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Trends and determinants of tobacco use initiation in India: analysis of two rounds of the Global Adult Tobacco Survey

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ABSTRACT

Objectives Early initiation of tobacco use can lead to lifelong addiction and increases tobacco-attributable morbidity and mortality. This study assesses trends in tobacco use initiation and factors associated with tobacco use initiation using disaggregated data from two rounds of the Global Adult Tobacco Survey India (GATS; 2009–2010 (GATS 1) and 2016–2017 (GATS 2)).

Design Secondary analysis of repeated cross-sectional studies.

Settings and participants The study involved data from 69 296 individuals and 76 069 households in GATS 1 and 74 037 individuals and 77 170 households in GATS 2, two rounds of a nationally representative survey in India.

Outcome measures Mean age of initiation (as recalled by the participants) of smoked and smokeless tobacco (SLT) use (dependent variable) was compared and analysed across different sociodemographic variables (independent factors). We assessed change in mean age of initiation of tobacco usage on a daily basis between GATS 1 and GATS 2, and investigated the factors associated with early tobacco use initiation in the GATS 2 dataset (reported using adjusted ORs (aORs) with 95% CIs).

Results The mean age of initiation of smoked tobacco and SLT in GATS 2 was 20.9±8.5 and 22.3±10.6 years, compared with 18.5±9.7 and 19.7±12.0 years in GATS 1. The mean age of initiation increased with age and among those who were better aware of the adverse effects of tobacco. As per GATS 2, males initiated smoked tobacco and SLT use earlier (20.6±7.4 and 21.7±9.1) than females (23.3±14.2 and 23.2±12.6 years). Younger participants (15–24 years) reported earlier initiation of SLT (15.5±4.2 years) compared with others. Binary logistic regression depicted variables associated with early initiation of tobacco. Awareness about the harms caused by tobacco affected the odds of SLT (aOR 1.4, 95% CI 1.3 to 1.7) and dual usage initiation (1.8, 1.6 to 2.0), but not of initiation of smoked tobacco products (1.1, 0.9 to 1.2).

Conclusions More robust health advocacy campaigns that communicate the harmful effects of tobacco on health could be useful to delay tobacco initiation, along with reducing the ease of access and affordability of tobacco products among vulnerable groups.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Large and nationally representative data on tobacco use from India were analysed.
⇒ Factors associated with early initiation were estimated through a weighted analysis highlighting feasible, actionable points.
⇒ Caution should be used when considering the adoption of recommendations in countries with similar sociodemographic indexes.
⇒ The cross-sectional study design of the surveys may lead to recall bias about the exact time of initiation and can be seen as an important limitation.

INTRODUCTION

Tobacco use remains a leading risk factor for morbidity and mortality globally.[1 2] According to the Global Burden of Disease 2019 estimates, all tobacco use accounted for at least 8.71 million deaths.[3] Further, majority of the smokeless tobacco (SLT) and smoked tobacco users belong to South East Asia including India. The region alone accounts for 81% and 22% of SLT and smoked tobacco users aged 15 years and above.[4] Despite this, tobacco companies continue to market products and target vulnerable populations such as youth and women, particularly those in low-income and middle-income countries.[5] Adolescents and young adults are particularly susceptible to developing an addiction to tobacco products.[6] The age of initiation of tobacco use can predict the intensity of dependence and potential quit rates in the future.[7] This is because nicotine induces persistent changes in neural connectivity in several brain areas like the amygdala, which are involved with emotion regulation and make them more sensitive to the rewarding effects of nicotine.[8] Young people underestimate the addictive potential of nicotine and overestimate their likelihood of quitting in the future.[9] Early initiation is attributed to a higher risk of chronic diseases, increased

psychological disturbances, decreased performance, and increased health costs to the individual and society.[10 11] Regular nicotine consumption at an early age may induce epigenetic modifications that sensitise the brain to other drugs and further increase the risks of future substance abuse.[12] Overall, substantial proof informs us that early initiation of tobacco use is critical in deciding the fate of the tobacco epidemic.[13]

