

Gendered Pattern and Predictors of Tobacco use in India: Evidence from the Second Round of Global adult Tobacco Survey

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Abstract

Background: India has completed the second round of the Global Adult Tobacco Survey (GATS) to monitor adult tobacco use and progress in tobacco control efforts. This study assesses the gendered pattern of tobacco use and its predictors in the second rounds of GATS. **Material and Methods:** Publicly available GATS-2 (2016–2017) data was analyzed which contains self-reported tobacco use information of ≥ 15 years Indians ($n = 74,037$). The independent predictors of “smoking only,” “smokeless only,” and “dual use” among current male and female tobacco users were assessed using the multinomial regression model. **Results:** The burden of “smoking only,” “smokeless only,” and “dual-use” of tobacco were 8.9% (8.74–9.15), 16.69% (16.42–16.96), and 3.89% (3.75–4.03), respectively, in the second round with wide regional variation as well as male dominance in use. Region, age, education, caste, and religion were significantly and consistently associated with different types of tobacco use in both genders. Other contextual predictors of tobacco use were residence, marital status, occupation, awareness, and wealth index (WI). **Conclusions:** Tobacco use predictors and their gendered patterns are contextual. Monitoring the predictors for tobacco use, which may change over time, should be given priority in the national tobacco control program.

Keywords: GATS-2, India, national tobacco control program, predictors, tobacco

INTRODUCTION

Tobacco use is a major and shared risk factor for multiple non-communicable diseases and has resulted in 8.71 million deaths globally in 2019.^[1] With annual 1.35 million tobacco attributable death,^[2,3] and myriad tobacco products use in varied socio-cultural-geographic contexts, the tobacco epidemic in India has become a complex phenomenon. In India, smoking causes a large proportion of premature mortality. The prime working-age range of 15 to 59 years is where the bulk of smoking-related deaths occur in India.^[4] At the same time, smokeless tobacco use is linked to a higher risk of cancer. In addition to several oral problems, smokeless tobacco is also highly addictive and leads to esophageal, pancreatic, and head and neck cancers.^[5,6]

In addition to the loss of life, it bears high social and economic repercussions. For those who were 35 years of age or older, the total economic expenditures attributed to tobacco use from all

diseases in India in 2017–18 came to USD 27.5 billion.^[7] With a large number of tobacco manufacturers in India's cottage and startups,^[8] India ranks second and third in the world for having a large pool of tobacco consumers and tobacco production, respectively.^[9,10] The country offers a wide range of tobacco products at varied price ranges.

According to the Global Adult Tobacco Survey (GATS) conducted in 2016–17, the overall prevalence of smoking tobacco use is 10.38% and smokeless tobacco use is 21.38% in

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India. Smokeless tobacco is the most popular type of tobacco used in India, and the top five commonly used smokeless tobacco products are khaini, gutkha, betel quid with tobacco, and zarda. Bidi and cigarettes are two smoked tobacco products.^[10] The prevalence of tobacco use among males and females differs depending on the country. According to the World Health Organization (WHO), in 2020, 22.3% of the global population used tobacco, including 36.7% of all men and 7.8% of the world's women.^[11] Although prevalence varies across nations, males consume cigarettes more frequently than women do. In India, the prevalence of smoking varies significantly between men and women. As per GATS2, of all adults, 28.6% currently consume tobacco either in smoked or smokeless form, including 42.4% of men and 14.2% of women.^[10] Another nationwide survey, the National Family Health Survey (NFHS), in its fifth round, estimated that the prevalence among males was 38% and that among females was 8.9%.^[12] Based on the GATS-1 report, higher age, lower education, and region are consistently influencing tobacco use across different forms of tobacco use in both genders.^[13] Other socio-demographic factors like occupation, wealth index (WI), residence, and awareness were contextual predictors in both genders and for tobacco products.^[4]

There is substantial literature discussing the prevalence of any one form of tobacco product across genders^[14-16] or the prevalence of various tobacco products for either men^[17,18] or women,^[19] or the prevalence of various tobacco products (smoking, smokeless, or dual users) alone.^[20-26] Understanding the most recent prevalence of all forms of tobacco use across both genders as well as its distribution and correlation with various population groups in this diverse country is essential to adjust and build effective health policies and interventions.

In this context, this study examined gender differences and predictors of smoking, smokeless, and dual tobacco use in India using GATS2 data. Additionally, this study explores the change in tobacco use from GATS1 to GATS2 in both genders. This information will generate pieces of evidence for gender-specific tobacco control programs and policies.

METHODS

Data

Secondary data of GATS2 of India (2016–17) was analyzed to examine the gendered pattern and predictors of various forms of tobacco use in both genders. Additionally, GATS1 (2009–10) and GATS2 data were compared to the change in various tobacco product use in both genders and state-wise variation. GATS data is publicly available from the Centers for Disease Control (CDC) website. GATS uses a standard core questionnaire, sample design, and data collection and management procedures for this nationally representative cross-sectional household survey among adult samples, aged 15 and above. In India, GATS1 surveyed 69,296 individuals in 29 states and 2 union territories, while GATS2 surveyed

74,037 in 30 states and 2 union territories. The households for the GATS survey were identified using a stratified multi-stage cluster sampling design. The survey was designed to provide data representative of the nation, state, residence (rural-urban), and gender (male-female). Wards in urban areas that were chosen through a three-stage process made up the primary sampling unit (PSU). The details of sampling are given in the GATS1 and GATS2 reports. A list of all the wards in towns and cities in each state was compiled during the first stage, and this list served as the sampling frame. Wards were chosen using the probability proportional to size (PPS) sampling method. A list of all census enumeration blocks (CEB) was prepared using PPS, from which one CEB was chosen for each selected ward. The required numbers of residential households were selected from each CEB in the third stage. Households in rural areas were chosen through a two-stage sampling process in which villages were PSU, chosen through PPS. The required number of households from each village was chosen in the second stage.

