Original Research Article

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Characteristics, risk factors and histopathological types of bronchogenic carcinoma among cases presented to Chest Department, Al-Zahraa Hospital, Al-Azhar University

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ABSTRACT

Background: Recently, lung cancer representing 5-7% of all cancers in Egypt with unavailable accurate epidemiological data. This study aims to identify characteristics, risk factors and histopathological types of bronchogenic carcinoma among a group of Egyptian patients.

Methods: A cross sectional study was conducted on 123 cases of histopathological confirmed bronchogenic carcinoma presented to chest diseases department, Al-Zahraa Hospital, Al-Azhar University, Egypt in the period from July 2013 to May 2017. Statistical analysis of patients' database was done using SPSS version 17.

Results: Male to female ratio was 3.2:1; the majority of cases presented in their fifth (55.3%) and sixth (29.3%) decades of life, and urban: rural residence ratio was 2.1:1. Smoking was the most significant risk factor among 93.5% of cases, among them 65.9% were current smokers, 13.0% were ex-smokers and 14.6% were passive smokers. Occupational exposure to cement dust were reported among 47.2% of cases, 16.3% were farmers, 13.0% were employees, 8.9% were house wives, 8.1% were shoe makers and 6.5% were drivers. COPD was reported among 54.5% of cases. The commonest histopathological types were squamous cell carcinoma (31.7%), adenocarcinoma (30.9%), and large cell carcinoma (26.0%). Adenocarcinoma was the predominant type among females (55.3%), passive smokers (31.6%) and non-smokers (15.8%).

Conclusions: Small cell lung cancer and squamous cell carcinoma subtypes were predominant among males, active smokers and workers exposed to cement dust. Adenocarcinoma was the commonest type among females, passive smokers and non-smokers. Conduction of anti-smoking campaigns; reduction of environmental pollution with regulation of occupational exposures to cement dust are recommended.

Keywords: Bronchogenic carcinoma, Histopathological type, Risk factors, Egypt

INTRODUCTION

Lung cancer has been the most common and fatal type of cancer; indeed worldwide incidence of lung cancer is alarming.¹ It is considered a leading cause of cancerrelated deaths among males and females due to environmental pollution, occupational exposure, genetic

susceptibility, increasing number of smokers and others. ^{2,3}

Moreover, a large proportion of people living in low and middle income countries are exposed to secondhand smoke (SHS) in their homes, workplaces, and other public places.⁴

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Although, lung cancer had become one of fatality causes of the 20th century due to an increasing life span combined with exposures to various etiologic factors, it is one of the leading causes of preventable deaths.⁵

There are various important risk factors other than tobacco smoking that can contribute substantially to the lung cancer mortality in never smokers; these other lung carcinogens often act in an additive or synergistic manner in individuals who smoke tobacco products.⁶

Globally, 19% of all cancers are attributable to the environment and the rising air pollution, including work setting, some industrial materials, particularly asbestos. Workers in various industries are exposed to numerous hazardous substances that commonly related to acute and chronic health effects on respiratory system.⁷

The major occupational hazards that workers in cement factories and construction workplaces are being exposed to; are silicate and cement dust particles which are emitted to the environment at most stages of cement production process.⁸

Chronic respiratory diseases represent a public health challenge in both industrialized and developing countries that are more prevalent in cement factories of developing countries, where occupational health and safety issues are less emphasized. In low income countries, respiratory problems are the sixth cause of death and most of these problems are due to dust exposure associated with increasing cement factories.

Recent evidence suggests that inflammation and cancer are closely linked and a number of inflammatory diseases can predispose to cancer. Chronic inflammation in chronic obstructive pulmonary disease (COPD) is a potent driver of lung cancer development. COPD and lung cancer occurring as co-morbidities at a higher rate than if they were independently triggered by smoking. ¹¹

Family history of lung cancer has been consistently associated with increased lung cancer risk; where inherited genetic predisposition has an epidemiologic support as a risk factor of lung cancer. 12

The possibility of reducing the risk of lung cancer attributable to preventable exposures, such as tobacco smoke, infections, occupational and environmental exposures, emphasizes the need to study lung cancer risk factors and their respective mitigation strategies for planning prevention and control programs through public health campaigns. ¹³

Mortality of lung cancer in Egypt increased between 2000 and 2014; smoking was the main risk factor of lung cancer among Egyptians. ¹⁴ Recently, lung cancer occupied the third or fourth ranks representing 5-7% of all cancers in Egypt. This increase reflected both

population growth mainly due to ageing of population and demographic change. ¹⁵

Data on lung cancer (particularly risk factors), still limited in Egypt pointing out to the need of more researches, prior to considering targeted prevention policies. Therefore, this study aimed to identify characteristics of bronchogenic carcinoma cases regarding, risk factors and histopathological types among a group of Egyptian patients.

