

# Regional and Socioeconomic Dimensions of Tobacco Consumption in India: What Do NFHS-5 and GATS-2 Data Reveal?

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## ABSTRACT

**Background & objectives:** Tobacco consumption remains a major public health issue in India, which is the second-largest consumer and third-largest producer of tobacco. Despite efforts like COTPA and the WHO FCTC, high tobacco use persists, especially in certain demographic groups. This study examines tobacco use trends and socioeconomic factors using data from the National Family Health Survey (NFHS-5) and the Global Adult Tobacco Survey (GATS-2).

**Methods:** The study analyzed data from GATS-2 (2016-2017) and NFHS-5 (2019-2021), which covered extensive household samples across India. Study used multivariable binary logistic regression to assess the impact of factors like residence type, age, gender, and health awareness on smoking behaviour in India.

**Results:** The NFHS-5 data revealed that 9% of women and 38% of men aged 15 and older use tobacco, with higher rates in rural areas (10.5% for women and 42.7% for men). Logistic regression showed that rural residents were 1.6 times more likely to smoke than urban residents. Age and gender significantly impact smoking patterns—females 13.0 times more likely to smoke compared to males, and the awareness of health risks related to smoking also influences smoking behaviour.

**Conclusion:** The study analyzes tobacco consumption trends in India using NFHS-5 and GATS-2 data that show persistent challenges despite regulations. Socioeconomic status significantly influences tobacco use. Recent data indicates decline in both smoked and smokeless tobacco. The study offers insights for policymakers to develop targeted tobacco control strategies for diverse population groups by considering prevalence and regional variations.

**Keywords:** Tobacco consumption, NFHS-5, GATS-2, logistic regression, health awareness

## INTRODUCTION

Tobacco consumption in India represents a significant global health concern, with the country ranking as the second-largest consumer and the third-largest producer of tobacco products. The government's regulatory initiatives, including the

implementation of the Cigarettes and Other Tobacco Products Act (COTPA) and its early adoption of the WHO Framework Convention on Tobacco Control (WHO FCTC) in 2004, signify a commitment to combatting tobacco use.<sup>(1)</sup> The fact that tobacco smoking is still highly prevalent

despite these efforts—predominantly in particular demographic groups—highlights the necessity of a comprehensive understanding of these trends. Tobacco consumption is a global public health challenge, standing as a prominent cause of preventable morbidity and mortality. The impact of tobacco is particularly pervasive, being the leading cause of non-communicable diseases (NCDs) globally, contributing to approximately 63% of NCD-related deaths.<sup>(2)</sup> The World Health Organization (WHO) estimates that 80% of tobacco-related deaths occur in Low and Middle-Income Countries (LMICs).<sup>(3)</sup> As of 2020, the projected tobacco-associated mortality is expected to rise significantly, accounting for 13.3% of global deaths.<sup>(4)</sup> In this context, India emerges as a key player in the global tobacco burden with an estimated 1.5 million tobacco-related deaths anticipated by 2020.<sup>(5)</sup>

India has a complex tobacco use environment with a range of smoking and non-smoking habits. Smoking encompasses bidis (hand-rolled tobacco wrapped in specific leaves) and cigarettes, while smokeless tobacco products include khaini, chewing pan, gutkha or pan masala, and mishri.<sup>(6)</sup> The complex choices in tobacco products and consumption methods are influenced by a myriad of demographic, social, economic, and cultural factors. It is crucial to recognize that both smoking and smokeless forms of tobacco use pose severe health risks.<sup>(7)</sup> A comprehensive analysis of tobacco uses trends in India, drawing from nationally representative surveys, highlights the complexity of the situation. Between 1987 and 2005, there was a notable increase in the prevalence of any smokeless tobacco use, rising from 15% to 23.4%, while any smoked tobacco witnessed a marginal decline from 19.8% to 18.3%.<sup>(8)</sup> Recent data from the Global Adult Tobacco Survey (GATS) spanning 2009–2010 to 2016–2017 indicates a 4.5% decline in smokeless tobacco use (from 25.9% to 21.4%) and a 3.3% decline in smoking (from 14.0% to 10.7%).<sup>(9)</sup> Socioeconomic status (SES) plays a pivotal role in shaping the

