Multilevel Analysis to Predict Both Tobacco Smoking and Smokeless Tobacco Product use in Bangladesh

Md. Moniruzzaman[1], Saroje Kumar Sarkar[1] and Papia Sultana[1*]

[1]Department of Statistics, University of Rajshahi,

Rajshahi-6205, Bangladesh

[*]Correspondence should be addressed to Papia Sultana
(papia.sta@ru.ac.bd)

Abstract

In Bangladesh tobacco use (both smoking and smokeless tobacco) has become not only a major contributor to the country's high morbidity, but also the biggest drains to the national economy. The present research aimed to identify significant correlates of tobacco use (both smoking and smokeless tobacco) using multilevel logistic regression. We had used secondary data collected by the Global Adult Tobacco Survey (GATS), 2010. It had been observed that prevalence of both tobacco smoking and smokeless tobacco product use was 7.07%, of which 14.46% were male and 0.68% were female. From multilevel logistic regression, it had been found that respondents of older age group (above 55 years) respondents were 12 times more likely to use both tobacco smoking and smokeless tobacco product than youngest group (less than or equal to 24 years) (OR=12.14, 95% CI=7.73, 19.07). Respondents with no formal schooling were most likely to use both tobacco smoking and smokeless tobacco product among the respondents. Businessman and farmers were more likely to be both user than employee and retired/unemployed persons or worker/laborer were less likely to be both user that employee. Respondents of lowest household wealth index group were most likely to use both tobacco smoking and smokeless tobacco product among the respondents. Therefore, along with implementation of WHO Framework Convention on Tobacco Control, a nationwide campaign is needed to aware people in rural area about the health risks of both tobacco smoking and smokeless tobacco product use.

1. Introduction

Tobacco use is the leading preventable cause of premature death and disease worldwide, and its impact is more pronounced in low and middle-income countries [Tobacco fact sheet, 2011]. Tobacco smoking is a leading modifiable global disease risk factor, with nearly 6 million premature death of global population, 6.9% of expected year of life lost and 5.5% disability adjusted life year (DYLYs) in 2010 [Ng et. al., 2014]. According to the World Health Organization (WHO), if current trend continue, by 2030 tobacco use may cause 8 million premature deaths annually [Global Adult Tobacco Survey report, 2009]. Nearly 80% of the total of more than one billion smokers worldwide live in low and middle-income countries, where burden of tobacco related illness and death is heaviest [WHO report, 2014]. Bangladesh is a low-income and one of the largest tobacco consuming countries in the world [Ng et. al., 2014]. In Bangladesh tobacco use (both smoking and smokeless tobacco) has become not only a major contributor to the country's high morbidity, but also the biggest drains to the national economy [Zamman et. al., 2007]. Several national and sub-national studies in Bangladesh have shown high prevalence of tobacco use [Bangladesh Urban Health Survey, 2006]. Surveys in Bangladesh have shown that males and individuals with no education, lower household income and a lower standard of living have higher smoking prevalence [Bangladesh Urban Health Survey, 2006]. However, these surveys were multi-topical and thus not designed solely to collect information on tobacco use. The Global Adult Tobacco Survey (WHO) offered an opportunity to focus on the prevalence of tobacco use in Bangladesh using a globally standard methodology. A study based on GATS finding analyzed the social determinates of tobacco use as a whole [Sinha et. al., 2011]. However, most of study investigated either on tobacco smoking or smokeless tobacco use(Begum and Sultana, 2018; Begum and Sultana 2017; Sultana et al., 2015; Nargis et. al., 2009). None of the study considered both tobacco smoking and smokeless tobacco use. The present research aimed to identify significant correlates of both tobacco smoking and smokeless tobacco using multilevel logistic regression.

