

Correlation between Clinico-radiological findings with Histopathological Patterns of Lung Cancer

Dr. Morshida Begum^{*1}, Dr. Md. Towhid Hossain², Dr. Abrar Mahbub³, Dr. AK. M Anowar Hossain⁴, Dr. Maruf Rahman⁵, Dr. Fauzia Tasnim Hossain⁶

^{*1}Associate Professor, Department of Radiology and Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh

²Professor and Head, Department of Pathology, North Bengal Medical College, Sirajgonj, Bangladesh.

³MBBS, Clinical Fellow, New Cross Hospital, The Royal Wolverhampton NHS Trust, Wolverhampton, West Midlands, UK

⁴Associate Professor, Department of Radiology and Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

⁵MBBS, MS Phase B Student, National Institute of Traumatology & Orthopaedic Rehabilitation, Dhaka, Bangladesh.

⁶MBBS, MO, Doctors Trust Kidney Dialysis and Transplant Center, Dhaka, Bangladesh.

KEYWORDS

Lung Cancer,
Clinico-Radiological
findings,
Histopathological
Pattern

ABSTRACT

Background: Lung cancer is the most common fatal neoplastic disease and the leading cause of cancer-related deaths worldwide. In Bangladesh, lung cancer has been in increasing trend possibly due to an increase in smoking and environmental air pollution.

Aim: The aim of the present study was to find out the correlation between clinico-radiological findings with histopathological patterns of lung cancer in Bangladesh.

Methods: This was a retrospective study conducted in the department of Radiology and Imaging during the period of January 2024 to December 2024. A total of 300 histopathologically confirmed diagnosed patients of lung cancer were included in the study.

Results: Out of 300 patients, 268 (89.33%) patients were smokers, 141 (47%) patients had a prior history of COPD. Lymphadenopathy was present in 40 (13.33%) patients. The ECOG performance status 37% of patients remained on scale 2, followed by 35% on scale 3. Among the clinical symptoms, cough was present in 258 cases (90%) followed by breathlessness 210 (70%). Radiological examination showed mass lesion as the most common finding 249 (83%) followed by pleural effusion 42(14%). Mass lesion was the major findings in both adenocarcinoma and squamous cell carcinoma. Pleural effusion was the major findings in small cell carcinoma followed by squamous cell carcinoma. Lung collapse was more prominent in squamous cell carcinoma. Lymphadenopathy was more common in adenocarcinoma.

Conclusion: This study showed that smoking is a principal risk factor in causation of lung carcinoma. Strong correlation was found between clinic-radical findings with patterns of lung cancer.

INTRODUCTION

Lung cancer had become one of the leading causes of preventable death worldwide at the end of the 20th century. Increasing life span along with exposure to etiological agents have made this once a rare disease a very serious health problem. It is the leading cause of cancer death (18.0% of the total cancer deaths) and the second most commonly diagnosed cancer in both sexes worldwide. Lung cancer is the most common cancer worldwide since 1985 both in terms of incidence and mortality. Globally, lung cancer is the largest contributor to new cancer diagnoses and to death from cancer. [1] In India, lung cancer constitutes 6.9 percent of all new cancer cases and 9.3 percent of all cancer-related deaths in both sexes. [2] According to World Health Organization (WHO), classification formulated in 1999; there are six major types of malignant epithelial Non-Small Cell Lung Carcinoma (NSCLC) and Small Cell Lung Carcinoma (SCLC). [3] Smoking is the cause for more than 85% of the bronchogenic carcinoma cases. [4]

Squamous cell carcinomas and small cell carcinomas shows significant association with smoking. [5] Occupational exposures and air pollution approximately accounts for 2% to 9% of lung cancers. Approximately 85% patients with lung cancer are symptomatic at presentation. In remaining patients, lung cancer is diagnosed by various radiological methods initiated for an unrelated health problem and histopathological examination. [6] The clinical features of carcinoma lung result from the local growth and regional growth of the tumor as well as lymphatic invasion, haematogenous distant metastatic spread and remote para-neoplastic effects from tumour products or immune cross- reaction with tumour antigens. [7] More interest has been developed in the histological characterization of lung cancer in recent years in view of newer histology guided therapeutic modalities and genomic classification of lung carcinoma. [8,9]

Targeted therapy or immunotherapy is mainly based on subtype analysis for mutation. Another changing trend has been observed in the morphological variety, with adenocarcinoma becoming equal to or even overtaking squamous cell carcinoma sometimes in some Asian and most Western countries. [10] About one-third of patients present with symptoms resulting from loco- regional growth of the tumor as well as hematogenous and lymphatic spread and para- neoplastic manifestations. In others, bronchial carcinoma is diagnosed by radiology done for unrelated health problems followed by histopathology.

