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Original Research Article

The relationship between lobar distribution and primary lung cancer histological types

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ABSTRACT

Background: Lung cancer is the primary cause of cancer-related deaths globally. Accurate tumor location and subtype characterization are critical for optimizing treatment and predicting outcomes. This study aims to identify the relationship between lobar distribution and primary lung cancer histological types and describe the most recent patterns at the country-level origin.
Methods: This cross-sectional study was conducted at a major tertiary care hospital in Bangladesh, including 165 patients recruited using purposive non-probability sampling. Data were collected using a semi-structured case record form and analyzed using SPSS version 28.0.
Results: Tumors were most commonly found in the central area (58.2%). Squamous cell carcinoma was the most prevalent type (46.1%), followed by adenocarcinoma (38.8%), small cell carcinoma (13.9%), and large cell carcinoma (1.2%). The incidence of squamous cell carcinoma was significantly higher in the upper lobe of the right lung (55.9%) compared to other forms, particularly in the central region of the right lung ($P < 0.001$). Squamous cell carcinoma was more common in the lower part of the left lung (42.9%), while adenocarcinoma was exclusively observed in the lingular portion of the left lung (100%). The major bronchus of the left lung primarily exhibited squamous cell carcinoma (60%), but this finding was not statistically significant (p=0.899).
Conclusion: The study highlights the significant association between lobar distribution and histological types of primary lung cancer, emphasizing the need for precise tumor characterization for better treatment strategies and prognostic evaluation.

Keywords: Lung cancer, Lobar distribution, Histological types, Tumor characteristics

INTRODUCTION

Worldwide, lung cancer stands as the most significant cause of cancer-related death for both men and women. Lung cancer represents 19% of all cancer cases.[1,2] The IARC's most recent study projected, based on GLOBOCAN 2018 estimates, that the incidence of cancer worldwide would rise to 18.1 million new cases and 9.6 million fatalities in 2018.[3] The 2018 lung cancer mortality rate was the highest cause of cancer cases and deaths, with 2.1 million new cases (11.6%) and 1.8 million deaths (18.4%) projected.[4] The multidisciplinary approach to

detecting and treating lung cancer relies heavily on determining the histologic type.[5] Lung cancer is sub-grouped into two major histological types, Non-small cell cancer (NSCLC) (85 % of patients) and Small-cell lung cancer (SCLC) (15% of patients).[6] The prevalence of lung cancer in men is squamous cell carcinoma (40.3%), adenocarcinoma (22.6%), and in women, adenocarcinoma (52.1%) and small cell carcinoma (15.8%).[7] Most invasive adenocarcinomas occurred in the upper lobes (69%).8 Among the newly diagnosed lung adenocarcinoma patients, 61.7 % had primary tumors in the upper lobes, and 32.8% had them in the lower lobes.[9] Squamous cell carcinomas tend to be larger and centrally located. On the contrary, adenocarcinomas are usually periphery tumors.[10]

The location of tumors has been linked to the prognosis of different solid tumors.[11] The patients with NSCLC in the lower lobes had a higher all-cause mortality rate than those with non-lower lobar cancers (48.6% and 40.3%, respectively).[12] In a meta-analysis of a 5-year survival rate, better outcomes were observed in patients with upper lobe tumors.[13] The SEER program (Surveillance, Epidemiology, and End Results Program) reported that patients diagnosed with small cell lung cancer (SCLC) had a 5-year survival rate of 6.5%, while those diagnosed with non-small cell lung cancer (NSCLC) had 23.1%.[14] The current study aimed to identify the relationship between lobar distribution and primary lung cancer histological types and to describe the most recent patterns at the country-level origin.

METHODS

Study area

An observational cross-sectional study was conducted in the Department of Respiratory Medicine, Department of Medicine, and Department of Oncology at Mymensingh Medical College Hospital in Mymensingh between

Study period

Study was conducted between May 2023 and October 2023.

Inclusion criteria

One hundred sixty-five patients were selected based on specific inclusion and exclusion criteria.

Exclusion criteria

Patients were excluded if they had prior lung surgery, previous chemotherapy or radiotherapy, secondary lung cancer, severe comorbid conditions that could interfere with the study, or were unwilling to provide informed consent. A purposive type of non-probability sampling technique was utilized.

The analysis centered on the patient's socio-demographic variables, which included age, gender, address, occupation, and economic status. Furthermore, the study focused on the percentage of lobar distribution and the percentage of histological types of lung cancer, which were carefully analyzed and evaluated to draw meaningful conclusions.

