



## ORIGINAL ARTICLE

# Smoking and alcoholism among adult population and its association with outlet density in a hilly area of North India

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## Keywords

Smoking • Alcohol • Outlet • Environment • Neighborhood

## Summary

**Background.** *The rising burden of non-communicable diseases is a threat to India. The behavioural risk factors having largest contribution to NCDs. Neighbourhood retailing of tobacco products, and alcohol are important risk factors. The objectives of the present study were to determine the prevalence of smoking and alcoholism among adults of Srikot, Uttarakhand, and to determine its relationship with tobacco, and alcohol retail outlet density.*

**Materials and methods.** *The study design was a community based cross sectional study, which was done in Srikot, Uttarakhand among adults aged above 20 years, selected by systematic sampling. A semi-structured questionnaire was used. The outlet density was measured mapped using android application.*

**Results.** *A total of 155 were enrolled in the study of which 61.3%*

*were females. A total of 11.6% of the study participants were smokers. On multivariate analysis male gender, and alcohol use was significantly associated with increased risk of smoking ( $p < 0.05$ ). A total of 16.8% of the study participants were alcohol user. On multivariate analysis it was found male gender, and smoking was significantly associated with increased risk of alcohol use ( $p < 0.05$ ). On mapping the study area, it was found that total tobacco selling outlets were 40. There was no alcohol-selling outlet in the study area.*

**Conclusion.** *The community is in an early stage of urbanization as evident from the burden of smoking, and alcohol use. This burden of smoking might be worsened by outlet density of tobacco seller.*

## Introduction

The rising burden of non-communicable diseases (NCDs) is a threat to India [1]. Non-communicable diseases (NCDs) contribute to around 5.87 million deaths that account for 60% of all deaths in India [2]. Hence 1 in 4 Indians risks dying from an NCD before they reach the age of 70. The main NCDs in India are cardiovascular diseases, hypertension, diabetes mellitus, chronic obstructive pulmonary diseases, and cancer [3].

The behavioural risk factors having largest contribution NCDs morbidity and mortality are tobacco use, harmful use of alcohol, unhealthy diet, and physical inactivity [3]. Tobacco use is the one of the primary causes of preventable death. The Global Adult Tobacco Survey study indicates that more than one third of Indian adults use tobacco [4]. India has over 275 million tobacco users, with 164 million users of only smokeless tobacco, 69 million exclusive smokers, and 42 million users of both smoking and smokeless tobacco [5]. The prevalence of smoking was significantly higher among rural residents as compared to urban residents in Chandigarh (17.7 vs. 13.6 %,  $P < 0.001$ ) as reported by ICMR study conducted in 2008-10. The prevalence of smoking among residents of rural Jharkhand, Maharashtra and Tamil Nadu was 13.7%, 10.5% and 21% respectively.

The prevalence of smoking among residents of urban Jharkhand, Maharashtra and Tamil Nadu was 14.5%, 11.1% and 20.1% respectively [6].

In present world, Alcohol use is a major public health concern. Each year harmful use of alcohol causes approximately 3.3 million deaths worldwide. Nearly 5.1% of the global burden of disease is attributable to alcohol consumption [7]. According to World Health Organization, in India 3.5% males > 15 years and < 0.1% females > 15 years age consumed at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days, heavy episodic drinking, in 2010 [8]. A cross-sectional survey was done among males aged 15-64 years in rural Wardha, India. The prevalence of alcohol intake was 22.7% [9]. The prevalence of alcoholism was significantly higher among rural residents as compared to urban residents in Jharkhand (33.6% vs. 18.1%,  $P < 0.001$ ) as reported by a study conducted in 2008-10. The prevalence of alcoholism among residents of rural Chandigarh, Maharashtra and Tamil Nadu was 17%, 11.8% and 22.2% respectively. The prevalence of smoking among residents of urban Chandigarh, Maharashtra and Tamil Nadu was 16.4%, 13.3% and 21.4% respectively [6].

