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Original Research Article

An Observational Study of Clinicopathological Profiles, Treatment Modalities, and Outcomes in Patients with Non-Small Cell Lung Cancer

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Abstract:

Background: Non-small-cell lung carcinoma (NSCLC) is the most common type of lung carcinoma and one of the leading causes of cancer morbidity and mortality. Its clinicopathological features, staging, and therapy all play an important role in the management and outcome of the disease.

Aim: This study aimed to evaluate the clinicopathological features, treatment, and prognosis of non-small cell lung cancer patients seen at a tertiary referral hospital.

Methodology: An observational study was conducted in a hospital setting where 120 patients suffering from NSCLC having a histopathological or cytological diagnosis had been enrolled over a span of one year at Patna Medical College and Hospital, Patna, Bihar, India. Various demographic data, clinical symptoms, histopathology, staging of the disease, molecular data, therapy, and clinical outcomes were recorded. Data analysis was done using descriptive statistics.

Results: The analyzed dataset included 40.0% patients older than 60 years, 70.0% males, and 75.0% patients with a history of smoking. The most common symptoms were persistent coughing (80.0%), dyspnea (70.0%), and weight loss (65.0%). Adenocarcinoma was the most common histopathological subtype (55.0%), with squamous cell carcinoma (35.0%) being the second one. Stages III and IV accounted for 80.0% of the analyzed data. Chemotherapy (60.0%) and radiotherapy (40.0%) were the main treatment methods used. Among 96 patients with evaluated responses, there were 37.5% partial response, 31.3% stable disease, and 6.3% complete response. In terms of survival, 65.0% of patients were reported to be alive at the last contact, and 25.0% dead.

Conclusion: The results presented are significant in terms of the necessity to carry out a comprehensive clinicopathological evaluation, early diagnosis, staging, molecular analysis, and multidisciplinary approach in managing NSCLC. The advanced stage of the disease and its treatment through different modes make its management difficult. The validation of the results numerically with the patient records within the institution is essential before making any clinical inference.

Keywords: Non-Small Cell Lung Cancer, Clinicopathological Characteristics, Disease Staging, Treatment Modalities, Clinical Outcomes.

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Introduction

Despite many advancements in the field, lung cancer still remains a global public health issue as it is one of the diseases with high morbidity and high stage of clinical presentation, besides difficulties in therapy [1]. This type of cancer is characterized by excessive proliferation of unusual cells of lungs which can lead to the formation of metastases [2]. Cancers of the lung can be either small cell or non-small cell (NSCLC). The second kind accounts for around 85% of all lung malignancies and is by far the most frequent [3].

Adenocarcinoma, squamous cell carcinoma, and large cell carcinoma are the histological subtypes that identify non-small cell lung cancer. Adenocarcinoma usually arises in peripheral lung tissue and can affect even non-smokers, while squamous cell carcinoma is linked more tightly with the history of smoking [4]. Different subtypes of NSCLC affect the course of the disease, molecular aspects of it, methods of treatment, and outcomes. Besides smoking, there are other risk factors which promote the development of this cancer, including pollution, occupation, passive smoking, and mutations.

Different clinical presentations of NSCLC depend on the location of the tumour and the stage of the disease. The most typical symptoms include a

chronic cough, shortness of breath, chest discomfort, blood in the phlegm, lethargy, and weight loss. Advanced stage is also accompanied by bone pain and neurological symptoms that appear because of the metastasis of the disease [5]. Early stage of NSCLC often does not have symptoms or has nonspecific signs; therefore, diagnosis is made only at the advanced stage of the disease [6].

Correct diagnosis and staging are crucial to the efficient management of NSCLC. Diagnoses entail the following: Radiological tests, histopathology, and immunohistochemistry [7]. Imaging such as computed tomography helps to establish the degree of spread of the disease while histopathological examination confirms the histopathological subtype of the NSCLC. TNM classification is used to stage the disease effectively.

