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Patterns, Predictors, and Cessation Intentions among Types of Tobacco Users in Northeast India: Findings from GATS-2

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Abstract

In Northeast (NE) India, where both smoking and smokeless forms are rather common, tobacco use still presents a major public health concern. Effective tobacco control efforts rely on understanding patterns of use and individuals' intentions to quit. The aim of this study was to investigate the prevalence and patterns of tobacco use (smoking, smokeless, dual) in selected NE states, identify socio-demographic predictors, and evaluate user cessation intentions. Data from the Global Adult Tobacco Survey-2 (GATS-2) India were obtained. Comprising five NE states—Manipur, Mizoram, Tripura, Meghalaya, and Assam—the study included a sample size of 9,190 adults. Socio-demographic factors such as age, gender, residence, education, caste, religion, wealth index, marital status, and occupation were included. Analytical techniques included descriptive statistics, chi-square tests, and logistic regression models. Men and individuals living in rural areas had significantly higher smoking prevalence compared to other groups. Whereas dual use was most common among men aged 45–64 years, smokeless tobacco was more common among women. All types of tobacco use were strongly associated with those who have no education, poor, have tribal affiliation and were working. Among older, rural, uneducated, and tribal people, intention to quit was low; but, among women, young people, and educated, it was higher. Strong predictors of both tobacco use and cessation intention are found by regression analysis to be gender, education, residence, and socioeconomic level. In NE India, tobacco use and readiness to quit are much influenced by socioeconomic inequalities. Particularly for tribal, rural, and economically depressed groups, targeted tobacco control programs are desperately needed.

Keywords

Cessation, Socio-demographic determinants, Nicotine dependence, North eastern India, Smokeless tobacco, Public health

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Introduction

One of the main causes of preventable morbidity and mortality globally, is the usage of tobacco that raises serious public health issues. Several life-threatening diseases, including cancer, cardiovascular diseases, and respiratory problems, are clearly linked to this risk factor. The World Health Organisation (WHO) Report on the Global Tobacco Epidemic (2011) claims that tobacco ranks second most often occurring cause of death worldwide. It caused almost 100 million deaths in the 20th century; current estimates place 4.9 million deaths yearly on tobacco use, a figure expected to climb to 10 million annually. Unbelievably, most of these deaths take place in developing nations like India. India's large and diverse population, sociocultural diversity, and economic inequality make it particularly difficult to reduce tobacco use. According to national surveys like NFHS-3 (2005–06), the prevalence of tobacco uses among male adolescents aged 15–19 years was 28.6%, while the prevalence among female adolescents was 3.5%. According to the 2009 Global Youth Tobacco Survey (GYTS), the prevalence among youths aged 13 to 15 was 14%, with boys making up 19% and girls making up 8.3%. Tobacco companies frequently target adolescents and young adults, who are the country's future. They are more likely to start using tobacco because of their innate propensity to experiment and mimic risky behaviours.

The 2011 Census found that 40.7% of Indians are under the age of 20, highlighting the need for preventative measures targeted for this age group. According to the Global Adult Tobacco Survey (GATS), tobacco use is consistently high in the Northeastern (NE) region of India, which is a major concern. Both smoking and the use of smokeless tobacco (SLT) are prevalent in this area, and dual usage is on the rise. This pattern is greatly influenced by elements like low awareness, easy availability, and cultural acceptability. Cessation rates are still low, particularly among socially marginalised groups, despite national tobacco control programs and laws. Using GATS-2 data, this study attempts to give a thorough understanding of tobacco use patterns, predictors, and cessation intentions in five NE states. In order to better capture the multi-level influences on adolescent tobacco use and support the development of more effective, region-specific public health interventions, analytical approaches were compared.

Materials and Methods

For the present study, secondary data from the Global Adult Tobacco Survey-2 (GATS-2), which was carried out in India from 2016 to 2017, was used. The purpose of the nationally representative household survey GATS-2 is to track important tobacco control indicators and monitor adult tobacco use. It offers thorough information on various aspects or dimensions of tobacco use, such as smoking and using smokeless tobacco, quitting attempts, second-hand smoke exposure, and attitudes, knowledge, and perceptions about tobacco and its negative health effects. The World Health Organisation (WHO) and the Centres for Disease Control and Prevention (CDC) provided technical assistance for the survey, which was conducted with the support, authority, or sponsorship of the Ministry of Health and Family Welfare, Government of India.