Various aspects of the local environment are important factors in explaining health and health-related behaviours. Neighbourhood retailing of tobacco products,

and alcohol, had been implicated in affecting prevalence rates of smoking, and alcoholism, respectively [10, 11]. High density of such retailers may increase the ease with which individuals can access these products. The smoking behavior may be reduced by limiting retail tobacco outlet density [12]. Moreover, the rural areas are rapidly undergoing urbanization. Much of this urbanization leads to large social, economic, and environmental transformations. This further leads to lifestyles characterized by unhealthy nutrition, reduced physical activity and tobacco consumption. Thereby increasing the risk and burden of non-communicable diseases [13]. The aim of the present study was to determine the prevalence of smoking and alcoholism among adult population of Srikot, Uttarakhand and its association with outlet density.

## Materials and methods

This study was a community based cross sectional study, carried out in Srikot about 5 km from Srinagar towards Joshimath, Uttarakhand. It was conducted in May to July 2016. Study participants were the adult male and female aged above 20 years. The sample size was calculated based on the prevalence of smoking in Indian population. For the calculation of the sample size the prevalence of smoking was taken to be 17.7% among adult population of rural Chandigarh, north India [6]. For logistic issues we took a precision of 6%. The final sample size came to be 155 after taking 6% precision and 95% confidence level.

Based on the previous studies [14-16], we developed interview schedule as relevant to the objectives of the present study. The interview schedule was finalized after incorporating changes based on the pretesting. This questionnaire contained questions relevant to socio-demographic data, smoking, tobacco use and alcohol behavior. These questions were asked in the local language. The density of tobacco, and alcohol outlet was measured in Srikot by walking. House to house survey was done. Systematic sampling in the community of Srikot identified eligible households. Every *n*th house was chosen after a random starting point between 1 and 10. The youngest eligible person in a house was considered for the study. Informed written consent was taken from study participants. The study participants were interviewed according to the interview schedule. The survey was conducted until the final sample size was achieved. The detailing of the geographic location and count of outlets were carried out by walking in the community. The coordinates of tobacco/alcohol outlets were picked up using free android app, Map it. The coordinate was recorded while standing at the entrance of the outlet. The appropriate items were purchased from the outlet to mark them as tobacco/alcohol outlets.

Current smoker/tobacco use/alcoholic was a person who smoked/consumed tobacco/alcohol respectively at any point within the past thirty days. Former smoker/tobacco use/alcoholic was a person who smoked/consumed to-

bacco/alcohol respectively at any point before the past thirty days. Never smoker/tobacco use/alcoholic was a person who had never smoked/ consumed tobacco/alcohol respectively at any point in the past. Tobacco/alcohol outlet was any settlement selling tobacco/alcohol respectively [15, 17].

Data were entered in Microsoft excel spreadsheet and analysed with SPSS version 17.0 (Chicago, IL, USA). Descriptive statistics was conducted for the percentage, mean, and standard deviation (SD); inferential statistics was conducted using test of significance to measure associations between outcome and explanatory variables. P value less than 0.05 was considered significant. Ethical clearance was received from institute Ethics committee.

## Results

In the present study, 38.7 percent were males and 61.3 percent were females. The majority (63.2%) of the study participants belonged to age group 21-40 years. The mean age of the study participants was 38.3 years (SD 13.6). Out of the 155, study participants, more than two third (68.3%) of males studied graduation or higher. On the other hand only 46.3 percent of females had studied graduation or higher. Overall, almost ten percent of the study participants studied primary class or less. Among males, 41.7% were office workers, having a private or government job. On the contrary among females three fourth (75.7%) were homemaker. The mean individual income and family income of the study participant was INR 10856.1 (SD 18117.2) and INR 28409.0 (SD 19950.1) respectively. Nearly 73.5% of the study participants had nuclear family. The mean per capitamonthly income was INR 7440.9 (SD 6261.0). Using revised modified BG Prasad socioeconomic classification scale, January 2014, it was found 47.7% of the study participants belonged upper class (INR > 5357) and 31.6% to upper middle class (INR 2652-5356) (Tab. I).

A total of 11.6% of the study participants were smokers and 7.7% were smokeless tobacco user. Among smokers, 8.4% were current smokers and 3.2% were former smoker. Nearly 3.2% were both smoker and smokeless tobacco user. Approximately 20.6% stated one or more family member as tobacco smoker (Tab. II). Table shows the pattern of smoking among the smokers with respect to frequency and quantity (Tab. III). Male gender, and alcohol use was significantly associated with increased risk of smoking ( $p < 0.05$ ) (Tab. IV). A total of 16.8 % of the study participants were alcohol user. Over 61% of the alcohol user reported daily consumption. The mean number of drinks consumed in atypical day was 1.95 (SD 0.87). Approximately 19.4% stated one or more family member as tobacco smoker. 23.1% of study participants reported failed attempt to stop alcohol use. The 7.7% of the study participants reported failure to perform normal activity due to alcohol use. Over 73% had knowledge of alcohol use is hazardous to health (Tab. V). On multivariate adjustment it was found male gender and smoking was significantly associated with increased risk of

Tab. I. Socio-demographic distribution of the study participants (n = 155).

