# Histopathological Examination Findings of CT-Guided Lung Biopsy in Patients Attending Tertiary Care Hospital, Nepal: A Cross-Sectional Study

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## Abstract

**Introduction:** Among various lesions encountered in the lung, lung cancer is one of the most common cancers and a cause of cancer-related deaths. Among malignancies, non-small cell lung carcinoma is the most common lung cancer. A CT-guided lung biopsy is a quick, reliable, and simple technique with fewer complications than other methods for diagnosing pulmonary lesions. The main objective of this study was to evaluate the histopathological outcomes of CT-guided lung biopsies and to classify the identified lung lesions.

**Methods:** This was a hospital-based, prospective, cross-sectional study conducted from 1st August 2023 to 31st January 2024, with ethical clearance from the Institutional Review Committee (IRC-PA-314/2023). A Convenience sampling included 73 patients. The obtained data were analyzed using Microsoft Excel and Statistical Package of Social Sciences version 16.

**Results:** The majority of cases with lung lesions were seen in the 71-80 years age group with male predominance. Of the 73 cases included in the study, neoplastic lesions comprised 56 (76.71%), followed by non-neoplastic lesions in 9 (12.33%), and inadequate biopsies in 8 (10.96%). Of the total 56 malignant lesions, the most common histological type was Non-Small Cell Lung Carcinoma, comprising 46 (82.14%), among which adenocarcinoma accounted for 30 (53.57%), followed by Squamous Cell Carcinoma accounting for 16 (28.57%).

**Conclusions:** Lung tumors are quite common in patients presenting with a mass lesion. The most common histological type in this study was Adenocarcinoma.

**Keywords:** *adenocarcinoma; biopsy; squamous cell carcinoma.*

## Introduction

Among the various lung lesions, neoplastic lesions account for the majority of cases in day-to-day practice.[1] Annual reporting shows that deaths due to lung cancer are > 1.6 million, which is more than the combined mortality from colon, breast and prostate cancer.[2] The lung is the most common site for primary neoplasms as well as metastatic deposits from various other organs.[3] The lung cancer is the second most common neoplasm in men and the sixth most common neoplasm in women.[4]

The histopathological examination of a lung biopsy is

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recommended to differentiate between benign and malignant lesions, primary versus metastatic deposits of neoplasm, and to further conduct special studies such as special stains, immunohistochemistry and molecular testing.[5] Small-cell lung carcinoma is seen in chronic smokers and has an increased chance of metastasizing rapidly.[6] Tuberculosis is more common and often misleads in making the diagnosis, as both tuberculosis and lung cancer can present with a radio-opaque lesion. Hence, a CT-guided lung biopsy is advised to confirm the diagnosis.[7]

The main objective of this study was to evaluate the histopathological outcomes of CT-guided lung biopsies and to classify the identified lung lesions.

## Methods

This hospital-based cross-sectional study was conducted from 1st August 2023 to 31st January 2024 in the department of Pathology, Birat Medical College and Teaching Hospital, after obtaining ethical clearance from the Institutional Review Committee (IRC-PA-314/2023). A Convenience sampling included 73 patients. All lung lesions with CT-guided biopsy were included in the study. Pleural and mediastinal biopsies, lobectomy and pneumonectomy specimens, and uncooperative patients were excluded from the study. After evaluating for coagulopathy, consent was obtained from the patient's family member after explaining the procedure. The biopsy samples obtained were single or multiple linear bits, ranging in length from 0.5 to 1 cm. The received tissue samples were fixed in 10% formalin, processed in the Slee tissue processor, and paraffin-embedded sections were prepared. After this, Hematoxylin and Eosin (H&E) staining and slide mounting were performed. Microscopic examination of the lung biopsy slides was performed, and findings were recorded. The lesions were categorized as non-neoplastic, neoplastic, positive for malignancy and unsatisfactory for interpretation. Information regarding age, sex and clinical history was obtained from the histopathological data sheet.

