Ann Natl Acad Med Sci (India), **44(3):** 187-198, 2008

Tobacco Smoking and Chronic Obstructive Lung Disease – The Indian Evidence

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Abstract

There is a large body of data on adverse effects of tobacco on non-neoplastic lung diseases. Adequate evidence on these effects is now available from studies in India. Tobacco smoking is the most important cause of chronic obstructive pulmonary disease. It is also responsible for increased morbidity and progressive deterioration of lung function in these patients. Passive exposure of nonsmoker individuals, especially women to smoking from others is a significant risk factor for the development of COPD.

Exposure to smoking is also known to adversely influence asthma. Childhood parental exposure to maternal smoking is important in the development of asthma. Passive smoking exposure is responsible for an increase in morbidity indices and acute exacerbation of asthma in both children and adults.

Introduction

Tobacco smoking is established as the most important risk factor in the development as well as in worsening the morbidity and mortality from various lung diseases. Not only the respiratory malignancies such as lung cancer, but several other non-neoplastic lung diseases are also caused and/or adversely influenced by tobacco.

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Chronic obstructive pulmonary disease (COPD) is the most important tobacco related lung disease. The others include bronchial asthma, respiratory infections and some forms of interstitial lung diseases (ILD). There is a fair amount of work now available from India on this association (1-6).

Chronic Obstructive Pulmonary Disease

COPD is a leading cause of morbidity and mortality worldwide (7, 8). It is also an important cause of economic burden in both the developed and the developing countries, including India (9, 10). In a study on assessment of costs of tobacco related COPD in India, on an average, a COPD patient spent about 15 percent of his income on smoking products and up to 30 percent on disease management (10). Tobacco smoking was also the most frequent cause of chronic cor pulmonale which occurred as a long term complication of COPD both amongst men and women patient (1). COPD globally accounted for 4.4% of total deaths in 1990, expected to rise to 6.9% of total deaths by 2020[7].

Chronic obstructive pulmonary disease which was hitherto underdiagnosed in the Indian subcontinent, is now recognized in 4-10% of adult male population of India and several other Asian countries. The Regional COPD Working Group for 12 Asia Pacific Countries and Regions used a COPD prevalence model and estimated an overall prevalence rate of 6.3% with a range from 3.5% (Hongkong and Singapore) to 6.7% (Vietnam). The smoking associations with COPD were high from most countries – 2.65 in India, 2.57 in China and 2.12 in Japan.

Chronic obstructive pulmonary disease which includes chronic bronchitis (CB) and emphysema is a common clinical condition but frequently misdiagnosed. Both asthma and COPD which may present similarly with several overlapping features bear a common name in Hindi and several other Indian languages. It is not always possible to separate the two conditions from each other especially in epidemiological studies in adults. But a good study-questionnaire, especially designed and validated for their diagnosis is generally adequate to arrive at epidemiological conclusions.

India

There are a large number of clinical and epidemiological reports from India on the prevalence of COPD (11). A review of different population reports for prevalence rates of COPD and the smoking association shows a wide range (Table 1) (11-26). The disease was

Table 1
Studies on the prevalence of chronic obstructive pulmonary disease (COPD) and its association

Authors	Population studied	Total Number	Prevalence of COPD (%)		Ratio of Sm:NSm
			M	F	Males
Viswanathan *et al*, 1964 (12)	Patna	15,905	2.1	1.3	7.4
Wig *et al*,1964 (13)	Delhi: Urban	2366	3.1	1.9	8.8
	Delhi: Rural	1401	8.4	2.4	4.7
Jindal 1993 (15)	Chandigarh	1473	5.0	2.7	9.6
Sikand *et al*, 1966 (16)	Delhi	14,460	3.3	2.6	5.9
Bhattacharya *et al*, 1975 (17)	Lucknow: Rural	1140	6.7	4.5	1.7
Joshi *et al*, 1975 (18)	Punjab (industrial workers	473	12.5*		5.3
Viswanathan and Singh 1977 (19)	Delhi: Urban	993	8.0	4.3	4.1
	Delhi: Rural		4.7	3.5	9.6
Thiruvengadam *et al*, 1977 (20)	Madras (Chennai)	817	1.9	1.2	10.2
Radha *et al*, 1977 (21)	Delhi	2098	4.2	2.1	1.8
Malik *et al*, 1977 (22)	Chandigarh	1154	8.3	5.3	4.8
Nigam *et al*, 1982 (23)	Jhansi: Rural	1424	8.1	4.5	1.4
Malik 1986 (24)	Chandigarh: Urban	1450	10.8	1.6	11.0
	Chandigarh: Rural	671	20.5	4.9	4.0
Malik & Kashyap 1986 (25)	Himachal Pradesh: Rural	446	21.7	19.0	5.5
Behera and Malik 1987 (26)	Chandigarh: School teachers	681	3.3	2.1	1.6
Ray *et al*, 1995 (14)	Tamil Nadu	9946	4.1	2.6	