The five Northeastern (NE) Indian states of Manipur, Mizoram, Tripura, Meghalaya,

and Assam were the subject of the current analysis. These states were chosen because prior national-level surveys indicated that tobacco use was historically high in these states. A total of 9,190 adult respondents from the chosen states who were at least 15 years old were included. GATS-2 used a multistage stratified cluster sampling design and all analyses applied survey weights, strata, and primary sampling units (PSUs) to account for the complex survey design.

Outcome Variables

Two main outcome variables were examined in the study:

1. Type of tobacco use: categorized into three categories with codes: 1 for Smoking Tobacco, 2 for Smokeless Tobacco and 3 for dual use (both smoking and SLT).

2. Intention to quit: The intention to continue using tobacco, which shows a lack of desire to do so in the future, derived from the question, "Which of the following best describes your thinking about quitting smoking/chewing tobacco?" Responses were coded as 1 for *preparing to quit within the next month*, 2 for *thinking about quitting within the next 12 months*, and 3 for *not thinking about quitting at all*. For regression models, the variable 'intention to quit' was dichotomized into two categories: 0 = no intention to quit, and 1 = intends to quit. The code 1 combined respondents who reported (i) preparing to quit within the next month and (ii) thinking about quitting within the next 12 months.

Independent Variables

Age group, gender, place of residence (rural or urban), education level, caste, religion, wealth index (a proxy for socioeconomic status), marital status, and current occupation were the important independent variables.

SPSS software was used to analyse the data. The distribution of tobacco use across sociodemographic groups was analysed by using descriptive statistics. Bivariate associations between the independent variables and the type of tobacco use and the intention to quit were examined using chi-square tests. Binary logistic regression models were used to find important predictors of tobacco use patterns and intentions to quit. The strength and direction of associations were interpreted using 95% CIs and unadjusted odds ratios (ORs) and p-values.

Statistical Model

This logistic regression model derived to determine the probability of using smoking or smokeless or dual usage using independent variables is determined as follows:

$$\ln (p\ 1-p) = \propto+\beta1\ x1 +\beta2\ x2 +\beta3\ x3 +...\beta i\ xi +e$$

Where - p is the likelihood of using SLT/smoking/dual use

p (y = 1); β1, β2, β3… βi refers to the beta coefficients;

x1, x2, x3, …xi refers to the independent variables,

and e is the error term.

$$P\ (SLT/Smoking/dual\ use) = 1/1+e-\ (\beta o+\beta xi)$$

where β0 = Constant

Results

The percentage distribution of tobacco consumption in eight Indian states in the northeast was displayed in Figure 1. Of the eight Northeastern states, Tripura (69.2%), Manipur (63.6%), Mizoram (59.6%), Meghalaya (51.7%), and Assam (50.7%) had tobacco use rates above 50%. The prevalence of usage of tobacco in the remaining states, Arunachal Pradesh, Nagaland, and Sikkim,

ranges from 21% to 45%. As a result, 9,190 participants from five Northeastern Indian states—Tripura, Manipur, Mizoram, Meghalaya, and Assam—were included in the study. Of the 9190 participants, 46.2% used smokeless tobacco, 29% used smoking tobacco, and 24.8% used dual tobacco, meaning they used both smoking and non-smoking tobacco (Figure 2).

