

# Prevalence and Correlates of Tobacco Use in a Suburban community of Nepal: Findings from the Dhulikhel Heart Study

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## ABSTRACT

### Background

Smoking and oral tobacco use are important risk factors for cancer and other chronic diseases. The distribution of tobacco consumption in Nepal varies across the population subgroups. There is little information on the correlates of tobacco use among suburban population in Nepal.

### Objective

To estimate the prevalence of smoking and oral tobacco use; and determine the socio-demographic and other CVD risk factors associated with them in a suburban population of Dhulikhel, Nepal.

### Method

This cross sectional study utilized data from the first wave of the baseline survey of the Dhulikhel Heart Study (DHS). A total of 2225 households of Dhulikhel city were enumerated and a third of the households (n=735) were randomly selected. Questions on tobacco use were ascertained from 1073 adults age 18 years and older using the questions based on the WHO STEPS survey questionnaire.

### Result

More than a third (36%) of the men were current smokers and 12% reported regular use of oral tobacco. About 14% of the women were current smokers and only 0.5% reported to use oral tobacco regularly. In the multivariate analysis, sex, ethnicity, education, alcohol consumption and body mass index were significantly associated with tobacco use. Males were 2.6 times as likely as females to smoke (95%: 1.53-4.59;  $p < 0.001$ ). Brahmin/Chhetri were 2.8 times more likely to smoke compared to Newars (95% CI: 1.53-5.18;  $p = 0.001$ ). Education reduced the odds of smoking; compared to those with no formal education, those with up to high school and those with a high school degree or higher were 0.50 (95% CI: 0.27-0.92;  $p = 0.02$ ) and 0.38 (95% CI: 0.16-0.91;  $p = 0.03$ ) percent less likely to smoke, respectively. Moderate drinkers were 8 times more likely (95% CI: .54 – 18.40;  $p < 0.001$ ) and high drinkers were 13 times (95% CI: 6.63 – 24.26;  $p < 0.001$ ) compared to non-drinkers. Regarding oral tobacco use males were 15 times as likely as females to use oral tobacco (95% CI: 4.1-58.8;  $p < 0.001$ ). Compared to Newars, Brahmin/Chhetri were 2.7 times as likely to use oral tobacco (95% CI: 1.08 – 6.66;  $p = 0.03$ ).

### Conclusion

Although Nepal has made some progress in passing progressive laws for tobacco control, and national surveys have shown slight reduction on tobacco use, this is far from satisfactory to meet the global target of bringing tobacco consumption to less than 5% by 2040. We recommend future studies to focus on socio-cultural, gender and behavioral aspects of tobacco use in addition to the epidemiological aspects.

## KEY WORDS

*Dhulikhel, Heart study, Sub-urban, Tobacco*

## INTRODUCTION

Smoking is an important risk factor in the development of cancer, lung disease, coronary heart disease, stroke, and birth defects.<sup>1-4</sup> Annually, smoking kills three million people worldwide and by 2020 it is expected to kill more people than any single disease.<sup>5</sup> Per capita single consumption rates are increasing in developing world.<sup>5</sup> It is estimated that the by 2025, smoking will cause 10 million deaths per year, and 70% of those will occur in developing world.<sup>6</sup>

In Nepal, the prevalence of smoking is 21% and oral tobacco use is 15%.<sup>7</sup> The most common tobacco use in Nepal is cigarettes. Oral tobacco in the forms of 'jardapaan' (a mixture of lime, areca nut, clove, cardamom, mint, tobacco, essence wrapped in a betel leaf); gutca (a mixture of crushed areca, nut, tobacco, catechu, paraffin, lime and sweet or savory flavour) are common.<sup>7</sup> Data on cancer incidence and mortality for Nepal are not available. However, a hospital based study in western Nepal has indicated that tobacco related cancer attribute to half of all cancers among males and a quarter among females.<sup>8</sup>