The household questionnaire was administered to all enrolled households to determine GATS eligibility requirements and to create a list of all eligible residents of the household. In addition, one adult was chosen at random from each household to complete the individual questionnaire. Both surveys (GATS1 and GATS2) collected self-reported tobacco use, second-hand smoking, tobacco cessation, tobacco economics, awareness of tobacco hazards and their source, and other information. This survey systematically evaluates adult tobacco use in both smoking and smokeless forms and traces its stratified findings by gender, residence, and states of India.^[10] Since this study involves anonymous secondary data analysis using freely available data in the public domain, an ethical review of the study was not sort.

Outcome variable

The current tobacco use status as smoking only, smokeless only, or dual use, among males and females serves as the outcome variable in this study. Tobacco use in the last 30 days preceding the survey is considered current use in GATS. The respondent was classified under the “smoking” group when he reported smoking cigarettes or bidis or cigars or pipe or hookah.^[27] If one respondent used chewing tobacco or snuff or gutkha/pan masala or pan with tobacco or khaini, he was categorized as a “smokeless tobacco use” group.^[28] Further, the participant was classified as a “dual user” if he used both smoked tobacco and smokeless tobacco (SLT).

Predictor variables

In this study, 10 socio-demographic variables were included as predictor variables such as 1. Age groups (15–24, 25–44, 45–64, and 65 and older) [AGE], 2. Residence (rural, urban) [RESIDENCE], 3. Education (uneducated/no education, up to the primary, up to secondary, less than secondary) [A04], 4. Occupation (self-employed, homemaker, student, others) [A05], 5. Marital status (single, married/cohabited, widow/separated/divorced) [A11], 6. Religion (Hinduism,

Islam, others) [A10], 7. Caste (scheduled caste (SC), scheduled tribe (ST), other backward castes) [A09], 8. WI (poorest, poor, moderate, rich, and richest), 9. Sub-national geographical regions (north, central, east, north-east, west, and south) [REGIONID], and 10. Awareness (aware, partially aware, and unaware) [H01 and H03].

The household economic status was assessed using the WI, which was estimated using principal component analysis of 13 household assets, namely, electricity [A06A], flush toilet [A06B], fixed telephone [A06C], cell phone [A06D], television [A06E], radio [A06F], refrigerator [A06G], car [A06H], motorcycle [A06I], computer/laptop [A06K], washing machine [A06J], air conditioner [A06M], electric fan [A06N], and internet connection [A06L], was excluded in the WI estimation owing to prevalence <5%. The households were categorized as poorest, poor, moderate, rich, and richest.

Questions on awareness about tobacco causing serious illness were described under section-H in the GATS questionnaire item [H01] for smoking causing serious illness and item [H03] for smokeless tobacco causing serious illness. Respondents with affirmative (s) to both items were classified as aware. Those respondents who answered no to both questions were classified as unaware, and the rest of the respondents were classified as partially aware.

Statistical analysis

The prevalence of different forms of tobacco smoking only, smokeless tobacco use only, and dual use of tobacco (both smoking and smokeless tobacco use) was defined as the number of persons consuming tobacco in this manner per 100 adult persons 15 years and above.

Bivariate analysis was used to estimate the prevalence of tobacco use in three different forms by background characteristics, and all analyses were performed separately for males and females. It was described using frequency (percentage) and 95 percent confidence intervals.

Multinomial logistic regression is used to estimate and assess the adjusted associations of different socio-economic, demographic, and knowledge-related characteristics. In a single model, multinomial logistic regression analysis was used to examine the four outcomes: smoking only, smokeless tobacco use only, dual tobacco use only, and non-user. Each outcome is modeled in relation to the group of non-tobacco users. The interaction between various tobacco forms and gender was

also explored in the same model. The rural residence (RRRs) and their respective 95% confidence intervals were provided.

The statistical analysis was performed using R software (version 3.2.5) (R Foundation for Statistical Computing, Vienna, Austria). GATS weight was used during the analysis, except for regression analysis. Global Tobacco Surveillance System (GTSS) had proposed analyzing variables with at least 25 unweighted cases. Therefore, the education variable for females was clubbed into two subgroups for analysis purposes.

RESULT

The overall burden of “smoking only,” “smokeless only,” and “dual use” of tobacco in the second round of GATS-India (2016) was 7.23%, 17.94%, and 3.44%, respectively. The prevalence of different forms of tobacco was higher in males than in their female counterparts. There was a reduction in the use of tobacco in comparison to the first round by 16.51%, 12.83%, and 35.34% for “smoking only,” “smokeless only,” and “dual use” of tobacco, respectively [Table 1]. There was wide interstate variation in the use of “smoking only,” “smokeless only,” and “dual use” of tobacco products in both genders. There was a reduction in the median estimates for the state-specific prevalence of “smoking only,” “smokeless only,” and “dual use” of tobacco products from the first to the second round of GATS except for smokeless tobacco product use among males [Figure 1].