Ethical approval

The study was conducted with the approval of the Institutional Review Board (Memo No. MMC/IRB/2023/570; Date: 24.6.2023), ensuring that all ethical standards were met. Patients exhibiting clinical characteristics indicative of lung cancer and verified through a chest CT scan and cytological/histopathological reports sought treatment at the OPD of the Respiratory Medicine, Medicine, and Oncology departments at Mymensingh Medical College Hospital consisted of the study population.

Statistical analysis

SPSS version 28.0, designed for Mac, was used for the statistical analyses. Continuous variables were calculated for mean values. Frequencies and percentages were used to indicate quantitative observations.

RESULTS

The analysis of patient demographics reveals some interesting observations. Notably, 38.2% of patients were aged 60-69 years, 86.7% of participants were male, 81.8% resided in rural areas, and 10.3% were in urban areas. About 59.4% of patients were from low socioeconomic backgrounds, with farmers representing the most significant proportion (42.4%) (Table 1).

Table 2 shows the various respiratory conditions, such as COPD (61.8%), asthma (24.2 %), tuberculosis (15.2%, post-TB fibrosis (11.5%, and DPLD (2.4%) of the patients. Among the patients, 64.8% had smoked for 20-39 pack years, 24.2% consumed Betel nut, and 18.2% previously used Jarda (Table 3).

Patients reported coughing, wheezing, difficulty breathing, hemoptysis, sputum production, weight loss, and anorexia. The incidence rates of these symptoms can vary widely, ranging from 18.2% to 96.4% (Table 4).

Over 40% of the patients had tumors larger than 7 cm, while 35.8% had tumors between 3-5 cm (Table 5). Figure 1 and Table 6 describe the general locations of the lung tumors.

Table 7 indicates the specific locations of tumors in the upper regions of the lungs (41.2% on the right and 21.2% on the left). Only 14.5% of patients showed partial lung collapse, while only 4.8% had complete collapse.

Necrosis, cavitation, and air bronchogram were observed in 10.3%, 11.5%, and 3% of cases, respectively. 4.5% of individuals had pleural effusion on the right side, while 19.4% had it on the left, and 4.8% had it bilaterally. 55.2% of individuals showed lymph node involvement, with the most common areas being right hilar, left hilar, and subcarinal (21.8%, 21.2%, and 23.6%, respectively). Metastases were identified in 57.6% of the patients, while solitary pulmonary nodules were observed in 10.9% of the patients included in the study. A pie chart shows squamous cell carcinoma as the most common type of cancer (46.1%), followed by adenocarcinoma (38.8%). Small cell carcinoma constituted 13.9% of cases, while large cell carcinoma was the least frequently diagnosed, accounting for only 1.2% of participants (Figure 2).

Table 1: Distribution of the study population by demographic characteristics (n=165).

Demographic characteristics	Number of patients	Percentage
Age (years)		
<30	1	0.6
30-39	1	0.6
40-49	14	8.5
50-59	35	21.2
60-69	64	38.8
>69	50	30.3
Mean±SD	55.3±10.9	
Sex		
Male	143	86.7
Female	22	13.3
Residence		
Rural	135	81.8
Urban	17	10.3
Semi-urban	13	7.9
Economic status		
Low	98	59.4
Lower-middle	59	35.8
Upper-middle	8	4.8
Occupation		
Farmer	70	42.4
Businessman	35	21.2
Service holder	7	4.2
Home maker	19	11.5
Unemployed	20	12.1
Others	14	8.5

Table 2: Medical history of the patients (n=165).

Medical history	Number of patients	Percentage
TB	25	15.2
Post TB fibrosis	19	11.5
COPD	102	61.8
Asthma	40	24.2
DPLD	4	2.4

Table 3: Personal history of the participants (n=165)

Personal history	Number of patients	Percentage
Tobacco use (Pack year)		
0	38	23.0
1-9	7	4.2
10-19	4	2.4
20-39	107	64.8
40-59	9	5.5
Other Substances abuse		
Betel nut	40	24.2
Jarda	30	18.2
Marijuana	4	2.4

Table 4: Clinical features of the patients (n=165).

Presenting complaints	Number of patients	Percentage
Cough	159	96.4
Hemoptysis	31	18.8
Shortness of breath	133	80.6
Chest pain	117	70.9
Wheezing	30	18.2
Sputum	40	24.2
Weight gain	117	70.9
Anorexia	125	75.8
Fever	76	46.1

Multiple responses*

Table 5: Size of the lesion ((n=165).