METHODS

Type and place of the study

A cross sectional study was conducted on bronchogenic carcinoma patients who had been presented to and diagnosed at chest diseases department, Al-Zahraa Hospital, Al-Azhar University, Cairo, Egypt in the period from July 2013 to May 2017.

Patients' sample

This study was carried out by revision and analysis of database of 123 patients with histopathological confirmed bronchogenic carcinoma that included:

1-Demographic data: Age, sex, residence, and occupation.

2-Smoking habits

- Smoking status: Patients were classified as nonsmokers (who never smoked or exposed to SHS); active smokers "comprised current and ex-smoker" and passive smokers "those exposed to involuntary inhalation of tobacco smoke regularly at home or at the work place"
- *Type of smoking*: whether they had smoked cigarettes, shisha, or both
- Smoking duration in years,
- Age of starting smoking/year
- Smoking index (pack/ year): it was calculated as the average number of cigarette packs smoked per day times the duration of smoking in years. While, for shisha smokers; a 20 minute session (equivalent to 25 cigarettes) was considered the baseline of calculation.¹⁶
- 3-Personal and family history of malignancies
- 4-History of co-existing chronic lung diseases e.g. COPD, diffuse parenchymal lung diseases (DPLD).
- 5-Histopathological types of bronchogenic carcinoma: Squamous cell carcinoma (SCC), small cell lung cancer (SCLC), adenocarcinoma (ADC) and large cell carcinoma (LCC) were considered the main pathological subtypes.

Ethical considerations

This study was approved by the Institutional Ethics Committee of the Faculty of Medicine for girls Al-Azhar University. All patients' data were coded to ensure confidentiality.

Statistical analysis

Data of the studied patients were included for statistical analysis by using the SPSS program version 17.0 (SPSS Inc.; Chicago, USA). Descriptive analysis was done for each item and the results were expressed as mean \pm SD for quantitative variables, and as frequencies and percentages for qualitative (categorical and nominal) variables. Chisquare (X^2) and t-test were used to compare between groups. Values of p<0.05 (with a confidence limit at

95%) were considered significant. Results were presented by tables and figures.

RESULTS

Table 1 shows that out of the total 123 patients, 76.4% were males, with male: female ratio of 3.2:1. The majority of cases (67.5%) residing in urban areas. The age of the studied cases at diagnosis ranged from 38-75 years; 55.3% of cases belong to age group 50 -59 years followed by 29.3% belong to 60-69 years age group. The most common occupations were workers in cement production and constructions (47.2%); followed by 16.3% farmers and other occupations ranked in descending order within the table. Personal history and family history of malignancies were reported among 5.7% and 9.8% respectively.

Table 1: General characteristics of the studied bronchogenic carcinoma cases.

Items		No=123
	Mean±SD	56.9±6.7
	Range	38-75
	Age group	
Age/years	<50 years	13 (10.6%)
	50–59 years	68 (55.3%)
	60–69 years	36 (29.3%)
	≥70 years	6 (4.8%)
Sex	Male	94 (76.4%)
Sex	Female	29 (23.6%)
D!-l	Urban	83 (67.5%)
Residence	Rural	40 (32.5%)
	Workers in cement production and constructions	58 (47.2%)
	Farmers	20 (16.3%)
Occupation	Employees	16 (13.0%)
Occupation	House wives	11 (8.9%)
	Shoe makers	10 (8.1%)
	Drivers	8 (6.5%)
Personal history of other malignancies		7 (5.7%)
Family history of malignancies		12 (9.8%)

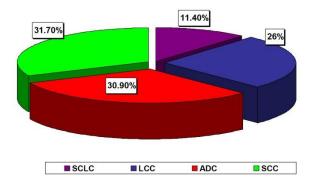


Figure 1: Distribution of cases by histopathological cell type.

SCC: Squamous cell carcinoma, SCLC: Small cell lung cancer, ADC: Adenocarcinoma, LCC: large cell carcinoma.

