Prevalence and patterns of smoking in Delhi: cross sectional study

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Abstract

Objective—To determine the prevalence and predictors of smoking in urban India.

Design—Cross sectional.

Setting—Delhi, urban India, 1985–6.

Subjects—Random sample of 13 558 men and women aged 25–64 years.

Main outcome measure—Smoking prevalence; subjects who were currently smoking and who had smoked ≥ 100 cigarettes or beedis or chuttas in their lifetime were defined as smokers.

Results—45% (95% confidence interval 43.8 to 46.2) of men and 7% (6.4 to 7.6) of women were smokers. Education was the strongest predictor of smoking, and men with no education were 1.8 (1.5 to 2.0) times more likely to be smokers than those with college education, and women with no education were 3.7 (2.9 to 4.8) times more likely. Among smokers, 52.6% of men and 4.9% of women smoked only cigarettes while the others also smoked beedi or chutta. Compared with cigarette smokers, people smoking beedi or chutta were more likely to be older and married; have lower education, manual occupations, incomes, and body mass index; and not drink alcohol or take part in leisure exercise.

Conclusion—There are two subpopulations of smokers in urban India, and the prevention strategy required for each may be different. The educated, white collar cigarette smoker in India might respond to measures that make non-smoking fashionable, while the less educated, low income people who smoke beedi or chutta may need strategies aimed at socioeconomic improvement.

Introduction

Use of tobacco currently accounts for 3 million deaths each year worldwide,¹ and nearly a third of these deaths occur in India alone.² The global health care costs resulting from tobacco use exceed \$200 billion a year—more than twice the current health budgets of all developing countries combined.³ It is predicted that by the 2020s there will be about 10 million tobacco related deaths annually worldwide,¹ and most of the increase in deaths will occur in the developing Asian countries of China and India,^{2,4} where the rate of tobacco consumption is increasing.⁵ Several reasons have been suggested for the rise in tobacco use in developing countries,⁶ but few reliable data exist on the distribution and determinants of smoking in India and other Asian countries. The influences on tobacco smoking in India may be different from those in the West. Furthermore, in addition to cigarettes, in India tobacco is smoked in uniquely local ways which include beedi (tobacco rolled in dry leaves) and chutta (a cheroot smoked with the lighted end inside the mouth). Knowledge of smoking and its determinants in India will facilitate preventive action.

We surveyed a random sample of adults living in urban Delhi in 1985–6 to study the epidemiology of tobacco smoking.

Methods

SUBJECTS

During a population based study of coronary heart disease, a structured questionnaire was used to obtain data on smoking, age, sex, religion, marital status, education, occupation, income, dietary habits, alcohol consumption, physical activity, and family medical history.⁷ The sampling frame consisted of the 1981 census population of Delhi, and 13 723 (93%) people from a cluster random sample of 14 770 adults aged 25–64 years, representing 7388 households, were interviewed at home by trained social scientists.⁷ Data on smoking were available on 13 558 (92%) subjects.

Respondents who were currently smoking and who had smoked ≥ 100 cigarettes or beedis or chuttas in their lifetime were defined as smokers. Smoking was typed as “cigarette” if cigarettes were the only form of tobacco smoked and as “beedi or chutta” if tobacco was smoked as beedi or chutta either solely or along with cigarettes. Occupation was classified into four groups: group I—professionals or supervisors, or both; group II—clerks, businessmen, and traders; group III—housewives, students, unemployed, and retired people; and group IV—skilled and unskilled workers. Respondents answering yes to the question, “Do you drink at present?” were classified as drinkers. Subjects answering yes to the question, “Are you a vegetarian?” were classified as vegetarians, and those responding yes to the question, “Do you eat eggs?” were classified as egg eaters. Respondents who were not vegetarians were asked to report the number of times a week they ate meat. Subjects answering yes to the question, “Do you currently take regular physical exercise outside of your job?” were classified as leisure time exercisers. Respondents were asked to classify the level of non-leisure physical activity in their jobs or at home as sedentary, light, moderate, or heavy. Body mass index was calculated as $\text{weight}(\text{kg})/(\text{height}(\text{m})^2)$.

