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Original Research Article

Epidemiology of lung cancer in Eastern India with focus on histopathological subtypes and smoking history: a single rural tertiary center experience

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ABSTRACT

Background: Lung cancer is the most common cancer and the leading cause of mortality worldwide. Smoking remains the commonest risk factor for development of lung cancer. This study aimed to evaluate the histopathological subtypes and smoking history among patients with lung cancer.
Methods: This was a retrospective observational study that included all the patients attending Radiotherapy OPD of Burdwan Medical College during 2017 and 2018. Demographic data, smoking history, comorbidities, symptoms, smoking history, histology of lung cancer, stage at presentation, site of metastasis, and site of lesions were collected.
Results: There were 484 patients, with a median age of 59 years, of which 82.4% were men and 17.6% were women. The men-to-women ratio was 4.7:1. Regular smoking was common in patients with lung cancer (72.7%). Total 12.4% of patients had small-cell carcinoma; of the 87.6% patients with non-small-cell carcinoma, the most common histology was adenocarcinoma (44.6%), followed by squamous cell (38.4%), large cell (17.0%). The most common metastatic sites were lung (42.1%) followed by bone (34.1%), lymph node (15.9%), liver (2.7%), vertebra (2.5%), pleura (2.1%), and anterior chest wall (0.6%). A larger proportion of men (92.6%) were smokers as compared women. There was a statistically higher occurrence of adenocarcinoma in smokers than in non-smokers (62.2% vs. 2.4%; $p<0.001$). The majority of patients with a smoking history (73.0%) were found to have advanced cancer (Stage IV).
Conclusions: The present study confirmed that apart from smoking history, demographic characteristics appear to have an impact on lung cancer development.

Keywords: Adenocarcinoma, Loss of weight, Non-small-cell carcinoma, Metastatic

INTRODUCTION

A recently published report from 28 population-based cancer registries (PBCRs) for the composite period 2012-2016 across India has made it evident that the cancer incidence, patterns, time trends, and mortality varies greatly across different geographic regions. The age-adjusted incidence rate ranged from 62.8 to 269.4 per 100000 population and age-adjusted mortality rate ranged from 20.5 to 152.7 per 100000 population across the Northeast region only.[1]

Worldwide, lung cancer has variable epidemiologic pattern according to the geographic region. The heterogenous epidemiology of lung cancer across the various geographic regions in India is also noteworthy.[2] It is estimated that lung cancer is the one of the top five prevalent types of cancer and one in 68 men across India will develop lung cancer during their lifetime. However,

the highest cancer incidence rate observed in the Northeast region compared to other areas in the country and lung cancer as one of the leading sites of cancer is a concerning fact.[1]

Global trend of rise in the incidence of adenocarcinoma among the patients with lung cancer indicates a vast change in histological pattern. Epidemiological studies from India have shown inconsistent patterns, few studies showing squamous histology as the prevalent one while others indicating adenocarcinoma and squamous cell carcinoma (SCC) as equally prevalent.[3,4] A recent evidence from North India has reported a similar global trend of highest prevalence of adenocarcinoma over other histology patterns.[5]

Indian epidemiological data on lung cancer is limited, more so from the eastern parts of the country and rural scenario. The present study aimed to assess the epidemiological patterns of lung cancer in a high-volume rural centre of Eastern India, and determine whether global trends observed with respect to changing patterns of epidemiological profile of lung cancer is also applicable for Indian population, especially in the rural scenario.

METHODS

This was a retrospective observational study that included all the patients attending Radiotherapy OPD of Burdwan Medical College and Hospital having histopathological diagnosis of lung cancer between June 2017 and November 2018. The study was conducted in accordance with the principles of Declaration of Helsinki and after ethics committee approval. The patients aged >18 years of either sex, diagnosed with lung cancer on histopathological examination were included in the study. Patients with thoracic metastatic disease from a non-pulmonary primary cancer were excluded.

Demographic data (age and sex), comorbidities, symptoms, smoking history, histology of lung cancer, stage at presentation, site of metastasis, and site of lesions were collected from hospital records. Diagnosis of lung cancer was confirmed by histopathological and/or cytological examination of representative tissue specimens at our center.

