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# Epidemiological and Clinical Characteristics of Lung Cancer Patients in Eastern Libya (2017–2022)
## A Descriptive Study.

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## Abstract

**Objective**: To explore the epidemiological, behavioral, and clinical determinants contributing to the increased incidence of lung cancer in Eastern Libya between 2017 and 2022.

**Methods**: A retrospective, cross-sectional hospital-based study was conducted at Benghazi Medical Center. Out of 484 lung cancer cases diagnosed between 2017–2022, 348 were systematically sampled. Patient records were analyzed for demographic, clinical, and behavioral characteristics.

**Results**: Of the 348 patients, 90% were male with a mean age of 62 years. Tobacco smoking was the most common risk factor (81%). Adenocarcinoma was the most frequent histological type. Most cases were diagnosed at Stage III/IV. In 2022, lung cancer was the leading cause of cancer-related death in the region (58 deaths). Hemoptysis and dyspnea were the most reported symptoms. Obese patients were typically non-smokers, while smokers were frequently underweight or normal BMI.

**Conclusion**: Lung cancer in Eastern Libya is predominantly associated with tobacco use and late-stage presentation. Urgent public health interventions targeting smoking cessation and early detection are warranted.

**Key words**: Lung cancer, Tobacco smoking, Hemoptysis, Dyspnea.

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# الخصائص الوبائية والسريرية لمرضى سرطان الرئة في شرق ليبيا (2017–2022): دراسة وصفية.

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**الملخص**

الهدف: استكشاف العوامل الوبائية والسلوكية والسريرية التي ساهمت في زيادة حالات سرطان الرئة في شرق ليبيا بين عامي 2017 و2022.

**المنهجية:** أُجريت دراسة استعادية مقطعية في مركز بنغازي الطبي. من بين 484 حالة سرطان رئة شُخِّصت بين عامي 2017 و2022، أُخذت عينات منهجية من 348 حالة. حُلِّلت سجلات المرضى من حيث الخصائص الديموغرافية والسريرية والسلوكية.

**النتائج:** من بين 348 مريضًا، كان 90% منهم من الذكور بمتوسط عمر 62 عامًا. كان تدخين التبغ عامل الخطر الأكثر شيوعًا (81%). كان سرطان الغدة الدرقية هو النوع النسيجي الأكثر شيوعًا. شُخِّصت معظم الحالات في المرحلتين الثالثة والرابعة. في عام 2022، كان سرطان الرئة السبب الرئيسي للوفاة المرتبطة بالسرطان في المنطقة (58 حالة وفاة). وكان نفث الدم وضيق التنفس من أكثر الأعراض شيوعًا. كان المرضى الذين يعانون من السمنة عادةً من غير المدخنين، بينما كان المدخنون غالبًا ما يعانون من نقص الوزن أو مؤشر كتلة الجسم طبيعيًا.

**الخلاصة:** يرتبط سرطان الرئة في شرق ليبيا بشكل رئيسي بتعاطي التبغ والظهور في مراحله المتأخرة. لذاك لابد من تدخلات عاجلة في مجال الصحة العامة تستهدف الإقلاع عن التدخين والكشف المبكر عنه.

**الكلمات الدالة:** سرطان الرئة، تدخين التبغ، نفث الدم، ضيق التنفس.

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## Introduction

Lung cancer remains the leading cause of cancer-related mortality globally, with over 2.2 million new cases and 1.8 million deaths reported in 2020 alone [1]. While many high-income countries have seen a decline in incidence due to comprehensive tobacco control policies, low- and middle-income countries, including Libya, are witnessing increasing burdens [2].

Libya's eastern region has experienced a concerning rise in lung cancer diagnoses since 2017, likely driven by a combination of behavioral, environmental, and healthcare system factors. Tobacco smoking continues to be the leading modifiable risk factor worldwide [3], with Libyan male smoking prevalence around 24%, and underreported rates in females due to cultural norms [4]. Environmental exposures in Eastern Libya such as Saharan dust storms, industrial pollution near oil fields, and poor indoor air quality may amplify lung cancer risk [5,6]. Indoor radon exposure, though more studied in Western Libya, is a known carcinogen with probable relevance across regions [7]. Using machine learning techniques, it is possible to correlate different clinical characteristics of cancer patients with their survival rates. ML also offers the benefit of lessening the workload of medical professionals and the possibility of human error. Healthcare providers find machine learning to be an exciting and inspiring technology because to its great performance. ML approaches enable the creation of survival prediction models based on cancer data. Nevertheless, none of the existing methods are suitable for use with a particular dataset [8]. This study aims to delineate the demographic, clinical, and behavioral traits of lung cancer cases identified at Benghazi Medical Center (BMC) between 2017 and 2022 is the goal of this study. More efficient regional cancer control efforts will be supported by this research's identification of important risk variables and presentation trends.