STATISTICAL ANALYSIS

For categorical variables the differences in smoking prevalence between groups were compared with a χ^2 test, and differences in continuous variables between smokers and non-smokers were compared with analysis of variance. Sikhs ($n = 1268$) were excluded from multivariable analysis because of the low prevalence of smoking (2.6% in men and 0% in women) among them. The Mantel-Haenszel procedure and multiple logistic regression analysis were used to assess risk factors for smoking, controlled for potentially confounding factors. Forward selection stepwise logistic regression analysis was used, with a threshold for selection of $P < 0.05$. Indicator variables were used to represent religion, marital status, occupation, and physical activity at work or at home, and the likelihood ratio test was used to assess the association between these variables and smoking. In stepwise logistic regression models, all indicators of one variable were required to be in or out together. The Mantel-Haenszel procedure and multiple logistic regression analysis were also used to assess factors among smokers that were associated with the type of smoking.

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Table 1—Prevalence of smoking in men and women according to strata of socioeconomic and lifestyle factors. Figures are numbers (percentages)

Variable	Men	Women
Education:		
None	954 (66.1)	3037 (14.1)
Primary	831 (57.4)	1125 (3.1)
Middle	1150 (49.4)	875 (2.1)
Secondary	1525 (41.4)	1036 (1.1)
College	173 (27.4)	1215 (1.4)
Religion:		
Hindu	4485 (47.9)	5634 (5.6)
Muslim	747 (58.6)	928 (21.0)
Sikh	569 (2.6)	699 (0)
Christian	53 (39.6)	71 (4.2)
Marital status:		
Married	5547 (45.5)	6413 (6.6)
Separated, divorced, widowed	140 (49.3)	684 (12.4)
Single	519 (38.5)	2357 (2.1)
Occupation*:		
Group I	1136 (32.1)	329 (1.8)
Group II	2312 (40.4)	272 (5.1)
Group III	703 (39.8)	6465 (7.0)
Group IV	2069 (58.9)	270 (15.9)
Family history of heart disease	4018 (42.1)	4831 (5.1)
No family history of heart disease	2203 (50.3)	2506 (10.8)
Vegetarian	2098 (36.2)	3575 (3.1)
Non vegetarian	4091 (49.6)	3741 (10.8)
Eats eggs	4199 (48.1)	3738 (9.5)
Does not eat eggs	1986 (38.7)	3566 (4.5)
Drinks alcohol	1806 (62.0)	31 (41.9)
Does not drink alcohol	4415 (38.1)	7306 (6.9)
Exercises during leisure	781 (33.8)	249 (1.6)
No exercise during leisure	5440 (46.6)	7088 (7.2)
Physical activity at work or at home:		
Sedentary	823 (38.5)	1359 (4.4)
Light	2608 (44.3)	5166 (7.9)
Moderate	2296 (46.6)	729 (4.5)
Heavy	436 (52.5)	40 (22.5)

*Group I = professionals, supervisors, and officers; group II = clerks, salesmen, businessmen, shopkeepers, and traders; group III = housewives, students, and retired or unemployed people; group IV = skilled and unskilled workers.

Results

SMOKING PREVALENCE AND ASSOCIATIONS

Overall, 24.5% (95% confidence interval 23.8 to 25.2) of 13 558 subjects were smokers, and men had a significantly higher prevalence than women (2799/6221; 45.0% (43.8% to 46.2%) *v* 516/7337; 7.0% (6.4% to 7.6%); $P<0.001$). Controlled for sex, prevalence of smoking varied by age ($P<0.001$). Among men, smoking prevalence was highest in those aged 35–44 years and lowest in those aged 55–64 years, but among women the prevalence increased with age (figure 1). After adjustment for sex and age, smokers had lower body mass index (mean body mass index (kg/m^2): smokers 21.0, non-smokers 23.0, $P<0.001$) and lower income (median income (rupees/month): smokers 750, non-smokers 900, $P<0.001$), and ate meat more often (mean number of times meat eaten a week: smokers 1.52, non-smokers 1.08, $P<0.001$) than non-smokers.

Among both men and women (table 1) the prevalence of smoking was univariately associated with education, religion, marital status, occupation, family history of heart disease, non-vegetarianism, eating eggs, alcohol drinking, leisure inactivity, and high levels of physical activity at work or at home ($P<0.001$ for each). Controlled for age, income, and education, smoking was significantly associated with an absence of a family history of heart disease in men and with religion, occupation, physical activity at work or at home, body mass index, non-vegetarianism, meat eating, egg eating, and alcohol drinking in both men and women ($P<0.05$ for each) (table 2). Muslim and Christian women had higher odds of being smokers than Hindu women, and skilled and unskilled workers had higher odds than professionals and supervisors.

