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Original Article

Oncology Section

Association of Sociodemographic Characteristics and Smoking with Various Subtypes of Lung Cancer: A Record Based Study

ARUNIMA GUPTA[1], JOYDEEP BASU[2], CHAITIPARNA DAS[3]

ABSTRACT

Introduction: Lung cancer is a major cause of cancer-related deaths in India. The occurrence of adenocarcinoma is more common than squamous cell carcinoma in many areas, even among the non-smokers.

Aim: To assess whether histological types of lung cancer vary with sociodemographic factors, smoking status, and the form of smoked tobacco.

Materials and Methods: This retrospective record-based study reviewed 342 lung cancer cases from May 2022 to December 2024 at a tertiary centre with 310 cases being confirmed histological subtypes. Records with missing demographic or smoking details were excluded, along with 32 Fine-Needle Aspiration Cytology (FNAC) cases that did not have subtype information. Demographic details with smoking categories, and type of smoked tobacco were collected from patient files and cross-checked. Active, passive, and non-smokers were identified from the documentation, and tobacco forms were listed. The collected data and variables were analysed with the Chi-square test, and mean age across subtypes was calculated with Analysis of Variance (ANOVA).

Results: Adenocarcinoma formed the largest group (37.4%), followed by squamous cell carcinoma (33.2%), large cell carcinoma (16.1%), and small cell carcinoma (13.2%). Men included approximately 80.6% of the sample, and the mean age was 62.68 years. More than half of the patients were active or passive smokers, while 23.2% had never smoked. The distribution of histological types was similar among the genders, age, and rural or urban areas. Smoking status did not change the histological pattern ($p=0.246$). The type of smoked tobacco also showed no difference in subtype distribution ($p=0.976$).

Conclusion: Adenocarcinoma is the dominant lung cancer subtype and occurs in all sociodemographic and exposure groups. Routine histologic and molecular analysis for every patient is needed to guide the treatment protocol and improve diagnostic accuracy.

Keywords: Adenocarcinoma, Air pollution, Molecular analysis, Non-filtered cigarettes, Small cell lung carcinoma, Tobacco exposure

INTRODUCTION

Lung cancer is the leading cause of cancer-related mortality globally, with an estimated 2.5 million new cases and 1.8 million deaths in 2022. It accounts for the highest incidence and mortality rates among all malignancies thus, showing its aggressive nature and late diagnosis [1]. In India, the burden is equally distressing as lung cancer ranks 4th in carcinoma incidence and 3rd in cancer-related deaths, with approximately 82,000 new cases and 75,000 deaths reported in 2022 [2]. Lung cancer incidence has stabilised or decreased among men in high-income countries both globally and in India, whereas it is steadily increasing among women, thus showing a significant and ongoing shift in the epidemiological pattern of the disease [3,4].

Tobacco use is the main risk factor for lung cancer, causing 80-90% of cases globally [5,6]. More than 50 carcinogens in tobacco smoke, including N-nitrosamines and polycyclic aromatic hydrocarbons, cause Deoxyribonucleic Acid (DNA) damage and lead to cancer [5]. In India, bidi smoking is common in rural and semi-urban areas and carries a relative risk of 2.64 for lung cancer, slightly higher than cigarettes, which have a relative risk of 2.23 [7,8]. India is the second-largest consumer and third-largest producer of tobacco, with 28.6% of adults using tobacco, 42.4% of men and 14.2% of women [9,10].

In South Asia, especially India, a high proportion of lung cancer patients have never smoked, with women being the most affected. Studies have reported that 30 to 55% of lung cancer cases occur in never-smokers, and adenocarcinoma is the most common type in this group [4,8,11,12]. Indoor air pollution from cooking with biomass fuel is a major contributor, affecting upto 75.9 % of women in rural households [13,14]. Some studies have shown that exposure to cooking fumes and solid fuels increases the lung cancer risk by 1.5 to 3 times in never-smoking women [8,15]. Passive smoking also increases risk, with environmental tobacco smoke raising lung cancer risk by 48% in men and 20% in women [7,8].

