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Histological spectrum of lung malignancy in central Madhya Pradesh, India: An observational study

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Abstract:
Lung cancer remains a major cause of cancer related morbidity and mortality, with histological patterns influenced by demographic and environmental factors. This prospective observational study analyzed 56 histopathologically confirmed lung malignancies diagnosed over five years at a tertiary care center in Central Madhya Pradesh, India. The mean age at presentation was 58.5 years; males constituted 71.4% of cases and 66.1% of patients had a history of smoking. Adenocarcinoma was the most common histological subtype (39.3%), followed by squamous cell carcinoma (28.6%) and small cell carcinoma (21.4%). Thus, data shows the predominance of smoking-associated lung cancers and the substantial occurrence of adenocarcinoma, emphasizing the need for effective tobacco-control measures, early detection and improved diagnostic facilities.

Keywords: Lung cancer, histopathology, squamous cell carcinoma, adenocarcinoma, small cell carcinoma

Background:
Lung cancer continues to pose a major global health challenge, accounting for a significant proportion of cancer morbidity and mortality **[1].** According to global cancer statistics, it is one of the leading causes of cancer related deaths due to late stage diagnosis and aggressive disease progression **[2].** Histologically, lung cancer is broadly classified into non-small cell lung cancer (NSCLC), which includes adenocarcinoma, squamous cell carcinoma and large cell carcinoma and small cell lung cancer (SCLC) **[3].** In recent decades, there has been a noticeable shift in the histological pattern of lung cancer, with adenocarcinoma emerging as the predominant subtype. This shift has been attributed to changes in smoking habits, environmental pollution, occupational exposures and improved diagnostic techniques **[4].** In India, particularly in Central Madhya Pradesh, there is limited data regarding the histological distribution of lung malignancies. Regional studies are essential to understand local epidemiological trends and to design effective public health interventions **[5, 6]**. Therefore, it is interest to evaluate the histological spectrum of lung malignancies and their association with demographic characteristics and smoking status in patients from Central Madhya Pradesh.

Materials and Methods:
This prospective observational study was conducted in the Department of Pulmonary Medicine, Chhindwara Institute of Medical Sciences and Chhindwara (M.P.) over a five year period (2021-2025). A total of 56 patients with clinico- radiological suspicion of malignancy, which underwent bronchoscopy, biopsy and histopathologically confirmed lung malignancy were included in this study. Sample size was based on all consecutively diagnosed histopathologically confirmed lung malignancy cases during the study period (2021–2025).

Inclusion criteria:
[1] Patients with confirmed lung malignancy
[2] Availability of demographic and histopathological data
[3] Patients who provide written informed consent

Exclusion criteria:
[1] Non-malignant lung diseases
[2] Patients who not provide written informed consent

Data collection:
Data collected from each patient included demographic characteristics (age and gender), smoking status, bronchoscopic findings and histopathological diagnosis of the lung malignancy

Ethical statement:
Ethical approval for the study was obtained from the Institutional Ethics Committee of Chhindwara Institute of Medical Sciences

Statistical analysis:
Data were entered into Microsoft Excel and analyzed using SPSS software version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages.

Results:
The age of patients ranged from 35 to 77 years, with a mean age of 58.5 years. Peak incidence observed in the 51–60 years age group with 40.35% patients with lung malignancy, this indicates lung cancer is predominantly a disease of older adults. Strong male predominance was observed with male to female ratio ≈ 2.35:1 **(Table 1)**. Adenocarcinoma emerged as the most common subtype (39.28%) followed by squamous cell carcinoma (28.57%) and small cell carcinoma (21.42%) **(Table 2)**. The majority of patients were smokers indicating strong association with lung malignancy. The most common malignancy amongst smokers was observed to be Adenocarcinoma with 31.25% patients **(Table 3)**. Right lung was most commonly involved with 30 patients with right lung mass lesions. 7 patients had bilateral lesions. The most common bronchoscopic finding was endobronchial mass followed by luminal narrowing from extrinsic compression. 3 patients of all had vocal cord palsy **(Table 4)**.