Table 3 presents the results of stepwise multiple logistic regression models, controlled for age, for men and women. Education entered into the model first as the strongest predictor of smoking ($P<0.001$) among both men and women. Men with no education were 1.8 times more likely to be smokers than men with college education, and women with no education were 3.7 times more likely than those with college education. Marital status, religion, occupation, body mass index, alcohol drinking, and non-vegetarianism (in that order) were also significantly associated with smoking in men. Among women religion, occupation, physical activity at work or at home, body mass index, alcohol drinking, and non-vegetarianism (in that order) were associated with smoking in addition to education. In separate stepwise logistic regression analyses education, alcohol drinking, and religion were selected as the strongest predictors of smoking in all age groups (25–34, 35–44, 45–54, 55–64 years) (data not shown).

Table 2—Results of multiple logistic regression models, controlled for age, income, and education. Dependent variable: smoking. Figures are odds ratios (95% confidence intervals)

Variable	Men	Women
Religion†:		
Hindu	1	1
Muslim	0.95 (0.80 to 1.13)	3.47 (2.81 to 4.28)
Christian	0.77 (0.43 to 1.36)	1.55 (0.46 to 5.22)
Marital status†:		
Married	1	1
Separated, divorced, widowed	0.56 (0.22 to 1.40)	3.06 (1.15 to 8.14)
Single	0.75 (0.18 to 3.18)	1.68 (0.47 to 5.99)
Occupation‡:		
Group I	1	1
Group II	1.04 (0.88 to 1.22)	1.39 (0.49 to 3.93)
Group III	0.83 (0.66 to 1.04)	0.50 (0.20 to 1.23)
Group IV	1.58 (1.31 to 1.91)	1.06 (0.41 to 2.78)
Physical activity at work or at home§:		
Sedentary	1	1
Light	1.09 (0.92 to 1.30)	1.81 (1.61 to 7.26)
Moderate	1.26 (1.06 to 1.51)	1.61 (1.02 to 2.53)
Heavy	1.50 (1.15 to 1.96)	7.26 (2.82 to 18.72)
Leisure exercise (yes)	0.95 (0.80 to 1.13)	0.66 (0.24 to 1.86)
Vegetarian (yes)	0.59 (0.52 to 0.66)	0.23 (0.18 to 0.29)
Drinks alcohol (yes)	3.69 (3.23 to 4.21)	66.77 (25.76 to 173.13)
Body mass index (per 5 kg/m^2)	0.63 (0.58 to 0.68)	0.66 (0.58 to 0.74)
Meat eating (per time per week)	1.06 (1.03 to 1.10)	1.25 (1.20 to 1.31)
Eats eggs (yes)	1.53 (1.36 to 1.72)	2.91 (2.36 to 3.59)
Family history of heart disease (yes)	0.84 (0.74 to 0.95)	0.95 (0.77 to 1.16)

* $P>0.05$ for men; $P<0.001$ for women.

† $P>0.05$ for men and women.

‡ $P<0.001$ for men and women.

§ $P<0.001$ for men and women.

Fig 1—Prevalence (%) of smoking specific for age and sex. Respondents who were currently smoking and who had smoked ≥ 100 cigarettes or beedi or chutta in their lifetime were defined as smokers

Table 3—Results of stepwise multiple logistic regression model* controlled for age. Dependent variable: smoking. Predictor variables listed in order of entry for men. For order of entry in women see footnote.† Figures are odds ratios (95% confidence intervals)

Variable	Men	Women
Education:		
None	1.75 (1.52 to 2.02)	3.72 (2.86 to 4.82)
Primary	1.29 (1.12 to 1.48)	1.13 (0.79 to 1.63)
Middle	1.06 (0.94 to 1.19)	0.94 (0.59 to 1.50)
Secondary	0.84 (0.75 to 0.94)	0.44 (0.24 to 0.79)
College	1	1
Marital status:		
Married	1	—
Separated, divorced, widowed	0.91 (0.61 to 1.37)	—
Single	0.73 (0.58 to 0.90)	—
Religion:		
Hindu	1	1
Muslim	1.33 (1.11 to 1.62)	2.64 (2.07 to 3.36)
Christian	0.69 (0.36 to 1.32)	0.37 (0.05 to 2.99)
Occupation:		
Group I	1	1
Group II	1.15 (0.96 to 1.38)	1.47 (0.47 to 4.62)
Group III	0.80 (0.63 to 1.02)	0.87 (0.32 to 2.41)
Group IV	1.39 (1.13 to 1.70)	1.91 (0.64 to 5.70)
Body mass index (per 5 kg/m ²)	0.60 (0.55 to 0.65)	0.66 (0.58 to 0.75)
Drinks alcohol (yes)	3.82 (3.30 to 4.42)	67.36 (23.34 to 194.37)
Vegetarian (yes)	0.82 (0.71 to 0.94)	0.34 (0.26 to 0.45)
Physical activity at work or at home:		
Sedentary	—	1
Light	—	1.51 (1.11 to 2.05)
Moderate	—	0.73 (0.43 to 1.24)
Heavy	—	2.69 (0.80 to 9.00)