The distribution of tobacco consumption in Nepal varies across the population subgroups. In a national survey, the spatial variation was independently associated with tobacco use prevalence.<sup>7</sup> However, the study was limited by the lack of data on characteristics within regions. Nepal is a country with more than 100 ethnic group living together with varied cultural differences. Therefore, it is important to learn the tobacco use pattern and their risk factors within a specific geographical area to come up with subgroup specific control strategies. The tobacco use patterns in Nepal have earlier been reported among adolescent from eastern terai, and youths of western Nepal.<sup>9,10</sup> In the present study, we utilized the data from Dhulikhel Heart Study to estimate the prevalence of smoking and oral tobacco use; and determine the socio-demographic and other CVD risk factors associated with them in a suburban population of Dhulikhel.<sup>11,12</sup>

## METHODS

This cross sectional study utilized data from the first wave of the baseline survey of the Dhulikhel Heart Study (DHS).<sup>11,12</sup> A total of 2225 households of Dhulikhel city were enumerated and a third of the households (n=735) were randomly selected stratified by 9 administrative wards in 2013. All of the eligible participants residing in the sample households were invited for participation. The eligibility criteria were: being a permanent resident of Dhulikhel; having lived in Dhulikhel for at least six months; non-pregnant at the time of data collection; and able to communicate in Nepali or Newari language.

A total of 1,372 eligible participants were enumerated, out of which the research staff were able to contact 1,103 (80%) participants. Eligible subjects who provided informed

consent (n=1,073, 78%) were recruited into the study. Ethical approval was obtained from the institutional review board of Kathmandu University School of Medical Sciences.

We conducted a door-to-door survey using a tablet based pretested and standardized questionnaire. The questionnaire contained questions on socio-demographic variables such as age, sex, ethnicity, religion, marital status, monthly income, education, alcohol consumption, physical activity and smoking.

Smoking questions were ascertained using the questions based on the WHO STEPS survey questionnaire.<sup>13</sup> Participants were categorized into current, former and non-smoker status. Physical activity was measured using a global physical activity questionnaire, and expressed as the metabolic equivalent of task (MET) minutes per week.<sup>14</sup> A weekly MET equivalent of 600 would be 30 minutes brisk walking for 5 times per week or 15 minutes running for 5 times per week. Three measurements of systolic and diastolic blood pressure were taken using a Microlife automatic blood pressure measuring device. The mean of the three measurements was used in the analysis (mmHg). Hypertension was defined as systolic blood pressure 140 mmHg or greater; or diastolic blood pressure 90 mmHg or greater; or taking antihypertensive medication.<sup>15</sup> Fruits and vegetables consumption were calculated using a validated food frequency questionnaire. Weight was measured without shoes and while wearing minimum clothing using an Omron Model HBF-400 scale and recorded to the nearest 0.1 pounds. Height was measured without shoes using a standard tape measure with participants standing against a wall for measurement and recorded to the nearest 0.1 cm. BMI was calculated as weight in kilograms divided by height in meters squared. Overweight was defined as BMI of 25 kg/m<sup>2</sup> or higher and obesity was defined as BMI of 30 kg/m<sup>2</sup> or higher based on international cut points.<sup>16</sup>

Sample characteristics were described for males and females using means and standard deviations for continuous variables and percentages for categorical variables. Our main models utilized logistic regression analysis with the binary smoking (current smoking yes/no) and oral tobacco use (yes/no) as a main outcome. We conducted univariate analysis and multivariate analysis exploring the association of smoking and oral tobacco use with age, sex, ethnicity, religion, marital status, income and education; alcohol consumption, physical activity, fruits and vegetable consumption, body mass index and hypertension. The odds ratios are reported with 95% confidence interval and corresponding p-values. We used Stata 15. (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC) for the data analysis.

## RESULTS

The demographic characteristics of the 446 (41.6%) men and 637 women in the study sample are shown in Table 1.

