

# LUNG CANCER PREVENTION AND EARLY DETECTION

*Abdul-Rahman Jazieba, MD, MPH  
King Abdulaziz Medical City for National Guard, Riyadh, KSA*

*Corresponding Author:  
Abdul Rahman Jazieba, MD, MPH  
Department of Oncology (Mail code 1777)  
P.O. Box 22490, Riyadh 11426, Kingdom of Saudi Arabia  
E-mail: jazieba@ngha.med.sa*

## **Abstract**

Lung cancer is the most common cancer in incidence and mortality worldwide. Most lung cancer cases are attributed to tobacco use which makes it very amendable to preventative interventions.

Although there is no proven benefit of mass screening for lung cancer, large study about the role of spiral CT scan is ongoing. Smoking cessations and avoidance of other known risk factors will reduce the risk of lung cancer significantly.

This manuscript discusses the epidemiology of lung cancer, its risk factors and the value of early detection and prevention.

## **Introduction**

Lung cancer ranks first in the world in incidence and mortality. Multiple risk factors have been identified and the majority of lung cancer cases are preventable.

This manuscript presents summary of the epidemiology of lung cancer and risk factors and reviews its prevention and early detection recommendations.

## **Epidemiology**

Lung cancer is the most common cancer worldwide (1.35 million of 10.9 million of new cases) and the deadliest cancer (1.18 million of 6.7 million cancer-related deaths).(1)

As per the Saudi National Cancer Registry 2004 statistics, there were 296 cases of lung cancer accounting for 4.2% of all diagnosed cases.(2) Lung cancer ranked fourth among male population and sixteenth among female population. It affected 233 (78.7%) males and 63 (21.3%) females with male to female ratio of 3.7:1. The overall Adjusted Standard Rate (ASR) was 3.1/100,000. ASR was 5.5/100,000 for males and 1.5/100,000 for females, which is much less than the Western figures. For example, ASR in the United States is 85.7/100,000 for males and 54.2/100,000 for females. The mean age at diagnosis was 64 years among males (range 24-98 years) and 61 years among females (range 24-89 years). The most common morphological subtypes are squamous cell carcinoma, adenocarcinoma and small cell lung cancer. Stage distribution showed that 55.7% are having distant metastasis at presentation, and localized disease, regional and unknown represent 13.2%, 10.8% and 20.3%, respectively.

## **Pathology**

Lung cancer is divided into non-small cell lung cancer (more than 80% of cases) and small cell lung cancer. The non-small cell lung cancer is divided into adenocarcinoma, squamous cell and large cell carcinoma.

There was a shift in the incidence of squamous cell carcinoma and adenocarcinoma. Up to the late 1980, squamous cell lung cancer was the most common subtype, which was then surpassed by adenocarcinoma.

It is note worthy that the risk of all of these subtype of cancer including adenocarcinomas is increased by smoking. This is contrary to the thought of some practitioners that adenocarcinoma

risk does not increase by smoking which is driven by the fact the adenocarcinoma is the most common sub-types in non-smokers.

### **Risk Factors for Lung Cancer**

#### **a. Smoking**

The rapid increase of lung cancer over the last century from a rare disease to an epidemic is attributed to the exposure to newly introduced major risk factors, which include smoking at the top of the list. Around 85-90% of lung cancer cases could be attributed to the use of tobacco, directly or indirectly. (3)

The relative risk of developing lung cancer is 11 – 20 times more in smokers compared to non-smoker. The risk of lung cancer is dependent on the number of cigarette smoked per day (calculated by pack/year number) and the duration of smoking with increase in risk of smoking started at younger age. (4 - 6)

For example, 35 year old man has a 9% chance of dying from lung cancer before age 85 if he smokes less than 25 cigarettes per day. This risk increases to 18% if he smokes more than 25 cigarettes per day. (7)

The environmental tobacco exposure (ETS), which may be referred to as “second hand smoking”, increases the risk by 27-80%. (8 - 11) ETS may occur at home or at work. For example, the risk of non-smoker spouse increases by 20 – 30% if the spouse is smoker over non-smoker’s spouse. (12,13) About 25% of the lung cancer in non-smoker is attributed to second hand smoking which constitutes about 5% of all lung cancer cases.

#### **b. Radon Gas**

The exposure to radon is an established risk factor of lung cancer, which was initially observed in uranium miners. (14, 15) However, this naturally occurring radioactive gas is a decay product of uranium – 238 and radium – 226 and accumulates also in buildings and homes especially in basements and lower level floors.