Further classification of malignant tumors was done as Small Cell Lung Carcinoma (SCLC) or Non-Small Cell Lung Carcinoma (NSCLC). NSCLC is sub-classified into Squamous Cell Carcinoma and Adenocarcinoma. The obtained data were analyzed using Microsoft Excel and Statistical Package of the Social Sciences version 16.

## Results

A total of 73 lung biopsy cases were included in this study. The most common age group was 71-80 years, 28 (38.36%). The majority of cases were male, 45 (61.64%), followed by 28 (38.36%) females.

**Table 1:** Distribution of the patients according to age (n=73)

| Age group | Frequency | Percentage |
|---|---|---|
| 31-40 | 1 | 1.36 |
| 41-50 | 8 | 10.96 |
| 51-60 | 13 | 17.81 |
| 61-70 | 21 | 28.77 |
| 71-80 | 28 | 38.36 |
| 81-90 | 2 | 2.74 |
| Total | 73 | 100 |

Based on histopathological findings, neoplastic cases were more common, 56 (76.71%) cases, followed by non-neoplastic lesions, comprising 9 (12.33%). Inadequate biopsies were seen in 8 (10.96%).

**Table 2:** Histopathological findings of lung biopsies (n=73)

| | Frequency | Percentage |
|---|---|---|
| Neoplastic | 56 | 76.71 |
| Non-neoplastic | 9 | 12.33 |
| Unsatisfactory | 8 | 10.96 |
| Total | 73 | 100 |

Of the 9 non-neoplastic lesions encountered, the most common was a granulomatous lesion, comprising 5 (55.56%), followed by pneumonia, containing 3 (33.33%), and fibrosis, comprising 1 (11.11%).

**Table 3:** Non-neoplastic lesions of guided lung biopsies (n=9)

| Non-neoplastic lesion | Frequency | Percentage (%) |
|---|---|---|
| Granulomatous | 5 | 55.56 |
| Pneumonia | 3 | 33.33 |
| Fibrosis | 1 | 11.11 |
| Total | 9 | 100 |

Of the total 56 malignant lesions, the most common histological type was NSCLC, comprising 46 (82.14%), among which adenocarcinoma accounted for 30 (53.57%), followed by SCC accounting for 16 (28.57%). The small cell carcinoma was seen in 4 (7.14%).

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**Table 4:** Distribution of malignant lesions of guided lung biopsies (n=56)

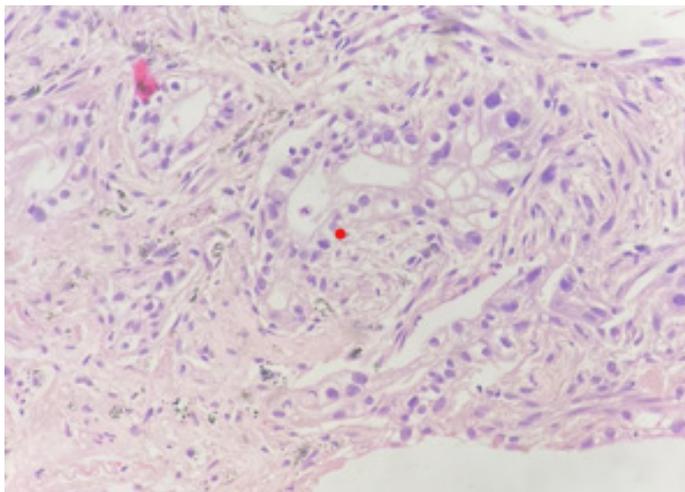| | Malignant lesions | Frequency | Percentage (%) |
|---|---|---|---|
| NSCLC | Adenocarcinoma | 30 | 53.57 |
| | SCC | 16 | 28.57 |
| SCLC | Small cell | 4 | 7.14 |
| | No subtype (Positive for malignancy) | 6 | 10.72 |
| | Total | 56 | 100 |