In the light of above context, the aim of the present study was to find out the correlation between clinico-radiological profiles with histopathological patterns of lung cancer.

1. MATERIALS AND METHODS

This was a retrospective study conducted in the Department of Radiology and Imaging, Bangladesh Medical University, Dhaka. Data were collected from the Department of Radiology and Imaging and Department of Pathology of Bangladesh Medical University, Dhaka, Islami Bank Hospital, Mirpur Dhaka and other tertiary referral center of Dhaka city over a duration of 1 year patients with histopathologically confirmed lung cancer. Suspected lung tissue were collected as CT guided core biopsy by interventional Radiologist. Histopathology of the core tissues were examined by pathologist.

A total of 300 histopathologically confirmed diagnosed patients with lung cancer were included in the study. Patients who had lung metastasis from a non-pulmonary primary tumor, lymphoproliferative disorder, tuberculosis and the patient already received treatment for lung cancer were excluded from this study.

Complete sociodemographic pictures, smoking status, previous history of COPD, radiological and histopathological characteristics of the tumor were recorded in the study. The performance status of patients was documented using the Eastern Cooperative Oncology Group scale (ECOG). CT scan of the chest was done in all patients. CT-guide dorfbre-optic bronchoscopic guided tissue sampling from lung lesions followed by histopathological examination was done to diagnose the appropriate tumor type.

Pathological characteristics of the tumor, clinical status of patients and radiological findings were recorded in this study. Data were entered and analyzed using SPSS software.

2. RESULTS

This retrospective study was undertaken on 300 histopathologically confirmed lung cancer to correlate clinic-radiological findings. Two hundred and fifty two were male (84%) and 48 (16%) female. Lung cancer less than 40 years and more than 70 years becoming decline in this study.

Table-1: Demographic and base line characteristics of the study group ; (n=300)

Gender	N (%)
Male	252(84)
Female	48 (16)
Age in years	
<40	16(5.33)
41-50	47 (15.67)
51-60	107 (35.67)
61-70	105 (35)

>70	25(8.33)
Total	300 (100%)
Smoking status	
Yes	268(89.33)
No	32 (10.67)
Total	300 (100%)
Chronic obstructive pulmonary Disease (COPD)	
Yes	141 (47)
No	159(53)
Total	300 (100%)
Lymphadenopathy	
Yes	40(13.33)
No	260(86.67)
Total	300 (100%)
Eastern Cooperative Oncology Group scale (ECOG)	
1	15(5)
2	111 (37)
3	105 (35)
4	45 (15)
5	24(8)
Total	300 (100%)

There were 36% and 35% of patients who belonged to age between 51-60 year and 60-70 year respectively. Out of 300 patients, 268 (89.33%) patients were smokers, 141 (47) patients had a prior history of COPD, and lymphadenopathy was present in 40 (13.33%) patients. The ECOG performance status 37% of patients remained on scale 2, followed by 35% on scale 3.

Table 2: Distribution of the study subjects according to clinical findings; (n=300)

A detailed analysis of clinical symptoms revealed cough in (90%), breathlessness (70%), chest pain (60%) followed by hemoptysis (43%), sputum production (39%), voice change (17%) and superior vena cava obstruction (6%). Radiological examination showed mass lesion was the most common finding (83%) followed by pleural effusion (14%) and collapse (13%)

Table-3: Histopathological diagnosis of the study group among smokers, non-smokers, COPD and Non-COPD

Histopathological type	Total (n=300) (%)	Smoker (268)	Non-smoker (32)	COPD (141)	Non-COPD (159)
Small cell carcinoma	45 (15%)	43	7	26	21
Squamous cell carcinoma	105 (35%)	95	11	64	40
Adenocarcinoma	138 (46%)	121	14	42	98
Undifferentiated carcinoma	12 (04%)	9	0	9	0
Total	300	268	32	26	159

Table-3 shows that the most frequent lung cancer in this study group was adenocarcinoma 138 (46%) followed by squamous cell carcinoma 105 (35%). Adenocarcinoma was the most common histopathological type in non-COPD patients and squamous cell carcinoma (35%) in COPD patients.

Table-4: Association of histopathological diagnosis with CXR/CECT findings

Histopathological diagnosis	CXR/CECT findings (Radiologic findings) of 300 study group			
	Effusion (n=42)	Mass (n=249)	Collapse (n=39)	LN (n=27)
Small cell carcinoma	24 (8%)	24 (8%)	0	4 (1.33)
Squamous cell carcinoma	11(3.67%)	91(30.33%)	20 (6.67%)	7 (2.33%)
Adenocarcinoma	7 (2.33%)	125(41.67%)	19 (6.33%)	16 (5.33%)
Undifferentiated carcinoma	0	9 (03%)	0	0
Total	42 (14%)	249 (83%)	39 (13%)	27 (9%)

CECT=Contrast-Enhanced Computed Tomography; CXR= Chest X-ray

Table-4 shows correlation of histopathological types with radiological findings. It showed that mass lesion was the major findings in adenocarcinoma 125(41.67%) followed by squamous cell carcinoma 91(30.33%) . Pleural effusion was the major findings in small cell carcinoma 24 (8%) followed by squamous cell carcinoma 11(3.67%). Lung collapse was more prominent in squamous cell carcinoma 20 (6.67%) followed by adenocarcinoma 19 (6.33%). Lymphadenopathy was more common in adenocarcinoma 16 (5.33%) followed by squamous cell carcinoma 7 (2.33%).