Lung cancer is classified into Non-Small Cell Lung Cancer (NSCLC, about 85%) and Small Cell Lung Cancer (SCLC, less than 15%) [16,17]. Among NSCLC subtypes, adenocarcinoma has become more common than squamous cell carcinoma, both globally and in India [4,18-20]. This is especially seen in younger patients, women, and never-smokers and is often associated to mutations such as EGFR and ALK that affect prognosis and treatment [11,14,16]. Histopathological subtyping remains unavailable in many Indian centres due to limited access to Computed Tomography (CT)-guided biopsies or immunohistochemistry. FNAC, commonly used in resource-limited settings, often cannot distinguish NSCLC subtypes [4,10]. In these cases, sociodemographic and smoking-related data, which are routinely collected, may help indicate the likely histology. Comprehensive analyses connecting sex, age, residence, and smoking patterns (active, passive, or never-smoker; bidi versus cigarette) to specific histological subtypes in India are limited. Individual studies from North and South India describe some trends, but an integrated, record-based study is lacking [4,13,19,20]. Hence, this study investigated whether the histological types of lung cancer vary with sex, age, rural or urban residence, smoking status, and the specific form of tobacco used.

MATERIALS AND METHODS

The present retrospective, record-based, cross-sectional study was carried out in the Radiotherapy Department of a Medical College in West Bengal, India. Records of 342 patients with histology or cytology-proven lung carcinoma who attended the outpatient department from May 2022 to December 2024 were reviewed. Approval from the Institutional Ethics Committee (IEC number: CMSDH/IEC/31/06-2025) was obtained before data collection.

Inclusion and exclusion criteria: Patients were included if they had a confirmed diagnosis of lung carcinoma by histopathological examination of tissue obtained by CT-guided biopsy or cell block analysis of pleural fluid, and if their records contained complete demographic and smoking information. Immunohistochemistry was performed only in 17 cases of adenocarcinoma lung. Provision for routine immunohistochemistry and molecular testing was not available in the pathology department of the institution, and economically weak patients could not afford these investigations in private laboratories. Patients with incomplete files or inconclusive histopathological subtypes on pathology reports were excluded. No further stratification of excluded cases was performed. Thirty-two patients with no specified pathological type were excluded based on this criterion. No other inclusion or exclusion criteria were applied, as the study aimed to assess associations between histological subtype and sociodemographic characteristics and smoking patterns, without relation to treatment status.

Study Procedure

Smoking categories were defined from the information documented during enrolment. An active smoker was a person who consumed any form of smoked tobacco regularly. Former smokers were not included in the non-smoker category. A non-smoker was someone with no history of active smoking. A passive smoker was a person who spent at least six hours per day almost daily in close proximity to an active smoker at home or at the workplace. Former smokers were included in the active smoking group, as the duration of abstinence was not consistently documented. Exposure to bidi, filtered cigarette, or non-filtered cigarette was self-reported during history taking. Pack-year calculation was not performed due to wide variation in smoking forms and incomplete documentation of duration and intensity.

All patients underwent contrast-enhanced CT imaging of the thorax and whole abdomen as part of the metastatic work-up. Pre-treatment blood tests were recorded for every patient. Contrast-enhanced Magnetic Resonance Imaging (MRI) of the brain and Tc-99m whole-body bone scans were performed for symptomatic patients. Treatment followed accepted clinical guidelines.

Most histopathological examinations were performed in the pathology department of the Medical College. Reports from outside laboratories were reviewed and verified by the institutional pathology department. Data extraction was done from patient files preserved in the record section. All data were collected from records generated on the first day of the patient's attendance at the outpatient department. No follow-up data were included. One investigator retrieved demographic and smoking information using a predesigned data sheet. Another investigator cross-checked the entries for accuracy. Missing entries for demographic or smoking details resulted in exclusion of the respective patient from analysis. Age, sex, residence (urban or rural), smoking pattern, and type of smoking were compared across histological subtypes of lung carcinoma.

STATISTICAL ANALYSIS

Categorical variables were analysed with the Chi-square test. Mean age across the groups was analysed with the ANOVA test. Statistical analysis was performed using an online statistical calculator (Social Science Statistics).