Descriptive data analysis was performed using Statistical package for social sciences (SPSS) version 23.0. Quantitative variables were presented as mean (standard deviation [SD]) and qualitative variables were presented as frequency and percentage.

RESULTS

A total of 484 patients with lung cancer were included in the study, 399 (82.4%) were men and 85 (17.6%) were women with a men-to-women ratio of 4.7:1. The median (range) age of study population was 59 (33-79) years. Majority of patients belonged to the age group of >40 to ≤60 years (52.3%) followed by the age group >60 years (42.8%) and the age group ≤40 years (4.9%).

Table 1: Demographic characteristics.

Parameters	Number of patients (N=484)
Sex	
Men	399 (82.4)
Women	85 (17.6)
Age [years], median (range)	59.0 (33.0-79.0)
Age groups [years]	
≤40	24 (4.9)
>40-≤60	253 (52.3)
>60	207 (42.8)
Comorbidities	
Diabetes mellitus	76 (15.7)
Hypertension	63 (13.0)
Chronic kidney disease	19 (3.9)
Hypothyroid	13 (2.7)
Ischemic heart disease	12 (2.5)
Other	4 (0.8)
Symptoms	
Loss of weight	390 (80.6)
Cough	293 (60.5)
Chest pain	281 (58.1)
Loss of appetite	251 (51.9)
Dyspnea	131 (27.1)
Fever	107 (22.1)

Continued.

Parameters	Number of patients (N=484)
Hemoptysis	86 (17.8)
Facial swelling	41 (8.5)
Hoarseness of voice	20 (4.1)
Smoking status	
Smoker	352 (72.7)
Non-smoker	132 (27.3)
Histological type of lung cancer	
Non-small cell lung cancer	424 (87.6)
Small cell lung cancer	60 (12.4)
Histological subtype of non-small cell lung cancer [n=424]	
Adenocarcinoma	189 (44.6)
Squamous cell carcinoma	163 (38.4)
Large-cell lung cancer	72 (17.0)
Stage	
II	18 (3.7)
III	209 (43.2)
IV	257 (53.1)
Sites of metastases	
Bone	204 (42.1)
Liver	165 (34.1)
Lung	77 (15.9)
Lymph node	13 (2.7)
Pleura	12 (2.5)
Vertebra	10 (2.1)
Ant chest wall	3 (0.6)
Site of lesion	
Right	298 (61.6)
Left	123 (25.4)
Bilateral	63 (13.0)
Data shown as n (%), unless otherwise specified. Other comorbid conditions: asthma (n=2); dementia (n=1); epilepsy (n=1).	

Table 2: Comparison of characteristics between smokers and non-smokers with lung cancer.

Parameters	Smoker (n=352)	Non-smoker (n=132)	P value
Sex			
Men	326 (92.6)	73 (55.3)	<0.001
Women	26 (7.4)	59 (44.7)	
Age [years], median (range)	53.0 (33.0-68.0)	64.0 (60.0-79.0)	<0.001
Age groups [years]			
≤40	24 (6.8)	-	<0.001
>40-≤60	230 (65.3)	23 (17.4)	
>60	98 (27.8)	109 (82.6)	
Comorbidities			
Diabetes mellitus	74 (21.0)	2 (1.5)	<0.001
Hypertension	56 (15.9)	7 (5.3)	
Chronic kidney disease	16 (4.5)	3 (2.3)	
Hypothyroid	12 (3.4)	-	
Ischemic heart disease	11 (3.1)	2 (1.5)	
Other	4 (1.1)	-	
Symptoms			
Loss of weight	326 (92.6)	64 (48.5)	<0.001
Cough	274 (77.8)	19 (14.4)	<0.001

Continued.