Table 2 describes socio-demographic variation in the prevalence of “smoking only,” “smokeless only,” and “dual use” of tobacco products among males and females. In different parts of the country, smokeless tobacco was more prevalent than smoking tobacco, except for males in North and South India and females in North India. The prevalence of consumption of all three forms of tobacco products was higher in the rural areas than their urban counterparts among both genders. There was a linear and positive association between age and the prevalence of various tobacco use behaviors seen in females. Unmarried males and females had used tobacco less frequently than their counterparts. Muslim men were more likely to use tobacco in any form than Muslim women. In comparison to their peers, female Muslims used smokeless tobacco more frequently, female Hindus used smoking tobacco more frequently, and other categories used dual tobacco more frequently. Students smoked the least in both genders, whereas self-employed people and homemakers smoked more. Additionally, women in “other” occupational groupings used cigarettes at higher

Table 1: Gender-stratified tobacco use in both first (2009–10) and second rounds (2016-17) of GATS in India

Tobacco Product Use	Overall Prevalence			Male Prevalence			Female Prevalence		
	GATS-1	GATS-2	Percentage Decrease	GATS-1	GATS-2	Percentage Decrease	GATS-1	GATS-2	Percentage Decrease
Smoking only	8.66%	7.23%	16.51%	15.01%	12.76%	14.99%	1.87%	1.45%	22.46%
Smokeless only	20.58%	17.94%	12.83%	23.62%	23.38%	1.02%	17.32%	12.26%	29.21%
Dual Use	5.32%	3.44%	35.34%	9.28%	6.25%	32.65%	1.08%	0.51%	52.78%

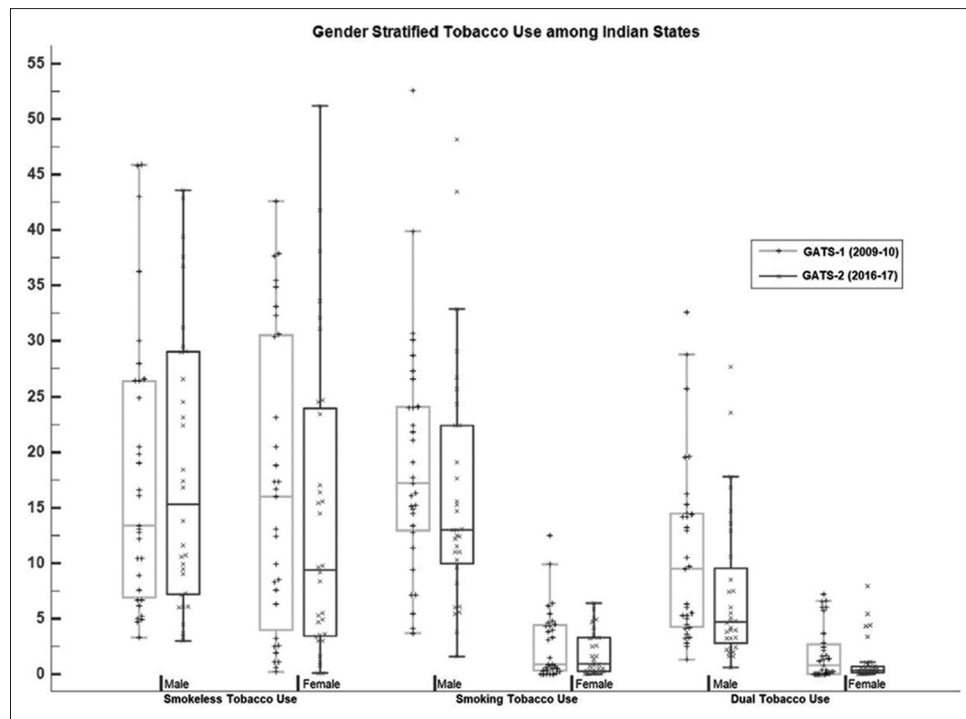


Figure 1: Gender-stratified prevalence of different forms of tobacco products in the Indian states during the first (2009–10) and second (2016–17) rounds of GATS

rates. For both genders, there was a strong gradient between lower cigarette usage and higher educational and awareness levels. According to the WI, men from disadvantaged groups smoked more than their peers did in any form. Rich people, however, smoked more and used smokeless tobacco less than their counterparts among females. Any form of tobacco use is high among SC and ST in both genders [Table 2].

Table 3a displays the multinomial regression results of male use of various tobacco products. Rural residence (RRR: 1.23) was a significant predictor of smoking. People from all regions were likely to smoke more, with the eastern region having the highest (RRR: 5.1). People over the age of 24 were more likely to smoke, with people aged 45 to 64 having the highest likelihood of smoking (RRR: 3.39). In terms of marital status, separated and cohabited people smoked more than unmarried people (RRR: 1.5 and 1.36, respectively). Hindu and Muslim females are likely to smoke more (RRR: 1.43, 1.74, respectively). Students were less likely to smoke than employed people (RRR: 0.40), whereas other occupational groups were more likely. The likelihood of smoking increases with a reduction in education level and wealth status. OBC people are less likely to smoke (RRR: 0.83), whereas ST and SC people are more likely to smoke (RRR: 1.85, 1.77, respectively).