*Income, education, marital status, religion, occupation, physical activity at work or at home, leisure activity, body mass index, drinking status, meat intake, egg eating, vegetarianism, and family history of heart disease were all available to models, and age was forced in. Results are presented only for variables that were selected. The threshold for selection was $P < 0.05$.

†Order of entry for women: education, religion, occupation, physical activity at work or at home, body mass index, alcohol drinking, and non-vegetarianism.

Table 4—Results of stepwise multiple logistic regression model* with risk factors for type of tobacco used among smokers. Dependent variable: type of smoking (beedi or chutta). Predictor variables listed in order of entry

Variable	Odds ratio (95% confidence interval)	P value
Age (per 10 years)	1.16 (1.05 to 1.28)	0.002
Sex (female)	10.20 (5.91 to 17.59)	<0.001
Income (per Rs 500)	0.86 (0.80 to 0.92)	<0.001
Education:		<0.001
None	2.88 (2.37 to 3.49)	
Primary	1.63 (1.35 to 1.96)	
Middle	1.12 (0.94 to 1.33)	
Secondary	0.62 (0.52 to 0.73)	
College	1	
Marital status:		0.025
Married	1	
Separated, divorced, widowed	0.90 (0.52 to 1.56)	
Single	0.61 (0.42 to 0.89)	
Religion:		<0.001
Hindu	1	
Muslim	0.62 (0.46 to 0.83)	
Christian	0.26 (0.07 to 1.03)	
Occupation:		<0.001
Group I	1	
Group II	0.68 (0.49 to 0.94)	
Group III	1.08 (0.70 to 1.67)	
Group IV	1.28 (0.91 to 1.81)	
Exercise during leisure (yes)	0.53 (0.36 to 0.78)	<0.001
Body mass index (per 5 kg/m ²)	0.77 (0.68 to 0.87)	<0.001
Drinks alcohol (yes)	0.65 (0.54 to 0.79)	<0.001
Meat eating (per time per week)	0.92 (0.88 to 0.98)	0.010
Family history of heart disease (yes)	0.75 (0.62 to 0.92)	0.004

*Age, sex, income, education, marital status, religion, occupation, physical activity at work or at home, leisure activity, body mass index, drinking status, meat intake, egg eating, vegetarianism, and family history of heart disease were all available to model. Results are presented only for variables that were selected. The threshold for selection was $P < 0.05$.

TYPE OF SMOKING

Cigarette users smoked a median of 10 (25th and 75th centiles: 5 and 15) cigarettes a day and for 12 (7 and 20) years. Beedi or chutta users smoked 10 (5 and 20) a day and for 15 (8 and 25) years. Among smokers 52.6% (1427/2712) of men smoked cigarettes, but only 4.9% (25/511) of women did so ($P < 0.001$). As shown in figure 2 a higher proportion of male smokers at all ages, except 55–64 years, smoked cigarettes than beedi or chutta; whereas among women a considerably higher proportion smoked beedi or chutta than cigarettes ($P < 0.001$). Among both men and women the proportion of smokers who smoked cigarettes decreased with age.

Table 4 shows the results of a stepwise multiple logistic regression model predicting the type of tobacco used among smokers. Compared with cigarette smokers, beedi or chutta smokers were significantly more likely to be older, women, married, and Hindu; to have lower incomes, lower education, skilled or unskilled manual occupations, and lower body mass indices; and to not exercise during leisure, not drink alcohol, and not have a family history of heart disease.