## Methodology

A retrospective cross-sectional study was conducted using hospital records from BMC between January 2017 and December 2022. Out of 484 documented lung cancer cases, 348 were selected using systematic random sampling.

### Inclusion Criteria:

- Patients of all ages and genders, and histologically confirmed primary lung cancer were included in this study.

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**Exclusion Criteria:**
- Secondary/metastatic tumors to the lung, and incomplete or missing data were excluded.

**Data collection:**
Patient data were extracted using a structured form that captured: demographics (age, sex, residence), clinical presentations (e.g., hemoptysis, dyspnea), risk factors (e.g., smoking, family history), BMI, tumor type and stage, comorbidities and metastasis sites.

**Statistical analysis:**
BMI classification followed WHO guidelines. SPSS v25 was used for data analysis. Ethical Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic and clinical characteristics of the patients.

**Ethical approval:**
This study was approved by the administration of Benghazi Medical Center (Quality Department, Medical Statistics Unit, and Oncology Department).

**Results:**
A total of 348 lung cancer patient records diagnosed at Benghazi Medical Center between January 2017 and December 2022 were retrospectively analyzed. The study population showed a marked gender disparity, with 90% (n=313) being male, corresponding to a male-to-female ratio of approximately 9:1. The mean age at diagnosis was 62 years, with a peak incidence among individuals aged 60–70 years [Figure 1].

Tobacco smoking emerged as the most dominant risk factor. Gender-disaggregated data showed that 80% of male patients were smokers compared to only 1% among females [Figure 2]. A positive family history of lung cancer was uncommon and reported in just 10% of the cases [Table 1]. Most patients were residents of urban centers, particularly Benghazi, which accounted for the highest number of cases, while rural areas were underrepresented as presented in [Figure 3]. Clinically, hemoptysis was the most frequently reported symptom, followed by chest pain and cough. These symptoms often reflected the advanced stage of disease at diagnosis [Figure 4]. Indeed, 95 % of all cases were diagnosed at either Stage III or Stage IV, highlighting the predominance of late presentation in this population [Figure 5].

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Histological examination revealed that adenocarcinoma was the most prevalent type of lung cancer, followed by squamous cell carcinoma and small cell carcinoma. Diagnostic confirmation in most cases was achieved through imaging studies and histopathological analysis. The presence of metastasis was common, with the Brain, bones and liver being the most frequently affected secondary sites.

Assessment of body mass index [BMI]patterns yielded notable findings: obese patients were more commonly non-smokers, while smokers predominantly fell into the underweight or normal BMI categories. This suggests possible associations between nutritional status, smoking habits, and cancer progression but We do not know what causes this inverse relationship between body weight [BMI] and lung cancer, and this variable needs more study in the future. In terms of comorbid conditions, a significant number of patients were found to suffer from chronic illnesses, most notably hypertension, diabetes mellitus, and chronic obstructive pulmonary disease (COPD). These comorbidities may have contributed to diagnostic delays and increased vulnerability to cancer-related complications. Mortality data for the year 2022, indicated that lung cancer was the leading cause of cancer-related death at Benghazi Medical Center, accounting for 58 deaths. It was followed by colon cancer [49 deaths], breast cancer [27], uterine cancer [22], and prostate cancer [19]. Other notable cancer-related mortalities included pancreatic [17], brain [11], gallbladder [10], stomach [10], and ovarian cancers [9], underscoring the particularly lethal nature of lung cancer within the studied population.