Table 1: Demographic profile of patients

Parameters	Groups	Frequency (N)	Percentages (%)
Age (years)	<40	3	5.26
	41-50	8	14.03
	51-60	23	40.35
	61-70	20	35.08
	>70	3	5.26
Gender	Male	40	70.17

Female	17	29.82

Table 2: Histopathological subtype and its gender wise distribution

Histological subtype	N (%)	Females N (%)	Male N (%)
Adenocarcinoma	22 (39.28%)	12	10
Squamous cell carcinoma	16 (28.57%)	1	15
Small cell carcinoma	12 (21.42%)	2	10
Unspecified	6 (10.71%)	1	5

Table 3: Association of smoking with lung malignancy

Smoking status	N (%)	Adenocarcinoma	Squamous	Small Cell	Unspecified
Smokers	32 (57.14%)	10 (31.25%)	8 (25%)	9 (28.12%)	5 (15.62%)
Non-smokers	24 (42.85%)	12 (50%)	8 (33.34%)	3 (12.5%)	1 (4.16%)

Table 4: Bronchoscopic findings in the various histological subtypes

	Squamous cell carcinoma	Small cell carcinoma	Adenocarcinoma	Unspecified	Total
No. of patients	16	12	22	6	56
Site of tumor					
1. Right	9	5	13	3	30
2. Left	5	6	5	3	19
3. Bilateral	2	1	4	-	7
Endobronchial mass	12	10	14	4	40
Luminal narrowing	5	2	7	1	15
Vocal cord palsy	-	1	1	1	3
Normal tracheobronchial tree	-	-	2	-	2

Discussion:

The mean age of patients in the present study was 58.5 years, with the highest proportion of cases occurring in the 51–60 year age groups. This observation is consistent with reports from the Indian National Cancer Registry Programme and several hospital based studies, which have demonstrated that lung cancer predominantly affects individuals in the sixth and seventh decades of life **[3, 4].** The age distribution observed may reflect the cumulative effects of long term exposure to carcinogenic factors such as tobacco smoke, environmental pollutants, occupational hazards and biomass fuel combustion. A marked male predominance (male ratio 2.35:1) was observed, which is comparable to findings reported by Mohan *et al.* **[5]** and Mehta *et al.* **[4].** This gender disparity is likely attributable to the higher prevalence of tobacco consumption and occupational exposures among males in the Indian population. Adenocarcinoma emerged as the most common histological subtype, followed by squamous cell carcinoma and small cell carcinoma. These findings support the globally recognized epidemiological transition from squamous cell carcinoma to adenocarcinoma as the predominant subtype of lung cancer. Similar trends have been reported in studies from different regions of India and internationally. Radhakrishnan *et al.* **[7],** reported adenocarcinoma as the most frequent histological subtype in a tertiary care center in Kerala, while Mohan *et al.* **[5],** observed a comparable predominance in a large North Indian cohort. Several factors have been proposed to explain this shift, including changes in cigarette design, increased use of filtered and low tar cigarettes resulting in deeper inhalation of smoke, rising exposure to environmental pollutants and improved pathological classification methods. Smoking remains the most important modifiable risk factor for lung cancer in the present study, highlighting its continued role in lung carcinogenesis. Similar smoking prevalence has been reported in previous Indian studies **[8].** Histological analysis showed that smoking was associated with all major lung cancer subtypes, although adenocarcinoma constituted the largest proportion among smokers **[9]**. Recent epidemiological investigations have shown that smoking substantially increases the risk of both adenocarcinoma and squamous cell carcinoma, while heavy smoking is particularly associated with aggressive pathological features and poorer outcomes **[10, 11]**. Bronchoscopic evaluation revealed that the right lung was more frequently involved than the left lung. Endobronchial mass lesions represented the most common bronchoscopic finding, followed by luminal narrowing due to extrinsic compression **[12, 13]**. Similar observations have been reported in previous bronchoscopic studies of lung cancer patients **[14, 15].** The predominance of endobronchial masses is expected because centrally located tumors, particularly squamous cell carcinoma and small cell carcinoma, commonly produce visible bronchial abnormalities. Vocal cord palsy was observed in a small proportion of patients, indicating advanced local disease with possible recurrent laryngeal nerve involvement **[16]**. These findings underscore the diagnostic value of bronchoscopy in the evaluation and tissue confirmation of suspected lung malignancies.

Conclusion:

Lung cancer predominantly affects older males, with adenocarcinoma increasingly replacing squamous cell carcinoma as the predominant histological subtype. Smoking remains the major risk factor, although the rising incidence among non-smokers is concerning. Tobacco control policies have reduced incidence rates in developed countries, while early detection remains a significant challenge.

Limitations and future scope:

The present study was limited by its relatively small sample size and the presence of a few histologically unspecified diagnoses; however, future research should focus on larger multicentric studies incorporating molecular profiling of lung cancer, evaluation of targeted therapeutic approaches and investigation of the role of environmental pollutants in the development of lung cancer among non-smokers.

Conflict of interest: None declared

Funding: None

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