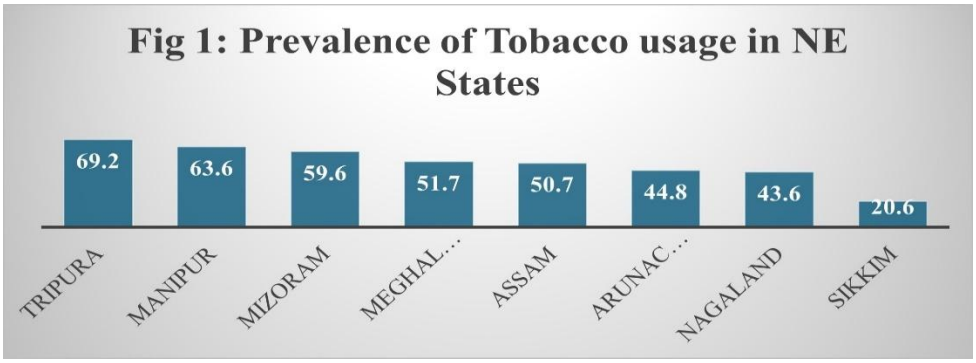

Figure 1 Prevalence of Tobacco usage in NE States

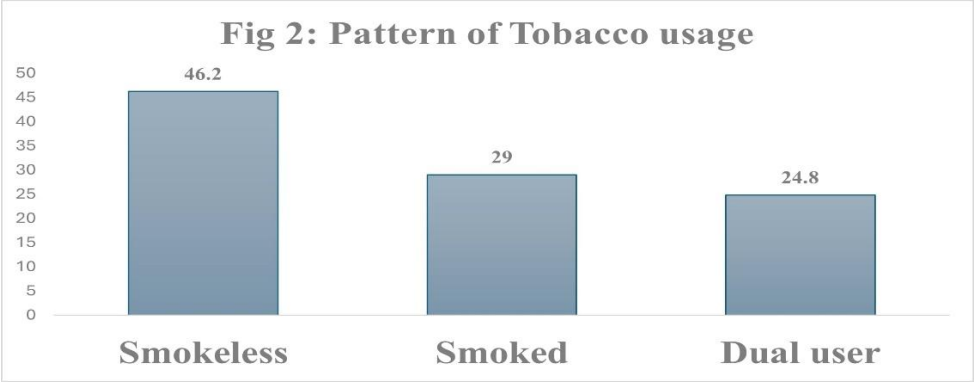

Figure 2 Pattern of Tobacco usage

Using GATS-2 data, Table 1 shows the sociodemographic distribution of the prevalence of smoking tobacco, smokeless tobacco (SLT), and dual users among the population surveyed in five Northeast Indian states. Tobacco use among the 9,190 respondents varied considerably by demographic category. The type of tobacco used was strongly associated with gender. The majority of males (28.4%) reported using smoking tobacco, whereas only about 24.4% reported using SLT. On the other hand, dual use remained low, and women were more likely to use SLT (39.8%) than smoke tobacco (3.8%). There was gender-based differences in tobacco use patterns in the area, as evidenced by the significantly higher prevalence of dual use among men (14.8%). Because tobacco use increased with age, age was another significant determinant. All forms of tobacco use were lower among younger people (15–24 years old), but usage increased gradually with age, reaching its highest among those aged 45–59, particularly for smokeless (37.6%) and dual tobacco use (12.5%). Long-standing consumption patterns or fewer attempts to stop smoking among older populations (60+) could be the cause of this trend. Differences were also found in caste and

tribal affiliation. Scheduled Tribes (STs) had the highest reported prevalence of SLT (40.5%) and dual use, followed by OBC. Social marginalisation as a risk factor for tobacco use was highlighted by the relatively lower prevalence among respondents who belonged to the scheduled caste and other caste categories.

Table 1 Socio-demographic variation among the prevalence of type of tobacco users

Variables	Categories	Types of Tobacco users		
		Smokeless (%)	Smoking tobacco (%)	Dual user (%)
Age***	15-24	16.1	9.9	4.6
	25-44	36.1	15.6	10.5
	45-59	37.6	19.2	12.5
	60+	31.6	18.2	9.4
Gender***	Male	24.4	28.4	14.8
	Female	39.8	3.8	4.6
Residence***	Urban	29	16	8.1
	Rural	33.4	15.9	10.2
Education***	No Education	40.1	17.2	10.2
	Primary Education	35	18.3	12.4
	Secondary Education	30.4	14.7	8.4
	Higher Education	23.2	12.8	6.6
Caste***	Scheduled tribe	40.5	12.3	8.4
	Scheduled caste	25.7	23.9	10.3
	OBC	38.5	8.1	12.6
	Others	36.9	8.1	7
Religion***	Hindu	38.4	9.8	8.9
	Muslim	36.4	9.5	8.6
	Christian	24.4	24.5	10.8
Marital Status***	Single	18.1	13.5	5.2
	Married	34.6	17	11
	Divorced/Separated	33.9	24.6	10.2
	Widowed	47.3	6.8	5.6
Wealth Index***	Poor	33.6	16.3	10.5
	Middle	30	15	7.6
	Rich	20	13.6	4.3
Occupation***	Unemployed	30.9	7.1	4.8
	Employed	33.3	22.6	13.3
Total		32.2	15.9	9.7

