

4.4

Tobacco and Lung Disease

There is compelling evidence to support a strong relationship between tobacco smoking and various lung diseases. Not only is lung cancer caused by tobacco smoking, so are several other lung diseases such as chronic obstructive pulmonary disease (COPD), bronchial asthma, respiratory infections and some interstitial lung diseases. Some of these problems are also reported in non-smokers who are exposed to second-hand smoke.

Magnitude of disease

Globally

COPD is a leading cause of morbidity and mortality worldwide.^{81,82} It is also a major cause of economic burden in both developed and developing countries.⁸³ It accounted for 5.8% of total deaths in 1990 and is expected to rise to 9.3% of deaths by 2020 (Table 4.3).

Box 4.3 Pathogenetic pathways

The role of inflammation and exposure to toxins in tobacco smoke is central to the pathogenesis of COPD. Tobacco smoke contains thousands of particulates and gaseous irritants and chemicals which cause inflammation and swelling of the respiratory tract. The resultant narrowing of the respiratory tubes causes obstruction to the airflow and trapping of air in the lungs, which swell like a hyperinflated balloon. The innumerable number of chemicals present in the smoke also initiate several enzymatic reactions causing damage to the lung tissue. Both the airway narrowing and lung damage are progressive, especially in the presence of continued smoking.

Within a few years, the irreversible lung damage results in marked respiratory disability, failure and premature death. In chronic bronchitis, an inflammatory airway response caused by chronic exposure to tobacco smoke is the central pathogenetic mechanism. In asthmatics, smoking can lead to amplification of the airway inflammation already present, by recruitment of inflammatory cells, release of pro-inflammatory mediators and enhancement of some cellular functions. In addition to inflammation, smoking is also associated with the increased airway wall remodelling seen in chronic asthma.

India

There are a large number of clinical and epidemiological reports from India on the prevalence of COPD. The disease was first highlighted in the 1960s from analyses of hospital records of patients attending outpatient chest clinics. Chronic bronchitis comprised 2.5% of the total admissions of several hospitals in north

Table 4.3 Deaths due to respiratory diseases in India and the world in 1990 and 2020⁸¹

	Deaths			
	1990 Estimated numbers (%)		2020 Projected numbers (%)	
	World	India	World	India
Respiratory diseases (total)	2,935,000 (5.8)	267,000 (2.8)	6,366,000 (9.3)	744,000 (6.5)
COPD	2,211,000 (4.4)	140,000 (1.5)	4,726,000 (6.9)	429,000 (3.8)
Asthma	137,000 (0.3)	20,000 (0.2)	326,000 (0.5)	55,000 (0.5)
Other respiratory diseases	587,000 (1.2)	106,000 (1.1)	1,313,000 (1.9)	261,000 (2.3)

COPD: chronic obstructive pulmonary disease

Figures in parentheses indicate respiratory deaths as percentages of total deaths

India.⁸⁴ COPD accounted for 31% of the clinic attendance in 1952–1954 in Punjab.⁸⁵

A prevalence rate of 4.1% in males was reported in a large prospective study from Tamil Nadu.⁸⁶ Epidemiological studies in the 1990s reported prevalence data from cross-sectional community surveys. The overall prevalence of COPD was found to be 5% in male and 2.8% in female subjects in a cross-sectional survey done in Haryana.⁸⁷

In a population survey done among 9090 students, with an age range of 9–20 years, 2.6% of boys were found to have asthma.⁸⁸

Evidence of a tobacco-related association

Global evidence

Tobacco smoking is the most important cause of the development of COPD. This relationship was first established in the 1960s through several population-based epidemiological

studies.^{89,90} It is universally accepted now that tobacco smoking accounts for over 80%–90% of cases of COPD.⁹¹ Tobacco smoking is now included as an important criterion for the diagnosis of COPD.⁹² Evidence favouring a causal relationship between tobacco and COPD is based on valid and consistent epidemiological, clinical and laboratory data from multiple studies.⁹³ The adverse effects of tobacco smoking in those with asthma are also well established.⁹⁴

Indian evidence

Active smoking

There are a large number of clinical and epidemiological reports from India on the prevalence of COPD and its association with tobacco smoking. The association between active smoking and COPD could be ascertained from a total of 15 studies, which have been reviewed here. Three of the reports included separate urban and rural data. These are summarized in Table 4.4.

