



# The Correlation Between Type and Stage of Lung Cancer with The Chronic Obstructive Pulmonary Disease Group at Arifin Achmad Hospital, Pekanbaru

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## Abstract

**Background:** The relationship between lung cancer (LC) and chronic obstructive pulmonary disease (COPD) has been extensively studied but is still up for debate. COPD is a molecularly based illness and one of the independent risk factors for lung cancer, particularly squamous cell carcinoma. This study uses spirometry to assess the relationship between the type and stage of LC and COPD in a group of LC patients at Arifin Achmad Hospital.

**Methods:** This cross-sectional study was conducted on lung cancer patients in Arifin Achmad Hospital, Pekanbaru, from June 2022 to December 2022. Based on spirometry examination, patients were grouped according to the degree of COPD. Then, the relationship between the COPD group and the type and degree of cancer was determined.

**Results:** The study involved 52 patients predominantly male (71.2%), aged over 40 years (92.3%), Smokers and former smokers with Severe Brinkman index (69.2%), restrictive lung function (34.6%), COPD group D (40.4%), adenocarcinoma (61.5%), stage IV lung cancer (92.3%) and WHO Performance Status Scale 2 (61.5%). The FEV<sub>1</sub>/FVC rate in this study was 66.67%. There is a link between the stage of lung cancer and the group of COPD ( $P=0.001$ ).

**Conclusion:** There is a relation between the stage of LC in the COPD group, which is predominantly with stage IV lung cancer, and group D of COPD.

**Keywords:** COPD, lung cancer, spirometry

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## INTRODUCTION

Two lung disorders with the highest incidence and death rates worldwide are lung cancer and chronic obstructive pulmonary disease (COPD).<sup>1</sup> In Norway, it was discovered that 69% of lung cancer patients also had 39% COPD or 59% emphysema.<sup>2</sup> COPD patients have a risk of lung cancer that is up to 3–6 times higher compared to non-COPD smokers.<sup>3,4</sup> It has also been reported that patients with COPD experience an increase in lung cancer incidence of 0.8% to 1.7% annually.<sup>5,6</sup> The incidence of lung cancer among COPD patients, according to Chubachi et al, conducted in Japan over three years, was 2.3%.<sup>7</sup>

Numerous studies have been conducted to investigate the connection between COPD and lung

cancer.<sup>8</sup> A previous study by Tockman et al explained that the risk of lung cancer is related to aging, smoking, and lung function. Among smokers, the presence of airway obstruction is a high predictor of cancer development compared to others. Smokers with airway obstruction have a higher risk of developing lung cancer than smokers without airway obstruction.<sup>9</sup>

Indonesia is a country with a high number of active smokers. Based on data from the Ministry of Health, the number of smokers in Indonesia reaches 70 million people, dominated by young people. Riau is one of the provinces with a high smoking rate of 27.76% according to the Central Statistics Agency.<sup>10</sup> The abundant presence of smokers increases the risk of people who will suffer COPD and developing lung cancer years later.

Based on the gaps that the authors identified, we aim to motivate researchers to conduct research and analyze the relationship between the type and stage of the disease and the COPD group.

## METHODS

This study is a cross-sectional study conducted at Arifin Ahmad General Hospital, Pekanbaru, from June–December 2022 with a population of all cancer patients who seek treatment at the hospital. All patients who have been diagnosed with lung cancer and COPD (along with their group based on Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria), known subtypes of cancer cells, have done spirometry, and are willing to participate in the study following informed consent, are included. The patients with metastases, without COPD, and who failed to perform spirometry were excluded. Before starting to fill out the questionnaire, the patient will perform spirometry. Demographic data, age, gender, body mass index, job status, with smoking history were collected.

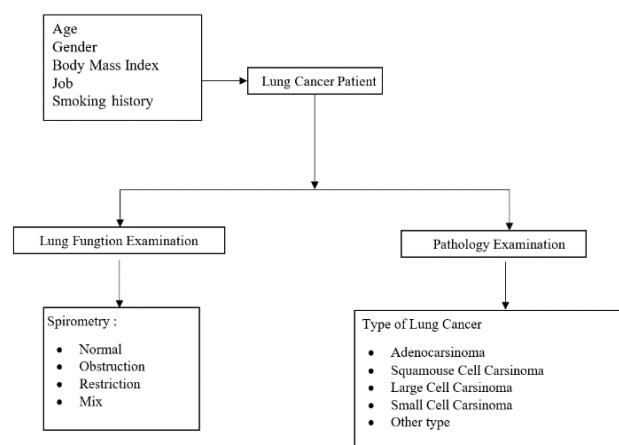


Figure 1. Study Workflow and Data Type Acquisition

Collected data were analyzed using SPSS Ver 24 for Macintosh. Descriptive analysis, for quantitative data, was presented as mean±standard deviation (SD), whereas qualitative data was presented as frequency and percentage (n (%)). After data normalization, bivariate analysis was performed to compare the lung cancer subtype and lung cancer stage with the COPD group using the chi-square test. Statistically significant was defined as  $P < 0.05$ . This research has been reviewed

and approved by the ethical committee of the Faculty of Medicine, Riau University, with Number B/077/UN19.5.1.1.8/UEPKK/2022.