Variable		N (%)
Gender	Male	60 (38.7)
	Female	95 (61.3)
Age	20-40	98 (63.2)
	40-60	44 (28.4)
	> 60	13 (8.4)
Occupation	Homemaker	72 (46.5)
	Teaching	17 (10.9)
	Not working/students	27 (17.4)
	Business	9 (5.8)
	Office worker/Job/Clerk	30 (19.4)
Education	Primary school or less	15 (9.7)
	Middle school	8 (5.2)
	Higher secondary or secondary school	47 (30.3)
	Graduation or higher	85 (54.8)
Monthly individual income	Mean (SD)	10856.1 (18117.2)
Monthly family income	Mean (SD)	28409.0 (19950.1)
Family size	Mean(SD)	4.4 (w1.6)
Socioeconomic status	Lower	7 (4.5)
	Lower middle	9 (5.8)
	Middle	16 (10.3)
	Upper middle	49 (31.6)
	Upper	74 (47.8)

Tab. II. The prevalence of smoking/tobacco use among the study participants (n = 155).

Variable	n (%)	95%CI
Total no. of tobacco smoker	18 (1.6)	7 to 17.7
Total no. of current smoker	13 (8.4)	4.5 to 13.9
Total no of former smoker	5 (3.2)	1.1 to 7.3
Total no. of smokeless tobacco user	12 (7.7)	4.1 to 13.1
Total no. of current smokeless tobacco user	7 (4.5)	1.8 to 9.1
Total no. of former smokeless tobacco user	5 (3.2)	1.1 to 7.3
Total no. of both tobacco smoker and smokeless tobacco user	5 (3.2)	1.1 to 7.3
Total no. of tobacco user	25 (16.1)	10.7 to 22.8
Reported one or more family member as tobacco smoker	32 (20.6)	14.5 to 27.9
Reported one or more family member as smokeless tobacco	19 (12.3)	7.5 to 18.5

Tab. III. The pattern of smoking/tobacco use among tobacco user.

Variable	Value
Frequency of smoking (n = 18) [n(%)]	
Daily	11(61.1)
Less than daily	7(38.9)
Mean number of cigarette/Bidi smoked in a day (SD)	14(11.5)
Frequency of use of smokeless tobacco (n = 12) [n(%)]	
Daily	6(50.0)
Less than daily	6(50.0)
Mean number of packets of tobacco use in a day (SD)	1.14(0.6)
Knowledge of tobacco use is hazardous to health present (n = 25) [n (%)]	23(92.0)

alcohol use while consumption of junk food was protective ( $p < 0.05$ ) (Tab. VI). Total tobacco selling outlets were 40. There was no outlet selling tobacco only. There was no alcohol outlet in the study area. The number of tobacco outlet per study participant was 0.3. There was no alcohol outlet in the study area.

## Discussion

To the best of our knowledge, this study is the first of its type to assess tobacco and alcohol outlet density relationship with prevalence of smoking and alcoholism among adults in a rural community in India. In addition, there is

Tab. IV. Distribution of various risk factors with smoking among study participants.