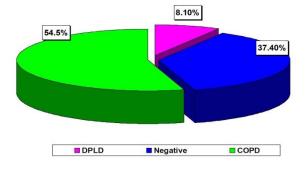


Figure 2: History of underlying chronic lung diseases among the studied cases.

COPD: chronic obstructive pulmonary disease, DPLD: Diffuse parenchymal lung diseases.

Figure 1 shows that the commonest histopathological type was SCC (31.7%), followed by adenocarcinoma (30.9%), LCC (26%) and SCLC (11.4%).

Figure 2 demonstrates that COPD is existed among 54.5% of cases while DPLD is present among only 8.1%.

Table 2: Smoking habits among the studied cases.

Items		No=123
Compline condition	Non-smokers	8 (6.5%)
Smoking condition	Smokers	115 (93.5%)
	Current smokers	81 (65.9%)
Smoking status	Ex-smokers	16 (13.0%)
	Passive smokers	18 (14.6%)
	Cigarettes	76 (66.1%)
Type of smoking	Shisha	14 (12.2%)
	Combined	25 (21.7%)
	Mean±SD	29.1±6.6
Age of starting smoking/years	Range	15-40
Age of starting smoking/years	≤20	17 (17.5%)
	>20	80 (82.5%)
Smoking duration/years	Mean±SD	28.5±10.8
Smoking duration/years	Range	8-60
Smoking pack/year	Mean±SD	31.4±14.9
Smoking pack/year	Range	5-60

Table 3: Gender difference of smoking habits among the studied cases.

Items		Sex		Sig. test	
		Male no=94	Female no=29	& p-value	
Smoking condition	Non-smokers	2 (2.1%)	6 (20.7%)	Chi-square=12.6	
Smoking condition	Smokers	92 (97.9%)	23 (79.3)	P<0.001*	
Smoking status	Current smokers	74(80.5%)	7 (30.4%)	Ch: 27.2	
	Ex-smokers	13(14.1%)	3(13.0%)	Chi-square=37.2 P<0.001*	
	Passive smokers	5 (5.4%)	13(56.6%)	1<0.001	
	Cigarette	54 (58.7%)	22 (95.7%)	Chi	
Type of smoking	Shisha	13 (14.1%)	1 (4.3%)	Chi-square=11.5 P=0.003*	
	Combined	25 (27.2%)	0 (0.0%)	r=0.005	
Age of starting smoking/	Mean±SD	28.9±6.7	30.8±6.1	t-test=0.7	
years	Range	15-40	22-38	P=0.46	
Constitute description	Mean±SD	29.4±10.4	18.7±11.5	t-test=2.7	
Smoking duration/years	Range	10-60	8-30	P=0.007*	
Smoking pack/year	Mean±SD	647.1±302.9	425.0±137.6	t-test = 2.0	
	Range	100-1200	300-600	P=0.04*	

^{*}Significant p-value

Table 2 shows that history of smoking was reported in 93.5% of studied cases; of them 65.9% were current smokers, 13.0% were ex-smokers and 14.6% were passive smokers. Cigarette smoking was the highest prevalent type of smoking (66.1%) followed by combined cigarettes and shisha (21.7%); while 12.2% smoked shisha only. The age of starting smoking ranged from 15-40 years; with 17.5% of cases started smoking at age \leq 20 years whereas 82.5% started smoking after age of 20 years. The duration of smoking ranged from 8-60 years and the mean smoking pack/year was 31.4±14.9.

Table 3 shows that smoking habit was significantly higher among males than females (97.9% versus 79.3%). Moreover, among males the highest percentage (80.5%) were current smokers, versus 30.4% of females; while the highest percentage of females (56.6%) were passive smokers versus 5.4% of males. Cigarette smoking was significantly the commonest type among both males and females while shisha smoking was reported among 14.1% of males versus 4.3% of females. There is a significant difference of smoking pack/year and smoking duration between male and female cases while age at starting smoking was insignificantly different.

Table 4: Characteristics of the studied cases by histopathological types.