Sm: Smokers: NSm: Nonsmokers
*Data for both combined

first highlighted in the 1960s from analyses of hospital records of patients attending outpatient chest clinics (12). Chronic bronchitis comprised 2.5% of the total admissions of several hospitals in north India (11). COPD accounted for 31% of the clinic attendance in 1952-1954 in Punjab (13). A prevalence rate of 4.1% in males was reported in a large prospective study from Tamil Nadu (14). Epidemiological studies in the 1990s reported prevalence data from cross-sectional community surveys. The overall median prevalence of COPD was found to be 5% in male and 2.8% in female subjects in the different population studies from India.

Tobacco Association

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 (27, 28). It is universally accepted now that tobacco smoking accounts for over 80%-90% of cases of COPD (29). Tobacco smoking is included as an important criterion for the diagnosis of COPD (30). Evidence favoring a causal relationship between tobacco and COPD is based on valid and consistent epidemiological, clinical and laboratory data from multiple studies (31).

Active Smoking

Most of the epidemiological reports on the prevalence of COPD clearly talk about smoking as the most important risk factor. The association between active smoking and COPD has been variably reported in the Indian studies (12-26). There was a large variation in the methodology 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 nonsmokers among those with COPD was invariably more than 1 in all the surveys reported.

To overcome the problem of variation, a large multicentric epidemiological study was undertaken at 4 different centers at Chandigarh, Delhi, Bangalore and Kanpur (2). The overall population prevalence of chronic bronchitis as a prototype of COPD was 4.1% of 35295 subjects with a male to female ratio of 1.56:1. In smokers, the prevalence was 7.7% with smoker: nonsmoker ratio of 2.65. Almost all forms of smoking products such as the cigarettes and the 'bidis' used in different countries were found to be significantly associated with COPD.

Odds ratio for COPD for cigarettes, bidis and 'hookah' were 1.952, 2.654 and 2.847 respectively (2).

The relationship of COPD with tobacco smoking seems independent of the type of product smoked, i.e. cigarettes, *bidis* or *chutta*, on the basis of some data available on *bidi* smoking and COPD. In an earlier study specifically examining *bidi* smoking, COPD was observed in 34.5% of *bidi* and 45.4% of cigarette smokers versus 3% of nonsmokers, the difference in the prevalence of COPD among cigarette and *bidi* smokers was not significant (32).

Passive Smoking and COPD

COPD was diagnosed in 2.9 percent of nonsmoker individuals. An important factor in these patients is the exposure to smoking from others e.g. spouses, colleagues, sibs and parents. In particular, nonsmoker women exposed to smoking from husbands are at significant risk. The odds ratio (1.535) for risk from passive smoking i.e. the environmental tobacco smoke (ETS) exposure in nonsmoker patients was significant during both the childhood and the adulthood (2). The other risk factor for COPD in nonsmoker women is the exposure to indoor air pollution from domestic combustion of solid (i.e. biomass) fuels emanating a lot of smoke containing particulate and gaseous air pollutants.