Rural residence was a significant predictor of SLT use (RRR: 1.27). All regions except the south and north are likely to have more SLT use (RRR: 0.32 in the south and RRR: 0.43 in the north), with the east region having the highest (RRR: 2.05). People over the age of 24 were

more likely to chew tobacco, with people aged 25–44 being highly susceptible (RRR: 1.62). Divorced/widowed/separated, and cohabited people used SLT more than unmarried people (RRR: 1.83 and 1.46, respectively). Hindu females are more likely to chew tobacco (RRR: 2.03). Students chew less than employed people (RRR: 0.33), whereas other occupational groups chew more. The likelihood of SLT use increases with a reduction in education level and wealth status. People from ST and SC are more likely to use SLT (RRR: 1.37, 1.67, respectively).

Rural residence (RRR: 1.19), Hindu religion (RRR: 1.42), SC/ST caste (RRR: 1.51 and 1.39, respectively), less education (RRR: 6.65), lower wealth status (RRR: 1.49), and being separated from their partner (RRR: 2.16) were all significant predictors of dual form tobacco use. Except for the south, people in all regions are more likely to use dual forms of tobacco (RRR: 0.82 in the south), with the east region having the highest (RRR: 12.65). People over the age of 24 were more likely to use both types of tobacco, with those aged 25–44 being the most vulnerable (RRR: 2.01). Like two other types, students are less likely than employed people to use dual forms of tobacco (RRR: 0.40), whereas all other occupational groups are more likely to use it [Table 3a].

Table 3b displays the multinomial regression results of female use of various tobacco products.

Smoking was significantly predicted by residence, region, age, education, and caste. Rural residents (RRR: 2.24) are more likely to smoke than their urban counterparts. People

Table 2: Gender-stratified prevalence of different forms of tobacco use in India by socio-demographic characteristics