## RESULTS

This study found 98 patients who had been diagnosed with lung cancer and 52 patients were included in the analysis as they had done interview COPD assessment test (CAT) and modified medical research council (mMRC) dyspnea scale, spirometry, bronchodilator tests, plain thoracic X-ray, thoracic CT scan, and diagnosed with lung cancer types based on histopathology examination.

Table 1. Demographical and General Characteristics of Research Respondents

Variables	n (%)
Age	
Mean (95% CI)	54.69 (51.91–57.48 )
No Risk (<40 years)	4 (7.7%)
Risk (>40 years)	48 (92.3%)
Sex	
Male	37 (71.2%)
Female	15 (28.8%)
Smoking History	
Smokers	19 (36.5%)
Non-Smokers	6 (11.5%)
Former Smoker	27 (51.9%)
Brinkman Index (n=28)	
Light	2 (3.8%)
Moderate	6 (11.5%)
Heavy	36 (69.2%)
COPD Group (n=28)	
B	2 (3.8%)
C	5 (9.6%)
D	21 (40.4%)
Lung Function	
Normal	4 (7.7%)
Obstructive	14 (26.9%)
Restrictive	18 (34.6%)
Mixed	16 (30.8%)
NSCLC	
Adenocarcinoma	32 (61.5%)
Squamous Cell Carcinoma	20 (38.5%)
Staging Cancer	
Stage I	1 (1.9%)
Stage II	1 (1.9%)
Stage III	2 (3.8%)
Stage IV	48 (92.3%)
PS	
0	7 (13.5%)
1	13 (25%)
2	32 (61.5%)

Based on Table 1, 37 patients (71.2%) were male and 48 patients (92.3%) were aged >40 years. This study also found that 19 patients (36.5%) were active smokers, 6 patients (11.5%) were non-smokers, and 27 patients were ex-smokers (51.9%). Among active and ex-smokers, the Brinkman index consisted of 2 patients (3.8%) with mild, 6 patients (11.5%) with moderate, and 36 patients (69.2%) with severe. Spirometry test found that 4 patients (7.7%) had normal lung function, 14 patients (26.9%) with obstruction, 18 patients (34.6%) with restriction, and 16 patients (30.8%) with mixed dysfunction. On the COPD categorization, 2 patients (3.8%) belong to group B, 5 patients (9.6%) to group C and 21 patients (40.4%) to group D.

The entire histology subtype included patients showing non-small cell lung carcinoma, with 32 patients identified as adenocarcinoma (61.5%) and 20 patients as squamous cell carcinoma (38.5%). Lung cancer with stage 4 became the most common finding in this study (48 patients, 92%). Performance status (PS) 2 is also frequently found in the majority of patients (32 patients, 61.5%).

Table 2. Pulmonary Function Test Characteristics

Variable	Minimal	Maximal	Mean	SD
FVC (mL)	865	3.478	1.934	863.01
FEV <sub>1</sub> (mL)	504	2.273	1.216	450.28
FEV <sub>1</sub> /FVC (%)	40.0	108.0	66.67	16.8

Our spirometry results showed a minimum FVC value of 865 mL, a maximum of 3.478 mL, and a mean of 1.934 mL. The mean value for FEV<sub>1</sub> is 1.216 mL, while the mean FEV<sub>1</sub>/FVC ratio is 66.67 mL (Table 2).

Table 3. The Correlation of Lung Cancer Subtype with COPD Group

Characteristics	COPD Group			P
	B	C	D	
Lung Cancer Subtype				
Ade noca carcinoma	2 (15.4%)	5 (38.5%)	6 (46.2%)	0.005
Squamous Cell Carcinoma	0 (0.0%)	0 (0.0%)	15 (100%)	
Stage				
III	1 (100%)	0 (0.0%)	0 (0.0%)	0.0001
IV	1 (3.7%)	5 (18.5%)	21 (77.8%)	

Regarding correlation analysis, there is a significant relationship between the type and stage of patients in the COPD group (Table 3).

Based on spirometry results, COPD patients have lung function values with FEV<sub>1</sub>/FVC ratios <70%. In this study, 28 patients met the criteria for COPD. Correlation analysis between COPD patients and demographics is shown in Table 4.