Understanding why and when people start using tobacco can help prevent or delay initiation. Many factors contribute to tobacco initiation at young ages. Still, the two leading contributors are the easy availability of tobacco products and environmental risk factors, including personal attitudes and beliefs about smoking, peer pressure, family dynamics, socioeconomic status and exposure to advertisements.[7 14] Further, knowledge of the average age of initiation is critical in realising national goals concerning tobacco use and related health burden.[15] Previous studies provide evidence that despite more addiction at younger ages, quitting may also be more successful because of the availability of new tools for quitting, such as nicotine gum and patches, and better awareness among the younger generations about the adverse effects of smoking.[16 17] Knowing the age of initiation can help inform policymakers about investments needed for cessation programmes and avert tobacco-related disease and death through age-appropriate interventions. For instance, tobacco use by young people is generally more responsive to changes in taxes and prices of tobacco products than older people.[18] Further, when implemented as part of comprehensive tobacco control programmes, school-based tobacco education programmes improve knowledge, contribute to de-normalising tobacco use and deter initiation.[18] Currently, the most vital interventions in this regard from India include increasing the age of sale or purchase of any form of tobacco products at the point of sale from the current 18 years (under section 6a of the Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply, and Distribution) Act, 2003) to 21 years.[19] Additional policies, such as vendor licensing, restricting marketing and sales, and smoke-free spaces, can supplement tobacco control.[13]

Given the enormous sociocultural diversity across jurisdictions in India, there is an urgent need for a population-based estimate that informs us regarding the age of initiation of tobacco use and the prevailing trends. Within this context, the Global Adult Tobacco Survey (GATS) allows us to study the pattern of tobacco initiation for smoked tobacco and SLT products. To date, India has conducted two rounds of GATS which collect data related to the age of initiation across states and different sociodemographic indicators. Therefore, this study aims to investigate and compare the trends in tobacco initiation in India, and to explore the factors associated with early tobacco use initiation among tobacco users using disaggregated data from two rounds (2009–2010 and 2016–2017) of the GATS India. The estimates will be useful for informing policymakers to design effective prevention strategies and efficiently allocate human and financial resources.

METHODS
Study design and data source
The current secondary data analysis uses data from repeated cross-sectional studies, specifically from rounds of the GATS done for India in 2009–2010 and 2016–2017.[20 21] We assessed change in mean age of initiation of tobacco usage on a daily basis between GATS 1 and GATS 2 and investigated the factors associated with early tobacco use initiation using the most recent dataset (GATS 2).

GATS 1 and 2 were household surveys of persons aged 15 years or older. The studies involved 69 296 individuals and 76 069 households in GATS 1 and 74 037 individuals and 77 170 households in GATS 2. Overall response rates were 91.8% and 92.9% in GATS 1 and GATS 2, respectively. The surveys collected nationally representative data from all 29 states and 2 union territories (UTs) in GATS 1, and all the 30 states of India (1 extra state added due to division of existing state) and 2 UTs in GATS 2 using a multistage, geographically clustered sample design to produce data representative of each state and UT. The survey segregated India's states and UTs into six regions (north, west, east, south, central and northeast). The three-stage sampling process was adopted for urban areas, while the two-stage method was adopted to get the sample size for rural areas. The nationally representative probability sample was used to provide national and regional estimates by residence and gender and state estimates by gender. One individual was randomly chosen from each selected household to participate in the surveys. The surveys were designed to produce internationally comparable data on tobacco use and other tobacco control indicators using a standardised questionnaire, sample design, data collection and management procedures. Both rounds have almost the same questionnaire, with a few questions added in the GATS 2. The detailed methodology of the GATS 1 and 2 is described in the official reports available in the public domain.[20 21]

Study variables
Dependent variable
Age of initiation was the primary dependent variable. For this, we first segregated the GATS participants as tobacco users (daily users and less than daily) and non-users (not at all, don't know, refused, missing/not applicable). Then, we estimated the current smokers, SLT and dual users. Current smokers were estimated using the question: *Do you currently use smoked tobacco products? (daily, less than daily, not at all, don't know, refused, missing/not applicable).* Current SLT users were estimated from the question: *Do you currently use smokeless tobacco? (daily, less than daily, not at all, don't know, refused, missing/not applicable).* To calculate dual users, we used the newly constructed outcomes

of variables: *Do you currently use smoked tobacco products? (daily, less than daily, not at all, don't know, refused, missing/ not applicable)* and *Do you currently use SLT? (daily, less than daily, not at all, don't know, refused, missing/not applicable)* to identify the respondents currently using both forms of tobacco. The responses *daily* and *less than daily* were clubbed into one category, 'yes'; and others ('don't know' and 'refused') were categorised into the response 'no'. From the tobacco users, we estimated the age of initiation using the questions: *How old were you when you first started smoking tobacco daily?* and *How old were you when you first started using SLT daily?* The recalled age of initiation of tobacco was recoded into four categories: <15 years, 16–18 years, 19–21 years and >21 years.

