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Epidemiological and Clinical Profile of Lung Cancer in Kirkuk: Relationship with Demography, Tumour Types and Risk Factors

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Annotation: Introduction & Aim: Lung cancer is still a significant health problem globally and is among the most common causes of cancer-related deaths, mainly because it closely correlates with smoking, environmental pollution and occupational exposure. Thus, the objective of this study was to examine demographic features as well as relationships between clinical symptoms and histological tumor types in patients with a diary history of lung cancer reporting to Kirkuk city.

Materials & Methods: In this research 87 patients with lung cancer and 80 healthy individuals were enrolled via Azadi Teaching Hospital and the Oncology Center in Kirkuk from September 2024 to June 2025. Information was collected by structured questionnaires, clinical records and histopathological reports. We excluded incomplete clinical data and unclear history of smoking.

Results: There was significant relationship between age and lung cancer as the incidence of lung cancer (n=92; 34.3%) increased from 51–60 years group to above (P<0.0001). Most cases

were males (85.06%)Hence, there was a severe male predominance. There was no difference in place of residence, although patients who were from urban areas predominated slightly. Smoking status showed a strong and significant correlation, as 70.11% were current smokers. The most common symptom was cough (52.87%), followed by hemoptysis and dyspnea. Squamous cell carcinoma was the most common type histologically (67.82%), with large cell carcinom having the lowest frequencey.

Conclusions: The present work shows that lung cancer in Kirkuk is greatly associated with age, smoking and male sex dominated disease where squamous cell carcinoma was the most frequent type of tumor. These results also underscore the importance of tailored preventive strategies and early diagnosis in high-risk populations. Local surveillance needs to be strengthened to improve the outcome of lung cancer.

Keywords: Lung cancer; Demographics; Smoking; Histology.

Introduction

Lung cancer is still a prevalent public health issue worldwide and one of the leading causes of cancer death, primarily caused by its close relationship with cigarette smoking, environmental pollution and occupational exposure (1,2). Despite advances in diagnosis imaging and new drug therapies, the majority of cases are identified at an advanced stage that has led to a relatively low survival rate worldwide. According to histological type, lung cancer is divided into the non-small cell lung cancer (NSCLC) which constitutes most of cases and the more aggressive small-cell lung cancer (SCLC), both with their specific biological behaviours and clinical implications (3). Genetic abnormalities, including mutations in oncogenes (for example EGFR, KRAS and MYC) and tumor suppressor genes like TP53 and RB are also involved in the disease pathology (4,5). In Iraq especially in Kirkuk, lung cancer has been on the rise for years due to largely high prevalence of smoking, persistent risk factors from the environment and limited application of early detection programs (6,7). However, in spite of the increasing prevalence of the disease, a significant paucity is still evident regarding local population-based studies focusing on epidemiology analysis factors (e.g., age groups, gender distribution, residential distribution and smoking habit), their association with incidence of lung cancer and the insufficient number of such studies to explore histological types' distribution and its relationship to clinical presentation among Kirkukian patients (8,9). This dearth of evidence within the local context constitutes a major research gap prohibiting effective prevention, screening and management programs tailored to this population.

Hence, the objective of this study is to fill in that gap by investigating the demographic relatedness to lung cancer incidence, querying the histological frequencies of tumour types and looking into how these are linked with clinical presentations seen among Kirkuk people.

Materials and Methods

Subjects

The population of this study consists of 87 patients with lung cancer and 80 as a control group. The patients were collected from Azadi Teaching Hospital and the Oncology Center, Kirkuk (September 2024 to June 2025). All clinical data gathering and the laboratory techniques were performed in specialized center, in Kirkuk city, Iraq. The two groups were organized in order to facilitate a valid comparison and the purposes regarding demographic factors, histologic distribution, and clinical associations.

Exclusion Criteria

Patients were excluded if they had insufficient clinical data, unknown history of smoking, conflict medical disorders affecting diagnosis (active chronic infection. Following the above criteria, none of these patients were included in the final analysis of this study.