The exposure to the indoor radon may be responsible for up to 9% if lung cancer in Western countries and it has synergistic effect with smoking. Smoking in miners increases the risk of lung cancer by 10 times over the non-smoker miners.(16)

#### **c. Industrial and Occupational Exposure**

Exposure to various carcinogens has been linked to lung cancer. The list of these carcinogens includes: arsenic, polycyclic hydrocarbons, diesel exhaust, herbicides and insecticides, silica, asbestos, beryllium and chromium. Asbestos is well known cause of not only mesothelioma but also of primary lung cancer. The risk of exposure to asbestos is about 5 times more than the general population but when it is combined with smoking, a synergetic effect takes place and increases the risk up to 50 – 100 times. The incidence peak of cancer occurs 25 – 30 years after exposure. (17 - 21)

#### **d. Air Pollution**

Exposure to outdoor pollution, especially nitrogen oxides from the traffic fumes has been linked to increase risk of lung cancer. (10, 22)

#### **e. Other Risk Factors**

There are other risk factors that were associated with increased incidence of lung cancer including family history, sedentary life, alcohol and dietary factors with variable strength of association. (23 - 26)

### **Presenting Signs and Symptoms**

Patients with lung cancer present with three categories of manifestations like most solid tumors (27 - 28). The first type is related to the mass effect of the primary tumors including: cough, chest

pain, shortness of breath and hemoptysis, post-obstructive pneumonia and superior vena cava syndrome.

The second type is related to distant metastatic lesions which may include seizure, pathologic fracture, lymphadenopathy or organomegaly. The third type of manifestations is related to systemic paraneoplastic manifestations not related to the mass effect per se which include: hypercalcemia, hyponatremias, Cushing syndrome, neurological manifestation, weight loss, or digital clubbing (hypertrophic pulmonary osteoarthropathy).

### **Management of Lung Cancer**

The management of lung cancer should be based on multidisciplinary team approach. The treatment is usually stage dependent. For early stages I, II and selected III: surgery is the main approach. Adjuvant chemotherapy is helpful in resected stages II and III but not stage I.

For stage III A/B which is considered locally advanced disease, treatment is usually combined chemotherapy and radiotherapy with surgical intervention in selected cases. For metastatic disease: systemic therapy using chemotherapy or biological therapy is the standard approach.

### **Prognosis and Outcome**

The prognosis of lung cancer is stage dependent with higher survival rates for earlier stages. The 5 years survival for stages ranges from 67% for stage I to less than 1% in stage IV. (32)

Therefore, the earlier the cancer is discovered, the better the chance of survival. Hence, the importance of identifying effective screening methods would be of great value.

### **Screening and Early Detection**

Various studies using chest x-ray, sputum cytology and spinal CT scans were not supportive of routine mass screening. (29 - 31) A large multisite National Cancer Institute-USA sponsored study of spinal CT scan including more than 50,000 participants may help answer this question.

### **Prevention**

Smoking cessation at any age is of proven benefits of reduction of lung cancer risk over extended period of time (15 – 20 years) but it remains higher than never smoker risk. (8, 34 - 35)

If smoker cannot quit completely, reducing the number of cigarette smoked may reduce the risk of cancer. (36) Smoking cessation and eliminating the risk of tobacco will eradicate the majority of lung cancer cases making it one of the most preventable cancer. (8, 35, 37) It is imperative to have a systemic campaigns or tobacco control programs that ban public advertising and promotions, especially those which targets the youth and that ban smoking in public areas such as restaurants or workplace. (38 - 44) Minimizing the occupational exposure to the above mentioned carcinogens will decrease the risk for lung cancer further.

### **Conclusion**

While lung cancer is the leading cancer in incidence and mortality, it is also a preventable disease in the majority of cases.

## **Recommendations for Early Detection and Prevention for Lung Cancer**

### **Primary Prevention:**

- Cancer prevention is highly recommended by avoiding tobacco products (including cigarettes, cigars, chewing tobacco, arjila or shisha and passive indirect smoking) smoking cessations and avoiding environmental tobacco exposure and exposure to other known risk factors.
- Stopping all forms of tobacco promotion and advertising is a major component of lung cancer prevention.

### Early Detection:

- No method was proven efficacious in early detection of lung cancer that translated into better survival.

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