**Table1: Family history of lung cancer is uncommon.**

| | | Frequency | Percent | Valid Percent |
|---|---|---|---|---|
| Valid | No family history | 258 | %74.0 | 88.0 |
| | Family history | 35 | %10.0 | 12.0 |
| | Total | 293 | %84 | 100.0 |
| Missing | | 55 | 16% | |
| Total | | 348 | %100.0 | |

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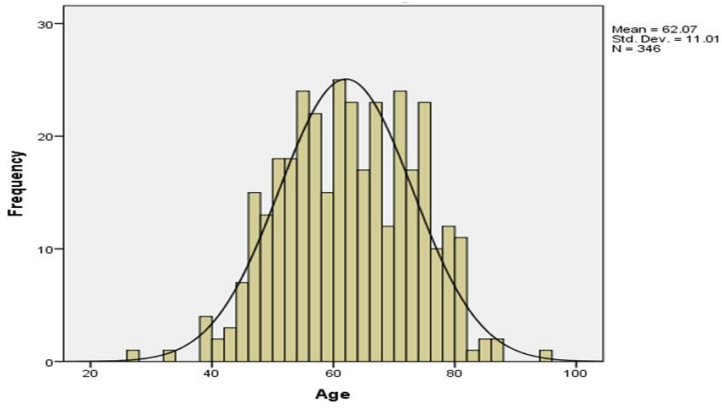



Figure 1: Age distribution – peak incidence between 60–70 years

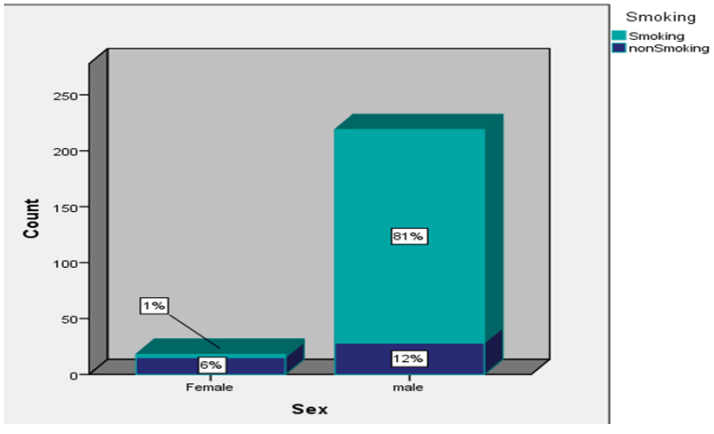
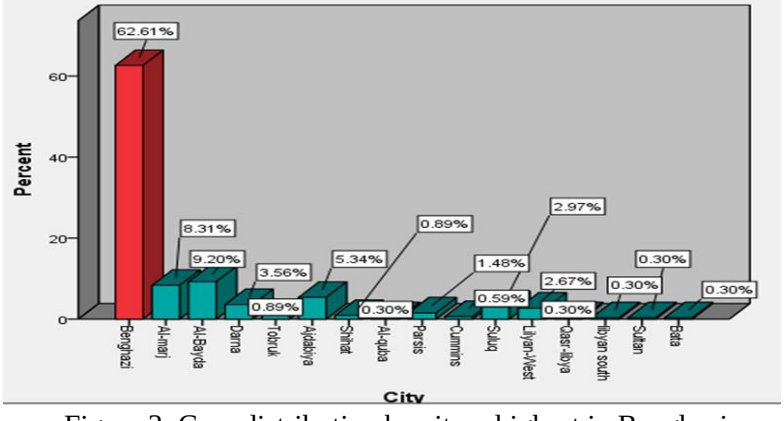



Figure 2: Smoking prevalence by gender – male 81%, female 1%.




.Figure 3: Case distribution by city – highest in Benghazi

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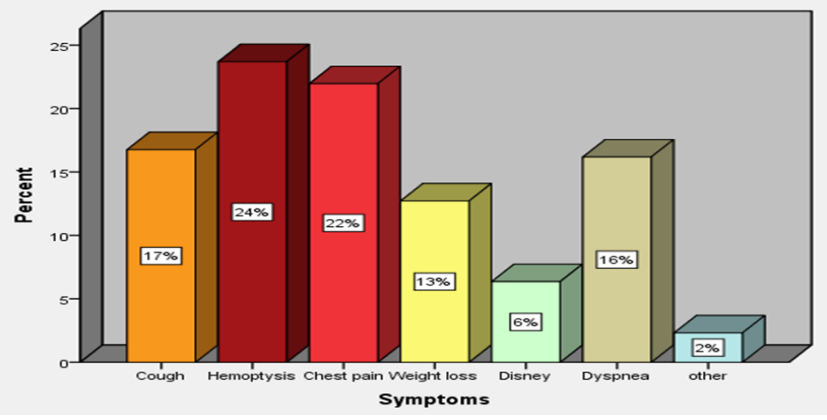


Figure 4: Symptoms – Hemoptysis > Dyspnea > Chest pain.