2. Data and Methodology

We had used secondary data collected by the Global Adult Tobacco Survey (GATS), 2010. The survey was conducted in 14 countries including Bangladesh,

Brazil, China, Egypt, India, Mexico, Philippines, Poland, Russia, Thailand, Turkey, Ukraine, Uruguay and Vietnam from 2008 to 2010. GATS used a global standardized methodology. It included information on the respondents' background characteristics, tobacco use (smoking and smokeless), cessation, second-hand smoke, economics, media, and knowledge, attitudes and perceptions of tobacco use. In Bangladesh, GATS was conducted in 2009 as a household survey of persons 15 years of age or older by the National Institute of Preventive and Social Medicine in collaboration with the Bangladesh Bureau of Statistics (BBS) and National Institute of Population Research and Training (NIPRT). A multi-stage (three-stage), geographically clustered sample design was used to produce nationally representative data. At the first stage 400 Primary Sampling Units (PSU)s (*Mauza*in rural and *Mohalla*in urban areas) were selected with probability proportional to size (PPS), followed by a random selection of one Secondary Sampling Unit (SSU) per selected PSU. At the third stage households were selected systematically within the listed households from a selected SSU. One individual was randomly chosen from each selected household to participate in the survey. Survey information was collected using handheld devices. The household response rate was 97.7%, the individual response rate was 95.8% and the overall response rate was 93.6%. There were a total of 9629 completed interviews (male=4468 and female=5161). Details about the survey methods, questionnaire, and definitions of various terminologies can be found in literature [Giovino et. al., 2012; Kalsbeek et. al., 2012].

The wealth index was constructed by the GATS Collaborator Team using principal component analysis. Asset information covered household ownership of a number of items, such as electricity, flush toilet, fixed telephone, cell telephone, television, radio, refrigerator, car, moped/scooter/motorcycle, washing machine, bicycle, sewing machine, almirah/ wardrobe, table, bed or cot, chair or bench, watch or clock, as well as the type of main material used for the roof of the main house (cement, tin and katcha such as bamboo/thatched/straw). Each asset was assigned a weight (factor score) generated through principal components analysis, and the resulting asset scores were standardized in relation to a normal distribution with a mean of zero and standard deviation of one. Each household was then assigned a score for each asset and the scores were summed for each household; individuals were ranked according to the total score of the household in which they resided. The sample was then divided into quintiles from one (lowest) to five

(highest). A single asset index was developed for the whole sample; indices were not prepared for urban and rural populations separately [GATS report, 2009].

2.1 Statistical Methods

Various statistical methodologies had been used to analyze the data. Descriptive analysis had been performed to know the characteristics of the study subjects. For that frequency with percentage had been reported. A comparison of socio-demographic and economic characteristics of study subjects to both user (tobacco smoking and smokeless tobacco product use) had been performed. To analyze the socio-demographic and economic predictors to both tobacco smoking and smokeless tobacco product user multilevel logistic regression had been used and adjusted Odds Ratio (OR) had been reported. Statistical software StataSE version 11 (StataCorp, USA) had been used to carry out statistical analyses. For advanced analysis missing data had been avoided and thus sample size 9565 had been used in the advanced analysis.

3. Results

It had been observed that prevalence of both tobacco smoking and smokeless tobacco product use was 7.07%, of which 14.46% were male and 0.68% were female. It had been observed that equivalent numbers of subjects were surveyed from rural and urban area (50.44% from urban and 49.56% from rural) [Table 1]. Among the survey subjects, females were a bit more than males (46.40% male and 53.60% female). Most of the subjects were of no formal schooling (35.48%) and most were of homemaker/housework (41.85%). Prevalence of both user was relatively higher in rural area (8.19%) than in urban area (5.97%) [Table 2]. Older people (above 45 years old) used both tobacco smoking and smokeless tobacco product most (44-54=10.53% and 55 and above=10.38%). Most of the both tobacco smoking and smokeless tobacco product users had no formal schooling (10.83%), were farming (land owner and farmer) (18.28%), and were of poorest wealth index (10.18%). Odds ratios derived from multilevel logistic regression to both tobacco smoking and smokeless tobacco product user (Sample size=9565) were shown in Table 3. It had been found that respondents of older age group (above 55 years) respondents were 12 times more likely to use both tobacco smoking and smokeless tobacco product than youngest group (less than or equal to 24 years) (OR=12.14, 95% CI=7.73, 19.07). Respondents with no formal

schooling were most likely to use both tobacco smoking and smokeless tobacco product among the respondents. Businessman and farmers were more likely to be both user than employee and retired/unemployed persons or worker/laborer were less likely to be both user that employee. Respondents of lowest household wealth index group were most likely to use both tobacco smoking and smokeless tobacco product among the respondents.