	Male			Female		
	Smoking only	Smokeless only	Dual use	Smoking only	Smokeless only	Dual use
Residence						
Urban	11.1 (9.95-12.3)	17.3 (15.65-18.9)	4.2 (3.5-4.99)	0.4 (0.25-0.63)	8.30 (7.08-9.58)	0.3 (0.11-0.41)
Rural	13.6 (12.64-15.0)	26.6 (25.00-27.9)	7.3 (6.56-8.08)	2.00 (1.65-2.31)	14.3 (13.38-15.23)	0.6 (0.44-0.82)
National Region						
North	20.6 (19.11-22.04)	8.7 (7.47-9.84)	3.8 (3.07-4.6)	2.6 (2.08-3.13)	1.40 (0.97-1.83)	0.30 (0.05-0.61)
Central	11.20 (9.62-12.80)	28.20 (26.22-30.24)	10.10 (8.68-11.45)	2.10 (1.46-2.68)	13.80 (12.23-15.46)	0.60 (0.33-0.79)
East	11.30 (9.97-12.63)	31.00 (29.06-32.98)	7.10 (6.09-8.11)	1.60 (1.16-1.98)	14.70 (13.3-16.14)	0.2 (0.05-0.29)
North-East	16.3 (14.24-18.32)	31.9 (29.41-34.38)	14 (12.46-15.47)	1.4 (0.94-1.8)	33.3 (30.95-35.73)	1.6 (1.16-2.04)
West	6.30 (5.30-7.37)	27.6 (25.07-30.07)	2.5 (1.68-3.36)	0.4 (0.09-0.76)	13.5 (10.89-16.14)	0.7 (0.10-1.35)
South	17.10 (15.77-18.51)	10.40 (9.09-11.79)	2.40 (1.94-2.92)	0.80 (0.42-1.20)	7.60 (6.41-8.87)	0.50 (0.23-0.76)
Age Group						
15-24 years	2.60 (2.01-3.09)	13.70 (12.24-15.22)	3.30 (2.36-4.15)	0.10 (0.04-0.24)	3.50 (2.83-4.21)	0.03 (0.01-0.05)
25-44 years	12.50 (11.49-13.55)	27.30 (26.07-28.61)	7.7 (6.99-8.41)	0.9 (0.61-1.13)	10.7 (9.82-11.55)	0.4 (0.26-0.6)
45-64 years	22.4 (20.97-23.78)	26.2 (24.57-27.92)	7.30 (6.39-8.24)	2.80 (2.26-3.41)	19.80 (18.37-21.23)	0.90 (0.53-1.23)
65+ years	19.80 (17.61-21.98)	26.60 (24.10-29.12)	6.20 (4.94-7.48)	4.40 (3.21-5.56)	25.30 (22.31-28.27)	1.30 (0.72-1.89)
Marital Status						
Unmarried	4.10 (3.42-4.69)	12.20 (10.83-13.47)	3.10 (2.37-3.92)	0.20 (0.01-0.45)	2.40 (1.79-3.04)	0.10 (0.01-0.24)
Cohabitated	16.20 (15.30-17.07)	27.80 (26.72-28.86)	7.50 (6.88-8.07)	1.40 (1.12-1.66)	12.50 (11.68-13.34)	0.50 (0.30-0.63)
Separated	20.60 (15.98-25.17)	33.60 (28.16-39.11)	8.80 (5.79-11.87)	3.80 (2.91-4.63)	25.40 (23.22-27.56)	1.30 (0.84-1.86)
Religion						
Hindu	12.30 (11.64-12.98)	23.80 (22.86-24.84)	6.30 (5.71-6.83)	1.60 (1.30-1.85)	12.20 (11.39-12.95)	0.50 (0.34-0.66)
Muslim	15.80 (13.39-18.23)	23.40 (20.90-25.92)	6.50 (5.06-7.94)	1.10 (0.72-1.41)	13.10 (10.87-15.28)	0.50 (0.19-0.82)
Others	11.50 (9.47-13.53)	15.90 (13.36-18.50)	5.20 (4.00-6.46)	0.70 (0.41-0.98)	11.40 (8.92-13.88)	0.60 (0.39-0.82)
Occupation						
Employed	11.70 (9.51-13.93)	15.00 (11.88-18.12)	2.90 (1.77-4.08)	0.30 (0.01-0.71)	8.40 (4.89-11.98)	0.00 (0.01-0.09)
Self-Employed	15.10 (13.77-16.34)	26.80 (25.23-28.29)	7.40 (6.53-8.23)	1.30 (0.57-2.01)	15.90 (13.62-18.12)	0.60 (0.07-1.06)
Homemaker	15.00 (10.40-19.65)	23.40 (17.00-29.87)	4.50 (1.67-7.27)	1.50 (1.20-1.71)	11.10 (10.31-11.98)	0.40 (0.28-0.56)
Student	1.70 (0.98-2.37)	3.80 (2.73-4.90)	0.60 (0.20-0.96)	0.30 (0.01-0.04)	0.80 (0.47-1.16)	0.0 (0.01-0.04)
Others	14.50 (13.67-15.35)	27.50 (26.27-28.68)	7.50 (6.71-8.20)	2.20 (1.57-2.77)	19.60 (17.94-21.35)	1.0 (0.65-1.32)
Education						
No Formal Education	24.10 (22.39-25.77)	31.10 (29.27-33.00)	10.90 (9.46-12.26)	3.30 (2.80-3.85)	21.50 (20.17-22.88)	1.10 (0.81-1.39)
Up to Primary	16.80 (15.47-18.16)	31.40 (29.79-33.08)	9.20 (8.15-10.34)	0.80 (0.41-1.10)	13.10 (11.77-14.36)	0.40 (0.13-0.62)
Up to Secondary	8.80 (8.07-9.48)	20.50 (19.31-21.61)	4.50 (3.92-5.02)	0.20 (0.05-0.33)	5.10 (4.41-5.86)	0.10 (0.03-0.17)
>Secondary	6.00 (4.97-6.97)	10.10 (8.49-11.62)	1.70 (1.09-2.34)	0.30 (0.01-0.78)	1.20 (0.47-1.89)	0.00 (0.01-0.02)
Awareness						
Unaware	15.50 (10.95-20.14)	32.80 (25.44-40.09)	6.70 (3.80-9.56)	3.50 (1.61-5.33)	22.70 (17.63-27.86)	2.90 (1.09-4.73)
Partially Aware	13.70 (11.17-16.23)	25.50 (22.41-28.62)	6.80 (5.14-8.49)	2.00 (1.00-2.95)	20.00 (16.59-23.41)	0.80 (0.37-1.22)
Aware	12.60 (11.88-13.27)	23.00 (22.10-23.94)	6.10 (5.62-6.66)	1.40 (1.12-1.58)	11.40 (10.70-12.17)	0.40 (0.29-0.56)
Wealth Index						
Poorest	15.40 (14.23-16.54)	25.00 (23.43-26.53)	5.50 (4.68-6.27)	1.10 (0.76-1.36)	13.90 (12.66-15.21)	0.60 (0.34-0.83)
Poor	13.60 (12.14-15.10)	28.60 (26.74-30.42)	8.00 (6.89-9.16)	1.70 (1.25-2.13)	14.30 (12.78-15.86)	0.60 (0.25-0.93)
Moderate	12.00 (10.70-13.33)	23.90 (22.23-25.56)	5.50 (4.63-6.30)	1.50 (1.06-1.94)	11.40 (10.23-12.61)	0.40 (0.24-0.63)
Rich	11.90 (0.67-13.14)	26.50 (24.50-28.55)	8.20 (6.92-9.41)	1.90 (1.38-2.46)	14.40 (12.98-15.74)	0.60 (0.32-0.82)
Richest	9.70 (8.40-10.99)	8.20 (6.82-9.54)	3.40 (2.50-4.20)	5.00 (0.14-0.84)	4.40 (3.38-5.34)	0.10 (0.04-0.21)
Caste						
SC	14.30 (12.95-15.71)	26.40 (24.55-28.35)	8.40 (7.26-9.45)	1.90 (1.41-2.44)	14.90 (13.47-16.35)	0.70 (0.36-0.99)
ST	14.40 (12.49-16.24)	33.70 (30.78-36.57)	8.00 (6.60-9.30)	2.30 (1.38-3.29)	21.90 (19.22-24.56)	1.00 (0.65-1.26)
OBC	11.60 (10.55-12.63)	22.50 (21.23-23.73)	5.90 (5.18-6.63)	1.40 (1.08-1.77)	10.30 (9.33-11.36)	0.50 (0.29-0.78)
Others	13.10 (11.96-14.31)	19.40 (17.99-20.80)	4.60 (3.82-5.33)	0.80 (0.57-1.12)	10.10 (8.84-11.35)	0.20 (0.08-0.28)

in all regions are more likely to smoke, with the east having the highest rate, followed by the north (RRR: 8.19 and 4.86, respectively). People over the age of 24 were more likely to

smoke, with people aged 45 to 64 being the most likely (RRR: 12.69). Female Muslims are more likely to smoke more (RRR: 2.38). Smoking becomes more likely as one's education level