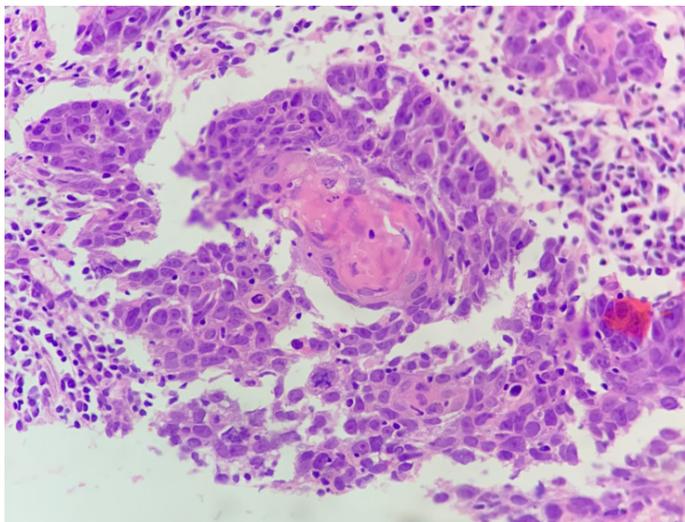**Figure 1:** Adenocarcinoma showing glandular pattern (H&E 400X)



**Figure 2:** Squamous cell carcinoma with areas of keratinization (H&E 400X)
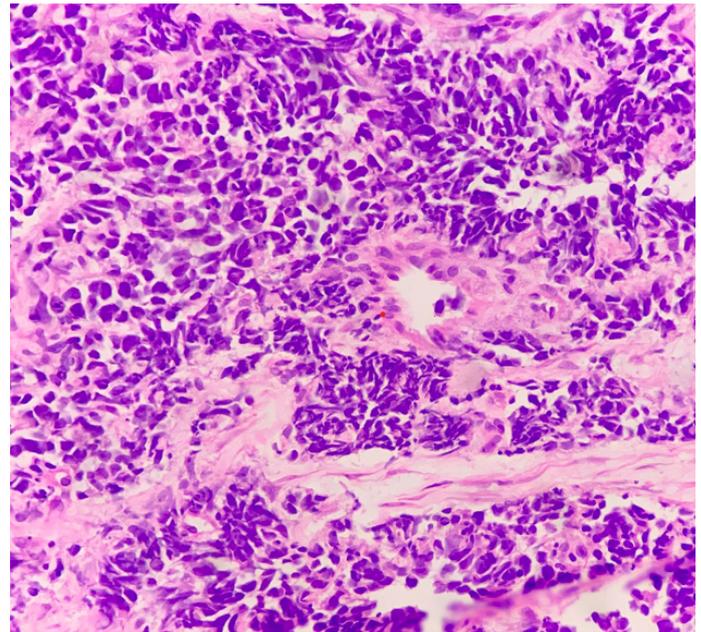


**Figure 3:** Small cell carcinoma showing crushing artefact (H&E 400X)

## Discussion

CT-guided lung biopsy is an outpatient diagnostic procedure. It is a safe, economical, and reliable method for diagnosing various lung lesions. It not only provides samples for histopathological examination but also supports further tests, such as special stains, immunohistochemistry, and molecular analysis.

In this study, the majority of cases with lung lesions were seen in the 71-80 years age group, followed by the 61-70 years age group. This was in contrast to the studies by Mittal et al., Khaparde et al., Malik et al., Agarwal et al., and Lad et al., in which the common age group affected was 60-70 years.[1,3,5,7,8] Majority of cases were from rural areas, and they tend to present at a later stage.

Male patients 45 (61.64%) were more commonly affected in our study than females, which was consistent with studies by Naik et al., Saha et al., and Bandyopadhyay et al., in which male patients comprised 69.2%, 78.9%, and 80.6%, respectively.[9,10,11] This can be due to more exposure to industrial hazards and an increased prevalence of smoking in males compared to females.