Discussion

SMOKING—PREVALENCE AND RISK FACTORS

In this large, population based study the prevalence of smoking in urban Delhi among people aged 25–64 years during 1985–6 was 24.5%, and these rates were higher among men (45.0%) than among women (7.0%). Few other comparable data on smoking in India exist. Among 1130 people aged 25–64 years in 1990, Kutty *et al* reported a prevalence of 21.9% (95% confidence interval 15.1 to 28.7) in a rural population in Kerala, but the definition of smoking was not reported.⁸ In rural Andhra Pradesh, Gavarrasana *et al* found that among 272 people aged 21–50 years attending an oral cancer control camp, 50.5% of men and 9.3% of women smoked.⁹

In our study, education was the strongest predictor of smoking, and men with no education were 1.8 times more likely to be smokers than men with college education, and women were 3.7 times more likely. Muslim women were more likely to smoke than Hindu or Chris-

Fig 2—Proportion of smokers who used either cigarettes or beedi and chutta according to sex and age groups. Sikhs were excluded

Key messages

- In 1985-6, 45% of men and 7% of women aged 25-64 years smoked in Delhi, urban India
- Lack of education was the strongest risk factor for smoking: men with no education were 1.8 times more likely to be smokers than those with college education, and women with no education were 3.7 times more likely
- There are two subpopulations of smokers in India: the affluent, white collar cigarette smoker and the less affluent labourer who smokes beedi or chutta
- Different preventive strategies may be required to target each of these two groups
- Prospective epidemiological studies of smoking in India will be of value

tian women; people in manual occupations were more likely to smoke than those in professional or supervisory occupations; non-vegetarians were more likely to smoke than vegetarians; and people who drank alcohol were more likely to smoke than those who did not. Education and socioeconomic factors have been reported to be associated with smoking in diverse groups worldwide,⁹⁻¹⁸ but risk factors like religion and non-vegetarianism may be unique to India. Other risk factors for smoking have been reported—notably, whether parents and family smoke,¹³⁻¹⁹ knowledge and attitudes related to smoking,²⁰⁻²¹ locus of control,²² self esteem,²³ and acculturation,¹⁵⁻¹⁸ but data on these were not obtained in the present study.

TYPE OF SMOKING

Among smokers, 52.6% of men and 4.9% of women consumed cigarettes and the rest smoked local forms of tobacco: beedi and chutta. Compared with those who used beedi or chutta, cigarette smokers were more likely to be younger, single, men, and alcohol drinkers and to have higher education, professional or supervisory occupations, higher incomes, higher body mass indices, and to take part in leisure exercise and have a family history of heart disease. This suggests two subpopulations of smokers: the affluent white collar cigarette smokers and the less affluent labourers who use beedi or chutta.

Cigarette smoking among educated, higher income Indians may be a function of fashion and of "westernisation," and those who smoke cigarettes are more likely than those who smoke beedi or chutta to have other cardiovascular risk factors—for example, sedentary jobs, a family history of heart disease, higher body mass index. The fact that the proportion of men and women smoking cigarettes decreased with age perhaps suggests that new smokers are more likely to smoke cigarettes, or perhaps people switch to local forms of tobacco as they get older.

SMOKING PREVENTION

It is estimated that tobacco sales in Asia will increase by 35% by the year 2000²⁴ and that by the 2020s there will be 10 million deaths related to use of tobacco each year worldwide.¹ A vast majority of these deaths will be in the developing countries of China and India.²⁻⁴ Thus, for health reasons, prevention of tobacco smoking is a priority for these countries. There are also economic reasons. It is estimated that tobacco consumption results in a net annual global loss of nearly \$200 billion, about a third of which occurs in developing countries,³ and the World Bank has decided not to lend money for tobacco production or marketing but to do so for anti-tobacco activities.²⁵

Data on risk factors for smoking will facilitate prevention strategies because often the decision to quit and success in maintaining abstinence are determined by many of the same factors affecting initiation and maintenance.²⁶⁻²⁷ Different prevention strategies may

also be needed for different segments of the smoking population. For example, the educated white collar cigarette smoker in India might respond to measures that make non-smoking fashionable, while the less educated person who smokes beedi or chutta may need strategies aimed at socioeconomic improvements.

Our findings may not be generalisable across India, and similar studies in other groups are needed, particularly among rural residents and young children. Prospective investigations are needed to confirm risk factors for smoking and also to assess the health risks of tobacco smoking in India, which may be unique because of the use of beedi, chutta, and other forms of tobacco. In the present century most of the deaths from smoking have been in developed countries, but in the next century most such deaths will occur in developing countries like India.¹ Investment in prospective epidemiological studies of smoking, its predictors, and its health consequences in a variety of population groups in India will be of considerable value.

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