Ethical Considerations

The study was approved by Ethical Committee of Kirkuk Health Directorate. All included anesthetists were provided full information about the aim and methods of the study, and a written informed consent was obtained from each before include in the study. Confidentiality was maintained in the course of study, and all procedures were carried out according to the ethical principles of Helsinki declaration.

Data Collection

Information was obtained by a preformed questionnaire and additional medical records. Data collected were age, sex, residence and history of smoking as well as symptoms (cough, chest pain, dyspnea, haemoptysis and weight loss). Additional information, including family history of cancer, and exposure to pollutants in the environment or workplace was also collected. For lung cancer patients, histopathological and imaging records were scrutinized to capture tumour type and clinical profile. The surveys were all performed by trained medical personnel through face-to-face interviews.

Statistical Analysis

Data were analyzed using SPSS (version 16). Demographic data, clinical features and histology characteristics of the tumor were presented with descriptive statistics. Categorical variables were compared with Chi-square test, and continuous variables using independent t-test or ANOVA when appropriate. P-values less than 0.05 were considered significant. Correlative analyses were performed to investigate the associations among demographic characteristics, histology outlines of the tumor, and clinical symptoms (10,11).

Results & Discussion

Socio - demographic characteristics

The relationship between lung cancer and age

The age of patients, were statistically significant at ($P \leq 0.01$) between age groups. The high percentage of lung cancer was found in 51-60-year group that reach to 40.23%. while, the low percentage of lung cancer was found in 20-30year group that reach to 2.30%, The average age of patients with lung cancer was 51.93±13.64 years, as shown in table (4-1).

Table (1): the number and percentage of lung cancer patients according to age

Age (year)	Control (n=80)		Lung cancer (n=87)		P-value
	No.	(%)	No.	(%)	
20-30	23	28.75٪	2	2.30%	0.001
31-40	19	23.75%	11	12.64%	0.136
41-50	14	17.50%	17	19.54%	0.185
51-60	15	18.75%	35	40.23%	0.007
<60	9	11.25%	22	25.29%	0.001
Total	80	100%	87	100%	-

The results of the current study indicate a highly statistically significant relationship between the age of patients and their incidence of lung cancer, at a significance level of ($P \leq 0.01$), which indicates that age is an important and fundamental factor in the occurrence of lung cancer. The results of the current study showed that the highest percentage of lung cancer patients was in the 51–60 age group (40.23%), while the lowest percentage was in the 20–30 age group (2.30%). These results reflect an expected logic, as the risk of developing lung cancer increases with age. These findings are somewhat similar to those of Al-Rahim (12) in his study of a sample of 390 patients from Baghdad, where he found that the average age of patients was approximately 63 years. This suggests that the middle-to-late age group (50–60 and above) represents an important segment for lung cancer diagnosis in Iraq. Furthermore, the result is consistent with another study conducted on lung cancer in Iraq between 2005 and 2019, in which Al-Hashimi et al. (13) reported that incidence rates increase significantly in the elderly, with a notable peak in the over-70 age group. However, in the current study, the peak incidence was in the 51-60 age group and not in the older age group, which may reflect the specificity of the sample (number 87) or the method of patient selection, or perhaps an improvement in diagnosis at earlier stages in the elderly compared to the past. The results of the current study showed that the peak incidence of lung cancer was in the 51–60-year age group (40.23%), with a mean age of 51.93 ± 13.64 years, which is lower than the mean reported by the Basra study for Iraq (60.7 ± 13.5 years) (14), where most cases were over 60 years old and rarely recorded before the age of 40. This indicates that the disease in the current study appears at a relatively younger age, and this may be due to the characteristics of the sample, early exposure to risk factors, or a difference in the method of diagnosing the disease, although the general trend of increasing incidence with advancing age is consistent with the results of previous Iraqi studies. Studies from the Middle East region have identified the 55–74 age group as a high-risk group for lung cancer, according to recommendations from screening and early diagnosis experts in the Middle East and Africa. A consulting report from the Gulf States found that the majority of lung cancer patients (over 50%) were over 45 years old, and in Qatar between 2011 and 2018, the majority of cases (56.1%) were in the 50–69 age group (15). This Arab data supports your findings, as approximately 40% of patients were in the 51–60 age group, placing your study within a common regional pattern (16). In an Egyptian study, for example, the mean age at diagnosis was approximately 59.33 ± 8.6 years (17). Similarly, in another Egyptian study of advanced cancer cases from the National Cancer Institute, the mean age was 53.4 years, with a significant proportion of patients under 45 years old (9). This shows that the current study, which has a portion of patients in the 20-30 age group (2.30%), is not far off from what has been observed in some Arabic studies that reported early cases, although they are relatively few. In a study from Turkey with 5,201 patients, researchers found that the median age at diagnosis was approximately 62 years, lower than the median in the United States (~71 years) (18). This aligns with your findings that diagnosis may occur at a relatively younger age, possibly due to population differences, environmental factors such as pollution, or behaviors such as smoking.