prevalence of tobacco use in India.<sup>(10–12)</sup> Existing literature has consistently highlighted the influence of various factors at different levels – from regional disparities and place of residence to household wealth status and individual characteristics such as age and gender – in determining patterns of smoking and smokeless tobacco use.<sup>(10–14)</sup> Understanding these socioeconomic determinants is critical for designing targeted interventions and policies to control tobacco consumption effectively. Studies have shown that community-level factors, including regional disparities, geographical location and place of residence, significantly influence tobacco use.<sup>(9)</sup> Additionally, at the household level, wealth status has been identified as a key factor, with individuals from lower socioeconomic backgrounds being more vulnerable to tobacco use.<sup>(13)</sup> Individual-level characteristics, such as age and gender, also play a crucial role, with studies demonstrating varying prevalence rates among different age groups and genders.<sup>(14)</sup>

Tobacco consumption in India is a multifaceted challenge with significant health, economic, and social implications. The complex patterns of smoking and smokeless tobacco use highlight the importance of ongoing research to inform targeted interventions and policies. This study, through a detailed analysis of the latest NFHS-5 and GATS-2 data, aims to contribute to our understanding of the evolving trends and socioeconomic correlates of tobacco use in India. Addressing the existing research gaps, this study seeks to provide valuable insights for policymakers, public health professionals, and researchers working towards effective tobacco control strategies. This study aims to provide a comprehensive analysis of smoking and smokeless tobacco prevalence in India by comparing data from the National Family Health Survey (NFHS-5) and the Global Adult Tobacco Survey (GATS-2). Additionally, the research seeks to examine regional variations in tobacco use across different states and territories, shedding light

on the socioeconomic that correlates influencing these patterns.

## MATERIALS & METHODS

This study draws upon data from the Global Adult Tobacco Survey 2016-2017 (GATS-2) in India, emphasizing its reliability and credibility through the endorsement of implementing agencies—the International Institute for Population Sciences (IIPS) and the Tata Institute of Social Sciences (TISS) recognized by the Ministry of Health & Family Welfare. The coherence between GATS-1 and GATS-2 datasets permits the development of significant predictors for various tobacco use behaviours, ensuring continuity in research. Consistency in sampling designs and interviewing techniques across surveys further enhances the reliability of collected data. The geographically clustered, multi-stage household sample employed in GATS covers men and women aged 15 and above from all 30 states and two Union Territories in India, providing a comprehensive representation of the population. Complementing GATS-2, the National Family Health Survey-5 (NFHS-5)

offers extensive insights, surveying over 6,36,699 households, 7,24,115 women, and 1,01,839 men in two phases from June 2019 to April 2021.<sup>(15)</sup> The phased approach of NFHS-5, combined with the release of factsheets containing information on specific states and Union Territories, adds temporal and regional dimensions to the analysis. The study's core objective is to discern socioeconomic correlations and identify factors influencing changes in smoking patterns in India, leveraging the richness of both GATS-2 and NFHS-5 datasets.

## STATISTICAL ANALYSIS

The objective of the study was to estimate the prevalence of smoking tobacco use in India and identify associations with selected background variables. The study utilized data from the Global Adult Tobacco Survey 2016-2017 (GATS-2) conducted in India. The analysis utilized multivariable binary logistic regression to model the probability of smoking tobacco use based on several explanatory variables. The logistic regression model is commonly represented as:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n$$

Where:

$p$  is the probability of the event (smoking).

$\beta_0$  is the intercept.

$\beta_1, \beta_2, \dots, \beta_n$  are the coefficients of the explanatory variables  $X_1, X_2, \dots, X_n$

### Variables Considered

- i. **Type of Residence:** Explanatory variable coded as Urban (reference category) and Rural
- ii. **Age Groups:** Explanatory variables for three age groups (15–24, 25–44, 45–64), with 65 and above as the reference category. Logistic regression coefficients  $\beta_0$  for each age group.
- iii. **Gender:** Explanatory variable coded as Male (reference category) and Female. Logistic regression coefficient  $\beta_0$  for Female: 2.567.

### iv. Awareness of Smoking-Related Health

**Risks:** Explanatory variables for awareness of smoking causing serious illness, stroke, heart attack, and lung cancer. Logistic regression coefficients  $\beta_0$  for each awareness variable.