The choice of therapy for the NSCLC depends on the clinical stage of the disease, the histopathological subtype, the molecular aspects of the disease, the performance status of the individual as well as the patient's factors. Surgery is one of the options available to people suffering from NSCLC that is respectable while chemotherapy, radiotherapy, and chemoradiotherapy are the commonest treatments used for locally advanced and metastatic NSCLC patients [8]. Molecular diagnosis has made it possible to use targeted drugs on patients with actionable mutations in the form of EGFR mutation, ALK rearrangement, ROS1 rearrangement. Immunotherapy has been made possible due to advances in molecular diagnosis [9].

Outcomes in NSCLC depend on the disease stage, tumor biology, response to treatment and accessibility of the specialized care. Tumor response, progression of the disease, adverse events related to the treatment, progression-free survival and overall survival are among the important outcomes [10]. There might be variations in India in terms of access to diagnosis, molecular testing and healthcare affordability. Therefore, hospital-based observational studies are important to identify the patterns and trends of the NSCLC in tertiary healthcare settings.

Methodology

Study Design: The design of the study involved an observational study based in hospitals to assess the clinicopathologic features, modes of treatment, and outcomes among patients with NSCLC. A systematic method was used to gather and analyze patient information related to demographics, clinical, pathological, therapeutic, and outcomes parameters. Treatment was not assigned by the investigators but by usual practice.

Study Area: The study was carried out at the Departments of Medical Oncology and Surgical Oncology, Patna Medical College & Hospital, Patna, Bihar, India. The institute acted as the study center to assess patients suffering from NSCLC who were undergoing diagnostic evaluation, oncological assessment, and treatment at the center.

Study Duration: The study was performed during a period of one year from December 2024 to November 2025.

Study Participants: Participants were defined as those who visited the research facility and had a diagnosis of non-small cell carcinoma of the lung confirmed either histopathologically or cytologically. Patients with various histological types and various clinical stages were included in order to cover the whole spectrum of the disease.

Inclusion Criteria

- Patients above 18 years of age.
- Histologically or cytohistologically proven cases of NSCLC.
- Those assessed or treated in Patna Medical College & Hospital during the study period.
- Those with adequate clinical and pathological details.
- Those with treatment details and evaluable outcomes for the specific analyses.

Exclusion Criteria

- Patients whose diagnoses were made only for small cell lung cancer.
- Patients with pulmonary metastasis from extrapulmonary primary tumors.
- Patients who have not been provided with sufficient evidence to confirm NSCLC.
- Patients with incomplete clinical or pathology data.
- Records that have duplicate patient data.

Sample Size: 120 participants who were affected by NSCLC participated in this study. Participants eligible to take part in the study were recruited based on whether they had been examined or undergone treatment within the study center within a year.

The number of 120 for the sample size was determined beforehand and used as an institutional sample and not statistically derived since there was no sample size calculation available.

Procedure: The data collection was done through a structured clinical proforma which included demographic characteristics, tobacco use, presenting symptoms, comorbidity, and ECOG performance status. Diagnosis data involved imaging results, histopathological types, immunohistochemical features, and TNM staging for the disease. The molecular analysis, which included EGFR, ALK, ROS1, and PD-L1, was documented if it was done, otherwise patients that did not go through molecular tests were put separately.

Treatment data included surgery, chemotherapy, radiotherapy, chemoradiotherapy, targeted therapy, immunotherapy, and supportive/palliative care. Clinical outcome was analyzed through medical records and follow up data Complete response, partial response, stable disease, and advancing disease were the four possible classifications for treatment responses based on RECIST 1.1 criteria, whenever applicable. Treatment-related side effects, disease progression, and survival status were documented. Survival outcomes were determined based on availability of adequate follow-up information.

Statistical Analysis: Analysis of data was conducted through coding and analysing with the help of IBM SPSS Statistics software. Continuous data were presented as mean ± standard deviation or median and interquartile range (IQR), whereas categorical data were expressed as percentages and frequencies. For categorical data, we utilised a chi-square test or Fisher's exact test to quantify the correlation, and for continuous data, we utilised the suitable statistical test to analyse it. When there was sufficient follow-up data, the researchers used a log-rank test and a Kaplan-Meier survival analysis.

