*Review article*

# Tobacco and Lung Health

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"Let's make every day – world no tobacco day"

## 1 Introduction

Tobacco smoking remains one of the main preventable causes of illness and premature death worldwide. Majority of smokers say that they do not enjoy smoking, but still continues to smoke. This is because of the reason that Nicotine in cigarettes generates strong urge to smoke. In this urge, smokers do neglect the negative effects of smoking. By this, smokers not only cause harm to themselves but also do harm to the ones who inhale that smoke – a term called Second-hand Smoking. This has an impact on non-smokers including children.[1]

### 1.1 Burden of smoking

Globally, around 1.1 billion people consume tobacco in one or the other form(including smokeless tobacco). In India, GATS-2 (2016-2017) study concluded that 99.5 million adults are smokers and 199.4 million adults are using smokeless tobacco. Current use of tobacco accounts to 26.8% (266.8 million adults), of which 42.4 % are men and 14.2% are women[2] What is shocking is that second-hand smoke exposure is on par with mainstream smoke. Nearly 38.7% adults were exposed to second hand smokeat home, 30.2% at work place, 7.4% at restaurants and in recent reports ill effects of third hand smoke (due to deposition of smoke indoors) is increasingly being reported.[2]

### 1.2 Ill effects of Smoking

Smoking causes illeffects on almost all organs of body,ranging from cancers (especially lung cancer), non-malignant respiratory disorders, cardiac problems, stroke, blindness, deafness, osteoporosis, also affects blood supply to limbs (Peripheral vascular diseases), infertility (males and females), miscarriages (in female smokers) etc.In this article, we mainly focused on how tobacco affects lung health

## 2 Smoking effects on lung

About 10,000 litres per day are inhaled by an adult. To protect the lungs from injury, the respiratory tract has an elegant set of mechanisms for handling the particles and gases in inhaled air. These defences include physical barriers, reflexes and the cough response, the sorptive capacity of the epithelial lining, the muco-ciliary apparatus, alveolar macrophages and immune responses of the lung.

Cigarette smoke contains more than 7000 chemicals of which atleast 70 are cancer causing. About 60 % of particles inhaled in mainstream smoking gets deposited at various levels of these defense barriers and lead to damage. Initially, these can be cleared by mucociliary mechanism, but high-level exposures, particularly when sustained, may overwhelm the lung's defenses, and some agents have the potential to reduce the efficacy of these defenses. Cigarette smoke, for example, contains components that impair mucociliary clearance

Also, cigarette smoking has very strong oxidant potential and contain high concentrations of free radicals. Among the reported consequences of oxidants in cigarette smoke are direct damage to lipids, nucleic acids, and proteins which are essential components of lung structure depletion of antioxidants; and enhancement of the respiratory burst in phagocytic cells, inactivation of proteases and enhancement of molecular mechanisms involved in the expression of pro-inflammatory mediator genes are other oxidant-induced effects.[3]

Few of the components of tobacco smoke with the potential to injure the lungs through a variety of mechanisms are

| | |
|---|---|
| **Acrolein** | Cilia toxic; impairs lung defences |
| **Formaldehyde** | Cilia toxic; irritant |
| **Nitrogen oxides** | Oxidant activity |
| **Cadmium** | Oxidative injury; promotion of emphysema |
| **Hydrogen cyanide** | Oxidative metabolism of cells affected |

### 2.1 Smoking – Lung growth

Chemicals in tobacco like nicotine, carbon monoxide, polycyclic aromatic hydrocarbons and so on are capable of causing detrimental effects on foetal and neonatal life. Lung development starts in early embryogenic period and continues till 2 years of life, some

development occurs till 15 years of life. Exposure to tobacco smoke in form of maternal smoking, secretion in breast milk, second and third hand smoking will impair lung growth, increases risk of wheezing episodes, alters immune response to viral infections and predisposes children to chronic lung diseases in adulthood.[3]

### 2.2 Smoking – COPD

COPD is one of the leading causes of morbidity and mortality worldwide. Smoking is the leading cause of COPD. Lifelong smokers have 50% probability of developing COPD. Acute exacerbations, usually secondary to infections are more common in smokers than in non smokers. In smokers, there is progressive lung function decline with each exacerbation. Evidence says that risk of developing COPD falls by half with smoking cessation.[1,4]