The multivariable binary logistic regression analysis conducted on the GATS-2 survey data in India aimed to uncover the factors influencing smoking behaviour. The methodology involved examining the impact of various explanatory variables, including type of residence, age groups, gender, and

awareness of smoking-related health risks, on the likelihood of being a smoker. The logistic regression equation was utilized to estimate the log-odds of smoking, with the results indicating both positive and negative coefficients for different variables. Positive coefficients suggested an increased likelihood of being a smoker, while negative coefficients implied a decreased likelihood. The odds ratios (Exp(B)) provided insights

into the magnitude of these effects. The significance of each variable was assessed through the Wald test. Notably, the reference category for smoking awareness variables was set to “Yes,” and its parameter was considered redundant. The findings of this analysis contribute valuable information for policymakers and public health practitioners, guiding targeted interventions and strategies to curb smoking prevalence in India.

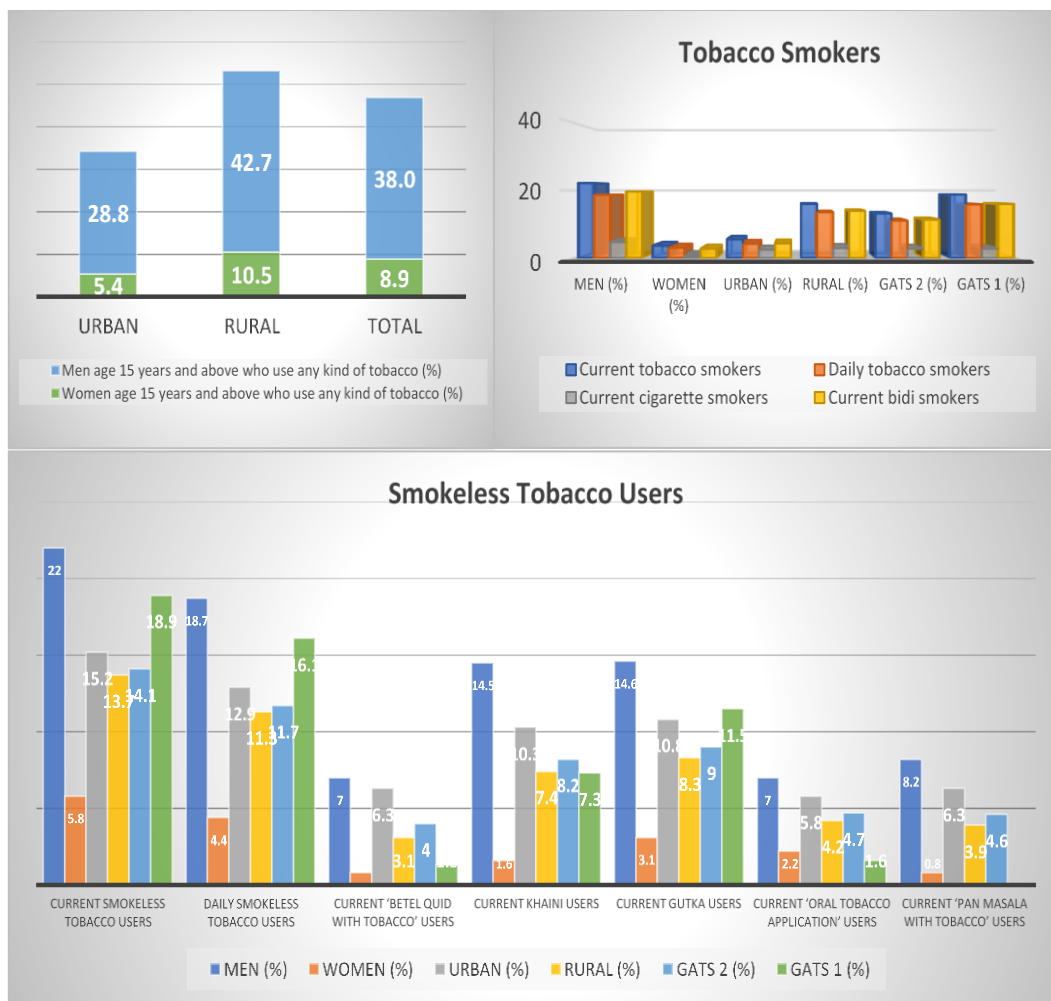


Figure 1. Prevalence (%) of tobacco uses, aged ≥15 years, India with smokers and non-smokers, GATS 2