Table 3a: Regression model for male use of different forms of tobacco in India by socio-demographic characteristics

Background Characteristics	Smoking Only RRR (95% CI), <i>P</i>	Smokeless Only RRR (95% CI), <i>P</i>	Dual User RRR (95% CI), <i>P</i>
Residence			
Urban		Ref.	
Rural	1.23 (1.14,1.32), <0.001	1.27 (1.18,1.36), <0.001	1.19 (1.06,1.33), <0.001
Region			
North	3.65 (3.16,4.24), <0.001	0.43 (0.38,0.49), <0.001	2.08 (1.61, 2.69), <0.001
Central	2.05 (1.75,2.40), <0.001	1.43 (1.28,1.60), <0.001	4.30 (3.37,5.50), <0.001
NE	1.61 (1.36,1.90), <0.001	1.76 (1.57,1.97), <0.001	4.31 (3.36,5.52), <0.001
East	5.10 (4.35,5.99), <0.01	2.05 (1.81,2.32), <0.01	12.65 (9.89,16.17), <0.01
West		Ref.	
South	2.02 (1.74,2.34), <0.001	0.32 (0.28,0.36), <0.001	0.82 (0.62,1.09), 0.172
Age Group			
15-24 years		Ref.	
25-44 years	2.42 (2.06, 2.86), <0.001	1.62 (1.43, 1.85), <0.001	2.01 (1.67, 2.47), <0.001
45-64 years	3.39 (2.85,4.03), <0.001	1.46 (1.26,1.68), <0.001	1.81 (1.45, 2.26), <0.001
65+ years	2.35 (1.93, 2.86), <0.001	1.12 (0.95,1.33), 0.179	0.92 (0.69, 1.21), 0.543
Marital Status			
Unmarried		Ref.	
Cohabitated	1.36 (1.20,1.55), <0.001	1.46 (1.30,1.64), <0.001	1.50 (1.25,1.79), <0.001
Separated	1.50 (1.15,1.96), <0.01	1.83 (1.43,2.35), <0.001	2.16 (1.51,3.08), <0.001
Religion			
Hindu	1.43 (1.27,1.60), <0.001	2.03 (1.79,2.30), <0.001	1.42 (1.20,1.68), <0.001
Muslim	1.74 (1.50,2.02), <0.001	1.93 (1.65,2.26), <0.001	1.29 (1.03,1.61), 0.023
Others		Ref.	
Occupation			
Employed		Ref.	
Self-Employed	1.26 (1.09,1.45), <0.01	1.35 (1.16,1.57), <0.001	1.48 (1.18,1.86), <0.01
Homemaker	1.35 (1.01,1.82), 0.049	1.08 (0.77,1.50), 0.663	1.33 (0.82,2.15), 0.241
Student	0.40 (0.31,0.53), <0.001	0.33 (0.26,0.42), <0.001	0.40 (0.27,0.59), <0.001
Others	1.29 (1.12,1.48), <0.001	1.37 (1.18,1.59), <0.001	1.64 (1.31,2.05), <0.001
Education			
Uneducated	4.99 (4.30,5.79), <0.01	3.17 (2.74,3.66), <0.01	6.85 (5.34,8.79), <0.01
Up to Primary	3.50 (3.05,4.03), <0.01	2.77 (2.42,3.17), <0.01	5.71 (4.51,7.23), <0.01
Up to Secondary	2.00 (1.76,2.27), <0.01	1.89 (1.67,2.14), <0.01	2.88 (2.30,3.61), <0.01
Above Secondary		Ref.	
Awareness			
Unaware	1.46 (1.06,2.02), 0.022	1.45 (1.07,1.97), 0.017	1.17 (0.73,1.88), 0.507
Partially Aware	1.17 (1.02,1.34), 0.024	1.15 (1.01,1.31), 0.031	1.12 (0.92,1.35), 0.250
Aware		Ref.	
Wealth Index			
Poorest	1.51 (1.34,1.70), <0.001	2.26 (1.98,2.57), <0.001	1.49 (1.23,1.80), <0.001
Poor	1.4 (1.24,1.56), <0.001	2.21 (1.94,2.52), <0.001	1.48 (1.23,1.79), <0.001
moderate	1.28 (1.13,1.44), <0.001	1.97 (1.73,2.24), <0.001	1.41 (1.17,1.70), <0.001
Rich	1.18 (1.05,1.33), <0.01	2.00 (1.76,2.28), <0.001	1.40 (1.16,1.69), <0.001
Richest		Ref.	
Caste			
SC	1.17 (1.05,1.30), 0.003	1.37 (1.24,1.52), <0.001	1.39 (1.18,1.62), <0.001
ST	1.85 (1.63,2.09), <0.01	1.67 (1.48,1.88), <0.001	1.51 (1.26,1.81), <0.001
OBC	0.83 (0.76,0.91), <0.001	1.04 (0.96,1.13), 0.341	1.11 (0.96,1.26), 0.145
Others		Ref.	

falls. People of all castes are more likely to smoke, with ST being the most vulnerable (RRR: 4.13).