the relationship between lung cancer and sex

The sex of patients, were statistically significant at (P≤0.01) between sex groups. The high percentage of lung cancer was found in male group that reach to 85.06%. while, the low percentage of lung cancer was found in female group that reach to 14.94%, as shown in table (2).

Table (2): the number and percentage of lung cancer patients according to sex

Sex	Control (n=80)		Lung cancer (n=87)		P-value
	No.	(%)	No.	(%)	
Male	55	68.75٪	74	85.06%	0.001
Female	25	31.25%	13	14.94%	0.084
Total	80	100%	87	100%	-

The results of the current study showed that the vast majority of lung cancer patients were male (85.06%) compared to 14.94% female, with statistical significance (P ≤ 0.01). At the Iraqi level, this finding is consistent with the Basra study, which showed that approximately 80% of lung cancer patients were male compared to 20% female (14), as well as a previous study in Baghdad that confirmed a similar male-to-female ratio (8). This is partly attributed to the higher prevalence of smoking among men, in addition to occupational exposure to carcinogens. At the Arab level, a study in the Gulf States showed that approximately 78–82% of cases were male (15). In Egypt, studies found that the percentage of males ranged from 76–80% to 20–24% females (20,21). Similarly, a study from Morocco of 1,200 cases found that males comprised 79% of cases compared to 21% females (22). These studies support the findings of the current study, confirming that males are more susceptible to infection in most Arab countries due to differences in lifestyles, environmental and behavioral factors, in addition to the potential role of sex hormones. Internationally, US data shows that approximately 60–65% of lung cancer cases were male compared to 35–40% female, while in China, the male proportion reached over 70% (23,24). In Europe, a German study of over 42,000 cases revealed that 67% of those affected were male (25), and in the UK, approximately 64% were male compared to 36% female (26). This demonstrates that a gender disparity exists globally, but its intensity varies according to population distribution, smoking habits, and exposure to carcinogens.

The relationship between lung cancer and Residence

The residence of patients, were statistically non-significant at (P≤0.05) between residence groups. The percentage of lung cancer was found in urban group that reach to 55.17%. while, the percentage of lung cancer was found in rural group that reach to 44.83%, as shown in table (3).

