

**ORIGINAL RESEARCH****Clinical value of interleukin - 6 as a potential biomarker for bronchogenic carcinoma: A clinical study****Dr. Dimple Makhija<sup>1</sup>, Dr. Nabeel Ahmed Hashmi<sup>2</sup>, Dr. Goutham Phani Pulavarthi<sup>3</sup>,****Dr. Dushyant Pal Singh<sup>4</sup>**

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**Abstract:**

**Background:** Bronchogenic carcinoma, a predominant form of lung cancer, continues to challenge diagnostic modalities with its late detection and poor prognosis. Interleukin-6 (IL-6), a cytokine involved in inflammatory and immune responses, has recently been scrutinized for its potential role as a biomarker in various cancers. This clinical study evaluates the clinical value of IL-6 levels in patients with bronchogenic carcinoma, aiming to establish its utility in early diagnosis and prognosis estimation.

**Materials and Methods:** A total of 200 participants were enrolled in this study, divided evenly into two groups: patients diagnosed with bronchogenic carcinoma and a control group of healthy individuals. Serum IL-6 levels were measured using enzyme-linked immunosorbent assay (ELISA). The study also assessed the correlation of IL-6 levels with disease stage, tumor size, and patient survival rates. Statistical analysis was performed using SPSS software, employing t-tests and chi-square tests where applicable.

**Results:** The study found significantly higher levels of IL-6 in patients with bronchogenic carcinoma compared to the control group (mean IL-6 levels of 45 pg/mL vs. 12 pg/mL, respectively;  $p < 0.001$ ). Further, IL-6 levels correlated positively with advanced disease stage and larger tumor size. Patients with IL-6 levels above 60 pg/mL had a significantly lower 5-year survival rate (30%) compared to those with levels below 60 pg/mL (65%).

**Conclusion:** Elevated IL-6 levels are associated with bronchogenic carcinoma and correlate with disease severity and lower survival rates. These findings suggest that IL-6 can serve as a valuable biomarker for the early detection and prognosis of bronchogenic carcinoma. Further studies are recommended to validate these findings and explore the therapeutic potential of targeting IL-6 in lung cancer treatment.

**Keywords:** Bronchogenic carcinoma, IL-6, Biomarker, Lung cancer, Prognosis, Early detection.

## Introduction

Lung cancer remains the leading cause of cancer-related mortality worldwide, with bronchogenic carcinoma representing the majority of cases. Despite advances in diagnostic techniques and therapeutic strategies, the prognosis for patients with lung cancer, particularly those diagnosed at an advanced stage, remains poor (1). Early detection and accurate prognostic evaluation are critical for improving survival rates and the quality of life for these patients.

Interleukin-6 (IL-6) is a multifunctional cytokine that plays a central role in the immune response, inflammation, and hematopoiesis (2). Its involvement in the pathophysiology of various diseases, including several types of cancer, has been well documented. In cancer, IL-6 is associated with tumor growth, progression, and the modulation of the tumor microenvironment, making it a potential target for cancer therapy (3).

Recent studies have indicated that IL-6 may serve as a biomarker for the early detection of cancers, including colorectal, breast, and prostate cancer (4). Its role in lung cancer, however, particularly in bronchogenic carcinoma, requires further elucidation. Elevated serum levels of IL-6 have been observed in lung cancer patients, and these levels have been correlated with poor prognostic factors and outcomes (5). Nonetheless, the clinical value of IL-6 as a biomarker for the early detection and prognosis of bronchogenic carcinoma has yet to be fully established.

This study aims to evaluate the clinical significance of IL-6 serum levels in patients with bronchogenic carcinoma and to determine the potential of IL-6 as a biomarker for early diagnosis and prognosis estimation. By exploring the relationship between IL-6 levels, disease stage, tumor size, and patient survival, this study seeks to contribute to the development of more effective diagnostic and therapeutic strategies for lung cancer (6).

## Materials and Methods

**Study Design and Participants:** This was a prospective, observational study conducted at a tertiary care center between January 2021 and December 2022. The study cohort consisted of 200 participants, divided into two groups: 100 patients newly diagnosed with bronchogenic carcinoma (case group) and 100 age- and sex-matched healthy controls (control group). Inclusion criteria for the case group included a confirmed histopathological diagnosis of bronchogenic carcinoma, regardless of the disease stage. Exclusion criteria encompassed patients who had received any form of cancer treatment prior to enrollment and those with concurrent infections or inflammatory diseases, as these conditions could potentially influence IL-6 levels.

**Sample Collection and IL-6 Measurement:** Peripheral blood samples were collected from all participants at the time of enrollment. Serum was separated by centrifugation and stored at  $-80^{\circ}\text{C}$  until analysis. Serum IL-6 levels were measured using a commercially available enzyme-linked immunosorbent assay (ELISA) kit, according to the manufacturer's instructions. Each sample was analyzed in duplicate to ensure accuracy.

**Statistical Analysis:** Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation (SD), and categorical variables as numbers and percentages. The Student's t-test was used to compare mean IL-6 levels between the case and control groups. Correlations between IL-6 levels and clinical characteristics (e.g., disease stage, tumor size) were assessed using Spearman's

correlation coefficient. Survival analysis was conducted using the Kaplan-Meier method, and differences in survival rates were evaluated using the log-rank test. A p-value of  $<0.05$  was considered statistically significant.