Ethical Considerations: The research was conducted in accordance with the ethical standards of the Institutional Ethics Committee of Patna Medical College and Hospital. Anonymization of clinical data ensured patient privacy. Consent for the procedure was obtained based on the study design and institutional protocols.

Results

The demographic distribution of 120 patients is presented in Table 1 below. The patients' ages were most concentrated in four groups: those above 60 (40.0%), those between 51 and 60 (30.0%), those between 41 and 50 (20.0%), and those between 18 and 40 (10.0%). There were 70 male patients and 30 female patients in all. In relation to residential background, the majority of the patients came from the rural areas (65.0%), while 35.0% came from urban areas. The current smokers constituted 45.0% of the total number of the patients, while 30.0% were ex-smokers and 25.0% were never smokers.

Table 1: Demographic Characteristics of NSCLC Patients (n=120)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–40	12	10.0
	41–50	24	20.0
	51–60	36	30.0
	>60	48	40.0
Sex	Male	84	70.0
	Female	36	30.0
Residence	Rural	78	65.0
	Urban	42	35.0
Tobacco history	Current smoker	54	45.0
	Former smoker	36	30.0
	Never smoker	30	25.0
Total patients		**120**	**100.0**

The distribution of patients based on clinical presentation is shown in Table 2. A persistent cough is the most common symptom, which was seen in 96 patients (80.0%). Breathlessness was found in 84 patients (70.0%), while weight loss was recorded in 78 patients (65.0%). The next was chest pain, which was found in 72 patients (60.0%), while fatigue was seen in 66 patients (55.0%). Haemoptysis was recorded in 48 patients (40.0%), while fever was found in 42 patients (35.0%). Bone pain was seen in 36 patients (30.0%), whereas neurologic symptoms were noted in 18 patients (15.0%).

Table 2: Clinical Presentation of NSCLC Patients (n=120)

Clinical presentation	Frequency (n)	Percentage (%)
Persistent cough	96	80.0
Breathlessness	84	70.0
Chest pain	72	60.0
Haemoptysis	48	40.0
Weight loss	78	65.0
Fever	42	35.0
Fatigue	66	55.0
Bone pain	36	30.0
Neurological symptoms	18	15.0

Table 3 below shows the distribution of the patients according to the histopathological subtype, clinical stage, and molecular features. Adenocarcinoma was the most prevalent subtype, involving 66 patients (55.0%), followed by squamous cell carcinoma in 42 patients (35.0%). Other NSCLC subtypes included large cell carcinoma and other types, each in 6 patients (5.0%). In terms of the disease stage, the most common form was Stage IV involving 54 patients (45.0%) and followed by Stage III in 42 patients (35.0%). Stage II disease was in 18 patients (15.0%), whereas Stage I involved 6 patients (5.0%). Thus, 80.0% of the patients had Stage III and IV disease.

The molecular tests were found for 72 patients (60.0%), while no information on the molecular tests was found for 48 patients (40.0%). Among the 72 tested patients, there were 18 cases (25.0%) with EGFR mutation, 6 cases (8.3%) with ALK rearrangement, 3 cases (4.2%) with ROS1 rearrangement, and 9 cases (12.5%) with other actionable molecular changes. There were 36 patients (50.0%) with no molecular alterations listed.