RESULTS

A total of 342 patients attended the Radiotherapy OPD during the study period. Of these, 258 patients had CT-guided lung biopsies, 26 patients were diagnosed through pleural fluid cell block study, and 58 patients underwent FNAC. Histological type was not recorded for 32 FNAC cases, so these 32 patients were excluded. The final analysis included 310 patients. The mean age of the study population was 62.68±10.217 years. The study group had 250 men (80.64%) and 60 women (19.36%). Urban residents numbered 207 (66.77%), and 103 (33.23%) lived in rural areas [Table/Fig-1].

[Table/Fig-2] shows the distribution of different pathological types of lung cancer across several patient factors. According to the records, out of 310 cases, 116 constituted adenocarcinoma, 103 squamous cell carcinoma, 50 large cell carcinoma and 41 small cell carcinoma. Among men, the numbers were 90 adenocarcinoma, 83 squamous cell carcinoma, 42 large cell carcinoma, and 35 small cell carcinomas. Among women, the counts were 26, 20, 8, and 6, respectively. The mean age stayed close across all four groups, with values from 62.365 to 63.6 years. Rural patients showed 42,

S. No.	Variables	Values
1.	**Age (years)**	
	(Mean±SD)	62.68±10.217
2.	**Sex**	
	Male	250 (80.64%)
	Female	60 (19.36%)
3.	**Residence**	
	Rural	103 (33.23%)
	Urban	207 (66.77%)

[Table/Fig-1]: Demographic profile of the study population (N=310).

Parameters		Adenocarcinoma	Squamous cell carcinoma	Large cell carcinoma	Small cell carcinoma	p-value
Sex	Male	90	83	42	35	0.65
	Female	26	20	8	6	
Age	Mean±SE	62.655±10.526	62.388±9.985	63.6± 10.486	62.365±9.873	0.913
Residence	Rural	42	29	18	14	0.605
	Urban	74	74	32	27	
Smoking habits	Active	65	54	29	25	0.246
	Passive	25	27	17	11	
	Non-smoker	26	22	4	5	
Type of smoking	Cigarette (Filtered)	24	19	12	8	0.976
	Cigarette (non-filtered)	3	2	2	1	
	Bidi	38	33	15	16	

[Table/Fig-2]: Factors associated with different pathological types of lung cancer.

29, 18, and 14 cases, while urban patients showed 74, 74, 32, and 27 cases of adenocarcinoma, squamous cell carcinoma, large cell carcinoma and small cell carcinoma, respectively. Active smokers had 65, 54, 29, and 25 cases, and passive smokers had 25, 27, 17, and 11 cases. Non-smokers had 26, 22, 4, and 5 cases. Cigarette (filtered) users showed 24, 19, 12, and 8 cases, non-filtered cigarette users had 3, 2, 2, and 1 case, and bidi users had 38, 33, 15, and 16 cases. The incidence of lung carcinoma was about five times lower in non-smokers when compared with active and passive smokers combined. The distribution of histological subtypes stayed similar across smoking groups (p=0.246). The type of smoked tobacco (bidi, filtered cigarette, or non-filtered cigarette) did not change the distribution of histological types (p=0.976).

DISCUSSION

The present record-based study examined how sociodemographic factors and smoking patterns relate to the histological types of lung cancer in patients treated at a tertiary care centre in India. Adenocarcinoma (37.4%) and squamous cell carcinoma (33.2%) formed the largest groups. Several Indian studies from North India, South India, and Kerala have also reported a rise in adenocarcinoma, now seen more often than squamous cell carcinoma [5,7,8,11,12,19,20]. The results showed no significant association between histological subtype and sex, age, rural or urban residence, smoking status (active, passive, or never-smoker), or the type of tobacco used (bidi or cigarette). This finding differs from studies that report adenocarcinoma in non-smokers [8,11,21,22] or squamous cell carcinoma in active smokers [7,17,19]. Some other Indian studies have reported similar distributions of histological types in varying exposure groups [13,20]. These differences among studies show a wide range of factors in India like tobacco habits, indoor air pollution, genetic factors, and diagnostic practices that may have an impact on the patterns observed in lung cancer [5,7,10,11,15].