4. Discussion

In this country representative cross-sectional study of Bangladesh, a significant percentage of people were both user (tobacco smoking and smokeless tobacco product use). Older people were more likely to be both user, people no formal education and with lowest wealth-index were more likely to be both user than their counterpart. Businessmen and farmers were more likely to be both user.

In terms of regional differences, respondents from rural area are more likely to use both tobacco smoking and smokeless tobacco product. This might be for their ignorance about adverse effect of tobacco. Older people had been found to be both user more than the younger one. Peoples of Bangladesh who were businessman and farmer were more likely to be both tobacco user than people with other profession. Also lower educated people and people with lower household wealth index were more likely to be both tobacco use than those with higher level.

The major strengths of our study include large sample size, the coverage of men and women smokers both tobacco smoking and smokeless tobacco product, the coverage of both rural and urban areas, and the nationally representative population. However, there are several limitations that need to be addressed. The findings in this report are based on self- reports. Furthermore, education categories were combined into broad groupings, which could have contributed to biased estimates in terms of the gradients observed. Nonetheless, these groupings provided greater precision than those used in earlier tobacco use research in Bangladesh. The data used in constructing wealth index is based on limited number of asset variables, which might result in incomplete or under representing socioeconomic status. Some other variables like psychological variables could provide more predicting accuracy, but no such variable is available.

In conclusion, the results of this study reveal that both tobacco user (tobacco smoking and smokeless tobacco use) is strongly associated with social disadvantage, for example, low socio-economic status, less education, rural area, unsecured job, etc. Therefore, along with implementation of WHO Framework Convention on Tobacco Control, a nationwide campaign is needed to educate people in rural area about the health risks of both tobacco smoking and smokeless tobacco product use which leaves them in risk of many life treating diseases.

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Table 1: Socio-demographic and economic characteristics of the study subjects.

Socio Demographic and Economic Characteristics	Sample size=9629, n(%)
Residence	
Urban	4857(50.44)
Rural	4772(49.56)
Gender	
Female	5161(53.60)
Male	4468(46.40)
Age(years)	
15-24	2073(21.53)
25-34	2665(27.68)
35-44	2232(23.18)
45-54	1329(13.80)
55 & above	1330(13.81)
Educational Level	
No formal schooling	3416(35.48)
Less than primary school completed	1487(15.44)
Primary school completed	1115(11.58)
Less than secondary school completed	1937(20.12)
Secondary school completed	663(6.89)
High school completed	463(4.81)
College/University completed	273(2.84)
Post graduate degree completed	211(2.19)
Missing	64(0.66)
Occupation	
Government employee	221(2.30)
Non-government employee	740(7.69)
Business-small	865(8.98)
Business-large	128(1.33)

Socio Demographic and Economic Characteristics	Sample size=9629, n(%)
Farming(land owner & farmer)	826(8.58)
Agricultural worker	374(3.88)
Industrial worker	214(2.22)
Daily laborer	631(6.55)
Other self-employed	318(3.30)
Student	463(4.81)
Homemaker/Housework	4030(41.85)
Retired	113(1.17)
Unemployed(able to work)	153(1.59)
Unemployed(unable to work)	165(1.71)
Other(specify)	388(4.03)
Wealth Index	
lowest	1866(19.38)
low	2068(21.48)
middle	1732(17.99)
High	2040(21.19)
Highest	1923(19.97)

Note: Wealth index was calculated using principal component analysis. Asset information covered household ownership of a number of items, such as electricity, flush toilet, fixed telephone, cell telephone, television, radio, refrigerator, car, moped/scooter/motorcycle, washing machine, bicycle, sewing machine, *almirah* wardrobe, table, bed or cot, chair or bench, watch or clock, as well as the type of main material used for the roof of the main house (cement, tin and *katcha*such as bamboo/thatched/straw).