**Discussion**.

This study highlights the urgent need for national tobacco cessation efforts and improved access to early diagnostic services in Libya. This is one of the largest analyses of lung cancer cases in Libya and provides up-to-date data on histological subtypes, risk factors, and late-stage presentations from a major regional center. Evidence before this study previous national data on lung cancer in Libya have been sparse or outdated. A few regional studies have shown a predominance of male cases and links with smoking but lack recent and systematic evaluations. This study reaffirms that smoking is the dominant risk factor for lung cancer in Eastern Libya, consistent with findings from global and regional stud【3,9,10】. The predominance of adenocarcinoma aligns with shifts observed in all developing countries, where this subtype is becoming more common due to changes in tobacco products and air pollution exposure【11】. A similar Egyptian study (2019) reported 76% of lung cancer patients were male, and 85% were smokers, paralleling the gender disparity seen in our sample【12】. A UK study (2023) found adenocarcinoma was the most frequent histological type, accounting for 45% of cases【13】. In contrast, a Turkish cohort (2021) reported higher squamous cell carcinoma prevalence among older smokers【14】. The high rate of late-stage presentation is alarming and indicates the absence of early detection or screening programs. Comparable studies in Jordan and Lebanon have also reported over 60% of patients presenting in Stage III/IV【15,16】. This study is consistent with that symptom of the condition were lung cancer, and the most important symptom was hemoptysis,

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which is largely identical to several studies【17,18】. But it was not like the study【19】. This delay reflects not only diagnostic capacity limitations but also cultural reluctance toward seeking care. Lastly but not least, While COVID-19 disrupted many healthcare systems globally, no significant increase in lung cancer cases was seen in our cohort during the pandemic years. However, delays in presentation could have worsened staging. Observed patterns between BMI and smoking status highlight potential behavioral and nutritional trends that warrant further study. While smokers tended to have lower BMI, non-smokers were more frequently obese, which may reflect differences in health-seeking behavior, dietary habits, or socioeconomic status.

**Limitations and Strengths**

Limitations of this study include its retrospective design, which limits causal inferences. The hospital-based nature of the data may not fully capture lung cancer prevalence in the broader community, particularly in rural or underserved areas. Additionally, environmental exposure data—such as air pollution, occupational risks, and radon levels—were not included due to a lack of available measurements. Social stigma may also have led to underreporting of smoking among female patients. Nevertheless, the study's strengths lie in its systematic sampling methodology, which enhances representativeness, and its comprehensive dataset of 348 cases, making it one of the largest recent analyses of lung cancer in Libya. The detailed demographic, clinical, and histological variables add valuable insights to a poorly documented health issue in the region.

**Implication Strategies for Practice and Research**

To combat the growing burden of lung cancer in Eastern Libya, several strategic interventions are needed:

**Tobacco Control**: Enact and enforce tobacco taxation, smoking bans in public spaces, and implement mass media campaigns. Establish national quitline and smoking cessation programs.

**Screening Programs:** Introduce low-dose computed tomography (LDCT) screening for high-risk groups (e.g., older adults with a history of heavy smoking).

**-Awareness Campaigns**: Educate the public about early symptoms of lung cancer, targeting both urban and rural populations with culturally sensitive messaging.

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**Infrastructure Investment:** Strengthen pathology, radiology, and oncology services across the eastern region, and train healthcare workers in early detection and multidisciplinary cancer care.

**Research Expansion:** Conduct population-based studies to assess environmental and occupational exposures (e.g., PM2.5, radon, industrial emissions) and their links to lung cancer. Investigate genetic and epigenetic risk factors among Libyan patients.

## Conclusion

Lung cancer in Eastern Libya is heavily influenced by tobacco use, male predominance, and late-stage detection. The disease represents the most lethal malignancy in the region, as reflected in mortality data from 2022. Despite global advances in early detection and treatment, patients in Libya continue to face delayed diagnoses, limited access to care, and a lack of preventive strategies. This study emphasizes the urgent need for a national lung cancer control plan encompassing tobacco control, early screening, public education, and healthcare system strengthening. Further research is essential to understand regional risk factors and guide effective policy-making.

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