The predominance of adenocarcinoma in this study was similar to the observations reported globally and in many parts of India. Squamous cell carcinoma was the most common type previously, but many countries have now reported that adenocarcinoma is the leading subtype. Reports from the United States have shown a constant increase in adenocarcinoma from 2000 to 2019, especially in women and never-smokers. Jeon J et al., (2025) have related these findings to filtered and low-tar cigarettes that promote deeper inhalation with better imaging that detects peripheral lung lesions more effectively [2]. China has reported similar findings, Zeng Q et al., (2019) studied 5870 female lung cancer patients and found that adenocarcinoma formed 76.1% of the cases in never-smokers and 46.8% in smokers. The proportion in never-smokers increased from 63.1% to 80.6% over the study years [23]. These results suggest strong roles for passive smoke and outdoor air pollution in countries across Asia.

Multiple Indian centres now report the same pattern. In a 15-year review from South India, Mehta AA et al., (2025) found adenocarcinoma in 37.1% of all cases and in 55 % of women, with a steady rise from 2008 to 2022 [4]. Mohan A et al., (2020) from North India studied 1862 patients and reported an increase in adenocarcinoma from 9.5 % to 35.9%, eventually surpassing squamous cell carcinoma [19]. Soumya M et al., (2020) found adenocarcinoma in 52% of cases [12], and Jose NK et al., (2023) from Kerala reported 56.4% adenocarcinoma and 25.6% squamous cell carcinoma [20]. Earlier reports also pointed toward the same pattern. Krishnamurthy A et al., (quoted in Noronha V et al., 2016) found adenocarcinoma in 42.6% and squamous cancer in 15.6% [7]. Malik PS et al., (2013) noted that after expert review, adenocarcinoma (37.3%) surpassed squamous cancer (33.3 %) at AIIMS, New Delhi [8].

Global data from Nordic countries reported by Pizzato M et al., (2022) describe rising adenocarcinoma numbers even when overall lung cancer incidence in men declined [18]. Possible reasons include changes in tobacco products, air pollution, and stronger pathology tools. In India, several contributors have been described, including filtered cigarettes and bidis that influence how carcinogens settle in the lungs [5,10,24], long-term exposure to biomass fuel smoke among women in rural homes [7,8,11,13,15], and extensive use of immunohistochemistry, which reduces the number of NSCLC cases which are otherwise unclassified [4,12,19]. Thus, the predominance of adenocarcinoma in the present study fits with published evidence from India and other countries and represents a broad change in the pattern of lung cancer, shaped by tobacco habits, air quality, and better diagnostic methods.

A major feature of lung cancer patterns in India is the large number of patients who have never smoked. Many Indian studies report that 30 to 55% of patients have no history of active tobacco use, which is far higher than the 10 to 15% reported in Western countries [4,8,11,19,20]. In the present study, 23.2% of patients were never-smokers, and another 32.3% were passive smokers. More than half of the sample group (55.5%) had no direct smoking history. Indian data have shown this pattern repeatedly. Das A et al., (2017) reported that 55.4 % of 495 lung cancer patients from Chennai were never-smokers, and 63% of all cases were adenocarcinoma. They linked this pattern to exposure to biomass fuel used for cooking [8]. Mehta AA et al., (2025) found that 52 % of lung cancer patients in South India were never-smokers, and more than 70% of women fell into this category [4]. Shirgaonkar R et al., (2024) studied 145 never-smokers in Odisha and found adenocarcinoma in 92.4%. Many patients carried EGFR mutations, showing that a separate biological pathway drives disease in this group [11].

Household air pollution plays a major part in this burden. Hong Y et al., (2025) showed that solid fuel smoke increases lung cancer risk by 1.5 to 3 times in never-smoking women. They reported a pooled odds ratio of 5.54 for solid fuel exposure and 5.30 for environmental tobacco smoke in females [15]. Kshetrimayum S et al., (2016) reported that 75.9 % of women with lung cancer were exposed to biomass fuel, and 72.7 % of never-smokers had adenocarcinoma [13]. Noronha V et al., (2016) noted that the smoker to never-smoker ratio in India often stays below 3 to 1, much lower than Western ratios, which are usually above 10 to 1 [7].