Parameters	Smoker (n=352)	Non-smoker (n=132)	P value
Chest pain	216 (61.4)	65 (49.2)	0.018
Loss of appetite	208 (59.1)	43 (32.6)	<0.001
Dyspnea	90 (25.6)	41 (31.1)	0.251
Fever	84 (23.9)	23 (17.4)	0.141
Hemoptysis	77 (21.9)	9 (6.8)	<0.001
Facial swelling	31 (8.8)	10 (7.6)	0.855
Hoarseness of voice	13 (3.7)	7 (5.3)	0.445
Histological type of lung cancer			
Non-small cell lung cancer	299 (84.9)	125 (94.7)	0.003
Small cell lung cancer	53 (15.1)	7 (5.3)	
Histological subtype of non-small cell lung cancer [n=424]			
Adenocarcinoma	186 (62.2)	3 (2.4)	<0.001
Squamous cell carcinoma	51 (17.1)	112 (89.6)	
Large-cell lung cancer	62 (20.7)	10 (8.0)	
Stage			
2	-	18 (13.6)	<0.001
3	95 (27.0)	114 (86.4)	
4	257 (73.0)	-	
Sites of metastases			
Bone	122 (34.7)	43 (32.6)	<0.001
Liver	-	13 (9.8)	
Lung	204 (58.0)	-	
Lymph node	26 (7.4)	51 (38.6)	
Pleura	-	10 (7.6)	
Vertebra	-	12 (9.1)	
Ant chest wall	-	3 (2.3)	
Site of lesion			
Right	298 (84.7)	-	<0.001
Left	50 (14.2)	73 (55.3)	
Bilateral	4 (1.1)	59 (44.7)	
Data shown as n (%), unless otherwise specified. Other comorbid conditions: asthma (n=2); dementia (n=1); epilepsy (n=1).			

The most common symptoms were loss of weight (80.6%), cough (60.5%), chest pain (58.1%), and loss of appetite (51.9%). While dyspnea, fever, hemoptysis, facial swelling, hoarseness of voice occurred in 27.1%, 22.1%, 17.8%, 8.5%, and 4.1% of patients, respectively. Regular smoking was common in patients with lung cancer (72.7%). Small cell lung cancer was diagnosed in 12.4% of patients, while 87.6% of the patients had non-small cell lung cancer (NSCLC). Within NSCLC, the most common histology was adenocarcinoma (44.6%) followed by SCC (38.4%) and large-cell lung cancer (17.0%). A small proportion (4.5%) of patients were diagnosed by cytology as NSCLC, without further histopathological sub-typing. Eighteen patients belonged to stage II, 209 patients in stage II, and 257 patients in stage IV. The most common metastatic sites were lung (42.1%) followed by bone (34.1%), lymph node (15.9%), liver (2.7%), vertebra (2.5%), pleura (2.1%), and anterior chest wall (0.6%). Out of 484 patients, 61.6% patients had the lesion on right side, 25.4% on left side while 13.0% of patients had bilateral lesions (Table 1).

A larger proportion of men (92.6%) were smokers as compared to only 7.4% of women who were smokers. The median age of non-smokers was significantly higher than that of smokers (64 versus 53 years, p<0.001). A larger proportion of non-smokers with lung cancer (82.6%) were noted in the older age group (>60 years). The NSCLC was the most common histological type both among smokers and non-smokers. There was a statistically higher occurrence of adenocarcinoma in smokers than in non-smokers (62.2% versus 2.4%; p<0.001). The SCC histology was more commonly found among non-smokers than smokers (89.6% versus 17.1%; p<0.001). The majority of patients with a smoking history (73.0%) were found to have advanced cancer (Stage IV). The most common metastatic sites among smokers were lung

(58.0%) and bone (34.7%). The most common metastatic sites among non-smokers were lymph node (38.6%) and bone (32.6%). Left and bilateral-sided lesions were significantly higher in non-smokers than smokers (55.3% versus 14.2% and 44.7% and 1.1%, respectively) (Table 2).