Variable	Smoking n (%) n = 18	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	
Age in years	< 60	13 (72.2)	0.2 (0.06-0.7)	0.017	0.3 (0.04-2.1)	0.219
	≥ 60	6 (27.8)				
Sex	Male	17 (94.4)	37.1 (4.7-288.3)	0.000	12.6 (1.2-128.4)	0.03
	Female	1 (5.6)				
Literacy status	≤ Secondary	11 (61.1)	2.1 (0.8-5.7)	0.208	-	-
	≥ Graduation	7 (38.9)				
Occupation	Unemployed/ Student/ Housewife	5 (27.8)	0.2 (0.1-0.5)	.001	0.7 (0.1-4.1)	0.683
	Employed	13 (72.2)				
Socioeconomic status	≤ Middle class	3 (16.7)	0.7 (0.2-2.7)	1.000	-	-
	≥ Upper class	15 (83.3)				
Type of family	Nuclear	14 (77.8)	1.3 (0.4-4.2)	0.782	-	-
	Extended	4 (22.2)				
Consumption of junk food	Present	13 (72.2)	0.1 (0.0-0.5)	.006	0.2 (0.02-1.9)	0.181
Obesity	Present	12 (66.7)	1.7 (0.6-4.8)	0.450	-	-
Smokeless tobacco use	Present	5 (27.8)	25.9 (4.5-147.3)	.000	9.6 (0.9-102.8)	0.062
Alcohol use	Present	13 (72.2)	24.8 (7.6-80.6)	.000	5.4 (1.2-24.2)	0.029

Tab. V. The prevalence and pattern of alcohol use among the study participants.

Variable	n (%)
Number of study participants ever used alcohol (n = 155)	26 (16.8) [95% CI 11.3 to 23.6]
Mean number of drinks in a typical day (SD)	1.95 (0.87)
Frequency of alcohol use in a week (n = 26)	
1 day	16 (61.5)
2-4 day	5 (19.2)
> 4 day	5 (19.2)
Reported failed attempt to stop alcohol use (n = 26)	6 (23.1)
Reported failed to perform normal activity due to alcohol use (n = 26)	2 (7.7)
Knowledge of alcohol use is hazardous to health present (n = 26)	19 (73.1)
Reported one or more family member alcohol use (n = 155)	30 (19.4) [95% CI 13.5 to 26.4]

a lack of published literature about presence of tobacco and alcohol outlet density the rural community of India. The prevalence of smoking in present study was 11.6% [confidence interval (CI): 7.0% to 17.7%] and 72.2% of these were current smokers. The present results were comparable to ICMR INDIDAB study. They found the prevalence of smoking among residents of rural Jharkhand, Maharashtra and Chandigarh was 13.7%, 10.5% and 17.7% respectively [6]. The present study prevalence of smoking was also similar to study from rural Kerala (14.8%) [18], and rural Chennai (14.3%) [19]. The prevalence of smoking was lower than that reported from tribes of central India (18.9%) [20], Nigeria (25%) [21] and Madagascar (19%) [22]. This might be due to difference in study tool and study setting.

The prevalence of current smoking in present study was 8.4% (CI: 4.5% to 13.9%). This was similar to studies from rural Wardha (14.2%) [9]. However, a study from rural Uttarakhand stated the prevalence of current smoking was 28.5% [4]. This difference could be due to small

sample size in the present study and a single site study area. Among males 28.3% and among females 1.1% was tobacco smokers. Among males, 21.6% were current tobacco smokers. This was lower than those found by studies in rural Andhra Pradesh [23], rural Uttarakhand [4], rural Rajasthan [24], primarily due to difference in sample size and study population. It was found in the present study that the risk of smoking significantly increases with male gender, smokeless tobacco uses and alcohol use. There was no association with literacy status or occupation. On contrary a study from urban slums of Chandigarh found the prevalence of tobacco use was high among low education status [5, 24, 25] and employed people [5].

The prevalence of alcohol use in present study was 16.8% (CI: 11.3% to 23.6%). The results of the present study was analogous with studies from rural Wardha (22.7%) [9], rural Chandigarh (17%), rural Maharashtra (11.8%), rural Tamil Nadu (22.2%) [6], tribes of central India (23.0%) [20], Mumbai (18.8%) [26], rural Rajast-

Tab. VI. Distribution of various risk factors with alcohol use of study participants (n = 155).