In the present study, histological patterns did not differ significantly across smoking groups (p=0.246). Tobacco smoke and indoor pollution can both produce adenocarcinoma through different biological paths. Tobacco-related tumours often show KRAS or TP53 mutations, while never-smokers in India frequently carry EGFR, ALK, or ROS1 alterations [11,16,19]. Garg P et al., (2024) stated that these differences make it difficult to rely on clinical details alone and stressed the need for broad molecular testing [16]. Indian studies have reported similar findings which show that both tobacco and household pollution are strong contributing factors for the increased numbers of adenocarcinoma recently [13,20].

The present study showed no association between the type of smoked tobacco and histological subtype (p=0.976). Bidi smoking formed 41.1% of active smokers in this study. There are some previous Indian studies that reported a rise in squamous cell carcinoma among regular bidi users, with higher squamous-to-adenocarcinoma ratios and greater lung cancer risk [10,19,22]. In contrast, the present study showed almost equal numbers of adenocarcinoma and squamous cell carcinoma among bidi users, which could be due to the changing pattern of lung cancer in India, where adenocarcinoma is increasing even among long-term smokers. This change was similar with the observations from various studies that reported filtered cigarettes and deeper inhalation patterns could alter the carcinogen deposition in peripheral airways thus favouring the progression of adenocarcinoma, which is evident even among traditional bidi smokers in India [6,23,24]. Remen T et al., (2018) reported that smoking duration and smoking intensity influence histological patterns more than the specific tobacco product [17]. The present study did not record detailed information on duration or intensity, which may have obscured possible patterns.

Men made up 80.6% of the study population, a proportion similar to reports from different Indian centers [5,19,20]. The analysis showed no association between sex and histological type (p=0.65). International reports often show more adenocarcinoma in women, especially among never-smokers [21,22]. Indian studies do not show this pattern in a clear way. Indian studies show no clear difference in adenocarcinoma rates between men and women [13,20]. Women inhale biomass fuel smoke for long periods, and men use bidi and smokeless tobacco [5,8,10]. These exposures act strongly in both genders and can lead to similar histologic findings. This pattern was in accordance with recent Indian observations that describe little variation in tumour type in both genders [15,25,26]. These exposures affect both sexes and may produce similar histological findings in both groups. The rural-urban distribution in this study showed 33.2% from rural areas, with no rural-urban difference in histology (p=0.605). Urban regions have high outdoor pollution, while rural families often depend on solid fuels and show high bidi use [7,15,26]. Indian findings show that rural and urban populations are exposed to a mix of industrial smoke, vehicle emissions, and household biomass fuel, creating similar exposure loads across regions [26,27]. Rural patients often reach hospitals later, but their tumour types match those seen in urban groups [28]. SCLC accounted for 13.2% of this study group. Heavy smoking usually explains most SCLC cases [29]. In this study, 16.1 percent of SCLC patients had no active smoking history, which is higher than expected. Reports from India and other countries now describe SCLC in people without direct smoking exposure, and factors like inherited traits or other environmental sources are the possible sources [29-31]. Hence, this study shows that adenocarcinoma is the predominant form of lung cancer in India and occurs across various smoking groups. It is essential to perform a routine histologic and molecular analysis for every patient to guide the accurate treatment process.

Strengths and Limitation(s)

This study was based on records from a single centre, so the results may not represent the entire country. Smoking history was self-reported, and details such as pack-years, biomass fuel use, workplace exposures, and indoor pollutants were not available. Most cases had confirmed histology, and tobacco exposure was separated into active smokers, passive smokers, and smokeless users. The findings show that age, sex, residence, and smoking habits shape who develops lung cancer in India, but these factors do not decide the histologic type. All patients should receive both histologic and molecular assessment, and future work should gather detailed exposure information through multi-center studies.

CONCLUSION(S)

This study shows that adenocarcinoma is now the most frequent form of lung cancer in India and appears across all smoking groups, age groups, and sociodemographic categories. Sex, geographical location, smoking status, and the type of smoked tobacco did not show any clear association with the histological pattern. Both tobacco exposure and household air pollution appear to influence disease in ways that make traditional predictors less reliable. Large scale studies with detailed exposure data will help clarify how environmental and lifestyle factors modulates the incidence of lung cancer in the country.