Independent variables

The independent variables were included based on a literature review, and the subcategories were created per the GATS standard coding protocol.[22 23] We included age (15–24 years, 25–44 years, 45–60 years and >60 years); gender (male, female); residence (urban, rural); national region (all states/UTs of India were divided into six geographical regions for analysis—the northern region consists of Jammu and Kashmir, Himachal Pradesh, Punjab, Chandigarh, Uttarakhand, Haryana and Delhi; the central region includes Rajasthan, Uttar Pradesh, Chhattisgarh and Madhya Pradesh; the eastern region contains West Bengal, Jharkhand, Odisha and Bihar; the northeastern region includes Sikkim Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and Assam; the western region consists of Gujarat, Maharashtra and Goa; and the southern region consists of Andhra Pradesh (later divided into Andhra Pradesh and Telangana), Karnataka, Kerala, Tamil Nadu and Puducherry); education (no formal education, primary school completed (less than primary school completed+primary school completed), secondary school completed (less than secondary school completed+secondary school completed), higher secondary school and above (higher secondary school completed+college/university completed+postgraduate degree completed, don't know (don't know+refuse) for both the rounds); occupation (employee (government+non-government+daily wagers), self-employed+retired, student+homemaker, unemployed (able to work+unable to work), don't know+refused); and knowledge about the harmful effects of tobacco (*based on what you know or believe, does smoking tobacco cause serious illness?* and *Based on what you know or believe, does using SLT cause serious illness?* for smoked tobacco and SLT products). The values 'yes' were labelled as yes, and the values 'no, don't know, refused and missing/not applicable' were clubbed together as 'no' for this study.

Statistical analysis

The data were analysed in SPSS V.24 software. All analyses were performed separately for smoked tobacco, SLT and dual-use tobacco products. The mean age (±SD) of initiating tobacco products was calculated and compared across all the independent variables included in our study. Student's t-test was used to compare the difference in mean age in two rounds of GATS. Logistic regression models were run to estimate the adjusted OR and 95% CI of the association of independent variables with early initiation of tobacco usage. For this, early initiators were classified as those who started consuming tobacco before 18 years, per the Cigarette and Other Tobacco Products Act (COTPA) 2003. Using variance inflation factor values, we tested for multicollinearity between the covariates. Sampling weights were applied, and weighted estimates were calculated to account for the complex study design due to clustering and stratification. All p values were two sided, and p<0.05 indicated statistical significance.

Patient and public involvement

None.

RESULTS

As per GATS 2, about 10.7% and 21.4% of the participants were daily smokers and SLT users, while 3.4% were dual users (table 1). Tobacco use in any form was more prevalent in older men and those who live in rural settings. It is particularly high among those who live in northeastern India. Those with limited schooling, and unemployed, self-employed, and retired men consumed more tobacco. Users unaware of the harms caused by tobacco use have a higher prevalence of tobacco use.

Table 2 depicts the mean age of initiation of smoked tobacco and SLT products across the two waves of GATS India. Overall, the mean age of initiation of smoked tobacco and SLT in GATS 2 was 20.9±8.5 and 22.3±10.6 years, compared with 18.5±9.7 and 19.7±12.0 years in GATS 1. The mean age increased across all age groups in both genders from GATS 1 to GATS 2. As per GATS 2, the mean age of initiating smoking and SLT use was lower in rural areas (20.8±11.6 and 19.3±12.0 years) compared with urban areas (21.0±7.9 and 20.5±11.6 years). There is a relative increase in the mean recalled age of initiation of smoked tobacco throughout the country for smoked tobacco and SLT products, except for south India, which depicted a non-significant increase in the age of initiation of SLT. Also, students and homemakers depicted a non-significant increase in the initiation age for smoking tobacco. Respondents who were aware that tobacco causes serious illness reported a higher mean recalled age of initiation among daily tobacco users.