****Significance level at 5%*

As education levels rise, tobacco use declines. The highest prevalence of tobacco use, including 40.1% for SLT, 17.2% for smoking, and 10.2% for dual use, was reported by those with only primary education or no formal education. In contrast, the prevalence of smoking (12.8%), dual use (6.6%), and all forms of SLT (23.2%) was significantly lower among those with higher secondary education or above, indicating a strong protective effect of education. Tobacco use was significantly influenced by residence. Compared to urban dwellers (29% and 8.1%, respectively), rural populations used smokeless tobacco more frequently (33.4%) and dual forms (10.2%), but smoking tobacco use was more similar in both groups. This probably reflects

traditional customs, increased accessibility to locally grown tobacco, and the normalisation of SLT in rural areas. The poorest quintile of the wealth distribution had the highest rate of tobacco use, with 33.6% using SLT and about 10.5% reporting dual use. The richest quintile, on the other hand, had a significantly lower prevalence: only 20% of users used SLT, and only 4.3% were dual users. This suggests that tobacco use varies by socioeconomic status. Employment had the highest prevalence of SLT and dual use, indicating that occupation also had an impact on tobacco use. 13.3% of dual use and 33.3% of smokeless forms were reported. Conversely, those without jobs used all forms very little, which suggested that the population was not financially secure. The majority of participants were SLT users among Muslims (36.4%) and Hindus (38.4%), while the majority of Christians (24.5%) smoked tobacco, and Christians had the highest percentage of dual users (10.8%) among all religious groups. The study participants' marital status showed that the majority of them use SLT, with the highest percentage among those who are married. Additionally, 10.2% of those who are divorced or separated use SLT and smoke tobacco, which is higher than its counterparts. With regard to the various categories of tobacco users, every study variable was statistically significant ($p < 0.05$).

Smokeless tobacco (SLT) users' intentions to quit were categorized by sociodemographic factors in Table 2. Younger SLT users, especially those between the ages of 15 and 24, showed a comparatively higher readiness to quit (58.7%), which declined with age. Approximately 51.5% of SLT users who were 60 years of age or older reported that they don't want to quit. Resignation to long-term use or a diminished sense of the advantages of stopping could be the cause of this age-related decline. Women were more willing to quit SLT (55.5%) than men (52%), which may have been brought on by social stigma or caregiving responsibilities, or by greater awareness or health issues during the childbearing years. The trend by residence supported previous findings: urban dwellers were more likely than their rural counterparts to quit tobacco (61.8%). A clear pattern was observed across different education levels. About 47.2% of SLT users who were illiterate reported that they had no intention of quitting, followed by 45.2% of those in primary education, 35.9% of those in secondary education, and 29.1% of those in higher education. Caste and religious background were also factors in cessation intentions; respondents from the Scheduled caste had a lower intention to quit (51.8%), whereas respondents from the ST, OBC, and other categories reported higher willingness to quit (above 50%). Among occupational groups, professionals and government workers were less likely to want to quit (52.7%) than those without jobs (56.3%). The intention to quit SLT was higher among those in higher wealth quintiles (75.7%) than among those in the poorest quintiles (51.9%). This implies that motivation and the capacity to quit are significantly influenced by socioeconomic security. Divorced or separated people had a higher intention to stop SLT (62.5%), while widowed people (53.3%) showed no interest at all. The majority of these associations were found to be statistically significant ($p < 0.05$).

Table 2 Socio-demographic variation of the cessation intentions among Smokeless tobacco users

Variables	Categories	Smokeless Tobacco Cessation		
		Preparing to quit (%)	Thinking about quitting (%)	Not at all (%)
Age***	15-24	3.6	58.7	37.7
	25-44	5.2	53.7	41.1
	45-59	9.7	54.5	35.8
	60+	4.9	51.5	43.5
Gender***	Male	5	52	43
	Female	5.3	55.5	39.1
Residence***	Urban	4.6	61.8	33.5
	Rural	5.4	51.8	42.8
Education***	No Education	3.5	49.3	47.2
	Primary Education	5.9	48.9	45.2
	Secondary Education	5.3	58.8	35.9
	Higher Education	6	64.8	29.1
Caste***	SC	7.7	40.5	51.8
	ST	4.2	57.5	38.3
	OBC	6.8	53.3	39.9
	Others	4.4	55.8	39.8
Religion***	Hindu	7.2	46.6	46.2
	Muslim	3.5	57.6	38.9
	Christian	3	64.4	32.6
Marital Status***	Single	8.9	57.4	33.8
	Married	4.9	54.7	40.5
	Divorced/Separated	10	62.5	27.5
	Widowed	3.1	43.7	53.3
Wealth Index***	Poor	5.5	51.9	42.6
	Middle	3.6	61.4	35
	Rich	5.6	75.7	18.7
Occupation***	Unemployed	5.2	56.3	38.5
	Employed	5.2	52.7	42.1
Total		5.2	54.2	40.6