## RESULT & DISCUSSION

The NFHS-5 found that about 9% of women and girls aged 15 and older have used tobacco in some way, with rural India having a higher proportion of users at 10.5%. (2019-21). In India, 38% of males used tobacco, with 42.7% of consumers living in rural areas. Urban regions had 28.8% of men and 5.4% of women who used tobacco,

respectively. About one in ten women aged 15 and up consume tobacco products, according to the NFHS (figure 1). The figure 1 also represents a comprehensive overview of tobacco consumption patterns, delineating disparities among demographic groups and survey periods. Men exhibit notably higher rates of tobacco use than women, with 22.2% identified as current smokers compared to

3.7% for women. Daily tobacco smoking is also more prevalent in men at 18.7% versus 3.1% for women. While current cigarette smoking is relatively low, bidi smoking stands out, particularly among men at 19.7%. Smokeless tobacco usage, encompassing various products, is more widespread in men and in urban areas. Urban populations consistently exhibit higher tobacco use across categories, reflecting a concerning trend. Interestingly, a decline in tobacco use is observed from GATS 1 to GATS 2, suggesting potential positive impacts of public health initiatives. Despite this trend, the prevalence of smokeless tobacco use remains substantial. These findings highlight the importance of targeted interventions, considering gender, urban-rural dynamics, and product-specific usage patterns to address the multifaceted challenges posed by tobacco consumption.

The presented table 1 offers a comprehensive snapshot of tobacco use prevalence among males aged 15 years and above across various states in India, as documented by the NFHS-5 (2019–20) and GATS (2016–17) surveys. The juxtaposition of values reveals intriguing patterns in tobacco consumption, indicating both temporal shifts and regional variations. A noticeable trend emerges from the data, suggesting an overall reduction in tobacco use prevalence from the GATS to the more recent NFHS-5. For instance, Andhra Pradesh witnessed a decrease from 30% in GATS to 22.6% in NFHS-5, signifying a potential positive impact of public health

interventions or a change in societal norms. Similarly, Assam experienced a substantial decline from 62.9% to 51.8%, reflecting a noteworthy shift in tobacco consumption patterns.

However, the dynamic nature of these trends is emphasized by variations at the state level. Some states, like Goa and Gujarat, exhibit increases in tobacco use prevalence, highlighting potential challenges or areas requiring intensified efforts in tobacco control. Conversely, states such as Karnataka, Kerala, and Tripura demonstrate encouraging reductions in prevalence, indicating successful anti-tobacco measures. These findings hold critical implications for public health policymakers. States experiencing declines may benefit from reinforcing existing successful interventions, while those with increasing trends may necessitate targeted strategies tailored to their unique challenges. It is crucial, however, to interpret these results cautiously, considering the intricacies of survey methodologies, sample sizes, and other contextual factors that may contribute to observed changes. This analysis offers a comprehensive perspective of the prevalence of tobacco use in India, showing both encouraging declines and alarming increases in certain states. To address the various dynamics of tobacco usage in the nation, the values put forward provide a basis for more research and emphasize the significance of constantly changing and region-specific anti-tobacco efforts.

	NFHS-5 (2019–20)	GATS (2016–17)	NFHS-5 (2019–20)	GATS (2016–17)
	Male		Female	
Andhra Pradesh	22.6	30	3.8	10.1
Assam	51.8	62.9	22.1	32.9
Bihar	48.8	43.4	5	6.9
Goa	18.2	<b>15.3</b>	2.6	4
Gujarat	41.1	35.5	8.7	10.4
Himachal Pradesh	32.3	30.4	1.7	1.7
Jammu and Kashmir	38.3	39.7	3.6	6.2
Karnataka	27.1	35.2	8.5	10.3
Kerala	<b>16.9</b>	23	<b>2.2</b>	3.6
Maharashtra	33.8	35.5	10.9	17.1
Manipur	58.1	62.5	43.1	47.8
Meghalaya	57.7	59.8	28.2	34.2



Mizoram	<b>72.9</b>	64.9	<b>61.6</b>	52.4
Nagaland	48.4	54.2	13.7	31.7
Sikkim	41.3	26.4	11.7	8.4
Telangana	22.3	25.9	5.6	9.8
Tripura	56.9	<b>67.5</b>	50.4	<b>61.4</b>
West Bengal	48.1	48.5	10.8	17.9