Using logistic regression, we identified factors associated with early initiation of daily tobacco usage (table 3). Early initiation of daily smoking depicted higher odds among males, older participants (>60 years), unemployed, those who live in rural areas and the northeastern region of India. A similar trend occurs for SLT products, except for the higher odds observed in those who had studied up to primary school and those who were employed, self-employed, students and homemakers. Likewise, early dual usage is observed among men between 25 and 44

Table 1 Demographic characteristics of current tobacco users from the second round of Global Adult Tobacco Survey India (GATS, 2016–2017)

Sample characteristics	GATS sample distribution	Current smoker		Current smokeless tobacco user		Dual user	
		N	Weighted prevalence (95% CI)	N	Weighted prevalence (95% CI)	N	Weighted prevalence (95% CI)
Overall	74037	9499	10.7 (10.2 to 11.1)	15235	21.4 (20.7 to 22.1)	2877	3.4 (3.2 to 3.7)
Gender							
Male	33772	8434	19.0 (18.2 to 19.9)	9561	29.6 (28.7 to 30.6)	2509	6.3 (5.8 to 6.8)
Female	40265	1065	2.0 (1.7 to 2.3)	5584	12.8 (12.0 to 13.5)	368	0.5 (0.4 to 0.7)
Age group							
15–24 years	12105	576	3.1 (2.6 to 3.7)	1266	10.5 (9.6 to 11.5)	231	1.7 (1.3 to 2.2)
25–44 years	34841	4440	10.9 (10.3 to 11.6)	7706	23.3 (22.3 to 24.2)	1546	4.1 (3.8 to 4.5)
45–60 years	16732	2854	16.9 (15.9 to 17.8)	3959	27.3 (26.0 to 28.6)	739	4.2 (3.7 to 4.8)
>60 years	8412	1432	15.8 (14.6 to 17.1)	1956	28.7 (27.0 to 30.5)	291	3.6 (3.0 to 4.3)
Education completed							
No formal schooling	18473	2754	14.3 (13.4 to 15.2)	4889	28.9 (27.7 to 30.1)	764	4.2 (3.8 to 4.8)
Primary school	16368	2909	15.0 (14.0 to 16.0)	4610	28.6 (27.3 to 29.8)	1022	5.3 (4.7 to 6.0)
Secondary school	22440	2681	8.8 (8.2 to 9.4)	4155	18.9 (17.9 to 19.9)	799	3.0 (2.6 to 3.4)
Higher secondary school and above	16697	1151	5.0 (4.5 to 5.6)	1571	9.2 (8.3 to 10.2)	291	1.4 (1.1 to 1.8)
Occupation							
Employed	23363	4571	16.3 (15.5 to 17.3)	6544	30.5 (29.3 to 31.8)	1449	5.8 (5.2 to 6.4)
Self-employed and retired	20089	3322	12.2 (11.3 to 13.1)	4508	20.3 (19.3 to 21.4)	1002	4.0 (3.5 to 4.4)
Students and homemakers	27304	1052	3.2 (2.9 to 3.6)	3459	13.1 (12.2 to 13.9)	273	0.7 (0.6 to 0.9)
Unemployed	3251	551	13.7 (11.9 to 15.8)	722	23.2 (20.7 to 26.1)	153	3.0 (2.2 to 4.1)
Residence							
Urban	26488	2519	8.3 (7.7 to 8.9)	3618	15.2 (14.0 to 16.5)	662	2.3 (2.0 to 2.7)
Rural	47549	6980	11.9 (11.3 to 12.6)	11617	24.6 (23.8 to 25.4)	2215	4.0 (3.7 to 4.4)
Region							
North	17128	2136	14.2 (13.3 to 15.1)	979	7.4 (6.4 to 8.4)	297	2.2 (1.8 to 2.7)
Central	11518	1438	12.2 (11.1 to 13.5)	3251	26.7 (25.2 to 28.3)	553	5.5 (4.8 to 6.2)
East	9834	1044	10.3 (9.5 to 11.2)	3052	26.8 (25.4 to 28.2)	444	3.7 (3.2 to 4.3)
Northeast	13574	3044	16.8 (15.6 to 18.2)	5155	40.5 (38.7 to 42.3)	1286	7.9 (7.1 to 8.8)
West	7901	431	5.1 (4.4 to 6.0)	1443	22.4 (20.4 to 24.6)	111	1.7 (1.2 to 2.2)
South	14082	1406	10.3 (9.6 to 11.1)	1355	10.5 (9.5 to 11.6)	186	1.5 (1.2 to 1.7)
Using tobacco causes serious illness							
Yes		8632/68182	10.5 (10.1 to 11.0)	14324/70798	21.0 (20.3 to 21.7)	2562/66897	3.4 (3.1 to 3.6)
No		867/5855	12.2 (11.0 to 13.6)	911/3239	29.5 (26.9 to 32.2)	315/7140	4.4 (3.7 to 5.4)