****Significance level at 5%*

Similar patterns of tobacco users' intentions to quit smoking are shown in Table 3. Younger people (15–24 years old) had the highest intention to quit (63.3%), similar to SLT users. With increasing age, the percentage declined, dropping to 50.2% among those aged 60 and above. Women continued to exhibit a higher intention to quit than men, with 57.4% expressing the desire to quit compared to 43.8% of men. Likewise, among smokers with less education, quitting intent increased steadily with education level, rising from 47.8% to 62.4%. In terms of wealth, the same upward trend was observed. Compared to smokers in the lowest quintile, who were 54.8% likely to express interest in quitting, smokers in the highest wealth quintile were more likely to do so (61.6%). Compared to their rural counterparts (54.9%), urban dwellers were more likely to indicate plans to quit (58.1%). While OBCs and other caste categories had somewhat higher percentages, scheduled tribes and scheduled castes had the lowest intention to quit (38%–49%). Additionally, marital status seemed to be a factor, as

married people were more likely than single or widowed people to express a wish to stop, perhaps as a result of family-related incentives. Among occupations, those with steady employment had the strongest intentions to quit (57.8%), while those without jobs had the lowest (47.2%). The majority of the relationships were statistically significant ($p < 0.05$), and the intention to stop smoking tobacco was lower among Hindu population.

Table 3 Socio-demographic variation of the cessation intentions among Smoking tobacco users

Variables	Categories	Smoking Tobacco Cessation		
		Preparing to quit (%)	Thinking about quitting (%)	Not at all (%)
Age***	15-24	7.9	63.3	28.8
	25-44	4.9	57	38.1
	45-59	8.5	50.2	41.4
	60+	4.8	55.2	40.1
Gender***	Male	10.1	43.8	46.1
	Female	5.3	57.4	37.3
Residence***	Urban	6.4	58.1	35.5
	Rural	5.7	54.9	39.4
Education***	No Education	2.6	47.8	49.6
	Primary Education	5.5	56.5	38
	Secondary Education	7.7	56.5	35.9
	Higher Education	7.1	62.4	30.5
Caste***	SC	10.8	40.2	49
	ST	4.7	56.7	38.6
	OBC	10.3	54	35.7
	Others	6.5	60	33.5
Religion***	Hindu	13.2	42.3	44.4
	Muslim	5.2	61.5	33.3
	Christian	3	60.4	36.7
Marital Status***	Single	4.8	59.2	36
	Married	6.2	55.5	38.3
	Divorced/Separated	0	62.1	37.9
	Widowed	6.1	36.4	57.6
Wealth Index***	Poor	5.7	54.8	39.6
	Middle	6.7	58.9	34.4
	Rich	6.8	61.6	31.5
Occupation***	Unemployed	10.6	47.2	42.2
	Employed	4.7	57.8	37.5
Total		5.9	55.7	38.4

****Significance level at 5%*

The multivariate logistic regression models assessing sociodemographic predictors of various tobacco use types are summarised in Table 4. Gender was still a powerful predictor: women were more likely to use SLT, while men were significantly more likely to smoke tobacco (OR: 12.137 with 95% CI 9.962-14.787, $p < 0.05$) and dual use (OR: 3.758). Other age groups had nearly twice as many odds of SLT as young participants, with a statistically significant difference of $p < 0.05$. The age group of 45-59 had the highest probability of dual usage (OR: 1.483; 95% CI 1.046-2102, $p < 0.05$), followed by the 25-44 age group (OR: 1.482). Even after adjusting for other variables ($p < 0.05$), there

was a significant association between rural residents with SLT use (OR: 1.087; 95% CI 0.963-1.228) and dual use (OR: 0.981; 95% CI 0.810-1.189). One of the most important predictors of all forms of tobacco use was low educational attainment. Higher educated respondents were nearly four times more likely to be dual users and more than twice as likely to use SLT than those with no education ($p < 0.001$), which demonstrated a consistent correlation with ignorance of the negative health effects of tobacco use. People from lower quintiles were twice as likely to use SLT and smoke tobacco products compared to those from higher quintiles, according to the wealth index, which showed a clear pattern. OBCs have a 1.7 times higher chance of dual usage (OR: 1.734; 95%CI 1.372-2.192), and scheduled caste categories were significantly linked to an increased likelihood of SLT (OR: 1.209; 95% CI 1.002-1.458). In terms of occupation, respondents without jobs had greater odds for all types of tobacco use. Using single as the reference category, the likelihood of using SLT was higher for those who were married (1.2 times), divorced/separated (1.4 times), and widowed (1.5 times). Those who were divorced or separated had a higher risk of dual usage (OR: 2.170; 95% CI 1.100-4.278), followed by married people and Christians (OR: 1.472; 95% CI 1.111-1.951, $p < 0.05$).

