Tobacco Use and Its Association with Risk Factors of Non-Communicable Diseases in the Rural Areas of Delhi, India

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Abstract

Introduction: Tobacco use is one of the leading risk factors for global disease burden in all countries. Its association with non-communicable diseases (NCDs) is well documented; however, little is known about the relationship with other risk factors of NCD.

Objectives: To find prevalence of tobacco use and its associated socio-demographic variables, other behavioral and metabolic risk factors of non-communicable diseases.

Materials and Methods: It was a community-based cross-sectional study conducted in two rural areas in Delhi among 1005 subjects aged above 18 years selected using systematic random sampling method. WHO STEPS approach was used to collect data about socio-demography, tobacco and alcohol use. Blood pressure, body mass index, blood sugar and lipid profile were measured. Data analysis was done using SPSS version 16. Differences between groups were assessed using Chi-square test for their statistical significance. P value less than 0.05 was considered statistically significant.

Results: The overall prevalence of current tobacco use was 11.1%. Out of 112, 107 (95.5%) subjects reported daily use of tobacco. The age of initiation of tobacco use was significantly lower among males than females (p<0.01). The mean number of bidi/cigarette consumed per day was significantly lower among females than males (p<0.01). Alcohol use was significantly higher in those with present tobacco use as compared to non-tobacco users (p<0.05). Proportion of subjects with hypertriglyceridemia was significantly higher among current tobacco users (35.7%) than non-users (20.2%) (p<0.05). A significantly higher percentage of tobacco users (18.8%) was underweight than non-users (9.3%) (p<0.05).

Conclusion: There is significant burden of tobacco use in rural areas of Delhi. Male gender, age and occupation, hypertriglyceridemia and underweight were associated with tobacco use.

Keywords: Tobacco, NCD risk factors, Rural, Delhi

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Introduction

Tobacco use is one of the three leading risk factors for global disease burden. The burden of disease attributable to tobacco use is substantial with 6.3% of Disability Adjusted Life Years (DALYs). The burden is mainly driven by active smoking, which accounts for 87% of the combined burden with second-hand smoke, and alcohol use which accounted for 5-5% of global DALYs in 2010.\(^1\) In 2012, global modeled age-standardized prevalence of daily tobacco smoking in the population older than 15 years was reported to be 31.1% for men and 6.2% for women. Although the global modeled prevalence declined from 1996 to 2006, the number of daily smokers increased from 721 million in 1980 to 967 million in 2012.\(^2\)

In a recent pooled data analysis among Asians, it was found that approximately 11.4, 30.5, and 19.8% of deaths due to cardiovascular diseases, cancer and respiratory diseases, respectively, were attributable to tobacco smoking among men. Corresponding proportions for East-Asian women were 3.7, 4.6, and 1.7%, respectively. The strongest association with tobacco smoking was found for lung cancer: a 3–4 fold elevated risk, accounting for 60.5 and 16.7% of lung cancer deaths, respectively, in Asian men and East-Asian women aged more than 45 years.\(^3\)

India being second-most populous country in the world, is currently facing a huge mortality and morbidity burden due to tobacco smoking in 2010.\(^4\) In addition to this, tobacco has serious economic implications on the individual's, families and society. Direct medical costs of treating tobacco related diseases in India amounted to $907 million for smoked tobacco and $285 million for smokeless tobacco. The indirect morbidity costs of tobacco use, which includes the cost of caregivers and value of work loss due to illness, amounted to $398 million for smoked tobacco and $104 million for smokeless tobacco. The total economic cost of tobacco use amounted to $1.7 billion with tuberculosis accounting for 18% of tobacco-related costs ($311 million) in India.\(^5\) Tobacco consumption is a complex issue with a number of determinants. The prevalence of tobacco use in rural communities is higher than in urban communities.\(^6\) Tobacco use in rural areas is often found associated with socio-demographic characteristics. The reasons may be lower level of education, traditional forms of livelihood and sociocultural factors.\(^7\)

Looking at the mortality and morbidity attributed to tobacco use and to frame evidence-based policies for future for tobacco control, there is a need to examine the burden and attributes of tobacco use among rural masses. This article presents findings of a research study conducted in two rural villages of Delhi, India, with an objective to find prevalence of tobacco use and its associated socio-demographic factors. Any association of tobacco use with other behavioral and metabolic risk factors of non-communicable diseases (NCDs) has been explored.

Materials and Methods

Study Design, Setting and Sample Size

This was a community-based cross-sectional survey conducted in two villages in Delhi. All individuals aged more than 18 years constituted the study population. The sample size was calculated on the basis of a previous study which recorded prevalence of lifetime tobacco use as 41.3%.\(^8\) Taking 95% confidence interval and 10% acceptable error, the required sample size came out to be 563. However, a total of 1005 subjects were included in the study. Systematic random sampling method was used to select study subjects in the study.