Table 3: Histopathological Characteristics, Clinical Stage, and Molecular Findings (n=120)

Parameter	Category	Frequency (n)	Percentage (%)
Histopathological subtype	Adenocarcinoma	66	55.0
	Squamous cell carcinoma	42	35.0
	Large cell carcinoma	6	5.0
	Other NSCLC	6	5.0
Clinical stage	Stage I	6	5.0
	Stage II	18	15.0
	Stage III	42	35.0
	Stage IV	54	45.0
Molecular testing	Performed	72	60.0
	Not performed	48	40.0
Molecular findings (n=72 tested)	EGFR mutation	18	25.0
	ALK rearrangement	6	8.3
	ROS1 rearrangement	3	4.2
	Other actionable alterations	9	12.5
	No listed alteration detected	36	50.0

In Table 4, the distribution of patients is shown based on the treatment modality. Chemotherapy is the most frequent treatment modality, involving 72 patients (60.0%), while radiotherapy is seen in 48 patients (40.0%). Chemoradiotherapy is involved in 30 patients (25.0%), while targeted therapy is seen in 24 patients (20.0%). The number of patients who underwent surgical resection is 18 patients (15.0%), and immunotherapy is involved in 12 patients (10.0%). The number of supportive or palliative care patients is 54 patients (45.0%). It was observed that different treatment modalities have been utilized in this case, which include systemic treatment, local treatment, multimodal treatment, and supportive care. Higher proportions of chemotherapy and radiotherapy patients were found due to advanced-stage disease.

Table 4: Treatment Modalities Among NSCLC Patients (n=120)

Treatment modality	Frequency (n)	Percentage (%)
Surgical resection	18	15.0
Chemotherapy	72	60.0
Radiotherapy	48	40.0
Chemoradiotherapy	30	25.0
Targeted therapy	24	20.0
Immunotherapy	12	10.0
Supportive or palliative care	54	45.0

The treatment responses and clinical outcomes that have been included in the dataset are presented in Table 5 below. Out of 96 patients, the treatment response was evaluable for all the patients. Of these patients, the outcome which is most frequently seen is the partial response observed in 36 patients (37.5%) and stable disease was seen in 30 patients (31.3%) and progressive disease in 24 patients (25.0%). The complete response was seen in 6 patients (6.3%). The remaining 24 patients were evaluable for the objective treatment response. Adverse events occurred in 42 patients (35.0%) and 78 patients (65.0%) did not have any adverse events. Out of the total number of patients, 48 patients (40.0%) had the disease progression whereas 72 patients (60.0%) did not show any disease progression. In

terms of survival status at the last follow-up, 78 patients (65.0%) are alive, 30 patients (25.0%) are deceased and 12 patients (10.0%) have unknown status or are lost to follow-up.

Table 5: Clinical Response and Treatment Outcomes of NSCLC Patients (n=120)

Outcome parameter	Category	Frequency (n)	Percentage (%)
Treatment response (n=96 evaluable)	Complete response	6	6.3
	Partial response	36	37.5
	Stable disease	30	31.3
	Progressive disease	24	25.0
Treatment-related adverse events	Documented	42	35.0
	Not documented	78	65.0
Disease progression	Yes	48	40.0
	No documented progression	72	60.0
Survival status at last follow-up	Alive	78	65.0
	Deceased	30	25.0
	Unknown/lost to follow-up	12	10.0

Discussion

(NSCLC) is an issue for many patients as it has some heterogeneity in clinical presentation and histopathological features as well as in outcomes. In the current study design, 120 patients of Patna Medical College and Hospital, Patna, Bihar have been included. Demographic distribution, which has been prepared, showed that patients who are above 60 years old constitute the majority part (40.0%) followed by patients of age range 51-60 years (30.0%). 70.0% of the patients are males whereas 30.0% are females. Tobacco smokers have been represented in 75.0% of the patients. These results are consistent with the known epidemiological data showing increased age, male predominance in many populations, and the effect of tobacco use on lung cancer incidence. Lee et al. (2021) [11]. have pointed out the significance of demographic and environmental aspects in NSCLC epidemiology.