Thomas		Type of bronchogenic carcinoma			
Items		SCC (n=39)	SCLC (n=14)	ADC (n=38)	LCC (n=32)
Age/years	Age group				
	<50 years	0 (0.0%)	6 (42.9%)	7 (18.4%)	0 (0.0%)
	50–59 years	12 (30.8%)	8 (57.1%)	30 (78.9%)	18 (56.3%)
	60–69 years	23 (59.0%)	0 (0.0%)	1 (2.6%)	12 (37.5%)
	≥70 years	4 (10.3%)	0 (0.0%)	0 (0.0%)	2(6.3%)
	Mean±SD	61.5±4.7	49.1±3.8	53.7±5.2	58.5±6.2
	Range	55-75	38-55	38-60	50-75
Sex	Male	37 (94.9%)	14 (100.0%)	17 (44.7%)	26 (81.2%)
	Female	2 (5.1%)	0 (0.0%)	21 (55.3%)	6 (18.8%)
D	Urban	25 (64.1%)	12 (85.7%)	29 (76.3%)	17 (53.1%)
Residence	Rural	14(35.9%)	2 (14.3%)	9 (23.7%)	15(46.9%)
	Workers in cement production and constructions	20 (51.3%)	14 (100%)	9 (23.7%)	15 (46.9%)
	Farmers	6 (15.4%)	0 (0.0%)	3 (7.9%)	11 (34.4%)
Occupation	Employees	2 (5.1%)	0 (0.0%)	12 (31.6%)	2 (6.3%)
	House wives	0 (0.0%)	0 (0.0%)	7 (18.4%)	4 (12.5%)
	Drivers	6 (15.4%)	0 (0.0%)	2 (5.3%)	0 (0.0%)
	Shoe makers	5 (12.8%)	0(0.0%)	5 (13.2%)	0 (0.0%)
Underlying CLD	Negative	12 (30.8%)	2 (14.3%)	24 (63.2%)	8 (25.0%)
	COPD	24 (61.5%)	12 (85.7%)	11 (28.9%)	20 (62.5%)
	DPLD	3 (7.7%)	0 (0.0%)	3 (7.9%)	4 (12.5%)
Personal history	of other malignancies	4 (10.3%)	0 (0.0%)	3 (7.9%)	0 (0.0%)
Family history	of malignancies	4 (10.3%)	0 (0.0%)	6 (15.8%)	2 (6.3%)

SCC: Squamous cell carcinoma, SCLC: Small cell lung cancer, ADC: Adenocarcinoma, LCC: large cell carcinoma, CLD: chronic lung diseases; COPD: chronic obstructive pulmonary disease, DPLD: Diffuse parenchymal lung diseases.

Table 5: Smoking habits among the studied cases by histopathological types.

	Type of bronchogenic carcinoma				
Items	SCC (n=39)	SCLC (n=14)	ADC (n=38)	LCC (n=32)	
Smoking status					
Non-smokers	0 (0.0%)	0 (0.0%)	6 (15.8%)	2 (6.3%)	
Active smokers	39 (100.0%)	14 (100.0%)	20 (52.6%)	24 (75.0%)	
Passive smokers	0 (0.0%)	0 (0.0%)	12 (31.6%)	6 (18.7%)	
Type of smoking					
Cigarettes	16 (41.0%)	9 (64.3%)	30 (93.8%)	21 (70.0%)	
Shisha	9 (23.1%)	0 (0.0%)	2 (6.3%)	3 (10.0%)	
Combined	14 (35.9%)	5 (35.7%)	0 (0.0%)	6 (20.0%)	
Age of starting smoking/years					
Mean±SD	29.6±6.2	24.7±6.7	33.9±5.4	27.3±6.2	
Range	15-40	15-35	19-40	18-37	
Smoking duration/years					
Mean±SD	31.4±11.2	29.1±5.6	16.7±8.2	32.1±8.5	
Range	14-60	22-40	8-35	13-48	
Smoking pack/year					
Mean±SD	36.0±12.6	46.6±9.5	15.7±11.2	26.9±10.6	
Range	5.5-60	27-60	5-45	13-52	

Table 4 shows that cases of SCLC had the youngest mean age $(49.1\pm3.8 \text{ years})$ while cases of SCC had the highest mean age $(61.3\pm4.6 \text{ years})$. Below 50 years of age, SCLC

was the commonest type (42.9%). In 50-59 years of age ADC was the commonest type (78.9%), while SCC was common (59.0%) in 60-69 years of age. Male gender was

predominant in all types of bronchogenic carcinoma; except for ADC that is predominant in females (55.3%). Urban residence was predominant in all types; especially in SCLC and ADC (85.7% and 76.3% respectively). Workers in cement production and constructions represented 100% of SCLC, 51.3% of SCC, 46.9% of LCC and 23.7% of ADC cases. While 34.4% of LCC cases were farmers, and 31.6% of ADC cases were employee. COPD is the main underlying chronic lung disease among all types of bronchogenic carcinoma with the higher percentages in SCLC (85.7%) and LCC (62.5%). Personal history of previous malignancies was reported among 10.3% of SCC and 7.9% of ADC. Family history of malignancies was reported among ADC, SCC and LCC (15.8%, 10.3% and 6.3% respectively) cases.