In our study, 56 (76.71%) of cases were neoplastic, 9 (12.33%) were non-neoplastic, and 8 (10.96%) were inconclusive. This was similar to the study by Naik et al., in which neoplastic, non-neoplastic, and inconclusive cases were observed in 75.6%, 15.4%, and 9%, respectively.[9] Similarly, in a study done by Garima et al., the majority (73% cases) were neoplastic.[12] However, in a study conducted by

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Kulshrestha R et al., non-neoplastic cases (55.2%) were more common.[13] The higher prevalence of neoplastic cases in our study could be because our hospital is an oncology as well as a tertiary referral centre.

The most common non-neoplastic lesion was granulomatous lesions 5 (55.56%), followed by Pneumonia comprising 3 (33.33%) and fibrosis 1 (11.11%), which was similar to the study done by Kulshrestha R et al., where granulomatous lesions comprised of 30.20% cases, followed by inflammatory lesions and fibrosis.[13] Similarly, in the study conducted by Li Liang et al., granulomatous lesions comprised of 51.80% cases, which was similar to our study.[2] However, this is in contrast to the study conducted by Garima et al., where among the non-neoplastic lesions, the majority of cases were inflammatory lesions, comprising of 37.50% cases, which mostly included chronic inflammatory cell collections like lymphocytes, followed by 25% cases of granulomatous lesions.[12] This can be due to the increased prevalence of tuberculosis in our setup, and tuberculosis radiologically mimics carcinoma.

In this study, among 56 malignant lesions, the most common histological type was NSCLC, comprising 46 (82.14%) cases, of which adenocarcinoma accounted for 30 (53.57%) and SCC for 16 (28.57%). Similar results were observed in the studies by Khaparde et al., Agarwal et al., Krishnamurthy et al., and Sundaram et al., in which adenocarcinoma comprised 46.60%, 29.30%, 42.60%, and 43.30% of cases, respectively. [3,7,14,15]

However, in studies by Kulshrestha et al., Sarfraz et al., Mandal et al., and Gupta R et al., squamous cell carcinoma was the most common malignancy, accounting for 60.50%, 50%, 49.10%, and 45.30% of cases, respectively.[13,16-18] Adenocarcinoma was more common in our study, which can be due to exposure to air pollution and a change in the trend of smoking, such as deep inhalation.[19] Second most common malignancy seen in our study was SCC, accounting for 28.57% cases, which was similar to the study done by Khaparde et al., Agarwal et al., Krishnamurthy et al., and Sundaram et al., where SCC comprised of 26.60%, 21.80%, 15.80% and 31.70% cases, respectively. [3,7,14,15]

Small sample size and single-centred study were limitations of our study. Immunohistochemistry, molecular testing, and special stains were not performed. In all cases of clinically and radiologically diagnosed lung lesions, a guided biopsy should be considered.

## Conclusions

CT-guided lung biopsy is a reliable method for diagnosing various lung lesions. It helps differentiate benign from malignant lesions and further subclassify malignant lesions, allowing treatment to be tailored accordingly. It also provides a sample on which further special staining and molecular studies can be done. Malignant lesions were more common in our study, and among malignant cases, adenocarcinoma was the most common histopathological type.

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## References

1. Mittal AR, Dongre SD,Karle RR. Histopathological study of guided lung biopsies in tertiary care. Int J Sci Res. 2021;10 ( 11 ):2277 - 8179.
DOI: 10.36106/ijsr

2. Liang L, Liu J, Buryanek J, Zhang S. CT-guided core needle biopsy of peripheral lung lesions with onsite adequate evaluation: Review of 215 cases. J Cytol Histol2014;4:1-5.
DOI: 10.4172/2157-7099.S4-018

3. Khaparde SH, Patrike SB, Deshmukh SD, Shinde BB. Role of needle biopsy in early diagnosis of lung lesions in tertiary care hospital. IP J DiagnPathol Oncol 2021;6(3):170-174.
DOI: 10.18231/j.jdpo.2021.038

4. Davidson MR, Gazdar AF, Clarke BE. The pivotal role of pathology in the management of lung cancer. J Thorac Dis 2013; 5:463-78.
DOI: 10.3978/j.issn.2072-1439.2013.08.43