3. DISCUSSION

Lung cancer has become one of the leading causes of preventable death worldwide. Increasing life span along with exposure to etiological agents have made this once a rare disease a very serious health problem. It is the leading cause of cancer death (18.0% of the total cancer deaths) and the second most commonly diagnosed cancer in both sexes worldwide. [11] Lung cancer is caused by mutations, causes abnormal proliferation of the mutated cells, and the formation of a tumor. Previously, lung cancer was broadly classified into non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). The availability of newer histology-guided targeted molecular therapies for lung cancer has made this classification inadequate. So, histopathological and genomic characterization of lung cancer has now become the topic of interest. [12]

There were 36% and 35% of patients who belonged to age between 51-60 year and 60-70 year respectively which was similar to other studies.

[13] It increases the risk of lung cancer with aging as life expectancy is increasing. [14] Similarly, the male predominance in our study was similar to observations done previously. [15,16] Out of 300 patients, 268 (89.33%) patients were smokers, 141(47%) patients had a prior history of COPD and lymphadenopathy was present in 27 (9%) patients. The risk for the development of lung cancer increased with the duration of smoking and the number of cigarettes smoked per day. Average smoking in males had an approximately 9- fold to 10-fold risk for lung cancer, whereas heavy smokers had at least a 20- fold risk. [17] Both COPD and lung cancer are indicating 4-6 fold increase risk of cancer compared to those without COPD.

The ECOG performance status showed that 37% of patients remained on scale 2, followed by 35% on scale 3. When we looked for clinical symptoms, cough was present in 258 (90%), breathlessness 210 (70%), chest pain 180 (60%) followed by hemoptysis 129 (43%), sputum production 117 (39%), voice change 51 (17%), and superior vena cava obstruction 18 (6%). Obstruction of the airway may cause post-obstructive pneumonia, which may have been associated with cough. [18] Mass lesion on radiological examination was the most common finding 249 (83%) followed by pleural effusion 42(14%) and collapse 39 (13%). Correlation of histopathological types with radiological findings showed that mass lesion was the major finding in both adenocarcinoma and squamous cell carcinoma. Pleural effusion was present in about more than half of the patients with adenocarcinoma. Lymphadenopathy was only present in adenocarcinoma. A similar observation regarding finding out of mass lesions was made by Aki et al [13] and Rawat et al. [19] Distribution of histopathological type according to radiological findings showed that pleural effusion was most commonly detected in adenocarcinoma, followed by small cell carcinoma. Sarfraz et al [20] also noted that adenocarcinoma was most commonly associated with pleural effusion.

Squamous cell carcinoma was seen to present more frequently as a central mass than a peripheral mass and adenocarcinoma was seen to present more frequently as a peripheral mass according to our study. The association of squamous cell carcinoma and central location of presentation along with association of adenocarcinoma and peripheral location of presentation were also proven to be statistically significant. Small cell carcinoma was also seen to present more frequently as central mass. Similar results were seen in study conducted by Sharma CP et al. [21] The study done by Bhadke B. on patients with lung carcinoma also denoted that squamous cell carcinoma commonly presents as central tumours, whereas adenocarcinoma as peripheral tumour. [22]

4. CONCLUSION

This study showed that smoking is a principal risk factor in causation of lung carcinoma. It was seen to present more frequently in elderly age groups. Patients commonly present with chief complaints of smoking and breathlessness. Further investigations should be carried out in such circumstances to confirm the diagnosis. Lung carcinoma should be suspected in a person presenting with cough and other symptoms such as malaise, weight loss, etc. Squamous cell carcinoma is still the most common histological type of lung carcinoma in India. Adenocarcinoma is also emerging as a dominant histological type due to changing trends in smoking habits.