Bronchial asthma

Asthma is a common respiratory disease in both children and adults. There have been widely different prevalence rates reported from different parts of India varying from about 1.8 to 3.5% in adults and from 2.8 to 16.6% in children (Table 2) (5, 33, 34). The most authentic data on asthma prevalence in adults has now become available from the Indian Council of Medical Research (ICMR) study which was conducted simultaneously at four different centers in the country with the help of the above mentioned questionnaire and methodology on 73605 individuals aged 15 years or over (43). The overall presence of ever asthma was diagnosed in 2.4% individuals while one or more respiratory symptoms were present in 4.3 - 10.5% of subjects (43).

Tobacco smoking has got important effects on asthma. Exposure to smoking is not only responsible for aggravation of asthma but is also important as a risk factor in the development of asthma. A few studies on the adverse role of environmental tobacco smoke (ETS) exposure in the development as well as aggravation of symptoms of asthma are available from India (4, 6, 40, 45). The

Table 2

Prevalence studies on asthma from India*

	Author	Study Population			Age (yrs)	Definition/ Methodology	Prevalence (%)
		Region	Group	No.			
1.	Viswanathan (1966) (33)	North (P)	Urban	15805	All ages	Symptoms on interview	1.8
	Children						
2.	Shah (2000) (34)	Multicentric	Schools	37171 31697	13-14 6-7	Self reported, (ISAAC)	3.7 4.5
3.	Awasthi (2004) (35)	North (L)	Schools	3000	13-14 6-7	do	3.3 2.3
4.	Mistry (2004) (36)	North (C)	Schools	575	13-14	Q. Wheezing	12.5
5.	Chakravarthy (2002) (37)	South (TN)	Field	855	< 12	Q. Diagnosed Asthma	5
6.	Chhabra (1998) (38)	North (D)	Schools	2609	4-17	Q. Current	11.6
7.	Paramesh (2002) (39)	South (B)	Schools	6550	6-15		16.6
8.	Gupta (2001) (40)	North (C)	Schools	9090	9-20	IUATLD based validated Q	2.3
	Adults						
9.	Chowgule (1998) (41)	West (M)	Field	2313	20-44	ECRHS Q	3.5
10.	Jindal (2000) (42)	North (C)	Field	2016	18 - > 70	Validated Q	2.8
11.	Aggarwal (2006) (43)	Multicentric	Field	73605	> 15	Validated Q	2.4

P = Patna; ISAAC = International Study on Allergies and Asthma in Children; L = Lucknow; C = Chandigarh; Q = Questionnaire; TN = Tamil Nadu; D = Delhi; B = Bangalore; IUATLD = International Union Against Tuberculosis & Lung Disease; M = Mumbai; ECRHS = European Community Respiratory Health Survey

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odds ratio for being asthmatic for children of 9 to 20 years age exposed to ETS compared to those not exposed was 1.78 (95% C.I. 1.33 – 2.31) (4). In the ISAAC International Study on Asthma and Atopy in Children) study on 2000 school going children near Delhi, the odds ratio for ETS exposure for asthma was 3.33 (95% CI = 1.88 – 7.65) (34). The in-utero exposure to maternal smoking may also be independently responsible for early onset of asthma (46, 47).

In adults, the ETS exposure during childhood and both during childhood and adulthood was significantly associated with an increased prevalence, while exposure during only adulthood was not associated with this risk (4). Among 62109 nonsmoking individuals, prevalence of asthma was higher in the ETS exposed than the non-ETS exposed individuals (2.2% vs 1.9%, $p < 0.05$) (4). ETS exposure was also shown to be responsible for increased indices of morbidity and poorer control of asthma in adults such as in nonsmoking women exposed to smoking from their husbands (48). Acute exacerbations were also more frequent in the ETS-exposed asthmatic patients (49). Bronchial responsiveness of nonsmoking asymptomatic individuals, who were ETS exposed was higher than of the non-ETS exposed individuals (50). The increase in bronchial responsiveness was even more pronounced in nonsmoker asthmatic individuals when exposed to ETS from smokers (51).

In conclusion, there is enough data from India especially from this Centre which demonstrates an adverse relationship of both active and passive smoking with obstructive lung diseases such as COPD and asthma. This is important from point of view of an individual patient for his clinical management as well as for adoption of public health program in tobacco cessation and control activities.

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