Table 5 shows that smoking is related to all types of bronchogenic carcinoma. All cases of SCC & SCLC, 75.0% of LCC and 52.6% of ADC were active smokers, while passive smoking was reported among 31.6% of ADC and 18.7% of LCC. Regarding type of smoking; cigarette smoking was the highest among all types; shisha smoking was reported among 23.1%,10.0% and 6.3% of SCC, LCC and ADC cases respectively, while combined cigarette and shisha smoking was reported by 35.9% of SCC, 35.7% of SCLC and 20.0% of LCC cases. SCLC cases had the youngest mean age of starting smoking (24.7±6.7 years) while cases of ADC started smoking at an older age (33.9±6.2 years). The shortest mean duration of smoking (16.7±8.2 years) was reported among ADC. Smoking pack/year was the highest among SCLC while the lowest mean smoking pack/ year (15.7±11.2) was in ADC.

DISCUSSION

The burden of cancer in developing countries is increasing due to adoption of cancer-associated lifestyle choices including smoking, physical inactivity and westernized diets.¹⁷

Accurate epidemiological data on lung cancer in Egypt are not yet available; since a comprehensive national population-based cancer registry is lacking. However, official statistics as well as institution and hospital-based studies show that it is the second most common cancer in men and the second cause of cancer related deaths, after bladder cancer.¹⁵

Demographic characteristics

Age of the studied cases at diagnosis ranged from 38-75 years, patients with SCC and LCC were older than patients with SCLC and ADC. Alongside; another study reported that most cases of bronchogenic carcinoma were in their sixth and seventh decade at time of diagnosis; where cases with SCC tend to be older than those with either SCLC or ADC.⁵ While, Gupta et al demonstrated that the highest prevalence of bronchogenic carcinoma was seen between 50-59 years of age.²

Sex distribution

In this study male to female ratio was 3.2:1; where male predominance was exclusive in all types of bronchogenic carcinoma except for ADC that had a female predominance. Similarly, other studies reported male predominance among bronchogenic carcinoma cases. 5,18,2,19

The higher incidence of lung cancer in men probably mirrors the higher rate of smoking among men while, it is less prevalent among women in Arab nations. Other factors, such as sex-linked genetic susceptibility or sex hormones, may be responsible for some of the gender-related differences in lung cancer risk. Although, presently, incidence of lung cancer is low in women, but changes in lifestyle might increase it in the future.¹

Residence

Results of this study revealed that urban: rural residence ratio was 2.1:1. This finding might be related to that urban areas are highly polluted by road traffic and industrial waste products as well as inhabitants' personal behaviour and occupational hazards. In the same context, Rawat et al reported males; elderly people and urban residents had about 3 times increased risk of lung cancer.²⁰ To our knowledge, there are no studies in Egypt that analyse differences in lung cancer according to urbanization.

Smoking habits

In this study smoking history was higher among males than females (97.9% versus 79.3%); 80.5% of males were current smokers, versus 30.4% of females; while passive smoking was higher among females (56.6%) than males (5.4%). Besides, cigarette smoking was higher than shisha smoking among both males and females. Likewise, another study reported that smoking rate was higher among men than in women.²¹ Also, Alamoudi reported that lung cancer in both male and female subjects can be attributed to cigarette smoking.²²

Generally, in this study history of smoking was reported among 93.5% of studied cases versus 6.5% were non-smokers; where 15.8% of ADC and 6.3% of LCC cases were non-smokers. Cigarette smoking was exclusively prevalent among all types of bronchogenic carcinoma. These findings denote that tobacco smoking remains the major risk factor and the leading cause of lung cancer. This finding is consistent with Rawat et al who reported that tobacco smoking is the most important principle risk factor and the leading cause of lung cancer worldwide, as ever smoker carried >7 times higher risk.²⁰ Furthermore, other studies reported higher percentages of smokers among cases of lung cancer.^{5,19} The occurrence of lung cancer in non-smokers could points to the possible existence of carcinogenic factors other than smoking.