REFERENCES

1. Dela Cruz CS, Tanoue LT, Matthay RA. Lung cancer: epidemiology, etiology, and prevention. Clinics Chest Medicine 2011;32 (4):605-644.
2. Malik PS, Raina V. Lung cancer: prevalent trends and emerging concepts. Indian J Med Res 2015;141(1):5-7.
3. Travis WD, Colby TV, Corrin B. Histological typing of tumors of lung and pleura. In: Sobin LH, edtr. World Health Organization classification of tumors. 3rd edn. Berlin: Springer-Verlag 1999.
4. Carr DT, Holoye PY, Hong WK. Bronchogenic carcinoma. In: Murray JF, Nadal JA, eds. Textbook of respiratory medicine. 2nd edn. Philadelphia: WB Saunders Company 1994:1528-1596.
5. Iribarren C, Tekawa IS, Sidney S, Friedman GD. Effect of cigar smoking on the risk of cardiovascular disease, chronic obstructive pulmonary disease, and cancer in men. New England Journal of Medicine. 1999 Jun 10;340(23):1773-80.
6. Gould MK, Maclean CC, Kuschner WG, Rydzak CE, Owens DK. Accuracy of positron emission tomography for diagnosis of pulmonary nodules and mass lesions: a meta- analysis. Jama. 2001 Feb 21;285(7):914-24.
7. Gerber RB, Mazzone P, Arroliga AC. Paraneoplastic syndromes associated with bronchogenic carcinoma. Clinics in chest medicine. 2002 Mar 1;23(1):257-64.
8. Standfield L, Weston AR, Barraclough H, Van Kooten M, Pavlakis N. Histology as a treatment effect modifier in advanced non- small cell lung cancer: A systematic review of the evidence. Respiriology. 2011 Nov;16(8): 1210-20.
9. Scagliotti G, Brodowicz T, Shepherd FA, Zielinski C, Vansteenkiste J, Manegold C, Simms L, Fossella F, Sugarman K, Belani CP. Treatment-by-histology interaction analyses in three phase III trials show

- superiority of pemetrexed in nonsquamous non-small cell lung cancer. *Journal of Thoracic Oncology*. 2011 Jan 1;6(1):64-70.
10. Mohan A, Latifi AN, Guleria R. Increasing incidence of adenocarcinoma lung in India: Following the global trend? *Indian journal of cancer*. 2016 Jan 1;53(1):92-5.
 11. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2021 May;71(3):209-49.
 12. Standfield L, Weston AR, Barraclough H, Van Kooten M, Pavlakis N. Histology as a treatment effect modifier in advanced non-small cell lung cancer: A systematic review of the evidence. *Respirology*. 2011 Nov;16(8):12 10-20.
 13. Akl YM, Emam RH, Sabry IM, Ali AA. Clinico-pathological profile of bronchogenic carcinoma cases presented to Chest Department, Cairo University in the last 10 years. *Egyptian Journal of Chest Diseases and Tuberculosis*. 2013 Oct 1;62(4):705-12.
 14. Tas F, Ciftci R, Kilic L, Karabulut S. Age is a prognostic factor affecting survival in lung cancer patients. *Oncology letters*. 2013 Nov 1; 6(5):1507-13.
 15. Sheikh S, Shah A, Arshed A, Makhdoomi R, Ahmad R. Histological pattern of primary malignant lung tumours diagnosed in a tertiary care hospital: 10 year study. *Asian Pac J Cancer Prev*. 2010 Jan 1;11(5):1341-6.
 16. Khan NA, Afroz F, Lone MM, Teli MA, Muzaffar M, Jan N. Profile of lung cancer in Kashmir, India: a five-year study. *The Indian Journal of Chest Diseases & Allied Sciences*. 2006 Jul 1;48(3):187-90.
 17. Cruz CS, Tanoue LT, Matthay RA. Lung cancer: epidemiology, etiology, and prevention. *Clinics in chest medicine*. 2011 Dec 1;32(4):605-44.
 18. Kvale PA. Chronic cough due to lung tumors: ACCP evidence-based clinical practice guidelines. *Chest*. 2006 Jan 1;129(1):147S-53 S.
 19. Rawat J, Sindhwani G, Gaur D, Dua R, Saini S. Clinico-pathological profile of lung cancer in Uttarakhand. *Lung India: official organ of Indian Chest Society*. 2009 Jul;26(3):74.
 20. Sarfraz S, Gupta R, Bhardwaj S. Histopathological patterns of endobronchial lung biopsy specimen in lung cancer along with clinico-radiological correlation. *International Journal of Contemporary Medical Research*. 2018;5(11): K1-5.
 21. Sharma CP, Behera D, Aggarwal AN, Gupta D, Jindal SK. Radiographic patterns in lung cancer. *Indian Journal of Chest Diseases and Allied Sciences*. 2002 Jan 1;44(1):25-30.
 22. Bhadke BB, Rathod RK, Deshmukh DG, Luniya AB, Mahajan P, Surjushe AU. Clinical profile of lung cancer in rural medical college of Maharashtra (India): a prospective study of three years. *Int J Med Res Rev*. 2016;4(6):10 63-71.