### 2.3 Smoking – Pulmonary hypertension

COPD itself may lead to pulmonary hypertension and right heart failure. important reason for this is thought to be hypoxia (decreased levels of oxygen in body). Smoking leads to increase in levels of Carbon monoxide which inturn leads to hypoxia and this vicious cycle continues.[4]

### 2.4 Smoking – Infections

The defence mechanisms of lung are damaged by smoking which predisposes individual to respiratory infections. One such infection is tuberculosis. Smoking impairs mucociliary system, macrophage and dendritic cell function (cells which play a role in combatting mycobacterium tuberculosis infection). Current and also smokers are at increased risk of tuberculosis infection. One study showed that this risk is even higher when person had more than 15 pack years of smoking history (one pack year is 20 cigarettes per day for one year). Also, smoking increases risk of death from pneumonia and influenza.[5]

### 2.5 Smoking – Lung cancer

Significant number of chemicals in tobacco smoke are carcinogenic,that is cancer causing. smoking is implicated as a causative factor in cancers of almost all organs of body, in particular lung cancer. It is linked to 80 – 90 % of lung cancer deaths. Smokers are 15 to 30 times more likely to get lung cancer than non smokers.[1,6]

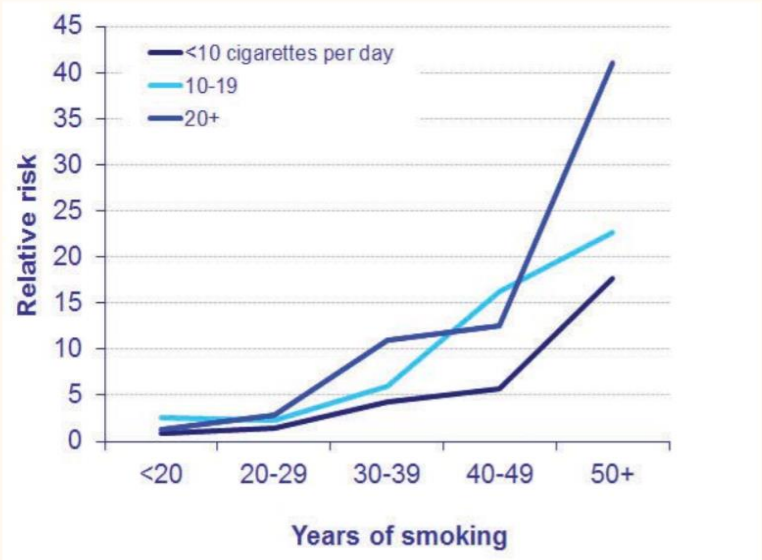


**Figure 2:** Relative risk of lung cancer, according to duration and intensity of smoking, men.
*Adapted from Cancer Research UK. Tobacco and cancer risk statistics.*[33]

### 2.6 Smoking – Asthma

Smokers with asthma who continues to smoke have more severe asthma symptoms, more frequent exacerbations, decreased response to medications and increased mortality as compared to never smokers. Also smokers have faster decline in lung function.[7]