**Table 1. Characteristics of 1,073 community based Nepalese adults participating in the Dhulikhel Heart Study**

Characteristics	Men (n=446)	Women (627)	Total (1,073)
<b>Age, mean(SD) (years)</b>	<b>40.77(16.5)</b>	<b>40.03(16.3)</b>	<b>40.3 (16.4)</b>
<b>Ethnicity (n,%)</b>			
Brahmin/ Chhetri	135(30.3)	163(26.6)	298(27.8)
Newar	214(48.0)	313(49.9)	527(49.1)
Other	97(21.7)	151(24.0)	248(23.1)
<b>Education (% , n)</b>			
No formal education	77(17.3)	263(42.0)	340(31.7)
Less than high school	240(53.8)	238(37.9)	478(44.6)
High school or more	129(28.9)	126(20.1)	255(23.8)
Mean years of education (SD)	8.2(5.1)	5.4(5.6)	6.6(5.5)
Annual income, (mean, SD)	1348.3 (3606.6)	474.4(2608.2)	873.7 (3091.6)
<b>Marital Status</b>			
Married	339(76.0)	445(71.0)	784(73.1)
Non married	107(24.0)	182(29.0)	289(26.9)
<b>Religion (n,%)</b>			
Hindu	379(84.9)	531(84.7)	910(84.8)
Non-Hindu	67(15.02)	96(15.3)	163(15.2)
<b>Alcohol, n (%)</b>			
Never drinkers	229(51.4)	506(80.7)	735(68.5)
Low (<1 glass per week)	46(10.3)	52(8.3)	98(9.1)
Moderate (1-3 glass per week)	39(8.7)	20(3.2)	59(5.5)
High (3 or more glass per week)	132(29.6)	49(7.8)	181(16.8)
Drinks per week, mean (SD)	12.8(37.3)	1.4(6.5)	6.2(25.2)
<b>Fruits and vegetable consumption</b>			
(servings per day), mean(SD)	3.5(2.01)	3.2(1.9)	3.4(2.0)
<b>Physical activity, n (%)</b>			
<600 MET minutes per week	164(36.8)	259(39.4)	423(39.4)
≥600 MET minutes per week	282(63.2)	368(58.7)	650(60.6)
MET minutes per week, mean (SD)	3107.1 (4934.9)	4044.7 (6070.6)	3496.9 (5452.7)
<b>BMI, n (%)</b>			
Underweight (<18.5 kg/m <sup>2</sup> )	28(6.3)	36(5.7)	64(56.0)
Normal (18.5 - 24.9 kg/m <sup>2</sup> )	265(35.4)	354(55.2)	611(56.9)
Overweight (25.0-29.9 kg/m <sup>2</sup> )	129(28.9)	186(29.7)	315(29.4)
Obese (30.0 or more kg/m <sup>2</sup> )	24(5.4)	59(9.4)	83(7.7)
BMI kg/m <sup>2</sup> , mean (SD)	23.6(3.7)	24.3(4.3)	23.9(4.0)
<b>Hypertension, n(%)</b>	<b>176(39.5)</b>	<b>145(23.3)</b>	<b>321(29.9)</b>

The subjects were of mean age 40 years and about half of them were of Newar ethnicity. More men were educated and had a higher annual income compared to women. The mean fruits and vegetable consumption were 3.4 servings per day, with men reporting slightly higher consumption. More men were smokers, drinkers, and were less physically active compared to women. The prevalence of obesity was higher in women whereas hypertension was more prevalent among men.

**Table 2. Prevalence of smoking and oral tobacco use in 1,073 community based Nepalese adults participating in the Dhulikhel Heart Study**

	Male (n=446)	Female (n=627)	Total (n=1,073)
<b>Smoking, n (%)</b>			
Never	231 (51.8)	495 (78.9)	726 (67.7)
Former	56 (12.6)	43 (6.9)	99 (9.2)
Current	159 (35.6)	89 (14.2)	248 (23.1)
<b>Oral tobacco, n (%)</b>			
Yes	55 (12.3)	3 (0.5)	58 (5.4)
No	391 (87.7)	624 (99.5)	1015 (94.5)
<b>Smoking or Oral Tobacco, n (%)</b>			
Yes	174 (39.0)	91 (14.5)	265 (24.7)
No	272 (61.0)	536 (85.5)	808 (75.3)

Table 2 presents the prevalence of smoking and oral tobacco consumption by sex. Both smoking and oral tobacco consumption was more prevalent among men. More than a third (36%) of the men were current smokers and 12% reported to use oral tobacco regularly. About 14% of the women were current smokers and only 0.5% reported to use oral tobacco regularly.