Also, Sen et al. stated that ADC was significantly higher in non-smokers than smokers. ²³

Furthermore, cigarette smoking was the commonest (66.1%) among our studied cases; shisha smoking reported among 12.2% while combined cigarette and shisha smoking was reported among 21.7% of cases. As well, cigarette smoking was the highest in ADC and LCC cases; while shisha smoking was higher among SCC cases either separate or combined with cigarette. Moreover, all cases of SCC and SCLC were active smokers, while 15.8% of ADC and 6.3% of LCC cases were non-smokers (Table 5). Similarly, Gupta et al. stated that the most common cell type amongst smokers was SCC; while among non-smokers the most common cell type was ADC. ¹⁸

Although, there is a little information about shisha smoking and the risk of bronchogenic carcinoma; findings of this study suggest that shisha smoking at any rate could be an important risk factor of bronchogenic carcinoma. Additionally, other studies reported a link between shisha smoking and the risk of bronchogenic carcinoma. Moreover, Becquemin et al declared that shisha smokers inhale a larger volume of smoke than cigarette smokers that is suggesting greater deposition of carcinogens in the respiratory tract. ²⁶

Furthermore, passive smoking was reported among 14.6% of our studied cases; where 56.6% of studied females reported exposure to passive smoke at home or at workplace. Also, 31.6% of ADC and 18.7% of LCC cases were passive smokers. This could be attributed to that the particle size in side-stream smoke inhaled by passive smokers is smaller than the particle size in the mainstream smoke inhaled by active smokers (0.09±0.01 vs. 0.27±0.03 microm), which promote peripheral deposition of carcinogens and hence development of peripherally located lung cancer (ADC and LCC).²⁷ Also, this finding suggests that; exposure to SHS is considered a risk factor for lung cancer especially among females. This is coinciding with the finding that exposure to SHS in Egypt ranged from 72.7% in government buildings, to 79.6% in public transportation, and 49.2% in healthcare facilities.4

Additionally, the duration of smoking in this study was ranged from 8-60 years. As well, the longer duration of smoking was reported among SCC and LCC cases. Also, the higher mean smoking pack/year was significantly reported among SCLC, SCC and LCC sequentially. Similarly, Behera and Balamugesh, reported that the risk of lung cancer increases with increasing both the number of smoked cigarettes/day and the duration/years of smoking or even with exposure to SHS. ²⁸

In the current study the age of starting smoking was ranged from 15-40 years; 17.5% of patients start smoking at age \leq 20 years and 82.5% start smoking after the age of 20 years. This finding indicates that those who started

smoking early in life while they were going through the critical periods of growth and development; they were experienced a longer duration of smoking and a higher susceptibility to the hazardous effects of smoke. These results were in agreement with Hegmann et al who stated that after controlling for age, sex, and amount of smoked tobacco; men who began smoking before age 20 years had a substantially higher risk of developing lung cancer compared to men who began smoking at age ≥20 years. ²⁹ Moreover, tobacco-smokers aged >50 years are at the highest risk for lung cancer. ¹

Occupational risk factors

Workplaces environment carry exposure to known carcinogens that can increase the risk of developing lung cancer, especially if workers are smokers. Workers in cement manufacturing workplaces might be exposed to as high as 30.18 mg/m³ or as low as 0.6 mg/m³ of respirable dust that are highly dangerous. 30,31 As well, in agricultural environment; exposure to respirable dust varies according to the season and local climate condition. 22 Cement industry and construction workers are exposed to cement dust on a daily basis. Cement contains hexavalent chromium, which might be a causative human carcinogen. 33

Workers in cement production and constructions represent 47.2% of the studied cases; they represent 100% of SCLC, 51.2% of SCC, 46.7% of LCC and 23.7% of ADC cases. These findings may be coinciding with the boom of construction in Egypt over the last decades, where workers in construction industries constitute the largest proportion of irregular laborers in Egypt.³⁴

Results of this study might be suggestive of a relationship between cement dust exposure and lung cancer. However, it would be hardly possible to interpret these results without exposure data. Moreover, these findings cannot be explained by the confounding effect of smoking alone. The relation between lung cancer and occupational exposure to cement remains inconclusive and controversial where other studies showed negative relationship.³⁵