Table 2 Comparison of the mean age of tobacco initiation among the daily users as per the two rounds of Global Adult Tobacco Survey (GATS) India

Characteristics	Daily smoked tobacco			Daily smokeless tobacco		
	GATS 1 Mean±SD	GATS 2 Mean±SD	P value	GATS 1 Mean±SD	GATS 2 Mean±SD	P value
Number total	N=9223	N=7647		N=13410	N=12721	
Overall	18.5±9.7	20.9±8.5	<0.01	19.7±12.0	22.3±10.6	<0.01
Gender						
Male	18.4±8.9	20.6±7.4	<0.01	19.6±10.7	21.7±9.1	<0.01
Female	18.8±14.5	23.3±14.2	<0.01	19.7±13.6	23.2±12.6	<0.01
Age group						
15–24 years	14.1±6.3	16.1±3.4	<0.01	14.1±6.3	15.5±4.2	<0.01
25–44 years	17.6±8.1	19.3±5.8	<0.01	18.3±9.0	20.2±6.9	<0.01
45–60 years	19.6±10.5	22.1±9.1	<0.01	21.9±13.4	24.7±11.5	<0.01
>60 years	20.7±13.4	24±12.2	<0.01	26.9±18.7	28.2±16.5	<0.01
Education						
No formal schooling	18.6±11.2	21.2±10.4	<0.01	20.2±13.6	23.1±12.7	<0.01
Primary school	17.9±9.2	20.3±7.5	<0.01	19.3±11.5	21.8±9.9	<0.01
Secondary school	18.6±8.6	20.7±7.5	<0.01	19.3±10	21.5±8.5	<0.01
Higher secondary school and above	18.9±8.6	21.8±6.9	<0.01	19.6±10.6	22.4±8.2	<0.01
Occupation						
Employed	19.2±8.2	20.4±7.3	<0.01	19.5±10.2	21.4±9.1	<0.01
Self-employed and retired	18.5±13.1	20.7±7.5	<0.01	19.5±13.7	22.1±9.4	<0.01
Students and homemakers	18.0±9.3	22.8±12.9	0.9	19.7±11.5	23.6±13.3	<0.01
Unemployed	18.2±12.4	22.3±10.8	<0.01	20.4±13.4	23.8±13.1	<0.01
Residence						
Urban	19.1±8.7	21.0±7.9	<0.01	20.5±11.6	22.6±10.7	<0.01
Rural	18.1±10.1	20.8±8.6	<0.01	19.3±12.0	22.1±10.5	<0.01
Region						
North	19.2±8.7	21.3±8.4	<0.01	20.7±10.6	22.2±9.0	<0.01
Central	19.9±9.1	21.1±9.7	<0.01	20.6±12.3	21.5±11.2	<0.01
East	19.5±9.6	22.1±8.8	<0.01	20.4±11.1	23.0±11.1	<0.01
Northeast	15.8±10.5	19.5±7.3	<0.01	16.7±11.7	21.5±9.0	<0.01
West	20.5±9.1	22.4±9.4	<0.01	20.8±11.4	21.9±10.2	<0.01
South	20.1±8.9	21.5±8.5	<0.01	23.2±13.2	25.2±12.8	0.7
Using tobacco causes serious illness						
No	18.6±9.5	20.9±8.3	<0.01	19.8±11.7	22.2±10.4	<0.01
Yes	17.3±10.6	21.2±9.4	<0.01	18.7±12.2	22.7±12.5	<0.01

years and those residing in northeastern India. Awareness about the harms caused by tobacco affected the odds of SLT and dual usage initiation, but not the initiation of smoked tobacco products.