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5.  Malik PS, Sharma MC, Mohanti BK, Shukla NK, Deo SV, Mohan A, et al. Clinico- pathological profile of lung cancer at AIIMS: a changing paradigm in India. Asian Pac J Cancer Prev 2013;14(1):489-94. DOI: 10.7314/APJCP.2013.14.1.489

6.  Noronha V, Dikshit R, Raut N, Joshi A, Pramesh CS, George K, et al. Epidemiology of lung cancer in India. Focus on the differences between non-smokers and smokers: A single-centre experience. Indian J Cancer 2012;49(1):74-81. DOI: 10.4103/0019-509X.98925

7.  Agarwal A, Tandon R, Singh L, Kumar P, Pant H, Prakash S. Clinical profile of lung cancer in a tertiary care teaching hospital in North India with special reference to acceptance and outcome of treatment. J Pulmon. 2018;2(1):4-8. Available from: https://www.pulsus.com

8.  Lad, Nirali &Daveshwar, Meena. Histopathological Study of Lung Biopsy inAssociation with Immunohistochemistry. Journal of Evolution of Medical and DentalSciences.2019; 8(48):3609-12. DOI: 10.14260/jemds/2019/779

9.  Naik KS, Jarag M, Shah P, Patel M, Patel A, Shah A. Shifting trends of lung tumours and its diagnosis by lung biopsy: a study of 78 cases. Int J Res Med Sci 2015;3(12):3524-9. DOI: 10.18203/2320-6012.ijrms20151392

10. Saha A, Kumar K, Choudhuri MK. Computed tomography-guided fine needle aspiration cytology of thoracic mass lesions: A study of 57 cases. J Cytol . 2009;26(2):55-9. DOI: 10.4103/0970-9371.55222

11. Bandyopadhyay A, Laha R, Das TK, Sen S, Mangal S, Mitra PK. CT guided fine needle aspiration cytology of thoracic mass lesions: A prospective study of immediate cytological evaluation. Indian J PatholMicrobiol. 2007;50(1):51-5. Available from: https://journals.lww.com/ijpm/abstract/2007/50010/ct_guided_fine_needle_aspiration_cytology_of.16.aspx

12. Garima B, Renuka IV, Ramya P, Prasad D. Pravallika Uppala and Prathyusha . Histopathological Study of Guided Lung Biopsies. Ann Pathol Lab Med. 2020;7(4):180-5. DOI: 10.21276/apalm.2699

13. Kulshrestha R, Menon BK, Vijayan VK. Role of a pattern based approach in interpretation of transbronchoscopic lung biopsy and its clinical implications. The Indian Journal of Chest diseases and allied sciences 2012;54(1):9-17. DOI: 10.5005/ijcdas-54-1-9

14. Krishnamurthy A, Vijaylakshmi R, Gadigi V, Ranganathan R, Sagar T. The relevance of "Nonsmoking- associated lung cancer" in India. A single-center experience. Indian J Cancer. 2012;49(1):82-8. DOI: 10.4103/0019-509X.98928

15. Sundaram V, Sanyal N. Clinicopathological profile of bronchogeniccarcinoma in a tertiary care hospital in eastern part of India. Clin Cancer Investig J. 2014;3(3):220-4. DOI: 10.4103/2278-0513.132114

16. 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):1-5. DOI: 10.21276/ijcmr.2018.5.11.1

17. Mandal SK, Singh TT, Sharma TD, Amrithalingam V. Clinico-pathology of lung cancer in a regional cancer centre in Northeastern India. Asian Pac J Cancer Prev 2013;14(12):7277-81. DOI: 10.7314/APJCP.2013.14.12.7277

18. Gupta R, Chowdary I, Singh P. Clinical, radiological and histological profile of primary lung carcinomas. JK Science 2015;17(3):146-51. www.jkscience.org

19. Prasad R, James P, Kesarwani V, Gupta R, Pant MC, Chaturvedi A, Shrivastava AN. Clinco-pathological study of bronchogenic carcinoma. Respirology 2004;9(4):557-60. DOI: 10.1111/j.1440-1843.2004.00600.x

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