



Original Article

## Smoking and Lung Cancer in Bangladesh

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### Abstract

We studied the relationship between smoking and lung cancer risk in North-West and Southern region of our country with a very high baseline risk of lung cancer in male sex using data from a case-control study of lung cancer conducted between May,1999 and May,2004 at Rajshahi Medical College Hospital. Cases were 218 patients with incident, histologically confirmed lung cancer and controls were 436 patients admitted to the same hospital with non-neoplastic and non-lung diseases.

Compared with never-smokers, the multivariate odds ratio (OR) for current smokers was 3.47[95%confidence interval (CI) 2.31-5.20], and for ex-smokers 1.53 (95% CI 0.81-2.87). Lung cancer risk increased by 20% (95% CI 14% to 28%) for an increment of five cigarettes per day. The OR for smokers reporting occupational exposure to selected known or likely lung carcinogens was 7.22, compared with non-smokers without occupational exposure. This study further confirms that cigarette smoking is a strong determinant of lung cancer also in this high-risk area of North-West and Southern area of our Bangladesh.

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### Introduction

In studies from Western countries, cigarette smoking is responsible for up to 90% of male cases [1,2] and the risk of lung cancer in smokers is ~10 times that for non-smokers. For example, mortality in heavy cigarette smokers was 15 times that of non-smokers in a cohort of British male doctors [3], and in the American Cancer Society Cancer Prevention study (CPS-I) the lung cancer mortality rate ratios in long-term smokers were > 10 for men and >5for Women [4]. conversely, in several Chinese studies , the risks in smokers are two to three times higher than those in non-smokers [5]. A combined analysis of 15 case-control studies of lung cancer found a summary

odds ratio (OR) of 2.2 for ever-smokers, and population-attributable risks (PARs) of 57% for males. [6,7]. A retrospective proportional mortality study found that, lung cancer death rates in males at age 35-69 years were about three times greater in smokers than in non-smokers. However, since the rates among non-smokers in different parts of varied widely, the absolute excesses of lung cancer in smokers also varied [8].

These differences with Western countries may be ascribed to the particular patterns of tobacco consumption (large use of pipe and cigars) [9], as well as to the low average daily tobacco consumption [10, 11] in before 1980.

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The North-West and Southern areas very high lung cancer death rates in both smokers and non-smokers in a retrospective mortality study including ~1 million deaths, conducted in 98 areas of [8, 12]. Bangladesh. This has been attributed to the high indoor pollution related to fumes from domestic heating and cooking [13-15]. In a previous investigation conducted on a population from the same area, the OR for >25 cigarettes per day was 3.7 for men [18].

In this paper we further assess the relationship between tobacco smoking and lung cancer using data from a case-control study conducted in Bangladesh.

### Patients and methods

The study was conducted between May 1999-May 2004 in Bangladesh. In the study province the 218 newly diagnosed, histologically confirmed lung cancer cases were hospitalized in the Department of Medicine of the hospitals in this area. The Controls were patients hospitalized in the Department of Medicine at the hospital where the cases were recruited. For each case, two controls were individually matched by sex, 5-year age interval and area of residence. For cases from rural areas or small towns, controls were matched to subjects living in the same or adjacent place (town or rural). Diagnoses at admission of controls comprised: conditions requiring general surgery, 183(42%); urological diseases, 126 (28.9%) and orthopaedic diseases and trauma 127 (29.1%). Before surgery, the study subjects were interviewed in the hospital wards by two interviewers specially trained using a structured questionnaire. Information was collected on socioeconomic status, medical history of lung diseases, smoking history, histories of occupation and exposure to recognized lung carcinogens[19], residential histories, and types of heating and cooking fuels use at home.

A smoker was considered as anyone who smoked at least one cigarette per day for 1 year or more. The questionnaire also collected information on the lifetime exposure to environmental tobacco smoke by source (i.e. home or workplace), intensity (i.e. number of smokers) and duration of exposure. Size in square metres of the home or workplace was also recorded.

### Data analysis

ORs and 95% confidence intervals (CIs) Were computed as measures of the relative risk using unconditional logistic regression models. Adjustments were made for sex, age, education, family history of lung cancer, residence (urban or rural ), and exposure to coal and to recognized lung carcinogens.

### Results

Table gives the distribution of lung cancer cases and controls according to selected smoking related variables, and the corresponding OR compared with never-smokers. Cases were more frequently current smokers (62.8%) than controls (38.3%), and the corresponding OR was 3.47 (95% CI 2.31-5.20). Ex-smokers had an OR of lung cancer of 1.53(95% CI 0.81-2.87). In current smokers, the OR was 4.29(95% CI 2.59-7.01) for smoking duration >35 years, and lung cancer risk increased by 20% (95% CI 14% to 28% ) for an increment of 5 years in duration. On average, cases smoked much more cigarettes per day than controls. The OR was 3.66 (95% CI 2.10-6.40) in smokers of >15 cigarettes per day, and lung cancer risk increased by 29% (95% CI 15% to 45% ) for an increment of five cigarettes per day. All tests for linear trend were significant ( $P < 0.01$ ). Taking as the reference category smokers of factory-made cigarettes, and also adjusting for duration and amount of smoking, the ORs were 1.98 for smokers of hand-made cigarettes and 2.07 for smokers of both types.