Table (3): the number and percentage of lung cancer patients according to Residence

Residence	Control (n=80)		Lung cancer (n=87)		P-value
	No.	(%)	No.	(%)	
Urban	46	57.5٪	48	55.17%	0.347
Rural	34	42.5%	39	44.83%	0.248
Total	80	100%	87	100%	-

The results of the current study showed that 55.17% of lung cancer patients were from urban areas compared to 44.83% from rural areas, with no statistically significant difference between the two groups (P≤0.05). This suggests that place of residence was not a major determining factor in disease prevalence, despite a slight bias towards urbanization. These findings are consistent with other Iraqi studies that have shown higher incidence rates among residents of major cities, partly attributed to increased exposure to air pollution from industrial traffic and smoke, as well as occupational exposure to certain carcinogens (13,14). At the Arab level, studies from Egypt and Saudi Arabia have indicated that patients in urban areas constitute the majority of cases, due to high levels of environmental pollution and urban lifestyles (15,19). Internationally, data from the

United States and China have shown a similar pattern, with urban areas recording higher incidence rates due to pollution from vehicles and industry, although varying access to healthcare may mitigate the impact of place of residence on the final outcome (24,27).

The relationship between lung cancer and smoking

The age of patients, were statistically significant at (P≤0.05) between smoking groups. The high percentage of lung cancer was found in smoking group that reach to 70.11%. while, the low percentage of lung cancer was found in non- smoking group that reach to 10.34%, as shown in table (4-4).

Table (4): the number and percentage of lung cancer patients according to smoking

Smoking	Control (n=80)		Lung cancer (n=87)		P-value
	No.	(%)	No.	(%)	
Smoking	18	22.5%	61	70.11%	0.001
Ex-smoking	13	16.25%	17	19.54%	0.163
Non-smoking	49	61.25%	9	10.34%	0.001
Total	80	100%	87	100%	-

The results of the current study showed that 70.11% of lung cancer patients were smokers, 19.54% were former smokers, and 10.34% were non-smokers, with statistical significance at P≤0.05, highlighting smoking as a major risk factor for lung cancer. These findings are consistent with previous Iraqi studies; a study by Al-Tamimi et al. (14) in Basra showed that approximately 68% of patients were smokers, while a multicenter study in Baghdad showed that 72% of lung cancer patients were smokers or former smokers (13). This high prevalence is attributed to the higher rate of smoking among Iraqi men compared to women, as well as exposure to secondhand smoke in public places and homes. In the Arab world, an Egyptian study showed that 68% of lung cancer patients were smokers, with a clear bias among men, while a Saudi study found that 65% of patients were smokers, and less than 20% were former smokers (15,19). Both studies suggested that secondhand smoke, in addition to occupational exposure to carcinogens such as asbestos and industrial dust, could explain some of the cases among non-smokers. Internationally, studies show that smoking accounts for more than 80% of lung cancer cases in the United States and Europe (27). In Germany, a study of more than 42,000 patients showed that 79% of cases were among current smokers, 15% among former smokers, while the percentage of non-smokers was very low (28). In Asia, a study from China showed that smoking was responsible for 72% of lung cancer cases, with a clear gender disparity, as men were significantly more likely to develop the disease (29). Data from South Korea also indicates that lung cancer rates among current smokers reach 75%, compared to 18% among former smokers, reflecting the continued risk of the disease even after quitting smoking (30). Scientifically, tobacco smoke contains more than 70 carcinogens, including nitrosamines, polycyclic aromatic hydrocarbons (PAHs), and heavy metals such as cadmium, which cause genetic mutations and permanent DNA damage in lung cells. Smoking also leads to chronic lung inflammation and weakens the immune system's defenses, increasing the likelihood of cancerous cell transformation. Former smokers still have an accumulation of genetic damage and altered cells, which explains the continued risk of developing the disease even after quitting smoking (31).

The relationship between lung cancer and clinical findings

The clinical findings of patients, were statistically significant at (P≤0.05) between clinical findings groups. The high percentage of lung cancer was found in Cough group that reach to 52.87%. while, the low percentage of lung cancer was found in Chest pain group that reach to 9.20%, as shown in table (5).