DISCUSSION

The study investigates the age of initiation of tobacco use in India based on recall data from two rounds of GATS, a nationally representative survey of adults aged 15 years and above. The findings reveal several significant points.

First, the mean age of initiation significantly increased for smoked tobacco and SLT in GATS 2 (20.9±8.5 and 22.3±10.6 years), compared with GATS 1 (18.5±9.7 and 19.7±12.0 years) across different sociodemographic variables. Second, smoked tobacco had a lower age of initiation compared with SLT products in all age groups except the youngest. Third, we find regional variations in initiation age, with the northeastern and central India regions showing earlier initiation. Fourth, specific sociodemographic factors were associated with higher odds

Table 3 Binary logistic regression to explore factors affecting early initiation of daily tobacco usage as per the second round of the Global Adult Tobacco Survey India

	Smokers		Smokeless tobacco users		Dual users	
	Unadjusted OR (95%CI)	Adjusted OR (95% CI)	Unadjusted OR (95%CI)	Adjusted OR (95% CI)	Unadjusted OR (95%CI)	Adjusted OR (95% CI)
Gender						
Female	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
Male	11.7 (10.1 to 13.7)	14.9 (12.4 to 17.9)	2.8 (2.7 to 3.1)	3.1 (2.8 to 3.4)	13.1 (9.9 to 17.3)	12.0 (8.8 to 16.4)
Age group						
15–24 years	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
25–44 years	3.8 (3.2 to 4.6)	3.5 (2.9 to 4.3)	2.6 (2.3 to 2.8)	2.4 (2.1 to 2.7)	2.4 (1.8 to 3.2)	2.2 (1.6 to 3.1)
45–60 years	6.3 (5.2 to 7.6)	5.4 (4.5 to 6.6)	3.2 (2.8 to 3.6)	2.7 (2.4 to 3.1)	2.5 (1.8 to 3.4)	2.1 (1.6 to 2.9)
>60 years	5.8 (4.8 to 7.2)	5.0 (4.0 to 6.3)	3.4 (3.0 to 3.9)	3.2 (2.8 to 3.7)	2.1 (1.5 to 2.9)	2.0 (1.3 to 2.8)
Education						
Primary school	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
No formal schooling	2.2 (0.6 to 7.9)	3.4 (0.7 to 15.1)	1.0 (0.3 to 2.9)	0.9 (0.2 to 3.0)	1.5 (0.2 to 10.3)	1.7 (0.2 to 12.6)
Secondary school	1.3 (0.3 to 4.6)	1.4 (0.3 to 3.3)	0.6 (0.2 to 1.6)	0.5 (0.1 to 1.6)	1.0 (0.1 to 7.1)	0.9 (0.1 to 6.3)
≥Higher secondary school	0.7 (0.2 to 2.5)	0.7 (0.1 to 3.3)	0.2 (0.1 to 0.7)	0.2 (0.1 to 0.7)	0.4 (0.1 to 3.4)	0.4 (0.1 to 2.9)
Occupation						
Unemployed	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
Employed	1.2 (0.2 to 5.9)	0.7 (0.1 to 6.6)	12.8 (1.8 to 87.7)	22.9 (2.9 to 179)	0.9 (0.7 to 1.2)	0.7 (0.6 to 1.0)
Self-employed and retired	0.8 (0.1 to 4.2)	0.6 (0.1 to 5.6)	7.4 (1.1 to 50.9)	15.4 (1.9 to 120.9)	0.6 (0.5 to 0.7)	0.7 (0.6 to 0.9)
Students and homemakers	0.2 (0.0 to 1.0)	0.5 (0.1 to 4.7)	4.3 (0.6 to 29.9)	12.4 (1.5 to 97.2)	0.1 (0 to 0.1)	0.5 (0.3 to 0.6)
Residence						
Urban	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
Rural	1.5 (1.3 to 1.6)	1.2 (1.1 to 1.4)	1.8 (1.6 to 2.0)	1.2 (1.1 to 1.5)	1.7 (1.4 to 2.1)	1.2 (0.9 to 1.4)
Region						
South	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
North	1.4 (1.2 to 1.6)	1.7 (1.5 to 2.0)	0.7 (0.6 to 0.8)	0.7 (0.6 to 0.9)	1.5 (1.1 to 1.9)	1.7 (1.2 to 2.2)
Central	1.2 (1.1 to 1.3)	1.2 (1.1 to 1.4)	3.1 (2.7 to 3.6)	3.5 (3.0 to 4.1)	3.9 (3.0 to 4.9)	3.8 (3.0 to 4.9)
East	0.9 (0.8 to 1.1)	0.9 (0.7 to 1.0)	3.1 (2.7 to 3.6)	3.3 (2.9 to 3.9)	2.6 (2.0 to 3.3)	2.4 (1.8 to 3.0)
Northeast	1.7 (1.5 to 2.0)	1.9 (1.6 to 2.2)	5.8 (5.0 to 6.6)	7.1 (6.1 to 8.2)	5.8 (4.6 to 7.2)	5.7 (4.5 to 7.2)
West	0.4 (0.3 to 0.5)	0.4 (0.3 to 0.5)	2.4 (2.1 to 2.9)	2.7 (2.3 to 3.3)	1.1 (0.7 to 1.6)	1.1 (0.8 to 1.7)
Using tobacco causes serious illness						
Yes	Ref value	Ref value	Ref value	Ref value	Ref value	Ref value
No	1.1 (1.0 to 1.3)	1.1 (0.9 to 1.2)	1.5 (1.3 to 1.8)	1.4 (1.2 to 1.7)	1.5 (1.3 to 1.7)	1.8 (1.6 to 2.0)