The sociodemographic predictors of tobacco users' intentions to quit are highlighted in Table 5. The sociodemographic characteristics that predict the intention to continue smoking are listed in this table. Males were more likely than females to have no intention of quitting SLT (OR of 1.406; 95% CI 1.150-1.719, $p < 0.05$) and to have no intention of quitting smoking tobacco (OR of 1.159; 95% CI 0.765-1.756). Higher quitting intent was strongly and consistently associated with higher educational attainment. The odds of not intending to quit were more than twice as high for those without education as compared to those with education ($p < 0.001$), and the non-willingness was higher for tobacco use. Compared to tobacco users (OR: 1.152), rural dwellers were less prepared to quit smoking SLT (OR: 1.200). The likelihood of a user intending to quit decreased with age, which continued to be a negative predictor. The odds were significantly lower for those over 60, with OR: 1.154 for SLT and OR: 1.41 for tobacco use. Professionals had a significantly higher likelihood of wanting to quit, while unemployed people had a significantly lower likelihood. ST and SC groups were substantially less likely to indicate that they were prepared to give up. Muslims and Hindus were 1.1 and 1.2 times more likely, respectively, to continue SLT. Widowed people are 2.013 times less likely to want to stop taking SLT (95% CI 1.333-3.040, $p < 0.05$), and those in the lower and middle wealth quintiles were less likely to want to stop. Together, these results show that age, gender, urbanisation, education, and socioeconomic status all have a significant impact on tobacco use and cessation behaviours.

Table 4 Regression model for use of different forms of tobacco in NE states by socio-demographic characteristics

Variables	Categories	Smokeless Unadjusted OR (95%CI)	Smoking Unadjusted OR (95%CI)	Dual user Unadjusted OR (95%CI)
Age	15-24		Ref.	
	25-44	2.326 (1.938 - 2.790) ***	1.357 (1.043 - 1.765) ***	1.482 (1.078 - 2.037) ***
	45-59	2.207 (1.793 - 2.718) ***	1.817 (1.353 - 2.440) ***	1.483 (1.046 - 2.102) ***
	60+	1.978 (1.627 - 2.404) ***	1.580 (1.205 - 2.071) ***	1.112 (0.795 - 1.557)
Gender	Male	0.383 (0.341 - 0.431) ***	12.137 (9.962 - 14.787) ***	3.758 (3.086 - 4.576) ***
	Female		Ref.	
Residence	Urban		Ref.	
	Rural	1.087 (0.963 - 1.228)	0.945 (0.798 - 1.118)	0.981 (0.810 - 1.189)
Education	No Education	1.462 (1.212 - 1.763) ***	3.630 (2.779 - 4.741) ***	2.135 (1.575 - 2.895) ***
	Primary Education	1.399 (1.187 - 1.651) ***	2.350 (1.873 - 2.949) ***	1.968 (1.512 - 2.563) ***
	Secondary Education	1.348 (1.154 - 1.576) ***	1.575 (1.271 - 1.952) ***	1.252 (0.967 - 1.620)
	Higher Education		Ref.	
Caste	SC	1.209 (1.002 - 1.458) ***	1.168 (0.855 - 1.596)	1.185 (0.854 - 1.646)
	ST	0.894 (0.745 - 1.072)	1.865 (1.403 - 2.479) ***	1.398 (1.043 - 1.873) ***
	OBC	1.176 (1.017 - 1.360) ***	0.764 (0.587 - 0.995) ***	1.734 (1.372 - 2.192) ***
	Others		Ref.	
Religion	Hindu		Ref.	
	Muslim	0.992 (0.851 - 1.157)	1.419 (1.081 - 1.863) ***	1.156 (0.896 - 1.493)
	Christian	0.825 (0.683 - 0.997) ***	1.163 (0.892 - 1.517)	1.472 (1.111 - 1.951) ***
Marital Status	Single		Ref.	
	Married	1.258 (1.072 - 1.475) ***	1.276 (1.030 - 1.580) ***	1.740 (1.322 - 2.289) ***
	Divorced/Separated	1.398 (0.908 - 2.152)	1.663 (0.943 - 2.933)	2.170 (1.100 - 4.278) ***
	Widowed	1.544 (1.197 - 1.991) ***	1.164 (0.739 - 1.834)	1.439 (0.874 - 2.370)
Wealth Index	Poor	1.607 (1.248 - 2.070) ***	1.016 (0.728 - 1.417)	2.256 (1.406 - 3.619) ***
	Middle	1.647 (1.278 - 2.122) ***	1.068 (0.770 - 1.480)	1.636 (1.017 - 2.633) ***
	Rich		Ref.	
Occupation	Unemployed	0.618 (0.549 - 0.696) ***	0.712 (0.594 - 0.855) ***	0.822 (0.670 - 1.010)
	Employed		Ref.	