There was a large variation in the methodology

Table 4.4 Studies on the prevalence of chronic obstructive pulmonary disease (COPD) and its association with smoking in males^{84,85,87,95–106}

Authors	Population studied	Total number	Prevalence of COPD (%)		Ratio of Sm:NSm Males
			M	F	
Viswanathan <i>et al.</i> 1964 ⁸⁴	Patna	15,905	2.1	1.3	7.4
Wig <i>et al.</i> 1964 ⁸⁵	Delhi: Urban	2366	3.1	1.9	8.8
	Delhi: Rural	1401	8.4	2.4	4.7
Jindal 1993 ⁸⁷	Chandigarh	1473	5.0	2.7	9.6
Sikand <i>et al.</i> 1966 ⁹⁵	Delhi	14,460	3.3	2.6	5.9
Bhattacharya <i>et al.</i> 1975 ⁹⁶	Lucknow: Rural	1140	6.7	4.5	1.7
Joshi <i>et al.</i> 1975 ⁹⁷	Punjab (industrial workers)	473		12.5*	5.3
Viswanathan and Singh 1977 ⁹⁸	Delhi: Urban	993	8.0	4.3	4.1
	Delhi: Rural		4.7	3.5	9.6
Thiruvengadam <i>et al.</i> 1977 ⁹⁹	Madras (Chennai)	817	1.9	1.2	10.2
Radha <i>et al.</i> 1977 ¹⁰⁰	Delhi	2098	4.2	2.1	1.8
Malik <i>et al.</i> 1977 ¹⁰¹	Chandigarh	1154	8.3	5.3	4.8
Nigam <i>et al.</i> 1982 ¹⁰²	Jhansi: Rural	1424	8.1	4.5	1.4
Malik 1986 ¹⁰³	Chandigarh: Urban	1450	10.8	1.6	11.0
	Chandigarh: Rural	671	20.5	4.9	4.0
Malik and Kashyap 1986 ¹⁰⁴	Himachal Pradesh: Rural	446	21.7	19.0	5.5
Behera and Malik 1987 ¹⁰⁵	Chandigarh: Schoolteachers	681	3.3	2.1	1.6
Ray <i>et al.</i> 1995 ¹⁰⁶	Tamil Nadu	9946	4.1	2.6	

Sm: smokers; NSm: non-smokers

*Data for both combined

employed in these surveys. Moreover, the populations surveyed also varied from hospital employees and patients' attendants to clusters of industrial workers or the general population. Smokers, however, were classified as separate groups in most of these studies. The prevalence ratio of smokers to non-smokers among those with COPD was invariably more than 1 in all the surveys reported.

The relationship of COPD with tobacco smoking seems independent of the type of product smoked, i.e. cigarettes, *beedis* or *chutta*, on the basis of some data available on *beedi* smoking and COPD. In a study specifically examining *beedi* smoking, COPD was observed in 34.6% of *beedi* and 45.4% of cigarette smokers versus 3% of non-smokers, the difference in the prevalence of COPD among cigarette and *beedi* smokers was not significant.¹⁰⁷

The prevalence of asthma and its relationship to smoking is being studied in an ongoing multicentric study conducted by the Indian Council of Medical Research (ICMR). The initial analyses of records of 51,504 individuals from four different centres have shown an increased risk of asthma in smokers. There was a weak association of asthma in adults with exposure to second-hand smoke at home (Table 4.5).

Passive smoking

Bronchial hyper-responsiveness (BHR) is an important determinant of decline in lung

Table 4.5 Odds ratio (OR) of having asthma in relation to smoking history and household exposure to second-hand smoke*

	OR	95% CI
Tobacco smoking		
Ever vs never	2.4	2.1–2.8
Type of smoking		
Cigarette	2.3	1.8–1.8
<i>Beedi</i>	2.3	1.9–2.7
<i>Hookah</i>	4.5	3.1–6.6
Exposure to second-hand smoke		
Any exposure	1.2	1.0–1.4
Time period		
Childhood	1.0	0.8–1.4
Adulthood	1.7	1.0–2.1

*Results from the preliminary analyses of a multicentric study on asthma sponsored by the Indian Council of Medical Research (personal communication)

function in normal subjects and those with chronic bronchitis.¹⁰⁸ The risk of BHR in healthy, asymptomatic women exposed to second-hand smoke was significantly high in comparison with non-exposed women.¹⁰⁹

In another study, children exposed to second-hand smoke were at 1.8 times increased risk of being asthmatic compared to unexposed children (OR = 1.8).⁸⁸ A study of asthma in 21,367 Delhi schoolchildren (5–17 years of age), in whom the prevalence of asthma was 11.9%, showed that the presence of smokers in the family was a significant risk factor for children developing asthma (OR = 1.6).¹¹⁰ In another study too, passive smoking was an important risk factor associated with asthma (OR = 3.33).¹¹¹

4.4 TOBACCO AND LUNG DISEASE

KEY MESSAGES

- Chronic obstructive pulmonary disease (COPD) is a progressive and disabling lung disease which leads to respiratory crippling and premature death. In India, it affects over 5% of males and 2.7% of females who are over 30 years of age.
- The association of tobacco smoking with respiratory diseases has been established for over 50 years. Till date, it remains the most important causal factor for COPD.
- Tobacco smoking is responsible for over 82% of COPD, which accounts for about 12 million adults suffering from smoking-attributed COPD in India.
- Tobacco smoking also increases bronchial responsiveness, is responsible for an exaggerated decline in lung function and predisposition to asthma.
- Exposure of non-smokers, especially children and women, to second-hand smoke from others is an important cause of respiratory infections, worsening of asthma and poor lung functions.