Size of the lesion (cm)	Frequency	Percentage
3-5	59	35.8
6-7	39	23.6
>7	67	40.6

Table 8 describes adenocarcinoma and squamous cell carcinoma as the predominant types of lung cancer in different lung regions.

Squamous cell cancer is more prevalent in the upper lobe of the right lung (55.9%) compared to other types of cancer. It is also linked explicitly to the center area of the right lung.

Adenocarcinoma predominantly manifests in the lower lobe of the right lung, accounting for 72.9% of cases. The lower region of the left lung exhibits a greater prevalence of squamous cell cancer (42.9%) in comparison to other forms of cancer.

Adenocarcinoma is exclusively observed in the lingular portion of the left lung, accounting for 100% of cases. The left lung's major bronchus predominantly displays Squamous Cell Carcinoma (60%).

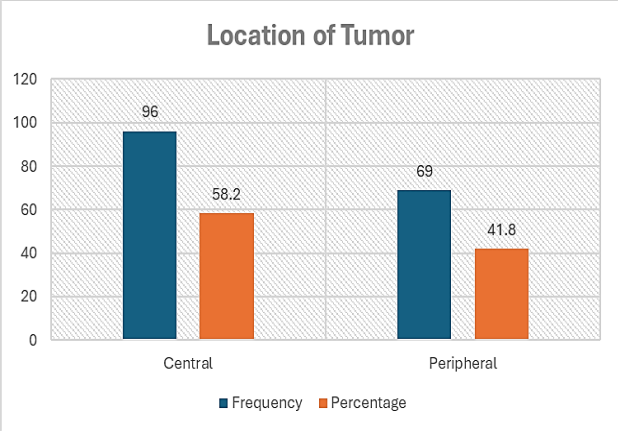

Figure 1: Location of the tumors.

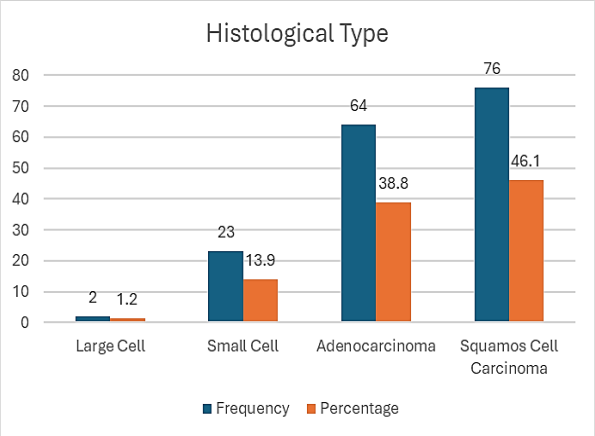

Figure 2: The frequency of histological types of lung cancer.

Table 6: Location and histological types of the tumors.

Location	Adenocarcinoma	Squamous cell carcinoma	Small cell carcinoma	Large cell carcinoma
Central	31 (32.3)	46 (47.9)	19 (19.8)	0 (0.0)
Peripheral	33 (47.8)	30 (43.5)	4 (5.8)	2 (2.9)

Table 7: Specific location of lung cancer (n=165).

Location	Frequency	Percentage
Mediastinal		
Absent	157	95.2
Present	8	4.8
Right lung		
None	69	41.8
Upper	68	41.2
Middle	6	3.6
Lower	22	13.3
Left lung		
None	92	55.8
Upper	35	21.2
Lingular	2	1.2
Lower	31	18.8
Main bronchus	5	3.0

Table 8: Showing the lobar distribution of lung cancer (n=165).

	Adenocarcinoma	Squamous cell carcinoma	Small cell carcinoma	Large cell carcinoma	P value
Lobes of right lung					
Upper	19 (27.9)	38 (55.9)	11 (6.2)	0 (0.0)	<0.001
Middle	0 (0.0)	6 (100)	0 (0.0)	0 (0.0)	
Lower	16 (72.7)	2 (9.1)	2 (9.1)	2 (9.1)	
Lobes of left lung					
Upper	14 (40.0)	15 (42.9)	6 (17.1)	0 (0.0)	0.899
Lingular	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	
Lower	11 (35.5)	16 (51.6)	4 (12.9)	0 (0.0)	
Main bronchus	2 (40)	3 (60)	0 (0.0)	0 (0.0)	