****Significance level at 5%, OR: Odds Ratio*

Table 5 Regression model for cessation intentions in NE states by socio-demographic characteristics

Variables	Categories	Smokeless Cessation Unadjusted OR (95%CI)	Smoking Cessation Unadjusted OR (95%CI)
Age	15-24		Ref.
	25-44	1.158 (0.837 - 1.602)	1.556 (0.957 - 2.528)
	45-59	0.861 (0.600 - 1.235)	1.534 (0.901 - 2.610)
	60+	1.154 (0.816 - 1.632)	1.41(0.852 - 2.335)
Gender	Male	1.406 (1.150 - 1.719) ***	1.159 (0.765 - 1.756)
	Female		Ref.
Residence	Urban		Ref.
	Rural	1.200 (0.978 - 1.472)	1.152 (0.860 - 1.542)
Education	No Education	2.141 (1.529 - 2.996) ***	2.571 (1.596 - 4.142) ***
	Primary Education	1.693 (1.254 - 2.286) ***	1.502 (0.988 - 2.282)
	Secondary Education	1.235 (0.928 - 1.643)	1.296 (0.870 - 1.932)
	Higher Education		Ref.
Caste	SC	1.245 (0.931 - 1.665)	1.749 (0.967 - 3.166)
	ST	1.547 (1.158 - 2.066) ***	1.967 (1.125 - 3.440) ***
	OBC	0.892 (0.711 - 1.120)	1.061 (0.618 - 1.820)
	Others		Ref.
Religion	Hindu	1.269 (0.921 - 1.750)	1.209 (0.746 - 1.958)
	Muslim	1.117 (0.762 - 1.638)	0.99 (0.479 - 2.044)
	Christian		Ref.
Marital Status	Single		Ref.
	Married	1.123 (0.842 - 1.499)	0.795 (0.542 - 1.167)
	Divorced/Separated	0.894 (0.414 - 1.934)	0.748 (0.316 - 1.768)
	Widowed	2.013 (1.333 - 3.040) ***	1.636 (0.692 - 3.869)
Wealth Index	Poor	1.829 (1.071 - 3.125) ***	1.238 (0.674 - 2.274)
	Middle	1.986 (1.156 - 3.413) ***	1.131 (0.624 - 2.050)
	Rich		Ref.
Occupation	Unemployed	0.943 (0.781 - 1.139)	1.231 (0.880 - 1.722)
	Employed		Ref.

****Significance level at 5%, OR: Odds Ratio*

Discussion

Based on the GATS-2 dataset, this study emphasized the multidimensional and complex nature of tobacco use in five Northeastern Indian states, a region distinguished by its unusual cultural customs and high tobacco burden. Despite continuous national anti-tobacco campaigns, these states—Tripura, Manipur, Mizoram, Meghalaya, and Assam—have been identified as tobacco consumption hotspots. The results highlight the ways in which sociodemographic factors influence tobacco use patterns and intentions to quit, highlighting the necessity of culturally sensitive, region-specific approaches. In this area, smoking tobacco is ingrained in local traditions and customs, especially with regard to smokeless tobacco (SLT), which is still widely available and accepted. These findings are corroborated by studies by Singh et al. (2018) and Bhattacharjee et al. (2020), which point to tribal customs and a lack of regulation as major factors. Dual tobacco use—smoking and SLT—is particularly common in the Northeast (Tata Institute of Social Sciences & Ministry of Health and Family Welfare, 2016), although similar SLT usage has been observed in rural Odisha and Chhattisgarh (Ghosh et al., 2018).