**Table 1: Prevalence (%) of tobacco use among the male and female, aged  $\geq 15$  years across the states of India**

Table 1 also provides a detailed examination of the prevalence of tobacco use among females aged 15 years and above across different states in India, as documented by the NFHS-5 (2019–20) and GATS (2016–17) surveys. The presented values illuminate distinct patterns and changes in tobacco consumption, offering valuable insights into the evolving landscape of female tobacco use. A noticeable trend across the states is the general reduction in tobacco use prevalence among females from the GATS to the more recent NFHS-5. This overarching decrease may indicate positive outcomes stemming from targeted public health interventions or shifting societal attitudes towards tobacco use among women.

However, the data also highlights subtleties unique to each state. States such as Manipur, Tripura, and Meghalaya demonstrate substantial declines in female tobacco use, suggesting effective anti-tobacco measures or changing cultural norms. On the other hand, Mizoram and Assam show increases, pointing to potential challenges in these regions that require closer examination. The implications of these findings are crucial for public health strategies, emphasizing the necessity for gender-specific interventions. States witnessing declines could benefit from reinforcing successful anti-tobacco initiatives, while those experiencing increases may need tailored and intensified efforts. Moreover, understanding the socio-cultural factors influencing female tobacco use is vital for crafting effective and culturally sensitive interventions. It's important to note that variations in prevalence may be influenced by regional disparities in awareness campaigns, policy effectiveness, and cultural perceptions of tobacco use among females. Therefore, a

more in-depth exploration of these contextual factors is necessary for a comprehensive understanding. An insightful viewpoint on female tobacco consumption in several Indian states is offered by this investigation. The presented values serve as a foundation for further research and the development of targeted public health strategies aimed at reducing tobacco consumption among women in the country.

Table 2 provides a comprehensive examination of tobacco use prevalence in India based on various socio-demographic factors, as revealed by the Global Adult Tobacco Survey (GATS) conducted in 2016–17. The data illustrates significant variations in smoking and non-smoking patterns across different segments of the population. Age emerges as a key determinant, with the prevalence of smoking highest among individuals aged 65 and above (15.5%) and lowest among those aged 15-24 (3.1%). This age-related trend suggests a potential cumulative effect of tobacco use over time. Gender disparities in smoking are striking, with a substantial difference between male (19.0%) and female (2.0%) smokers. This emphasizes the need for gender-specific approaches in tobacco control initiatives. Marital status plays a role, showcasing that married individuals have a higher smoking prevalence (12.8%) compared to their single counterparts (4.7%). These findings hint at the influence of marital status on lifestyle choices, potentially impacting tobacco use. Caste, religion, and education exhibit notable associations with smoking prevalence. Scheduled Tribes (ST) and Scheduled Castes (SC) share a similar smoking prevalence (12.7%), indicating the need for targeted interventions. Religious affiliations demonstrate diverse smoking rates, ranging

from 5.4% among Sikhs to 12.9% among Christians. Education levels reveal an inverse relationship, with higher education correlating with lower smoking prevalence.