Study Instruments and Data Collection

A pre-designed, pre-tested, semi-structured questionnaire containing items to assess socio-demographic profile like age, sex, identification data and socioeconomic status, etc., was used. The World Health Organization (WHO) STEPS approach was employed to study the profile of tobacco use in the population. STEPS approach includes three sequential phases: collection of information on socio-demographic variables, and behavioral risk factors, that is, tobacco use, alcohol use and related factors using a questionnaire (STEP 1); obtaining clinical measurements such as weight, height, and blood pressure using standardized protocols and instruments (STEP 2); measuring total cholesterol, triglycerides and high-density lipoprotein (HDL) (STEP 3).\(^9\) The standard WHO STEPS questionnaire was pretested before the study. It was adapted by including local terms and translated into local (Hindi) language and back translated in English by Hindi and English experts and field tested. Self-reported history of use of tobacco as bidi or cigarette or any other form of tobacco and alcohol consumption was obtained from the respondents. Respondents who reported tobacco use in any form at the time of survey were classified as "current tobacco users".\(^10\)

Measurements

- Blood pressure was recorded three times in sitting position, in the right arm, using a standard android
dial BP apparatus (Mercury type of BP apparatus has been phased out from health care setting in India). The standard protocol was followed and the average of the last two readings was used in the analyses. Hypertensive subjects were defined as those who were on medication for hypertension or those with systolic blood pressure (SBP) equal to or more than 140 mmHg and or diastolic blood pressure (DBP) equal to or more than 90 mmHg or those being treated for hypertension.

- Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Overweight and obesity were defined as BMI ≥23–24.9 kg/m\(^2\) and BMI ≥25 kg/m\(^2\) respectively.

- Blood sugar fasting and post prandial was measured among study subjects. Diabetes mellitus was defined as per criteria given by American Diabetes Association (ADA).

- Lipid disorders were classified as per National Cholesterol Education Programme (NCEP) guidelines. Hypercholesterolemia was diagnosed with serum cholesterol levels ≥200 mg/dL (≥5.2 mmol/L). Hypertriglyceridemia was taken with serum triglyceride levels ≥150 mg/dL (≥1.7 mmol/L) and reduced HDL cholesterol was considered with HDL cholesterol levels <40 mg/dL (<1.04 mmol/L) for men and <50 mg/dL (<1.3 mmol/L) for women.

**Ethical Issues**

Each selected subject was explained about the procedure and objectives of the study. Written informed consent was obtained and referral services were provided, if required. Prior ethical clearance for the study was obtained from the institutional ethics committee.

**Statistical Analysis**

Data analysis was done using SPSS version 16. The results were explained in simple proportion and mean (standard deviation). Differences between groups were assessed using Chi-square test for their statistical significance. Difference between mean in two groups was analyzed for its significance using independent sample T-test (normal distribution) or Mann Whitney Test (non-normal distribution). P value less than 0.05 was considered statistically significant.

**Results**

The overall prevalence of current tobacco use was 11.1%. Among males, 24.6% reported current tobacco use while 2.6% females reported the same. A total of 112 subjects reported current use of tobacco in any form. Out of 112, 107 (95.5%) subjects reported daily use of tobacco. 18 males and 15 females reported using chewable form of tobacco in addition to tobacco smoke. The mean (±SD) age of starting tobacco use was 34.1 ± 19.2 years for females and 20.1 ± 8.9 years for males. This showed that age of initiation of tobacco use was significantly lower among males than females (p<0.01). Bidi was reported by all 112 (100.0%) subjects while cigarette was used by only 1 (0.9%) subject. The mean number of bidi/cigarette consumed per day was 4.3 ± 3.2 among females and 12.7 ± 10.8 among males. This difference was statistically significant (p<0.01). Only 4 (0.4%) subjects reported past tobacco use.

Table 1 shows the socio-demographic characteristics such as age, sex, education, occupation and religion of study subjects. The prevalence of current tobacco use was significantly higher among males than females (p<0.05). There was significant difference in prevalence of current tobacco use in individuals more than 35 years than less than 35 years (p<0.05). There was no significant difference in proportion of current tobacco use with respect to education, monthly per capita income and religion (p>0.05). Likewise significant difference was seen in occupation categories with current tobacco use where highest prevalence was seen in retired and lowest among professional (p<0.05).