The region, age, marital status, religion, occupation, education, wealth, and caste were all significant predictors of smokeless

tobacco use among females. Except for the south and north, all regions are likely to have more SLT use (RRR: 0.57 in the south and RRR: 0.12 in the north), with the east having the highest (RRR: 6.06). People over the age of 24 were

Table 3b: Regression model for female use of different forms of tobacco in India by socio-demographic characteristics

Background Characteristics	Smoking Only RRR (95% CI), <i>P</i>	Smokeless Only RRR (95% CI), <i>P</i>	Dual User RRR (95% CI), <i>P</i>
Residence			
Urban		Ref	
Rural	2.24 (1.76,2.84), <0.001	1.10 (1.01,1.193), 0.033	1.11 (0.83,1.49), 0.464
Region			
North	4.86 (3.04,7.76), <0.001	0.12 (0.09,0.15), <0.01	0.54 (0.28,1.03), 0.061
Central	2.74 (1.68,4.46), <0.001	1.55 (1.35,1.78), <0.001	0.85 (0.48,1.51), 0.586
NE	2.60 (1.59,4.27), <0.001	1.56 (1.36,1.79), <0.001	0.24 (0.11,0.53), <0.001
East	8.19 (5.04,13.29), <0.001	6.06 (5.29,6.93), <0.001	7.66 (4.69,12.50), <0.001
West		Ref	
South	1.02 (0.60,1.73), 0.934	0.57 (0.49,0.66), <0.001	0.41 (0.22,0.76), <0.01
Age Group			
15-24 years		Ref	
25-44 years	2.83 (1.63,4.90), <0.001	1.92 (1.66,2.21), <0.001	1.91 (1.16,3.13), <0.001
45-64 years	7.79 (4.49,13.53), <0.001	3.14 (2.69,3.67), <0.001	3.35 (1.99,5.63), <0.001
65+ years	12.69 (7.13,22.55), <0.001	3.62 (3.01,4.36), <0.001	3.08 (1.68,5.66), <0.001
Marital Status			
Unmarried		Ref	
Cohabitated	1.66 (0.86,3.18), 0.129	1.19 (0.99,1.42), 0.056	1.56 (0.88,2.78), 0.130
Separated	2.38 (1.20,4.70), 0.012	1.64 (1.33,2.01), <0.001	2.32 (1.20,4.47), 0.012
Religion			
Hindu	1.20 (0.92,1.56), 0.179	1.76 (1.56,1.99), <0.001	0.81 (0.57,1.14), 0.231
Muslim	2.12 (1.50,3.01), <0.001	2.19 (1.86,2.59), <0.001	2.10 (1.26,3.50), <0.01
Others		Ref	
Occupation			
Employed		Ref	
Self-employed	0.77 (0.40,1.49), 0.444	1.51 (1.18,1.92), <0.001	0.86 (0.43,1.72), 0.666
Homemaker	0.76 (0.42,1.39), 0.379	1.06 (0.84,1.32), 0.638	0.70 (0.36,1.35), 0.288
Student	0.96 (0.32,2.86), 0.943	0.58 (0.40,0.83), <0.01	0.50 (0.15,1.61), 0.243
Others	1.09 (0.59,2.03), 0.779	1.82 (1.44,2.29), <0.001	1.59 (0.82,3.09), 0.172
Education			
Up to Primary	4.15 (3.11,5.54), <0.001	1.88 (1.72,2.05), <0.001	4.22 (3.02,5.87), <0.001
Up to Secondary and Above		Ref	
Awareness			
Unaware	1.64 (1.01,2.66), 0.047	1.10 (0.86,1.41), 0.447	2.69 (1.66,4.35), <0.001
Partially Aware	0.84 (0.61,1.15), 0.272	0.97 (0.84,1.11), 0.647	0.43 (0.31,0.61), <0.001
Aware		Ref	
Wealth Index			
Poorest	1.32 (0.94,1.85), 0.109	1.77 (1.53,2.03), <0.001	1.13 (0.71,1.79), 0.609
Poor	1.17 (0.85,1.60), 0.338	1.41 (1.23,1.62), <0.001	0.70 (0.45,1.08), 0.114
Moderate	1.12 (0.82,1.54), 0.469	1.27 (1.09,1.46), <0.01	0.98 (0.64,1.5), 0.935
Rich	1.24 (0.90,1.70), 0.181	1.53 (1.33,1.76), <0.001	1.38 (0.92,2.07), 0.123
Richest		Ref	
Caste			
SC	1.64 (1.25,2.15), <0.001	1.65 (1.46,1.85), <0.001	3.22 (1.79,5.82), <0.001
ST	4.13 (3.09,5.52), <0.001	2.10 (1.85,2.34), <0.001	8.54 (4.98,14.64), <0.001
OBC	1.41 (1.10,1.82), <0.01	0.97 (0.88,1.08), 0.586	3.18 (1.93,5.24), <0.001
Others		Ref	

more likely to chew tobacco, with people over the age of 65 being highly susceptible (RRR: 3.62). People who were divorced/widowed/separated used SLT more than unmarried people (RRR: 1.64). Hindu and Muslim women chew tobacco more frequently than others (RRR: 1.76 and 2.19, respectively). Students chew less than employed people (RRR: 0.58), while

other occupational groups chew more. In comparison to the richest, all other wealthy groups are more likely to use SLT. People from ST and SC are more likely to use SLT (RRR: 1.65, 2.10), whereas people from OBC are less likely.