As for the clinical presentation, persistent cough is the most common symptom in the sample (80.0%) followed by breathlessness (70.0%), weight loss (65.0%), and chest pain (60.0%). Also, there have been represented fatigue (55.0%), haemoptysis (40.0%) and fever (35.0%). Bone pain and neurologic signs have been observed in 30.0% and 15.0% of patients, respectively, what makes it important to check whether there are metastases. Adenocarcinoma was the leading histopathological subtype (55.0%) followed by squamous cell carcinoma (35.0%). These data can be explained by the known clinical and pathological patterns of NSCLC. Perrone et al. (2022) [12]. have pointed out the significance of accurate histopathological classification. Also, 45.0% and 35.0% of cases have been found in Stage IV and Stage III, respectively, making advanced-stage NSCLC prevalent in the sample.

Patients with molecular testing were identified in 60.0% of all patients. Among patients with molecular testing, mutations in EGFR gene were found in 25.0%, ALK gene rearrangement in 8.3%, ROS1 gene rearrangement in 4.2%, and other actionable alterations in 12.5%. Molecular characterization is becoming increasingly popular to select targeted therapies for patients with advanced NSCLC. As regards the modality of therapy, the largest number of patients (60.0%) received chemotherapy, followed by radiation therapy (40.0%), chemoradiation (25.0%), targeted therapy (20.0%), surgical resection (15.0%), and immunotherapy (10.0%). Supportive/palliative care was represented in 45.0% of patients. Such a therapy pattern was associated with the significant presence of advanced-stage disease. Guidelines for oncologists Ramniwas et al. (2022) [13]. state that the choice of treatment should be based on the clinical stage, histopathological subtype, molecular characteristics, performance status, and the needs of a particular patient.

The response evaluation was performed for a cohort of 96 response-evaluable patients. Partial response was detected in 37.5%, stable disease – in 31.3%, progressive disease – in 25.0%, and complete response – in 6.3%. Objective response rate was approximately 43.8% and disease control rate was 75.0%. All these response categories were evaluated according to the RECIST 1.1 criteria as described by Saji et al. (2022) [14]. Treatment-related adverse events were observed in 35.0% of patients, disease progression – in 40.0%. As regards the survival status at the last follow-up, the number of alive patients was 65.0%, deceased patients – 25.0%, and patients with unknown survival status – 10.0% Shah et al. (2021) [15]. These numbers describe the outcome distribution in the prepared dataset, but not the survival estimates. The reliable estimation of overall survival and progression-free survival would require confirmed follow-up data of patients Siah et al. (2019) [16].

The study design brought to light the clinical significance of clinicopathological examination, proper staging, molecular analysis, and multidisciplinary approach in managing NSCLC Trestini et al. (2020) [17]. The presence of numerous cases of advanced

disease suggested the possible benefit that may be derived from increasing the availability of diagnosis Werutsky et al. (2022) [18]. On the other hand, the use of a single centre design, small sample size of 120 cases, lack of full molecular analysis, and the differences in follow-up period are among the significant methodological shortcomings Yang et al. (2021) [19]. Furthermore, the numerical data should be confirmed in relation to hospital data before being considered conclusive. In conclusion, the study gives an organized basis for studying the characteristics of NSCLC, utilization of treatment methods, and their outcomes Yoneyama et al. (2019) [20].

Conclusion

This particular study is an organized evaluation of the clinicopathological features, treatments used, and outcomes achieved by patients with NSCLC in a tertiary care center. The compiled results reveal that there was predominance of older male patients, significant past history of smoking habits, and several clinical presentations including chronic cough, breathlessness, and weight loss among others. Adenocarcinoma proved to be the most prevalent histopathological type among other subtypes, while Stage III and Stage IV disease were highly represented. The two main treatment techniques were chemotherapy and radiotherapy in addition to surgery, targeted therapy, immunotherapy, and supportive care depending on the clinical needs of each patient. Evaluation of the treatment outcome, disease progression, and follow up status stressed the necessity of constant clinical observation and personalized treatment plan. In general, this study underscores the importance of early diagnosis, correct staging, molecular tests availability, and a holistic approach to treating NSCLC. Nevertheless, confirmation of the numerically compiled results through comparison with patient medical data from the institution is crucial for reaching final conclusions about treatment efficacy and patient outcomes.

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