Gender differences were seen, with men preferring smoking and women opting for SLT. This is in line with Mishra et al. (2017) and Sharma et al. (2020) who found women use SLT for its discreetness, social and cultural acceptance, and traditional integration into daily life and in some cases, belief in its health or dental benefits. Women in this study had a stronger intention to quit possibly due to health awareness or family responsibilities (Rani et al., 2003). Dual usage was higher among men possibly due to more exposure, peer influence and occupational stressors among males. Age also plays a role. Tobacco use increases with age, peaks at 45-59 years possibly due to prolonged exposure and nicotine dependence (Jain et al., 2016; Sharma et al., 2015). The lowest usage was seen in 15-24 years age group who also showed higher quit intent, as found by Sinha et al. (2019). This is supported by NFHS-5, which also reported a declining trend of tobacco use among adolescents and young adults compared to NFHS-4, especially among younger adults and urban populations (IIPS and ICF, 2021). These youth driven trends provide opportunities for early intervention through education and digital platforms. Contrary to this, studies from states like Bihar and Uttar Pradesh show low youth quit intent possibly due to socioeconomic deprivation and lack of educational infrastructure (Kumari & Nath, 2021). So, the higher quit intent among northeastern youth should be leveraged through targeted interventions in educational institutions and youth groups. Education and wealth emerged as strong protective factors. Individuals with less education and in lower wealth quintiles were more likely to use tobacco and less likely to quit, as found globally (WHO-SEARO, 2019; Freire et al., 2018; Mishra et al., 2017; Rani et al., 2003). This shows that economic stress, lower health literacy and affordability of SLT products drive usage among low-income groups. This highlights the need to link tobacco control with broader development initiatives. On the other hand, the richest group had the lowest prevalence possibly due to better education, healthcare access and exposure to cessation campaigns. The richest were more motivated to quit especially in SLT, indicating socio-economic empowerment as a key enabler of health behaviour change. Professional occupation and higher education were strong predictors of quit intention—supporting Sinha et al. (2019) who found socio-economic mobility as a key driver of healthy behaviours. Higher usage among rural, ST and SC further show the impact of social and geographical marginalization (Gupta et al., 2017; Tiwari et al., 2021). Contrary to this, evidence from Kerala shows that when tribal populations are engaged in culturally relevant health interventions, usage can be reduced (Babu et al., 2019). Recent work on tribal interventions demonstrates that culturally tailored strategies, such as community-led awareness and inclusion of traditional leaders, are more effective in reducing use (Das & Pal, 2022; Nongkynrih et al., 2023). Widowed or divorced and working professionals had higher tobacco use, indicating psychosocial stressors and occupational influence (Kulkarni et al., 2015). Regression analysis confirmed the key predictors: gender, age, education, caste, wealth, religion and location. Christians had higher dual use especially in Mizoram and Nagaland (Reddy et al., 2022) and the poorest had the lowest quit intent. Policy implications are strong. The findings underscore the need for strengthening the National Tobacco Control Programme (NTCP) with region-specific strategies. For example, targeted cessation interventions in

tribal and rural areas, integration of culturally relevant messaging, and expansion of tobacco cessation centres are critical. Linking NTCP efforts with community health workers, school-based programs, and economic empowerment schemes may enhance effectiveness. The higher quit intent among youth and women highlights priority groups for intervention. Strengthening NTCP in the North-east with region-specific models similar to Kerala can accelerate progress towards India's goal of reducing tobacco use prevalence by 30% by 2025, in line with WHO's NCD Global Monitoring Framework. The findings also suggested the need for targeted, intersectional interventions that consider cultural, social and economic factors in tobacco control.

Conclusions

This study shows how deeply entrenched tobacco use is in India's North East, driven by cultural practices, economic hardship and social inequalities. High smokeless tobacco uses among women and rural population, and low quit intent among older, less educated and marginalized groups shows that there is no targeted public health effort. The strong correlation between low education and high tobacco use points to the need for school and community-based awareness programs. Regression results show that quitting tobacco is not an individual decision but is influenced by socio economic conditions. It's encouraging that youth and educated individuals show a greater readiness to quit, providing a valuable entry point for targeted interventions. For tobacco control strategies to be effective, an intersectional approach must be taken such as —tackling issues like poverty, lack of education, and gaps in rural healthcare. These findings demand equity based, culturally sensitive policies that prioritise vulnerable groups. Tobacco control in North East is key to building inclusive and responsive public health systems in India.

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