Explanatory variables	Smoker		non-smoker	
	N	%	N	%
<b>Age group</b>				
15-24	7180824	3.1%	225043007	96.9%
25-44	41317676	10.9%	337701822	89.1%
45-64	36580045	<b>16.9%</b>	180191720	83.1%
65 and above	12169449	15.5%	66237236	84.5%
<b>Gender</b>				
Female	8936601	2.0%	447052252	98.0%
Male	90585160	<b>19.0%</b>	385913781	81.0%
<b>Marital status</b>				
Single	10149077	4.7%	204515929	95.3%
Married	83819616	<b>12.8%</b>	569739444	87.2%
Separated/divorced/widow/Others	5553068	8.6%	58710660	91.4%
<b>Caste</b>				
SC	22676990	12.7%	155314853	87.3%
ST	10512050	<b>12.7%</b>	72174859	87.3%
OBC	41802848	9.9%	380359877	90.1%
Others	24529873	9.8%	225116444	90.2%
<b>Religion</b>				
Hindu	79136298	10.6%	670026876	89.4%
Muslim	15914643	12.0%	116649183	88.0%
Christian	2825170	12.9%	19035541	87.1%
Buddhism	534726	7.2%	6863678	92.8%
Sikh	816229	5.4%	14353190	94.6%
Others	294696	4.7%	6037566	95.3%
<b>Education</b>				
No education	35120271	14.3%	211108052	85.7%
Primary	28676940	15.0%	162779261	85.0%
Secondary	25312364	8.8%	263113679	91.2%
Higher	10373971	5.0%	195437592	95.0%
<b>Occupation</b>				
Government Employee	2726439	10.7%	22721033	89.3%
Non-Government Employee	9234654	11.9%	68213334	88.1%
Labourer	37205802	18.8%	160768251	81.2%
Self-Employed	33936439	18.8%	146618849	81.2%
Homemaker	1534817	1.4%	109606881	98.6%
Student	6106634	2.2%	274225861	97.8%
Retired	2592101	13.3%	16918634	86.7%
Unemployed	6132453	15.4%	33568682	84.6%
<b>Type of Residence</b>				
Urban	26564865	8.3%	295083564	91.7%
Rural	72956896	11.9%	537882470	88.1%
<b>Region</b>				
North	11505963	14.2%	69645130	85.8%
Central	33221870	12.2%	238359934	87.8%
East	20791661	10.3%	181392134	89.7%
North East	5824099	16.8%	28741141	83.2%
West	7193275	5.1%	132883764	94.9%
South	20984893	10.3%	181943930	89.7%

**Table 2: Prevalence of smoking and non-smoke use of tobacco according to selected background characteristics in India, GATS-2016-17.**

Occupation is a significant determinant, with laborers and self-employed individuals exhibiting higher smoking rates (18.8%). Government employees and retirees, conversely, display lower prevalence, suggesting occupational disparities in smoking habits. Residence type differentiates smoking prevalence, with urban areas presenting lower rates (8.3%) compared to rural regions (11.9%). This

urban-rural divide highlights the importance of tailoring interventions to address specific regional contexts. In figure 2, the regional variations in smoking prevalence are evident, with the North East region having the highest prevalence (16.8%) and the West exhibiting the lowest (5.1%). The development of focused smoking cessation initiatives requires an understanding of these regional differences.