of early tobacco initiation. Lastly, awareness campaigns about tobacco's harmful effects affect SLT and dual usage initiation, but not smoking initiation.

The trend of increasing age of initiation of various tobacco products across sociodemographic groups is promising and could be attributed to strategies like MPOWER, including anti-tobacco advertisements and bans on vending machines and promotions.[24] However, there is room for stricter advertising bans and higher tobacco taxes. Compliance with smoke-free policies has improved between 2011 and 2015. Although taxes on tobacco products increased by 14% between 2010 and 2014, they remain lower than recommended (75%) by the WHO and are known to be one of the most decisive measures of tobacco control in India.[25–29] Though the affordability of cigarettes has declined since 2010, accessibility and affordability of bidis, a significant smoked tobacco product in India, remain a concern. Studies have found that a substantial increase in taxes on tobacco products at par with increasing income can reverse the affordability of these products.[30 31]

Notably, the study found that people aged 15–24 years started tobacco use at an average age of 14 years in GATS 1 and 16 years in GATS 2. Early initiation increases the risk of severe nicotine dependence, making quitting harder and leading to health issues.[14] Easy accessibility and affordability are the two parameters responsible for the early initiation of tobacco, worsened by ineffective COTPA implementation. In a recent study by Ali *et al*, the compliance with policies that protect minors and youth (Section 6a and 6b of COTPA) was 68.57% and 52.85%, respectively, in open spaces in Delhi.[32] Therefore, the policies that restrict minors' access to tobacco and align with the WHO's Framework Convention on Tobacco Control are essential. We also need to design and implement interventions that alter various factors that facilitate early tobacco initiation and encompass personal, psychological, social, cultural and environmental factors. A systematic review on predictors of smoking initiation among adolescents aged <18 years found 98 such potential predictors.[33] Furthermore, there is a contrast between the age of initiation of smoked tobacco and SLT products. The mean age of initiating SLT was highest in the youngest age groups, indicating the need for targeted interventions. This is coherent with the findings from the Global Youth Tobacco Survey India, where the majority of the participants (52%) initiated SLT use before their 10th birthday, followed by bidi (47%) and cigarette (38%), with a median age of 9.9, 10.5 and 11.5 years, respectively.[34] However, the influence of different factors affecting tobacco use in the younger age groups makes abstinence difficult, and even with evidence-based cessation interventions, relapse is common due to altered mood, withdrawal symptoms and cravings.[35] The ultimate aim, however, should be to prolong abstinence that helps mitigate tobacco harm through proven interventions like physical activity, enhanced cessation counselling sessions, incentives, behaviour change programmes and

pharmacotherapy like nicotine gums and patches.[36] But such efforts are scarce in resource-constrained settings, and previous studies suggest that only 3–5% of smokers who try to quit unaided achieve prolonged abstinence at 6–12 months.[37] Such people with relapse can still be offered help through the tobacco harm reduction approach, where smoked tobacco or SLT products are substituted by low-risk nicotine products, and is currently being acknowledged widely for benefits not achieved by adopting abstinence.[38 39]