Table 2 shows relationship of current tobacco use with other behavioral and metabolic risk factors for non-communicable diseases. A significantly higher proportion of subjects (21.4%), who were using tobacco currently reported use of alcohol ever than those who were not using tobacco (4.1%) (p<0.05). Alcohol use in past one year was also significantly higher (18.8%) in those with present tobacco use as compared to non-tobacco users (3.0%) (p<0.05). There was no significant difference in two groups with Diabetes mellitus Type 2 (p>0.05). The prevalence of hypertension was higher (17.9%) among current tobacco users as compared to those who were not using tobacco (13.7%); however, this difference was not statistically significant (p>0.05). Similarly, proportion of raised total cholesterol levels and decreased HDL levels was higher among tobacco users but the difference was not statistically significant (p>0.05). Proportion of subjects with hypertriglyceridemia was significantly higher among current tobacco users (35.7%) than in non-users (20.2%) (p<0.05). A significantly higher percentage of tobacco users (18.8%) was underweight than non-users (9.3%) (p<0.05).
### Table 1. Socio-demographic Characteristics of the Study Subjects

| Variable          | Sub-groups                        | Current Tobacco Use | \( \chi^2 \), p value |
|-------------------|-----------------------------------|---------------------|----------------------|
|                   |                                   | Yes                 | No                   |
| Gender            | Male (N=391)                      | 96                  | 24.6                 | 295                  | 75.4                 | 116.1, 0.01         |
|                   | Female (N=614)                    | 16                  | 2.6                  | 598                  | 97.4                 |                       |
| Age               | Less than 35 years (N=449)        | 30                  | 6.7                  | 419                  | 93.3                 | 16.3, 0.01          |
|                   | More than 35 years (N=556)        | 82                  | 14.7                 | 474                  | 85.3                 |                       |
| Religion          | Hindu (N=980)                     | 109                 | 11.1                 | 871                  | 88.9                 | 0.2, 0.98           |
|                   | Others (N=25)                     | 3                   | 12.0                 | 22                   | 88.0                 |                       |
| Education Level   | Illiterate (N=211)                | 20                  | 9.5                  | 191                  | 90.5                 | 4.2, 0.63           |
|                   | Primary (N=21)                    | 2                   | 9.5                  | 19                   | 90.5                 |                       |
|                   | Middle (N=205)                    | 24                  | 11.7                 | 181                  | 88.3                 |                       |
|                   | High School (N=247)               | 35                  | 14.2                 | 212                  | 85.8                 |                       |
|                   | Junior college (N=167)            | 18                  | 10.8                 | 149                  | 89.2                 |                       |
|                   | Graduate (N=114)                  | 9                   | 7.9                  | 105                  | 92.1                 |                       |
|                   | Post-Graduate (N=40)              | 4                   | 10.0                 | 36                   | 90.0                 |                       |
| Monthly per capita income | Up to Rs. 1000 (N=367)             | 34                  | 9.3                  | 333                  | 90.7                 | 4.2, 0.23           |
|                   | Between Rs. 1001 and Rs. 2000 (N=263) | 38              | 14.4                 | 225                  | 85.6                 |                       |
|                   | Between Rs. 2001 and Rs. 5000 (N=291) | 31           | 10.7                 | 260                  | 89.3                 |                       |
|                   | More than Rs. 5001 (N=84)         | 9                   | 10.7                 | 75                   | 89.3                 |                       |
| Occupation        | Professional (N=66)               | 1                   | 1.5                  | 65                   | 98.5                 | 106.5, 0.01         |
|                   | Semi-Professional (N=19)          | 2                   | 10.5                 | 17                   | 89.5                 |                       |
|                   | Clerical, shop-owners, farm owners (N=24) | 6           | 25.0                 | 18                   | 75.0                 |                       |
|                   | Skilled worker (N=36)             | 12                  | 33.3                 | 24                   | 66.7                 |                       |
|                   | Semi-skilled worker (N=64)        | 9                   | 14.1                 | 55                   | 85.9                 |                       |
|                   | Unskilled worker (N=146)          | 35                  | 24.0                 | 111                  | 76.0                 |                       |
|                   | Housewife (N=488)                 | 15                  | 3.1                  | 473                  | 96.9                 |                       |
|                   | Retired (N=17)                    | 7                   | 41.2                 | 10                   | 58.8                 |                       |
|                   | Unemployed (N=145)                | 25                  | 17.2                 | 120                  | 82.8                 |                       |

Note: All figures are expressed as number (%) row-wise.