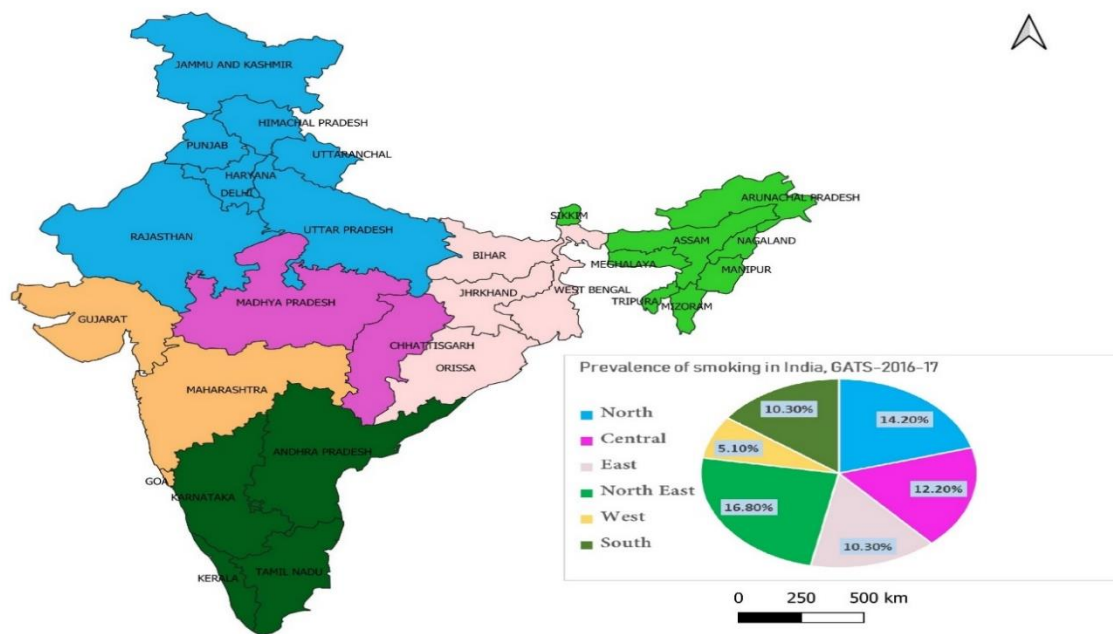


Figure 2. Zone wise prevalence of smoking in India, GATS-2016-17

Table 3 results demonstrate the complex interactions between demographic parameters that impact tobacco usage in India. Understanding these variables in depth is necessary to create public health policies that effectively address the various requirements of various demographic segments through specific treatments. Table 3 presents the results of a multivariable binary logistic regression analysis, offering insights into the determinants of smoking in India based on the 2016–17 Global Adult Tobacco Survey (GATS). Several explanatory variables are examined, shedding light on the significant factors associated with smoking prevalence. The residence type variable indicates that individuals in rural areas are 1.629 times more likely to be smokers compared to their

urban counterparts. This emphasizes the need for region-specific anti-smoking initiatives, recognizing the distinct characteristics of rural communities. Age emerges as a significant factor, with a clear trend showing decreasing odds of smoking with increasing age. Individuals in the 15–24 age group have the highest likelihood of being smokers, while the odds decrease for the 25–44 and 45–64 age groups. This age-related pattern emphasizes the importance of age-tailored interventions to address varying susceptibility to smoking across different life stages. Gender disparities in smoking prevalence are stark, with females having a substantially higher likelihood of being smokers (13.023 times) compared to males. This gender divide emphasizes the necessity



for gender-specific approaches in anti-smoking campaigns.

Explanatory variables	B	Std. Error	Wald	d f	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
<b>Type of Residence</b>								
(Urban)®				0				
Rural	0.488	0.029	285.89	1	0.000	1.629	1.539	1.723
<b>Age groups</b>								
65 and above®				0				
(15–24)	1.354	0.063	456.331	1	0.000	3.872	3.42	4.385
25–44	0.214	0.046	21.614	1	0.000	1.238	1.131	1.355
45–64	-0.167	0.048	12.221	1	0.000	0.846	0.77	0.929
<b>Gender</b>								
(Male)®				0				
Female	2.567	0.039	4408.889	1	0.000	13.023	12.073	14.048
<b>Smoking causes serious illness (awareness)</b>								
(Yes)®				0				
No	0.017	0.054	0.098	1	0.754	1.017	0.915	1.131
<b>Smoking causes stroke</b>								
(Yes)®				0				
No	-0.148	0.039	14.122	1	0.000	0.862	0.798	0.932
<b>Smoking causes heart attack</b>								
(Yes)®				0				
No	-0.078	0.048	2.64	1	0.104	0.925	0.842	1.016
<b>Smoking causes lung cancer</b>								
(Yes)®				0				
No	-0.365	0.073	25.024	1	0.000	0.694	0.602	0.801

Note: The reference category is: ®Yes. This parameter is set to zero because it is redundant

Table 3: Multivariable binary logistic regression for smokers in India, GATS-16-17.

Interestingly, awareness of certain health risks associated with smoking influences smoking behavior. Those aware that smoking causes stroke and lung cancer demonstrate a lower likelihood of being smokers. However, awareness of smoking causing serious illness or heart attacks does not significantly impact smoking behavior. These findings highlight the role of health education in shaping attitudes towards smoking and emphasize the need for targeted awareness campaigns. Logistic regression analysis provides a valuable understanding of the factors influencing smoking in India. The results suggest the importance of tailoring interventions based on residence type, age, gender, and specific health awareness components. Implementing

targeted strategies informed by these findings can contribute to more effective tobacco control efforts in the country.

## CONCLUSION

This study provides a detailed analysis of tobacco consumption trends in India, synthesizing data from NFHS-5 and GATS-2. Despite regulatory efforts, tobacco use remains a formidable public health concern, necessitating targeted interventions. The observed declines in tobacco use prevalence suggest potential positive impacts of public health measures, but regional variations emphasize the dynamic nature of this challenge. The complex relationship between age, gender, type of dwelling, and health consciousness and smoking behaviour is

demonstrated by socioeconomic correlates. The logistic regression analysis elucidates the multifaceted determinants of smoking, emphasizing the need for tailored interventions. The study contributes to bridging research gaps, offering valuable insights for policymakers, public health professionals, and researchers engaged in effective tobacco control strategies. The complex relationship between smoking behaviour and residence type, age, gender, and health awareness are demonstrated by socioeconomic correlates.

#### **Declaration by Authors**

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