The factors associated with smoking are presented in Table 3. In unadjusted models, age, male sex, ethnicity, religion, marital status, education, alcohol consumption, physical activity, fruits and vegetable consumption, and body mass index were significantly associated with smoking. In the multivariate analysis, sex, ethnicity, education, alcohol consumption and body mass index stayed significant. Males were 2.6 times as likely as females to smoke (95%: 1.53-4.59;  $p < 0.001$ ). Brahmin/Chhetri caste was 2.8 times likely to smoke compared to Newars (95% CI: 1.53-5.18;  $p = 0.001$ ). Compared to those with no education, those with any education had 50% or less odds of smoking (less than high school education OR 0.50, 95% CI: 0.27-0.92; high school or more OR 0.38, 95% CI 0.16-0.91). Moderate drinkers were 8 times as likely (95% CI: 3.54-18.40;  $p < 0.001$ ) and high drinkers were 13 times (95% CI: 6.63-24.26;  $p < 0.001$ ) compared to non-drinkers. Underweight was positively associated (OR: 3.2; 95% CI 1.22-8.45;  $p = 0.02$ ); and overweight was negatively associated with smoking (OR:

**Table 3.** Factors associated with smoking among of 1,073 community based Nepalese adults participating in the Dhulikhel Heart Study

	Univariate analysis n= 1073			Multivariate analysis n = 1073		
	Odds Ratio	95% CI	P-value	Odds Ratio	95% CI	P-value
<b>Age, years</b>	1.03	1.01 – 1.04	<0.001	1.02	0.99 – 1.04	0.07
<b>Sex</b>						
Female	Ref					
Male	3.35	2.48 – 4.50	<0.001	2.65	1.53 – 4.59	<0.001
<b>Ethnicity</b>						
Newar	Ref					
Brahmin/Chhetri	1.45	1.01 – 2.08	0.04	2.82	1.53 – 5.18	0.001
Other	3.23	2.29 – 4.57	<0.001	1.30	0.58 – 2.92	0.52
<b>Religion</b>						
Hindu	Ref					
Non- Hindu	0.38	0.27 – 0.54	<0.001	0.66	0.28 – 1.57	0.35
<b>Marital Status</b>						
Not-Married	Ref					
Married	0.49	0.34 – 0.79	<0.001	0.93	0.67 – 1.31	0.71
<b>Education</b>						
No formal education	Ref					
Less than high school	0.53	0.39 – 0.72	<0.001	0.50	0.27 – 0.92	0.02
High School or more	0.25	0.16 – 0.38	<0.001	0.38	0.16 – 0.91	0.03
<b>Monthly Income(per USD 10 increase)</b>	0.10	0.99 – 0.10	0.88	0.99	0.99 – 1.00	0.79
<b>Alcohol, n (%)</b>						
Never drinkers	Ref					
Low (<1 glass per week)	1.47	0.83 – 2.58	0.83	1.93	0.82 – 4.54	0.12
Moderate (1-3 glass per week)	5.89	3.38 – 10.29	<0.001	8.06	3.54 – 18.40	<0.001
High (3 or more glass per week)	11.34	7.83 – 16.44	<0.001	12.87	6.63 – 24.26	<0.001
<b>Fruits and vegetable consumption</b>						
(servings per day), mean (SD)	0.98	0.97 – 0.99	0.01	1.00	0.83 – 4.54	0.13
<b>Physical activity, n (%)</b>						
<600 MET minutes per week	Ref					
≥600 MET minutes per week	1.45	1.08 – 1.96	0.01	1.10	0.99 – 1.02	0.99
<b>BMI, n (%)</b>						
Underweight (<18.5 kg/m <sup>2</sup> )	1.65	0.96 – 2.83	0.07	3.21	1.22 – 8.45	0.02
Normal (18.5 - 24.9 kg/m <sup>2</sup> )	Ref					
Overweight (25.0-29.9 kg/m <sup>2</sup> )	0.66	0.47 – 0.93	0.02	0.49	0.29 – 0.82	0.007
Obese (30.0 or more kg/m <sup>2</sup> )	0.48	0.26 – 0.94	0.03	0.71	0.30 – 1.69	0.44
<b>Hypertension, n (%)</b>						
No	Ref					
Yes	0.89	0.58 – 1.36	0.60	0.90	0.47 – 1.72	0.75

0.49; 95% CI: 0.29-0.82; p=0.007). Age, religion, marital status, annual income, fruits and vegetables consumption, physical activity and hypertension were not significantly associated with smoking.