### Table 2. Relationship of current tobacco use with other behavioral and metabolic risk factors

| Variable                      | Sub-groups                        | Current Tobacco Use | \( \chi^2 \), p value |
|-------------------------------|-----------------------------------|---------------------|----------------------|
|                               |                                   | Yes                 | No                   |
|                               |                                   | n=112               | %                    | n=893                | %                    |
| Alcohol use ever              | Yes                               | 24                  | 21.4                 | 37                   | 4.1                  | 52.1, 0.01          |
|                               | No                                | 88                  | 78.6                 | 856                  | 95.9                 |                       |
| Alcohol use in past one year  | Yes                               | 21                  | 18.8                 | 27                   | 3.0                  | 54.1, 0.01          |
|                               | No                                | 91                  | 81.2                 | 866                  | 97.0                 |                       |
| Diabetes mellitus Type 2      | Yes                               | 5                   | 4.5                  | 41                   | 4.6                  | 0.01, 0.95          |
|                               | No                                | 107                 | 95.5                 | 852                  | 95.4                 |                       |
| Hypertension                  | Yes                               | 20                  | 17.9                 | 122                  | 13.7                 | 1.4, 0.23           |
|                               | No                                | 92                  | 82.1                 | 771                  | 86.3                 |                       |
| Total cholesterol             | Raised                            | 43                  | 38.4                 | 271                  | 30.3                 | 2.9, 0.08           |
|                               | Normal                            | 69                  | 61.6                 | 622                  | 69.7                 |                       |
| High Density Lipoprotein      | Decreased                         | 111                 | 99.1                 | 851                  | 95.3                 | 3.5, 0.06           |
| Cholesterol (HDL)             | Normal                            | 1                   | 0.9                  | 42                   | 4.7                  |                       |
| Triglycerides                 | Raised                            | 40                  | 35.7                 | 180                  | 20.2                 | 15.2, 0.01          |
|                               | Normal                            | 72                  | 64.3                 | 713                  | 79.8                 |                       |
| Body mass index (BMI)         | Underweight                       | 21                  | 18.8                 | 83                   | 9.3                  | 12.1, 0.01          |
|                               | Normal                            | 34                  | 30.4                 | 271                  | 30.3                 |                       |
|                               | Overweight                        | 20                  | 17.9                 | 139                  | 15.6                 |                       |
|                               | Obese                             | 37                  | 33.0                 | 400                  | 44.8                 |                       |
Discussion

The present study was conducted in rural areas of Delhi to find prevalence and socio-demographic determinants of tobacco use. The prevalence of tobacco use was 24.6% among males and 2.6% among females. This figure is lower than reported prevalence in other rural areas in India by other studies.\(^{15,16}\) The reason could be study areas situated in outskirts of national capital of India with relatively faster pace of urbanization, increasing access to means of mass media and better education status. The males were more likely to smoke than females. Similarly, increased age group also had higher prevalence of tobacco use. This is consistent with the findings reported by Singh et al. in which male gender and higher age were significantly associated with tobacco use.\(^{17}\) Not only age of initiation of tobacco use was lower among females, mean number of cigarettes/bidis smoked was also less as compared to males. This showed that gender is an important determinant of tobacco use. Gender as an independent determinant of tobacco use has been documented by Sorensen et al. also.\(^{18}\) There was significant variation in tobacco use pattern among different occupations with high prevalence among retired personnel, skilled and unskilled workers. Such association of tobacco use with occupation classes has been documented by Ham et al.\(^{19}\) In the research, it was found that blue-collar workers and construction workers were more likely to use tobacco in any form as compared to other occupation classes. A majority of tobacco users reported daily use of tobacco.

Data was also analyzed to assess association of tobacco use with other risk factors for NCDs. Higher proportion of participants with tobacco use reported use of alcohol use in past year and ever than non-tobacco users. This shows that tobacco users were more likely to indulge in alcohol use as well. This is similar to findings reported in another study conducted by Gruca et al. in which it was revealed that smokers had 4.5-fold higher odds of alcohol use disorders than never-smokers.\(^{20}\) The prevalence of hypertension was higher among tobacco users than in non-users; although it was not statistically significant. A systematic review stated that smoking leads to increased arterial stiffness which may lead to hypertension.\(^{21}\) An animal study on mice has clearly shown that smoking leads to hypertension and endothelial dysfunction.\(^{22}\) Dyslipidemia was more prevalent among tobacco users than in non-users. This is consistent with findings reported by Thomas et al. in which dyslipidemia was significantly more among smokers.\(^{23}\) A higher proportion of tobacco users were underweight than non-users. Other studies also have demonstrated that tobacco use is associated with low BMI among masses.\(^{24,25}\) BMI of blue colored workers is lower as their energy consumption is higher and intake is lower. This could be the reason of lower BMI among tobacco users.

Conclusion

It can be concluded that prevalence of tobacco use in rural Delhi was 11.1%. Male gender, increasing age and occupation were significant determinants of tobacco use. Tobacco use was significantly associated with alcohol use, dyslipidemia and low body mass index. During quit tobacco interventions assessment and control of these factors would should be carried out to reduce overall non-communicable diseases.

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Conflict of Interest: Nil

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