DISCUSSION

This study attempted to identify the relationship between lobar distribution and primary lung cancer histological types in a tertiary medical college in Bangladesh. It was conducted as a cross-sectional observational study. Between May 2023 and October 2023, 165 patients who satisfied the inclusion criteria were identified. The study found that 38.2% of lung cancer patients were in the age range of 60-69 years, with an average age of 55.3±10.9 years. Ueno et al, also reported an increased incidence of lung cancer in individuals aged 65 and above.17 Most patients were male, accounting for 86.7% of the total, which is consistent with the findings of Barta et al.18 Most the participants (42.4%) in this study were engaged in agricultural occupations, whereas 59.4% came from low socioeconomic backgrounds. De Groot et al. (2018) found that 27.9% of individuals living below the poverty line engage in smoking, which is a significant contributing factor to the onset of lung cancer.19 The patients exhibited a range of respiratory diseases, including COPD (61.8%), asthma (24.2%), tuberculosis (15.2%), post-TB fibrosis (11.5%), and DPLD (2.4%). In 2023, Preda et al, highlighted that tuberculosis could potentially induce carcinogenic effects by genetic alteration, persistent inflammation, and fibrosis.20 According to a study conducted by Paraskevas et al. in 2021, individuals with bronchial asthma have an increased likelihood of acquiring lung cancer. The predicted odds ratio for squamous and small cell lung carcinoma is 1.69 and 1.71, respectively.[21] In a study conducted in 2018, Husebo et al established that individuals with chronic obstructive pulmonary disease (COPD) were at a considerably elevated risk of acquiring lung cancer.[22] This study does not demonstrate any association between family history and lung cancer; only 4.2% of patients have a family history of lung cancer. In 2012, Cote et al proposed that those with a family history of a first-degree relative have a roughly 50% higher chance of developing lung cancer compared to those without a family history.[23] The patients experienced symptoms such as coughing, wheezing, shortness of breath, coughing up blood, sputum production, losing weight, and losing appetite. The prevalence of these symptoms ranged from 18.2% to 96.4%. Buccheri et al, highlight that, on average, patients encountered two or three symptoms. The most prevalent symptoms were cough and systemic symptoms, followed by dyspnea, chest discomfort, and bloody sputum.[24] According to the study, small cell carcinoma accounts for 19.8% of all lung cancers in the central region and 48.5% in the peripheral region. A 2022 study by Gao et al. found that 53.3% of our patients had peripheral tumors at the time of diagnosis, and 39.0% had central tumors.[25] The study reported squamous cell carcinoma as the most common type of cancer (46.1%), followed by adenocarcinoma (38.8%). Small cell carcinoma constituted 13.9% of cases, while large cell carcinoma was the least frequently diagnosed, accounting for only 1.2% of participants. In 2005, Hamilton et al. reported the following distribution of cancer types, 32% squamous carcinoma, 23% adenocarcinoma, 21% small cell carcinoma, 9% large cell carcinoma, and 11% nonspecific carcinoma.[26] Adenocarcinoma and squamous cell Carcinoma are the predominant types of lung cancer that occur in different regions of the lung. Squamous Cell cancer is more prevalent in the upper lobe of the right lung (55.9%) compared to other types of cancer, which is statistically significant ($p<0.001$). It is also linked explicitly to the central area of the right lung. The lower area of the left lung exhibits a greater prevalence of Squamous Cell cancer (42.9%) in comparison to other forms of cancer. Significantly, adenocarcinoma is solely seen in the lingular lobe (100%) of the left lung. The left lung's major bronchus predominantly displays Squamous Cell Carcinoma (60%), which is not statistically significant ($p=0.899$). According to Wang BY et al, most cases of lung cancer were found in the upper lobe when considering the tumor's location.[27] More precisely, squamous cell carcinoma constituted 53.67% of these instances, which is consistent with the results of our study. Our study found that adenocarcinoma primarily occurs in the lower lobe of the right lung, making up 72.9% of cases. Based on the study conducted by Wang BY et al, the occurrence of adenocarcinoma was found to be 53.92% in the upper lobe of lung. Nevertheless, this finding did not show any statistical significance.[27]

Limitations of the study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

The findings of the current study emphasized the need to accurately identify the histological subtypes while making treatment options and evaluating prognosis. Precise identification of the tumor subtype is crucial for optimizing treatment strategies and predicting patient prognoses.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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