Table 4 presents the factors associated with oral tobacco use. In the univariate analysis, oral tobacco use was significantly associated with age, sex, marital status, high alcohol consumption and hypertension. However, when we included all the variables in the model, age, sex, ethnicity,

and high alcohol consumption remained significant. With each year increase in age, the odds of oral tobacco use was 3% higher (95% CI: 1.00-1.06; p<0.001). Males were 15 times as likely as females to use oral tobacco (95% CI: 4.1-58.8; p<0.001). Compared to Newars, Brahmin/Chhetri were 2.7 times as likely to use oral tobacco (95% CI: 1.08-6.66; p=0.03). And the chance of using oral tobacco was 5 times among high alcohol users compared to non-users (95% CI: 2.13-13.79; p<0.001).

**Table 4.** Factors associated with oral tobacco use among 1,073 community based Nepalese adults participating in the Dhulikhel Heart Study

	Univariate analysis n= 1073			Multivariate analysis n = 1073		
	Odds Ratio	95% CI	P-value	Odds Ratio	95% CI	P-value
<b>Age, years</b>	1.03	1.01 – 1.05	<0.001	1.03	1.00 – 1.06	<0.001
<b>Sex</b>						
Female	Ref					
Male	29.26	9.09 – 94.16	<0.001	15.61	4.14 – 58.82	<0.001
<b>Ethnicity</b>						
Newar	Ref					
Brahmin/Chhetri	1.37	0.74 – 2.52	0.31	2.69	1.08 – 6.66	0.03
Other	1.20	0.61 – 2.35	0.59	1.26	0.34 – 4.73	0.72
<b>Religion</b>						
Hindu	Ref					
Non- Hindu	1.58	0.66 – 3.75	0.29	2.07	0.43 – 9.86	0.92
<b>Marital Status</b>						
Not-Married	Ref					
Married	1.42	1.07 – 1.88	0.01	1.15	0.53 – 2.51	0.72
<b>Education</b>						
No formal education	Ref					
Less than high school	2.06	1.10 – 3.87	0.02	1.57	0.58 – 4.26	0.37
High School or more	0.46	0.16 – 1.31	0.15	0.72	0.17 – 3.05	0.66
<b>Monthly Income, (per USD 10 increase)</b>	0.10	0.99 – 0.10	0.60	0.99	0.99 – 1.00	0.24
<b>Alcohol, n (%)</b>						
Never drinkers	Ref					
Low (<1 glass per week)	1.47	0.48 – 4.30	0.51	1.78	0.48 – 6.62	0.38
Moderate (1-3 glass per week)	2.47	0.82 – 7.45	0.11	1.64	3.83 – 7.02	0.50
High (3 or more glass per week)	6.48	3.60 – 11.68	<0.001	5.42	2.13 – 13.79	<0.001
<b>Fruits and vegetable consumption</b>						
(servings per day), mean(SD)	1.00	0.98 – 1.02	0.90	1.02	0.99 – 1.05	0.10
<b>Physical activity, n (%)</b>						
< 600 MET minutes per week	Ref					
≥ 600 MET minutes per week	1.15	0.66 – 2.00	0.60	1.51	0.69 – 3.31	0.29
<b>BMI, n (%)</b>						
Underweight (<18.5 kg/m <sup>2</sup> )	0.67	0.15 – 2.88	0.59	0.66	0.07 – 5.95	0.71
Normal (18.5 - 24.9 kg/m <sup>2</sup> )	Ref					
Overweight (25.0-29.9 kg/m <sup>2</sup> )	1.56	0.88 – 2.78	0.13	1.14	0.51 – 2.55	0.74
Obese (30.0 or more kg/m <sup>2</sup> )	1.62	0.65 – 4.04	0.29	2.17	0.63 – 7.43	0.29
<b>Hypertension, n (%)</b>						
No	Ref					
Yes	2.20	1.19 – 4.08	0.01	1.32	0.54 – 3.21	0.53