DISCUSSION

The present study comprises a total of 484 patients. Majority of them were men with a men-to-women ratio of 4.7:1. The majority of the present study population was from the age group >40 to ≤60 years. The average age of presentation in the study was 59 years. Regular smoking was common in patients with lung cancer. The NSCLC was diagnosed in 87.6% of the patients. Within NSCLC, the most common histology was adenocarcinoma followed by SCC and large-cell lung cancer. Most of the patients were in the late stage. Lung, bone, lymph node, liver, vertebra, pleura, and anterior chest wall were the common sites of metastases. There was a statistically higher occurrence of adenocarcinoma in smokers than in non-smokers. The majority of patients with smoking history were in advanced cancer stage (Stage IV).

Men predominance in patients with lung cancer was observed in this study. This finding is in general agreement with previous worldwide and Indian reports showing that the incidence of lung cancer is more often in men than women, and in younger adults aged >40 years.[6] Lu et al used the Surveillance, Epidemiology, and End results (SEER) database and noted that lung cancer incidence was majorly driven by men (n=646,662).[7] Another noteworthy study from Indian literature that included patients with lung cancer noted the prevalence of men over women (82.9 versus 17.1%).[5] Hence, men patients are more prone to develop lung cancer.

In the present study, younger patients reported a higher incidence of lung cancer than older patients. A study by Noronha et al that the incidence of lung cancer was directly proportional with increasing age and the majority of patients diagnosed with lung cancer were in the age group of >40-60 years.[8] The previous study conducted at a regional cancer centre from western India reported the prevalence of lung cancer and it was found to be highest in the younger age group (15-60 years).[9] Another evidence-based ambispective observational study reported the analysis of 1862 patients with lung cancer and remarkable prevalence in younger individuals aged between 46-70 years (75.7%).[5] Regarding age distribution, the burden of lung cancer has increased with an increasing incidence of diagnosed lung cancer in the adult age 40 years and older.[2]

Tobacco smoking is the major cause of all major histopathological types of lung cancer. Smoking history was the most common lifestyle-related risk factor seen among this study population. These findings are in concordance with Agarwal et al, study wherein smoking and tobacco were the risk factors shown to be strongly associated with lung cancer.10 The risk of developing lung cancer was 20-50-fold higher among continuous smokers than non-smokers.[11] The epidemiological studies have drawn a causal association between exposure to cigarette smoke and lung cancer risk.[12,13] Gupta et al, demonstrated that environmental tobacco smoke exposure during childhood was associated with the risk of developing lung cancer (odds ratio, OR: 3.9, 95% confidence interval [95% CI] 1.9-8.2).[14] Overall evidence reveals that passive smoking led to poor lung function and increased risk for the development of lung cancer.

The NSCLC was present among 87.6% of patients with lung cancer. Adenocarcinoma was found to be commonest histological type followed by SCC, and large-cell lung cancer. These observation concord with a previous study in the literature wherein adenocarcinoma was the most common histological type observed in 29.3% of patients with lung cancer.10 Krishna et al, reported a higher incidence of NSCLC (80-85%) among lung carcinomas. Furthermore, within NSCLC adenocarcinoma was found to be the predominant histologic type in India.[15] Similarly, another study from India demonstrated that adenocarcinoma was the most common histological type which accounts for 44.0% of the patients.[8] Therefore, all these evidences along with the present study conclude that the predominance of adenocarcinoma among patients with lung cancer.

Adenocarcinomas appear to be more common in non-smokers, light smokers, or former smokers, whereas SCC or other histologic types are more common in heavy smokers and current smokers. A study by Noronha et al reported that around 52% of lung cancer patients were found to be never smokers, with adenocarcinoma being the most common histology followed by SCC.[8] Similar findings were observed in study done by Das et al. in Chennai which reported adenocarcinoma being the most common histology non-smokers.[16] However, SCC was the most common histology among the smokers. In contrast to these results present study noted a higher occurrence of adenocarcinoma in smokers than in non-smokers.

Limitations

The major limitations of this study are its retrospective design and small sample size. This study did not record the fatality status of the patients therefore the study could not calculate the association between smoking history and the risk of death. Further large study population-based studies are required to better explain the above trends.

CONCLUSION

The present study confirmed that apart from smoking history, demographic characteristics, including age, and sex appear to have an impact on lung cancer development. In addition, present reflected the global trend of rise in the incidence of adenocarcinoma.

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