Table (5): the number and percentage of lung cancer patients according to clinical findings

Smoking	Lung cancer (n=87)	
	No.	(%)
Cough	46	52.87%
Haemoptysis	20	22.99%
Dyspnea	13	14.94%
Chest pain	8	9.20%
Total	87	100%

The results of the current study showed that cough was the most common symptom among lung cancer patients (52.87%), followed by hemoptysis (22.99%), then shortness of breath (14.94%), while chest pain was the least common (9.20%), with statistical significance at the ($P \leq 0.05$) level. These results are consistent with Iraqi studies; Al-Tamimi et al. (14) indicated that cough was the most common symptom among patients in southern Iraq, while a multicenter study in Baghdad found that cough and hemoptysis constituted the majority of initial symptoms (13). This pattern is attributed to the advanced stage of the disease at diagnosis in most patients, in addition to the prevalence of smoking as a major contributing factor to early respiratory symptoms. In the Arab world, an Egyptian study showed that cough was the primary symptom in the majority of patients (approximately 60%), followed by hemoptysis and shortness of breath (20), while a Saudi study reported that cough and hemoptysis were the most common symptoms in advanced cancer cases (15). These patterns are attributed to the nature of the most common cancers in the region, such as non-small cell carcinoma (NSCLC), which often grows within the airway and causes irritation leading to coughing. Globally, reports from the United States and Europe confirm that coughing occurs in 50–70% of cases, while hemoptysis occurs in 20–30%, consistent with the findings of the current study (28,32). Data from Korean and Chinese studies also indicate that coughing remains the most common symptom across various populations, followed by shortness of breath and chest pain (24,30). The differences in symptoms are related to the stage of diagnosis, tumor type, and anatomical location; central tumors cause coughing and hemoptysis, while peripheral tumors may not present symptoms until advanced stages.

The relationship between lung cancer and tumor type

The tumor types showed statistically significant at ($P \leq 0.05$) between groups. The high percentage of lung cancer was found in sequamous cell carcinoma group that reach to 67.82%. while, the low percentage of lung cancer was found in large cell carcinoma group that reach to 4.60%, as shown in table (6).

Table (6): the number and percentage of lung cancer patients according to tumor type

Tumor type	Lung cancer (n=87)	
	No.	(%)
Sequamous cell carcinoma	59	67.82%
Adenocarcinoma	15	17.24%
Small cell carcinoma	9	10.34%
Large cell carcinoma	4	4.60%
Total	87	100%

The results of the current study showed that squamous cell carcinoma was the most common type of lung cancer among patients, accounting for 67.82%, followed by adenocarcinoma (17.24%), then small cell carcinoma (10.34%), while large cell carcinoma was the least common (4.60%), with statistically significant differences ($P \leq 0.05$). This pattern indicates a local predominance of squamous cell carcinoma, the type most strongly associated with heavy smoking and prolonged exposure to respiratory irritants. These findings are consistent with those of the Basra study, which showed that squamous cell carcinoma was the most common, representing over 60% of cases (14).

A multicenter study in Baghdad also demonstrated that squamous cell carcinoma was the most prevalent type, particularly among men and smokers (13). These Iraqi studies suggest that the high smoking rates in the country directly influence the predominant tumor type. At the Arab level, an Egyptian study showed that squamous cell carcinoma accounted for approximately 55–60% of cases, while adenocarcinoma constituted a much smaller percentage (20). A Saudi study also showed that squamous cell carcinoma remains the most common type among patients, especially smokers (15). These findings from Iraq, Egypt, and Saudi Arabia demonstrate a consistent regional pattern: the continued dominance of squamous cell carcinoma in the Middle East, contrary to the global trend of increasing adenocarcinoma.

Conclusions

The data in this study show, high incidence rate of lung cancer due to age and smoking and predominance in males as the other societies, squamous cell carcinoma is the most type of tumor. These results suggest the importance of targeted interventions and early detection initiatives in the high-risk population. Enhancing local surveillance is the key to enhancement of lung cancer survival.

Limitations

This study has a small sample size in one region, which may limit the generalizability of findings. Data was based on medical records and self-reports, which can have recall or reporting bias. Larger, multi-center studies are warranted to validate these findings.

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