REFERENCES

[1] Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74(3):229-63.

[2] Jeon J, Cao P, Meza R. Lung cancer incidence trends by histology and individual- and county-level sociodemographic characteristics in the United States from 2000 to 2019. J Natl Cancer Inst Monogr. 2025;2025(70):211-23.

[3] World Health Organization. International Agency for Research on Cancer Global Cancer Observatory. Cancer today. 2018.

[4] Mehta AA, Pavithran K, Nair PK, Vazhoor V, Gutjahr G, Lakshmi Priya VP. Epidemiological and histopathological profile of lung Cancer: Insights from a 15-year cross-sectional study at a tertiary care centre in South India. Glob Epidemiol. 2025;9:100208.

[5] Singh N, Agrawal S, Jiwnani S, Khosla D, Malik PS, Mohan A, et al. Lung Cancer in India. J Thorac Oncol. 2021;16(8):1250-66.

[6] Wang A, Kubo J, Luo J, Desai M, Hedlin H, Henderson M, et al. Active and passive smoking in relation to lung cancer incidence in the Women's Health Initiative Observational Study prospective cohort. Ann Oncol. 2015;26(1):221-30.

[7] Noronha V, Pinninti R, Patil VM, Joshi A, Prabhash K. Lung cancer in the Indian subcontinent. South Asian J Cancer. 2016;5(3):95-103.

[8] Das A, Krishnamurthy A, Ramshankar V, Sagar TG, Swaminathan R. The increasing challenge of never smokers with adenocarcinoma lung: Need to look beyond tobacco exposure. Indian J Cancer. 2017;54(1):172-77.

[9] Chengappa KS, Rao A, Shenoy R, Pai MB, Jodalli P, Br A. Tobacco control policy in india: Progress and challenges quantified using the tobacco control scale. Asian Pac J Cancer Prev. 2024;25(9):3209-17.

[10] Kulothungan V, Ramamoorthy T, Sarveswaran G, Jadhav SY, Mathur P. Association of tobacco use and cancer incidence in india: A systematic review and meta-analysis. JCO Global Oncology. 2024;10:e2400152.

[11] Shirgaonkar R, Mohapatra PR, Panigrahi MK, Mishra P, Bhuniya S, Sarkar S, et al. Evaluation of risk factors for lung cancer among never smokers and their association with common driver mutations. Cureus. 2024;16(3):e56024.

[12] Soumya M, Mohan A, Harikrishna J, Bhargav KM, Ravisankar A, Rukmangadha N, et al. Demographic characteristics, clinical presentation, risk factors and pathological types of lung cancer: A prospective study. Journal of Clinical and Scientific Research. 2020;9(1):16-24.

[13] Kshetrimayum S, Srivastava A, Kant S, Verma AK, Prakash V, Bajaj DK, et al. A study of the sociodemographic, clinical, pathological and radiological profile of lung cancer in a tertiary care center. Int J Adv Med. 2016;3(4):920-27.

[14] Tzu-Hsuan Chen D, Hirst J, Coupland CAC, Liao W, Baldwin DR, et al. Ethnic disparities in lung cancer incidence and differences in diagnostic characteristics: A population-based cohort study in England. Lancet Reg Health Eur. 2024;48:101124.

[15] Hong Y, Jang KS, Xie H. Meta-analysis of the association between indoor environmental pollution and lung cancer risk in never-smokers. Am J Transl Res. 2025;17(8):5779-98.

[16] Garg P, Singhal S, Kulkarni P, Horne D, Malhotra J, salgia r, et al. advances in non-small cell lung cancer: Current Insights and Future Directions. J Clin Med. 2024;13(14):4189.

[17] Remen T, Pintos J, Abrahamowicz M, Siemiatycki J. Risk of lung cancer in relation to various metrics of smoking history: A case-control study in Montreal. BMC Cancer. 2018;18(1):1275.

[18] Pizzato M, Martinsen JI, Heikkinen S, Vignat J, Lynge E, Sparén P, et al. Socioeconomic status and risk of lung cancer by histological subtype in the Nordic countries. Cancer Med. 2022;11(8):1850-59.

