. This finding aligns with the typical presentation of lung cancer, where weight loss is a common feature. It highlights the metabolic impact of malignancy, including nutritional deficiencies and the catabolic effects of systemic inflammation, which were also demonstrated in this study and play a crucial role in the pathogenesis of both diseases.

Thrombocytosis, when present, may serve as an additional biomarker of inflammation and could be associated with an increased risk of thromboembolic events in oncology patients.

The presence of anemia in cancer patients has important therapeutic implications, emphasizing the need for correcting nutritional deficiencies and initiating appropriate treatment, which underscores the necessity of close monitoring in this population.

Central lung cancer localization was predominant among ever-smokers, which can be explained by the fact that smoking-related lung cancers are most commonly squamous cell carcinomas or small cell carcinomas, both of which tend to develop near the pulmonary hilum[31]. However, adenocarcinoma, which is typically peripherally located and more frequently observed in never-smokers, can also occur in ever-smokers. Additionally, the clinical similarities between lung cancer and COPD highlight the importance of maintaining a high level of suspicion for an underlying malignancy in COPD patients. The identified comorbidities confirm trends observed in other studies[32] and may influence the clinical presentation and quality of life, necessitating periodic evaluation.

Conclusions

The analysis of epidemiological and clinical variables confirms the association between chronic smoking, COPD, and lung cancer, underscoring the importance of prevention strategies and early screening. This study reinforces that the majority of COPD patients are chronic smokers and that disease severity may correlate with tobacco exposure. Additionally, COPD is considered a risk factor for lung cancer, suggesting that chronic inflammation and oxidative stress play a role in carcinogenesis. The impact of smoking-related diseases affects both the quality of life and mortality of patients. Therefore, public health strategies should prioritize effective smoking cessation programs, lung cancer screening for COPD patients, and a multidisciplinary approach for their monitoring and treatment. Such strategies are essential in reducing the overall burden of these diseases on society.

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Abbreviations

The following abbreviations are used in this manuscript:

Chronic Obstructive Pulmonary Disease	COPD
Reactive Oxygen Species	ROS
Deoxyribonucleic Acid	DNA
C-Reactive Protein	CRP
Nuclear Factor Kappa B	NF-kB
Non-small Cell Lung Cancer	
Small Cell Lung Cancer	SCLC
Protein 53 Kilodaltons	p53
Phosphoinositide 3-Kinase	PI3K
Hypoxia-Inducible Factor 1-Alpha	HIF-α
N-Acetylcysteine	NAC
Global Initiative for Chronic Obstructive	
Lung Disease	GOLD
Body Mass Index	BMI
Standard Deviation	SD
Male	M
Female	F
Systolic Blood Pressure	SBP
Diastolic Blood Pressure	BP
Forced Expiratory Volume in 1 Second	FEV1
Coronary Artery Disease	CAD
High Blood Pressure	HBP
Heart Failure	F
Low-dose Computed Tomography	LDCT

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