Moreover, this study revealed that 16.3% of cases were farmers (Table 1); of them 34.4% had LCC, 15.4% had SCC and 7.9% had ADC (Table 4). This finding might be possibly point out the relation between farming environment and an increased risk of bronchogenic carcinoma. However, we can't conclude a causal relationship due to lack of exposure data, small sample size, and the confounding effect of smoking. Another study reported an excess risk of lung cancer among vineyard farmers exposed to arsenic-based pesticides and among those exposed to organo-phosphate and carbamate insecticides and phenoxyacetic acid herbicides.³⁶

Additionally, other occupations were reported within the studied cases including (employees, house wives, shoe makers and drivers) that were ranked in descending order in Table 1. Generally this finding most probably related to the positive history of smoking among most of studied cases. Therefore, we can't determine a causal relationship between these occupations and the risk of bronchogenic carcinoma due to deficient information about the workplace environment, small sample size and the confounding effect of smoking.

Underlying chronic lung diseases

Coexisting COPD was reported among 54.5% of studied cases (Figure 2). Likewise, lung cancer is up to five times more likely to occur in smokers with COPD than those with normal lung function. This association could be interpreted by; both lung cancer and COPD shared the same underlying predispositions, genetic susceptibility, telomere shortening, mitochondrial dysfunction or premature aging. ¹¹

Additionally, 8.1% of the studied cases had DPLD (Figure 2), that is reported among LCC (12.5%), ADC (7.9%) and SCC (7.7%) (Table 4). This is may be correlated to the intense epithelial proliferation and the fibrotic process of DPLD that is could increases the occurrence of carcinomatous changes.³⁷ Meanwhile, the most frequent bronchogenic carcinoma types in patients with DPLD were SCC or ADC.³⁸

Personal and family history of malignancies

This study demonstrates that 9.8% of patients had family history of malignancies with higher incidence among ADC patients, followed by SCC cases, and LCC (Table 4). Likewise persons with family history of cancer have an increased risk of lung cancer as it is a hereditary disease. 12 Additionally, personal history of other malignancies was reported in 5.7% of studied cases; mainly patients with SCC followed by ADC. This could be attributed to the sharing same genetic background, smoking habit or the environmental conditions shared among the family members. This finding coincide with other studies stated that family history of lung cancer was significantly associated with increased risk of SCC and ADC after adjusting of smoking history. Also, history of laryngeal and bladder cancers was frequently reported in patients with SCC and ADC.21,39

Histopathological types of Bronchogenic carcinoma

Results of this study revealed the main pathological subtypes were SCC, followed by ADC, LCC and SCLC. SCC was the most frequent type and exclusively reported in active smokers; SCLC predominates below 60 years. ADC was found in 30.9% of patients and most frequently in females, non-smokers and\or passive smokers. In the same context, other studies reported that the commonest

type of lung malignancy among males was SCC and SCLC while, among females was ADC. 2,5,18-20,22

Additionally, the studied cases of ADC were characterised by the highest mean age of starting smoking, shortest smoking duration and smallest mean of smoking pack/year. These findings point out that; patients with ADC are more susceptible to the carcinogenic effects of smoking within a shorter duration and a smaller smoking pack/year. Up to the late 1980, SCC was the most common subtype of lung cancer; however there was a shift in the incidence of SCC; which was then surpassed by ADC. 40

This study presents some limitations: firstly; is that data analysis was based on the recorded patients' database where the exposure data were not available and not assessed. Second limitation is related to the confounding role of smoking with other factors like occupational exposure to cement dust and farming environment exposure.

CONCLUSION

Male urban residence, tobacco smoking, sex. occupational exposure to cement dust, farming environment, underlying chronic lung diseases and environmental tobacco smoke were the associated risk factors of lung cancer among the studied cases. The commonest histopathological type was SCC that predominates above age of 50 years while, SCLC predominates below age of 60 years. ADC cases were linked to female sex while, LCC cases were linked to exposure to cement dust and farming environment. Accordingly, we recommend good application of tobacco control programs with firm restrictions on tobacco use at home and in public places. Workers in cement factories and constructions should be trained on occupational health and safety. Furthermore, there is a need to conduct health education, develop a comprehensive occupational safety program besides health insurance coverage for irregular labourers to assure early detection and treatment of cases. Further studies are needed to establish the causal association between lung cancer and different risk factors in Egypt.

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