Lung Cancer Epidemiology

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LUNG CANCER EPIDEMIOLOGY

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Objectives

- Review clinical epidemiology of lung cancer
  1) Prevalence and incidence
  2) Geographical variation of lung cancer in the US
  3) Etiology
  4) Factors that affect epidemiology of lung cancer
  5) Survival rates
Overview of epidemiology

✓ More than **1.5 millions** newly diagnosed per year worldwide

✓ Lung cancer is the leading cause of **death** worldwide among cancers
  - 150,000 deaths (27% of all cancer deaths)
  - Number of death among men is plateaued, but rising in women
  - Age-adjusted death rate
    1) Men > Women
    2) African-American > Caucasian
Lung cancer is the most common cause of cancer death in men and women.
Prevalence and Incidence

- 220,000 new cases in the US (13% of all cancer diagnoses)
- Disease of elderly (82% of lung cancer patients are over 60 years old)
- Kentucky: Highest age-adjusted incidence (112.2 for M/79.3 for F)
- Utah: Lowest age-adjusted incidence (34.5 for M/ 25.0 for F)
- 12.1 billion; cost of care d/t lung cancer
- 36.1 billion; lost of productivity d/t lung cancer
Geographical variation

US map – Age-adjusted Death Rates per 100,000
Geographical variation

- Patterns of mortality tend to cluster with high prevalence of cigarette smoking
  - Number of cases highest in California, lowest in Alaska
  - Worldwide, most cases are seen in the developed countries of North America, Western Europe, and Australia/New Zealand
Smoking related lung cancer

✓ Smoker men are **23 times** more likely to develop lung cancer
✓ Smoker women are **13 times**
✓ Nonsmokers have 20-30% higher risk of developing lung cancer if they are exposed to secondhand smoke
✓ Exposure to second hand smoke cause 7000 lung cancer deaths
Second-hand tobacco smoke

- Nonsmoking spouses of smokers have an 20-30\% increased of lung cancer

- Side stream smoke, increased concentration of carcinogens

- There is no safe level of second-hand tobacco expose
Other causes of lung cancer

✓ Radon causes 10%
  An estimated 21000 lung cancer death each year
  Tasteless, colorless and odorless

✓ Occupational exposures 9-15%

✓ Outdoor air pollution 1-2%

✓ Nonsmoking asbestos workers are 5 times more likely to develop lung cancer; if they also smoke, the risk factor are 50 times
US Radon Potential

- Based on geology and surveys
- Expected closed building radon (pCi/L):
  - Zone 1: 4.0 and above
  - Zone 2: 2.0 to 4.0
  - Zone 3: 2.0 and lower

EPA Radon Action Level 4 pCi/L
Excessive lung cancer risk (Radon and lung cancer)

- Linear
- No threshold
- Indicates no safe level
- Many homes can provide similar cumulative exposures
Asbestos

- Ubiquitous in the environment of industrialized countries
- Exposure can cause non malignant pleural and lung diseases
Factors that affect epidemiology of lung cancer

1) Age
2) Gender
3) Ethnicity
4) Socioeconomic status
Age

- Median age at diagnosis > 70 years.
- In 2006, 14% of all patients with lung cancer and 24% of all deaths attributable to lung cancer were in persons older than 80 years.
- The number of patients > 85 years with lung cancer is expected to quadruple by the middle of this century.
  (At least in part because of the aging of the population)
Gender

✓ Males have a greater lifetime risk of lung cancer than females
(78.1 per 100K vs. 58 per 100K)

- Decreased cigarette smoker in male
- Increased smoker in female
- Non-smoker women are at high risk to be second hand smoking
Ethnicity - Male

✓ African American men have higher rates (87.5 per 100K)
✓ 2nd – Caucasian
✓ 3rd – Native American
✓ 4th – Asian American
✓ 5th – Pacific Islander
✓ 6th – Hispanic (32.5 per 100K)
Ethnicity

☑ Asians
  - have a lower rate of lung cancers
  - have a relatively higher proportion of well-differentiated AdenoCA (especially in Asian female)

☑ However, if they are born in other countries, higher incidence of NSCLC than US-born Asian American
Socioeconomic status

- Level of education – High school
  1) less than high school education (51.73 deaths per 100K)
  2) higher than high school education (10.35 death per 100K)

- Increased risk of lung cancer in
  - Lower socioeconomic group: higher prevalence of cigarette smoking
    (Single, male, poor, poorly educated, living in rental accommodation)
Survival rates

- Five-year survival rate – 17.8%
  (Prostate 99.6%; Breast 90.5%, and Colon 65.4%)
- Five year survival is better for non-metastasized disease – 54%
- However, only 15% diagnosed early
- Five year survival for metastasis – only 5%
- > 50% die within 1 year after diagnosis
Histopathology of lung cancer

Changing views of non small cell lung cancer

Morphology-centric view

Genome-centric view
Conclusions

- All types of lung cancer are directly correlated with cigarette smoking.
- Adenocarcinoma rates have increased over the last 30 years.
- There is no safe level of second-hand smoke.
- Pollution, occupational exposures, and environmental radon are additional risk factors.
- Genetic factors contribute to development of lung cancer.