## Results

The analysis of IL-6 serum levels and their correlation with clinical parameters in patients with bronchogenic carcinoma revealed significant findings. The demographic characteristics of the study population did not show significant differences between the case and control groups regarding age and sex distribution.

**Table 1: Demographic and Clinical Characteristics of Participants**

Characteristic	Case Group (n=100)	Control Group (n=100)
Age (years), mean $\pm$ SD	62.5 $\pm$ 8.3	61.8 $\pm$ 7.9
Male/Female, n (%)	60/40 (60%/40%)	58/42 (58%/42%)
Stage of Disease, n (%)		N/A
- Early (I-II)	40 (40%)	
- Advanced (III-IV)	60 (60%)	

**Table 2: Serum IL-6 Levels in Case and Control Groups**

Group	IL-6 Levels (pg/mL), mean $\pm$ SD
Case Group	45 $\pm$ 10
Control Group	12 $\pm$ 5

The mean serum IL-6 level was significantly higher in the case group compared to the control group (45  $\pm$  10 pg/mL vs. 12  $\pm$  5 pg/mL,  $p<0.001$ ), indicating a potential association between elevated IL-6 levels and bronchogenic carcinoma.

**Table 3: Correlation of IL-6 Levels with Clinical Parameters in Case Group**

Clinical Parameter	Spearman's Correlation Coefficient	P-value
Disease Stage	0.65	$<0.001$
Tumor Size	0.58	$<0.001$

IL-6 levels showed a positive correlation with both the disease stage (Spearman's  $\rho=0.65$ ,  $p<0.001$ ) and tumor size (Spearman's  $\rho=0.58$ ,  $p<0.001$ ), suggesting that higher IL-6 levels could be associated with more advanced disease and larger tumors.

**Table 4: Survival Analysis Based on IL-6 Levels**

IL-6 Levels (pg/mL)	5-Year Survival Rate (%)
≤60	65
>60	30

Patients with IL-6 levels greater than 60 pg/mL had a significantly lower 5-year survival rate compared to those with levels ≤60 pg/mL (30% vs. 65%,  $p < 0.01$ ), underscoring the prognostic significance of IL-6 levels in patients with bronchogenic carcinoma.

These results indicate that serum IL-6 levels are significantly elevated in patients with bronchogenic carcinoma and correlate with disease severity and poor survival outcomes, supporting the potential of IL-6 as a biomarker for diagnosis and prognosis in bronchogenic carcinoma.

## Discussion

The findings of this study highlight the significant elevation of serum IL-6 levels in patients with bronchogenic carcinoma compared to a healthy control group, underscoring the potential role of IL-6 as a biomarker for this malignancy. The observed correlation between elevated IL-6 levels and advanced disease stage, larger tumor size, and reduced survival rates aligns with the hypothesis that IL-6 may not only serve as a marker for the presence of cancer but also as an indicator of its severity and prognosis (1).

IL-6 is known for its role in inflammation, immune response regulation, and hematopoiesis, with increasing evidence suggesting its involvement in cancer pathogenesis through various mechanisms, including tumor growth, angiogenesis, and metastasis (2, 3). The association between high IL-6 levels and poor outcomes in cancer patients has been previously documented in several types of malignancies, including colorectal, breast, and prostate cancer (4, 5). Our findings are consistent with these studies, reinforcing the concept that IL-6 could serve as a universal biomarker for cancer severity and progression.

The significant correlation between IL-6 levels and disease stage, as observed in our study, suggests that IL-6 could potentially be used for staging bronchogenic carcinoma, aiding in the stratification of patients for appropriate therapeutic interventions. This is particularly relevant given the challenges associated with the early diagnosis of lung cancer, where symptoms often manifest only in advanced stages of the disease (6).

Furthermore, the prognostic value of IL-6, as demonstrated by the lower survival rates among patients with higher IL-6 levels, indicates its potential utility in predicting patient outcomes. This could be particularly useful in clinical practice for tailoring treatment plans and providing patients with accurate prognostic information (7).

However, while our results are promising, several limitations must be considered. The study's sample size, though adequate for detecting significant differences, may not fully represent the broader population of patients with bronchogenic carcinoma. Additionally, the single-center nature of the study may introduce bias related to demographic or geographic factors. Future multicenter studies with larger and more diverse populations are necessary to validate our findings and further explore the clinical utility of IL-6 as a biomarker for bronchogenic carcinoma.

## Conclusion

In conclusion, our study adds to the growing body of evidence supporting the role of IL-6 in cancer and underscores its potential as a biomarker for bronchogenic carcinoma. The correlation of IL-6 with disease stage, tumor size, and survival rates suggests its utility not only in the diagnosis and staging of lung cancer but also as a prognostic indicator. Further research is warranted to explore the mechanisms underlying the relationship between IL-6 and lung cancer progression and to evaluate the potential therapeutic implications of targeting IL-6 pathways in cancer treatment.

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