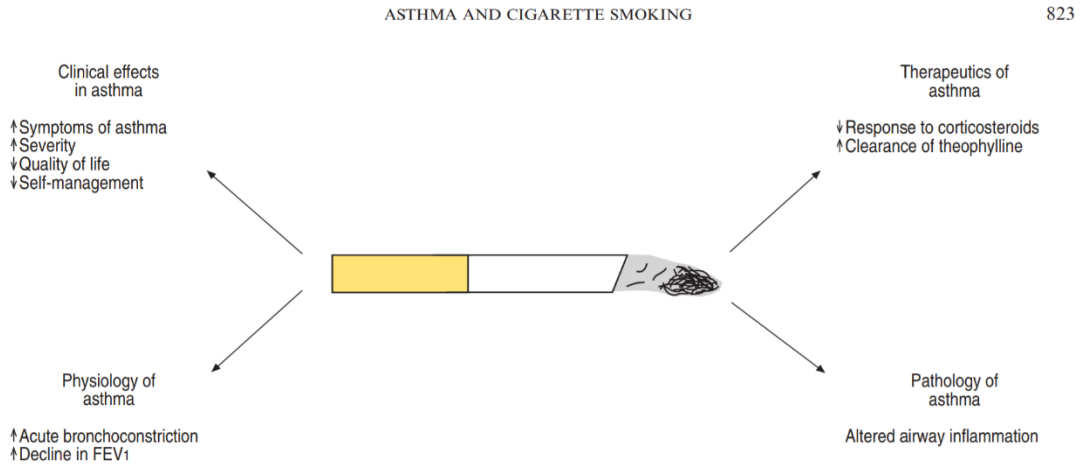


Fig. 1.–Interactions between asthma and cigarette smoking. FEV1: forced expiratory volume in one second; ↑: increase; ↓: decrease.

### 2.7 Smoking – Life expectancy

Smokers who continue to smoke lose an average of 10 years of life expectancy as compared to never smokers.

### 2.8 About green tobacco sickness

Green tobacco sickness is seen in those working in tobacco farms, like cutting, loading tobacco leaves. Nicotine from tobacco leaves get absorbed through the skin surface and cause breathing difficulty, weakness, abdominal pain, fever, fluctuations in BP.[8]

## 3 Why should a person quit smoking?

Quitting smoking has a lot of benefits in terms of life expectancy, risk of heart diseases, lung function decline and so on.

1. If a smoker quits smoking before the age of 35 years , his life expectancy will be same as that of a never smoker and if person quits in late 30's , he can get 2- 3 months of healthy life / each year of quitting smoking.
2. Rate of decline in lung function can come to that of age matched decline in lung function, depending on age at which person has quit smoking.
3. Quitting tobacco use reduces the number of exacerbations in patients with COPD and Asthma.
4. Quitting smoking reduces the risk of lung cancer.
5. Risk of heart attacks reduces by 50% within 1 year of smoking cessation.
6. Improves fatal outcomes.

These are some of the benefits of smoking cessation. Overall smoking related morbidities and associated ill effects can come down with smoking cessation.[1,9]

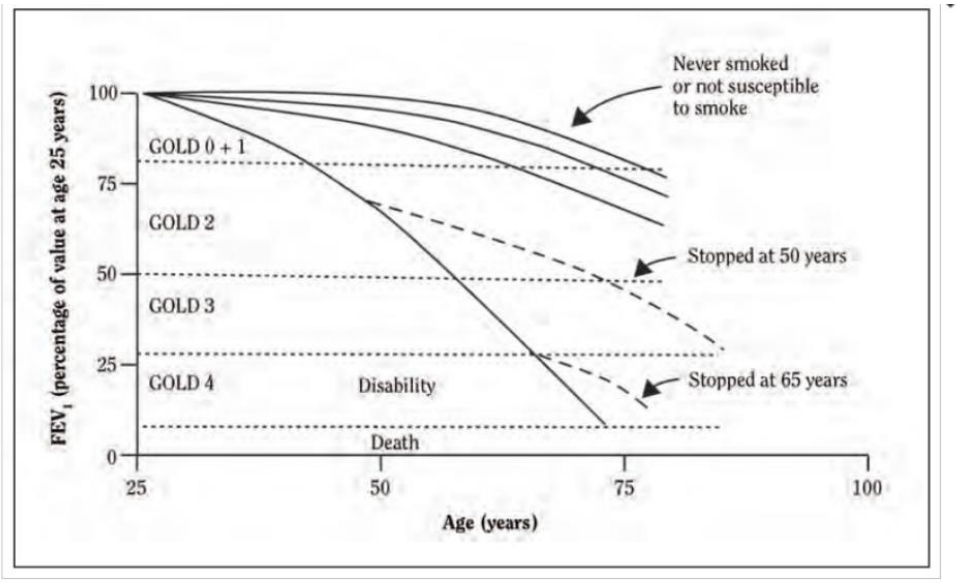


**Figure 7.4 Natural history of decline in forced expiratory volume with aging measured in a group of working men in West London over about six years**

*Source:* Hogg 2004. Reprinted with permission from Elsevier, © 2004.

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