**Table.** ORs and 95% of lung cancer according to smoking habit.

Smoking habit	Cases		Controls		OR(95%CI)a		OR(95%CI)b	
	n	%	n	%				
Never-smokers	61	28.0	217	49.8	1c		1c	
Ex-smokers	20	9.2	52	11.9	1.57(0.84-2.19)		1.53(2.31-5.20)	
Current smokers	137	62.8	167	38.3	3.40(2.29-5.01)		3.47(2.31-5.20)	
<b>Duration(year, current smokers)</b>								
1-24	37	17.0	60	13.7	2.11(1.19-3.73)		2.55(1.39-4.65)	
25-35	37	17.0	46	10.6	2.90(1.70-4.96)		3.40(1.91-6.04)	
>35	63	28.8	61	14.0	3.89(2.46-6.14)		4.29(2.59-7.01)	
Trend x2							39.12*	36.37*
per 5 years increase							1.19(1.12-1.25)	1.20(1.14-1.28)
<b>Daily cigarettes consumption (current smokers)</b>								
<5per day	17	7.8	26	6.0	2.13(1.09-4.17)		2.61(1.28-5.35)	
5-15per day	77	35.3	92	21.1	3.22(2.13-4.88)		3.67(2.32-5.48)	
>15per day	43	19.7	49	11.2	3.39(2.01-5.71)		3.66(2.10-.640)	
Trend X2							35.64*	32.98*
Per five cigarettes/per day							1.25(1.12-1.39)	1.29(1.15-1.45)
<b>Type of cigarette (current smokers)</b>								
Factory made (Fm)	79	36.2	121	27.8	1c		1c	
Hand made (Hm)	25	11.5	22	5.1	1.68(0.88-3.22)		1.98(0.98-4.08)	
Mixed (Fm, Hm ,pipe)	33	15.1	24	5.4	1.98(1.06-3.68)		2.07(1.06-4.03)	

a. Estimates from multiple logistic regression including terms for quinquennia of age and sex.

b. Estimates from multiple logistic regression including terms for quinquennia of age and sex, education, family history of lung cancer, residence (urban or rural), and exposure to coal and recognized lung carcinogens. for type of cigarette we also adjusted for duration and amount of smoking. c Reference category.

\*P<0.001.

OR, odds ratio; CI, confidence interval.

## Discussion

The study further quantifies the association between cigarette smoking and lung cancer risk in a high lung cancer risk area in north-west and southern area of Bangladesh compared with never-smokers, the OR for current smokers was 3.5, and increased with duration and dose.

In this and other studies in the same population [18,20], hand-made cigarettes were associated with a higher lung cancer risk than factory-made ones, even after adjustment for smoking quantity. The major difference between factory-made and hand-made cigarettes is that hand-made cigarettes use dry tobacco leaves without any processing. Cigarettes manufactured in Bangladesh were once thought to be less harmful, but subsequent studies indicated that risks of lung cancer among Bangladeshi smokers are comparable to those in Western societies once the amounts smoked are standardized [21]. Investigation in areas of Bangladesh with exceptionally high rates of lung cancer provide some of the strongest evidence to date that indoor air pollutants may increase cancer risk [22]. In urban area, indoor pollution from use of coal-burning heating devices contributes to the area's high rates of lung cancer [14,17]. This, in combination with the lower dose of cigarettes [in

fact this study only a small portion of controls (11%) smoked more than 15 cigarettes per day], may at least partially explain the lower PAR for smoking, which in this study was 48% (adjusted for major confounding factors), as compared with Europe and North America. Other studies from the same area found PAR to vary between 26% and 52% [9]. In the study, the PAR was 59% for males, whereas in industrialized countries the lung cancer mortality attributable to smoking in the year 2000 was >90% for males [7,23].

When we examined the combined effect of smoking and selected occupational exposures, the two factors appeared to act independently on lung cancer risk, although the data were too scanty to further model their joint effect. In addition, stratified analysis found no heterogeneity across any covariate of interest. This study, however was of relatively limited size, which hampered any analysis of subgroups or interactions.

Among potential sources of bias, the study was not population-based and did not record information on histological type of lung cancer. On the other hand, participation in the study was practically complete, cases and controls came from similar attachment areas, and allowance for major identified potential confounding factors did not modify any of the results.

In conclusion this study further confirms that cigarette smoking is a strong determinant of lung cancer also in this high risk area., that the lower risks observed in Bangladesh for ever-smokers are due to a lower amount of cigarettes consumed and that hand-made cigarettes lead to a higher risk of lung cancer than factory-made ones.

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