[19] Mohan A, Garg A, Gupta A, Sahu S, Choudhari C, Vashistha V, et al. Clinical profile of lung cancer in North India: A 10-year analysis of 1862 patients from a tertiary care center. Lung India. 2020;37(3):190-97.

[20] Jose NK, Soman B, Thulaseedharan JV, Varghese BT, Thomas S, Tom JJ, et al. Demographic and clinical characteristics of primary lung cancer patients in Kerala: Analysis of data from six teaching centers. J Family Med Prim Care. 2023;12(10):2501-06.

[21] Pinheiro PS, Callahan KE, Medina HN, Koru-Sengul T, Kobetz EN, Gomez SL, et al. Lung cancer in never smokers: Distinct population-based patterns by age, sex, and race/ethnicity. Lung Cancer. 2022;174:50-56.

[22] Banks KC, Sumner ET, Alabaster A, Hsu DS, Quesenberry CP Jr, Sakoda LC, et al. Sociodemographic and clinical characteristics associated with never-smoking status in patients with lung cancer: Findings from a large integrated health system. Transl Cancer Res. 2022;11(10):3522-34.

[23] Zeng Q, Vogtmann E, Jia MM, Parascandola M, Li JB, Wu YL, et al. Tobacco smoking and trends in histological subtypes of female lung cancer at the Cancer Hospital of the Chinese Academy of Medical Sciences over 13 years. Thorac Cancer. 2019;10(8):1717-24.

[24] Li Y, Hecht SS. Carcinogenic components of tobacco and tobacco smoke: A 2022 update. Food Chem Toxicol. 2022;165:113179.

[25] Sivasubramanian N, Mahalakshmi B, Ramalakshmi G. Awareness on passive smoking among Indian adults. Bioinformation. 2023;19(1):10.

[26] Chowdhury S, Pillarisetti A, Oberholzer A, Jetter J, Mitchell J, Cappuccilli E, et al. A global review of the state of the evidence of household air pollution's contribution to ambient fine particulate matter and their related health impacts. Environment international. 2023;173:107835.

[27] Rao S, Wu H, Zhang G, Dong W, Cui L, Wang Y, et al. A comparative analysis of the burden, trends and inequalities of tracheal, bronchus, and lung cancer in India from 2000 to 2021: A systematic analysis for the Global Burden of Disease study 2021. PLoS One. 2025;20(5):e0322646.

[28] Mathew A, George PS, Ramadas K, Mathew BS, Kumar A, Roshni S, et al. Sociodemographic factors and stage of cancer at diagnosis: A population-based study in South India. Journal of Global Oncology. 2019;5:1-0.

[29] Tseng JS, Chiang CJ, Chen KC, Zheng ZR, Yang TY, Lee WC, et al. Association of smoking with patient characteristics and outcomes in small cell lung carcinoma, 2011-2018. JAMA network open. 2022;5(3):e224830.

[30] Frank C. Detterbeck, Roy H. Decker, Lynn Tanoue and Rogerio C. Lilenbaum. Non-Small Cell Lung Cancer. Vincent T. Devita Jr, Theodore S. Lawrence, Steven A. Rosenberg, editors. 10th ed. Cancer: Principles & Practice of Oncology. Wolter Kluwer; 2015. pp 495-535.

[31] Wistuba II, Brambilla E, Noguchi M. Classic anatomic pathology and lung cancer. InIASLC Thoracic Oncology 2018 Jan 1 (pp. 143-163). Elsevier.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Radiotherapy, College of Medicine and Sagore Dutta Hospital, Kolkata, West Bengal, India.
2. Assistant Professor, Department of Radiotherapy, Tamralipto Government Medical College and Hospital, Tamluk, West Bengal, India.
3. Associate Professor, Department of Radiotherapy, College of Medicine and Sagore Dutta Hospital, Kolkata, West Bengal, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Chaitiparna Das,
FC-82, Sector-3, Salt Lake, North 24 Paraganas, Kolkata-700106,
West Bengal, India.
E-mail: chaitiparna.kol106@gmail.com

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