Variable		Alcoholism n (%) n = 26	Unadjusted OR (95% CI)	p-value	Adjusted OR (95%CI)	p-value
Age in years	< 60	21 (80.8)	0.4 (0.1-1.1)	0.136	0.9 (0.1-5.8)	0.874
	≥ 60	5 (19.2)				
Sex	Male	23 (88.5)	19.1 (5.4-67.4)	0.000	5.9 (1.2-28.9)	0.027
	Female	3 (11.5)				
Literacy status	≤ Secondary	13 (50.0)	1.3 (0.5-2.9)	0.668	-	-
	≥ Graduation	13 (50.0)				
Occupation	Unemployed/ Student/ Housewife	6 (23.1)	0.1 (0.04-0.3)	0.000	0.2 (0.1-1.0)	0.057
	Employed	20 (76.9)				
Socioeconomic status	≤ Middle class	4 (15.4)	0.7 (0.2-2.1)	0.600	-	-
	≥ Upper class	22 (84.6)				
Type of Family	Nuclear	19 (73.1)	1 (0.4-2.5)	1.000	-	-
	Extended	7 (26.9)				
Consumption of Junk food	Present	20 (76.9)	0.2 (0.04-0.6)	0.006	0.1 (0.02-0.9)	0.04
Obesity	Present	14 (53.8)	0.9 (0.4-2.2)	1.000	-	-
Smokeless Tobacco use	Present	5 (19.2)	15.1 (2.8-83.1)	.002	3.7 (0.5-29.7)	0.212
Smoking	Present	13 (50.0)	24.8 (7.6-80.6)	0.000	5.3 (1.3-21.5)	0.020

han (24.7%) [27]. Nevertheless, the prevalence of alcohol use in present study was lower compared to another study from rural Tamil Nadu (35.7%) [28], (62.4%) [29], West Bengal (65.8%) [30] and rural Goa (39.5%) [31]. This might be because the later study included only male participants. It was found 38.3% of men and 3.2% of women had consumed alcohol in the past 1 month. This was higher compared to a study from Madhya Pradesh [32]. Main reason for this could be the later study included both urban and rural population. In addition, there was difference in the operational definitions. An overall 23.1% of alcohol user in present study stated they consume more than 4 days a week. This was similar to study from Mumbai, which mentioned of all current alcoholic 32.8%, drank on at least 6 days per week [26]. The alcohol use in the present study was significantly associated with male gender, employment, non-consumption of junk food and associated smoking. Studies urban slums of north India [33], Vellore [34] and south India reported a likely, statistically significant association of alcohol use and occupation [35]. The study from Vellore also mentioned smoking is associated with alcohol use [34]. The disease burden clearly reflects that the community is in early stages of urbanization.

The density tobacco outlet in present study, per study participant was 0.3 respectively. There was no outlet selling only tobacco. This is high or low tobacco outlet density is difficult to understand, as there is no similar study from India or a like countries. A study conducted in US, which revealed less than half of study subjects lived within ½ mile of a tobacco outlet. They stated higher tobacco outlet density near home was associated with risk of smoking [36]. Another study from Rhode Island, Australia, and Scotland mentioned association exists between high odds of smoking and high tobacco

outlet density [37-39]. A study revealed the prevalence of current smoking was higher at schools in neighborhoods with the more than five tobacco outlets [38]. There was no alcohol outlet in the study area. This is because of implemented laws and regulation of government of Uttarakhand, India. However, prevalence of alcohol use was similar to many previous studies. This could be due to the presence of the alcohol outlet in nearby city. In addition, previous studies stated alcohol outlet density [8, 40] were directly related to greater drinking frequencies. Another study found the greatest variation in drinking were for an upper limit of 70 alcohol outlets per square mile [40]. The study has its limitations as well. We were not able to map the smoker and alcohol user's location for logistic reasons. A better understanding of practices especially that focuses on urbanization of rural population one needs a qualitative study, which was beyond the scope of this study.

## Conclusion

The high burden of smoking is influenced by prevalent tobacco selling outlet density in the environment. The tobacco outlet environment may be a critical factor in promoting and sustaining tobacco use. This suggests greater outlet densities may have affected smoking behaviours, purchases from shops or lower cigarette prices. The community is in an early stage of urbanization as evident from the burden of smoking, and alcohol use. The present study suggested the importance of environmental when studying alcohol consumption. Despite the strict policies for alcohol outlets, supply varies significantly across space for off-licences, the burden of alcoholism is still high. Knowledge of the environment

could help policy makers better to determine the density of alcohol outlet burden in the community to combat the burden of alcoholism. This quest for research on prevention approaches for neighbourhoods at risk.

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## Conflict of interest statement

The authors declare no conflict of interest.

## Authors' contributions

AG conceived the study, YSR collected data, VSR analyzed the data, YSR and AG wrote the manuscript draft. AKS, VSR, AG and YSR reviewed the manuscript. AG approved the final draft.

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