Table 2: Comparing socio-demographic and economic factors between both tobacco smoking and smokeless tobacco product user.

Socio Demographic and Economic Characteristics	Status Of Tobacco Use			
	Non User	Tobacco Smoking	Smokeless Tobacco	Both User
Residence				
Urban	60.08	21.91	23.99	5.97
Rural	51.74	24.5	31.96	8.19
Age				
15-24	83.65	11.19	6.75	1.59
25-34	64.39	22.03	19.4	5.82
35-44	46.64	28.94	34.05	9.63
45-54	35.67	30.47	44.39	10.53
55 and above	31.73	27.29	51.35	10.38
Gender				
Female	71.32	1.47	27.88	0.68
Male	38.18	48.28	28	14.46
Work Status				
employee(govt/non-govt)	60.35	27.16	18.73	6.24
business(small/large)	37.46	48.14	28.2	13.8
farming(land owner & farmer	29.66	53.15	35.47	18.28
agri/industrial worker, daily labour, self-employment	33.44	49.51	32.99	15.94
home maker/house worker	71.36	1.27	27.97	0.6
retired, unemployed(able/unable to work)	48.03	23.2	34.34	5.57
student/ other	69.68	16.8	18.21	4.7
Education level				
no formal schooling	37.7	30.12	43	10.83
less than primary school completed	52.52	26.9	28.92	8.34
Primary school completed	61.97	17.85	25.65	5.47
Less than secondary school completed	70.57	18.22	15.49	4.28
Secondary school completed	75.72	15.23	12.37	3.32
High school completed	79.91	13.39	8.64	1.94
College/University completed and above	72.73	18.39	11.36	2.48
Missing	56.25	0	43.75	0
Wealth				
lowest	44.16	28.14	37.89	10.18
low	49.56	27.47	31.91	8.95
middle	55.37	23.21	28.35	6.93
High	59.51	21.32	25.2	6.03
Highest	70.98	15.76	16.54	3.28

*Total sample size=9629.

Table 3: Odds ratios derived from multilevel logistic regression to both tobacco smoking and smokeless tobacco product user (Sample size=9565)

Socio Demographic and Economic Characteristics	Both Tobacco User	
	Odds-ratio (95% CI)	P-value
Residence		
Urban	1	.
Rural	0.99(.77,1.29)	0.983
Age		
15-24	1	.
25-34	4.25(2.83,6.40)	<0.001
35-44	8.61(5.71,12.99)	<0.001
45-54	11.14(7.69,18.53)	<0.001
55 and above	12.14(7.73,19.07)	<0.001
Occupation		
employee(govt/non-govt)	1	.
business(small/large)	2.21(1.48,3.25)	<0.001
farming(land owner & farmer)	1.81(1.81,2.78)	0.006
agri/industrial worker, daily labouer, self-employment, home maker/house worker	0.24(0.16,0.35)	<0.001
retired, unemployed(able/unable to work)	0.34(0.18,0.63)	0.001
student/ other	0.65(0.39,1.09)	0.106
Education level		
no formal schooling	1	.
less than primary school completed	0.71(0.54,0.93)	0.013
Primary school completed	0.47(0.33,0.66)	<0.001
Less than secondary school completed	0.37(0.27,0.51)	<0.001
Secondary school completed and above	0.18(0.11,0.27)	<0.001
Wealth		
lowest	1	.
low	0.75(0.57,0.99)	0.044
middle	0.51(0.37,0.69)	<0.001
High	0.41(0.31,0.57)	<0.001
Highest	0.23(0.15,0.36)	<0.001

Note: Dependent variable was dichotomous (both tobacco use and no use at all). Second level variable was EAs. Gender was not included in the model as it was much skewed. Total sample size=9565.