## DISCUSSION

This study is one of the few studies from Nepal that provides important insights on the use of tobacco in Nepal. The prevalence of smoking in this study is higher than the national average (35.6 % versus 27% among males and 14.2 versus 10% among females) as determined by the nationwide STEPS survey of 2014.<sup>17</sup> Although it is likely that our study population might have higher smoking rates,

this difference might also be partly explained by the age distribution of the two studies. STEPS survey included participants from 15 to 69 years whereas our study participants were 18 years or older. We had comparatively higher proportion of older age groups which might have led to the higher proportion of smokers.

Although the smoking prevalence among males in our study is lower than the neighboring countries India, Bangladesh



and Pakistan, prevalence among females is alarmingly higher compared to these countries.<sup>18</sup> In fact, Nepal has one of highest prevalence of female smokers in Asia. In another study from Eastern town in Nepal, the prevalence of female smokers was 12.9%.<sup>19</sup> A study among women aged 20-35 in rural Nepal showed that the prevalence of smoking was among about 42%.<sup>20</sup> In-depth epidemiological as well as qualitative studies on the socio-cultural and gender aspects on smoking in Nepal are necessary to develop effective public health measures to curb smoking.

We also found clear associations between ethnicity and smoking. In multivariate analysis, Brahmins had a higher prevalence of smoking compared to Newars (OR: 2.82, 95% CI: 1.53-5.18). Another study in Nepal also showed similar findings.<sup>21</sup> This is an interesting finding because it suggests that the historical cultural restriction of alcohol consumption among Brahmins have not influenced corresponding low use of smoking. Future studies should also investigate these ethnic predispositions on smoking.

The findings of our study on the relationship of education and smoking is consistent with other studies from Nepal.<sup>17,21</sup> Several studies have shown that less educated people are more likely to be smokers compared to educated ones. Awareness on the health impacts of smoking through education as well as better access to mass media might be a main reason for this. The strong relationship between alcohol consumption and smoking in our study is consistent with other findings and highlights the clustering of high-risk behaviors. Smoking prevention, control and cessation efforts should thus take this into consideration and target smokers to screen for other potential CVD risk factors and behaviors as well.

The use of oral tobacco was substantially lower compared to smoking (12.3% versus 35.6% among males and 0.5% versus 14.2% among females) in our study. These rates are also lower compared to the national STEPS survey findings (31% for males and 5% among females).<sup>17</sup> Higher proportion of financially well-off people in Dhulikhel, who

could afford to smoke (which is generally more expensive than smokeless tobacco) may be one of the reasons for this difference with national surveys. As in the case of tobacco smoking, we also observed associations between oral tobacco use with age, gender, ethnicity and alcohol consumption. This also deserves in-depth epidemiological and qualitative studies on the socio-cultural, gender and behavioral aspects of oral tobacco use. Unlike in smoking, there was no statistically significant relationship between oral tobacco use and education. Although recent studies have not shown increasing trends of oral tobacco use among Nepalese unlike in Bangladesh and India, current findings highlight the need to have strong programs to discourage the use of smokeless tobacco among Nepalese population.<sup>22</sup>

## CONCLUSION

Despite a small sample size, single location and cross-sectional nature of this study, it provides some critical insights into patterns of tobacco use in a suburban setting in Nepal. Although Nepal has made some progress in passing progressive laws for tobacco control, the prevalence of tobacco use is still high. National surveys have shown slight reductions in tobacco use.<sup>18</sup> However, this is far from satisfactory to meet the global target of bringing tobacco consumption to less than 5% by 2040.<sup>23</sup> We recommend future studies to focus on socio-cultural, ethnic, gender-related and behavioral aspects of tobacco use in addition to the epidemiological aspects. This will be crucial to advance evidence-based strategies to reduce tobacco use in the population.

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