Age, marital status, religion, education, and caste were significant predictors of dual forms of tobacco use among

females. Except for the eastern region, all regions are less likely to use dual tobacco (RRR: 7.66). People over the age of 24 were more likely to use dual tobacco products, with people aged 45–64 being highly susceptible (RRR: 3.35). People who were divorced/widowed/separated were more likely to use dual forms of tobacco than unmarried people (RRR: 2.32). Muslim females are more likely to use dual forms of tobacco (RRR: 2.10). The likelihood of dual tobacco use increases as the education level decreases (RRR: 4.22). People of all castes are more likely to use dual tobacco, with ST being the most vulnerable (RRR: 8.54) [Table 3b].

DISCUSSION

Gender plays an important role in predicting tobacco use. This study shows that smokeless tobacco is the most commonly used form of tobacco in both genders. According to the study findings from GATS2-India, males are more likely to consume tobacco than females. Females are more likely to use smokeless tobacco with limited use of smoking tobacco and dual use, while a good number of males use all forms of tobacco.^[10] Palipudi *et al.*^[22] (2012) has reported that the proportion of female smokers is lower, which is consistent with our findings. Some studies, on the other hand, found no female smokers in their sample.^[29,30] Singh *et al.*, 2020^[31] found that males are more likely than females to use dual forms of tobacco.

In this study region, age, education, caste, and religion are found to be common significant predictors for all three types of tobacco use in both genders. Age is a significant predictor for all types of tobacco product use in this GATS2 analysis. A similar finding was noted in GATS1.

Studies have shown a wide regional disparity in tobacco product consumption,^[4] and this study also finds a well-demarcated consumption of tobacco forms across Indian subnational regions; the north-east region was more prevalent to being a tobacco user, as reported by another Indian study,^[4] which can be attributed to the country's cultural diversity. A few studies have discovered regional differences in all forms of tobacco consumption; contributing factors included low socio-economic status, low education, and a lack of awareness, as well as shared cultural norms about tobacco consumption, implementation, and control of tobacco control provisions in a specific region.^[32]

This study identified all forms of tobacco use are very common among Muslim women than their counterparts and higher smoking tobacco use among Muslim men than their counterparts. A study by Rani *et al.*^[25] found that Muslim men are more likely to smoke than their counterparts, but no differential use was observed for Muslim women. This study found that education is the most significant predictor of tobacco use, regardless of the type of use and gender. Higher education and socio-economic status had a significant protective effect against tobacco use. Tobacco consumption was found to be higher in the least educated group.^[33]

In India, lower wealth quintiles are associated with a higher likelihood of using any form of tobacco. Wealth is a significant predictor of all types of tobacco use in men, but it is only a significant predictor of smokeless tobacco use in women. In contrast, a 2014 study from India found that lower-income people are more likely to use smokeless tobacco among males and both smokeless and dual tobacco among females.^[4] Another contrasting report from a recent study in India stated that higher education and wealth status correlated with higher tobacco use.^[20]

Furthermore, respondents who were separated/divorced/widowed at the time of the survey were more likely to use tobacco. This holds true for both genders. The findings of this study are consistent with those of an Ethiopian study.^[34]

The likelihood of consuming tobacco in various forms is significantly influenced by a lack of awareness of the specific health risks associated with tobacco use. A similar study observed that respondents who were unaware of the dangers of smoking had a higher prevalence of tobacco use in all forms.^[25]

The likelihood of consuming tobacco in various forms is significantly influenced by a lack of awareness of the specific health risks associated with tobacco use. A similar study observed that respondents who were unaware of the dangers of smoking had a higher prevalence of tobacco use in all forms.^[25] Another study explains that tobacco smokers, on the other hand, are sometimes unaware of the severity of the health consequences, which is frequently attributed to a lack of education and awareness.^[35] Other studies suggest that the knowledge of the health hazards of tobacco is significantly related to ignorance behavior.^[36] This underlines the need for prioritization in targeting these high-risk groups in the national tobacco control program for improving tobacco quitting rates among them.

CONCLUSIONS

The prevalence of smoking, smokeless, and dual tobacco usage in India is influenced by various contextual factors. The socio-demographic interplay on tobacco use is complex. Higher tobacco use among underprivileged groups of society is a concern. Regional disparities and social gradients in tobacco consumption need to be considered in the national tobacco control program. Tobacco hazard awareness may be helpful to reduce the tobacco burden in India. The study emphasizes the significance of monitoring of tobacco use, as well as the identification of target groups to tailor public health messages and interventions.

Ethical approval and consent

The study involves anonymous secondary data analysis using freely available data in the public domain.

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Conflicts of interest

There are no conflicts of interest.

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