Table 4. The Correlation of COPD with Patient Demographic Profile

Variables	COPD Group		P
	COPD	Non-COPD	
Age			
No Risk (<40 years)	0 (0.0%)	4 (7.7%)	0.025
Risk (>40 years)	28 (53.8%)	20 (38.5%)	
Sex			
Male	26 (50%)	11 (21.2%)	0.0001
Female	2 (3.8%)	13 (25%)	
Smoking history			
Smokers	19 (36.5%)	0 (0.0%)	0.0001
Non Smokers	2 (3.8%)	4 (7.7%)	
Former Smoker	7 (13.5%)	20 (38.5%)	

## DISCUSSION

This study found that lung cancer is predominantly found in male patients. Our findings are in line with previous research, which states that lung cancer is more prevalent in men and smokers. Cigarette smoking is one of the significant risk factors for lung cancer. Previous research indicates that men were more likely to smoke than women, although this disparity has narrowed in recent years, which aligns with the overall decline in smoking rates. Notably, within the smoking population, men are more prone to developing lung cancer compared to women.<sup>11</sup>

The most common type of lung cancer is NSCLC, that to be precise, prevalent with adenocarcinoma. This study also exhibited the same previous study results that the entire patient population has NSCLC with adenocarcinoma as the prevalent subtype. Most lung cancers are diagnosed at stages III and IV,<sup>4,12</sup> and lung cancer patients diagnosed with COPD based on spirometry have a good clinical performance, generally PS 0-2, with an average of 70%.<sup>13</sup> Following previous research, this study's patients showed a clinical appearance of PS 2 as the most common, with the majority belonging to stages 3 and 4. Patients with poor clinical appearance are generally unable to perform spirometry tests, so they are excluded from this study

Spirometry tests aim to measure static and dynamic lung volume as an indicator of lung function. Abnormalities can be in the form of restriction, obstruction, or mixture. Spirometry tests can assist in diagnosis by determining the type of abnormality and its severity, but cannot make a specific diagnosis.<sup>14</sup> This study shows that most patients have a distinctive type of lung abnormality, with restrictive disease as the primary finding among lung cancer patients.

Decreased lung function due to restriction is associated with the risk of lung cancer. Decreased FEV<sub>1</sub> in smokers increases the incidence of cancer in patients. Every 100 ml decrease in FEV<sub>1</sub> will increase 5% of lung cancer. Even a slight decrease in FEV<sub>1</sub> can increase the risk of lung cancer by 1.3 in men and 2.64 in women.<sup>15</sup>

In some studies, it is mentioned that lung cancer patients do not always experience airflow obstruction. The FEV<sub>1</sub>/FVC ratio is still within normal limits, and a normal FEV<sub>1</sub> value. This indicates a change in spirometry results in cancer patients, which is related to other risk factors such as smoking duration and exposure to air in the work environment.<sup>15</sup> In addition to external factors that can reduce the FEV<sub>1</sub>/FVC ratio, genetic factors can also have an effect. Some theories also suggest using FEV<sub>1</sub>/FVC ratio phenotyping as a biomarker in lung cancer.<sup>15</sup>

Spirometry examination was performed to find the prevalence of lung cancer among patients with COPD. In this study, 61.5% in adenocarcinoma type and 38.5% in squamous cell carcinoma type. The bivariate test used in this study indicates that there is a correlation between the incidence of lung cancer and COPD, which is supported by research by Zhai et al who looked at the relationship between the results of  $P=0.005$  and found that there is a correlation ( $P=0.001$ ) between the incidence of lung cancer and COPD.<sup>16</sup>

Forty-eight patients with stage IV, two patients with stage III, and one patient from each stage I and II were described in this research. Table 4 shows that there were 77.8% of patients with COPD in group D, 18.5% of patients in group C, and 3.7% of patients in group B. The findings of the statistical test revealed

that the value of  $P=0.001$ , indicating that there is a strong correlation between the type and stage of COPD Group patients. According to this study, there is a link between the stage of lung cancer and the prevalence of COPD. When compared to smokers without COPD, patients with COPD have a risk of lung cancer up to 3–6 times higher.<sup>3–5</sup> The average annual risk of lung cancer for those with COPD is believed to be between 0.8 and 1.7%.<sup>5</sup>

Based on spirometry results, COPD patients have lung function values with FEV<sub>1</sub>/FVC ratios <70%. In this study, 28 patients met the criteria for COPD. In COPD patients, age has a significant influence on the incidence of COPD, with a value of  $P=0.025$ . While gender, men have a strong relationship with the incidence of COPD, with a value of  $P=0.001$ , and smokers also have a strong relationship with the incidence of COPD, with a value of  $P=0.001$ .

## LIMITATION

There are several limitations in this study, among which are most of the samples in this study are lung cancer patients with stages III and IV, this is because in Indonesia patients who seek treatment at the hospital are patients who have complaints such as shortness of breath and chest pain, as well as the lack of screening of lung cancer and COPD patients in our country. Symptoms of shortness of breath and chest pain are also difficult to distinguish between patients with COPD symptoms alone or accompanied by lung cancer.

## CONCLUSION

Lung cancer patients who became research subjects were mainly male, had an average age of 54.69 years, smokers' lung function abnormalities with moderate and severe Brinkman index were mostly restricted and the most common type of lung cancer suffered was adenocarcinoma. The characteristics of COPD subjects are mainly male, smokers, the most common type of cancer suffered is adenocarcinoma, has the most common lung function abnormalities are restriction, mixture, and obstruction. There were 21 patients in stage IV with

group D COPD, 1 patient in stage IV with group B COPD, and 5 patients in stage IV with group C COPD. The statistical test results showed there is a significant relationship between the type and stage of patients in the COPD group.

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## CONFLICT OF INTEREST

The authors affirm have no conflict of interest.

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