There were higher odds of early initiation of tobacco per certain sociodemographic factors assessed in our study. The less educated people do not know about the harmful effects of tobacco and do not even try to look into the statutory warnings as those do not make any sense to them.[40] The affordability of tobacco products can be the reason for higher consumption among employed people. As discussed earlier, rural areas have more access to local tobacco products that bypass the legal restrictions, promoting easy access at earlier ages.[41] Another geospatial analysis from the USA depicted that more tobacco products are available at a unit cost in rural areas compared with urban settlements as the industry targets disadvantaged populations for their sales.[42] Prioritising the strengthening of retail-focused tobacco control measures could counter easy accessibility, even in rural areas. Regional differences play a role too, with the northern and northeastern regions showing earlier initiation. This is possibly due to cultural practices adopted by different communities. Though perceived as an individual habit, tobacco use often acquires a ritualistic character involving group behaviour. A commonly cited example of the ritual aspect of tobacco consumption would be the use of the hookah by the northern rural Indian men, who usually assembled in caste-based or social class-based groups to share a hookah in daily gatherings.[43] Further, easy access to local tobacco products deeply embedded in cultural practices normalises tobacco use. It is sometimes also considered a healthy alternative to commercial tobacco products that promotes their usage.[44 45] This, in turn, is also affected by the awareness regarding the harmful effects of tobacco among the residents of that region.[17] Also, if females are more into tobacco consumption, then the age of initiation can even be lower, as they tend to consume tobacco within their houses, thus exposing children at an early age.[46 47] Therefore, multitudes of social and cultural practices also need to be recognised to comprehend tobacco use across social, religious and ethnic subgroups.

We observed that the awareness regarding the harmful effects of tobacco significantly affected the odds of early initiation of SLT and dual usage, but not for smoking. Thus, intensive and more focused awareness campaigns about the harmful effects of tobacco consumption among the general population can mitigate new initiations among minors and youth.[17] On similar lines, education also plays a role, with higher education linked to lower odds of early initiation. Several studies have found a positive impact of education on tobacco use.[13 48 49] The

collaboration of the Ministries of Education and Information and Broadcasting could enhance awareness efforts, including regulating tobacco-related internet content. One of the significant drawbacks of tobacco control laws is their partial implication on content available on the internet without any statutory warning. It is still uncommon to see any statutory warnings on the media content delivered through over-the-top internet-based streaming platforms that exhibit tobacco use or violate tobacco control laws.[50]

Strengths of the study include its use of nationally representative data, offering generalisability and comparability with other countries participating in GATS. A comprehensive multistage sampling design provides robust estimates crucial for planning and management at the national and subnational levels. However, one of the significant limitations of the secondary analysis is the limited availability of the study variables. Many other factors may affect our study results, like exposure to tobacco through family members, etc. There is a chance of recall bias that may affect our estimates regarding the age of initiation; hence, we preferred to label it as a recalled age of initiation. The cross-sectional nature of the survey makes it difficult to ascertain temporal associations. The self-reported data in the survey may be affected by social desirability bias.

The study's policy implications suggest a need to address geographical disparities and further reduce the tobacco burden. We have to ensure a reduced tobacco burden to ensure healthy living, similar to several member states of the European region that have pledged to become tobacco free and achieve a smoking prevalence of less than or equal to 5%.[51] Though tobacco control policies in India have reduced the prevalence of tobacco use from 34.5% to 28.5% between two rounds of the GATS, there is a need to revamp and develop policies targeting disparities. Proposals include raising the legal age for buying tobacco products, licensing all points of sale and standardising packaging to deter single-cigarette sales and ensure prominent health warnings. The sale of single or loose cigarettes and other unpackaged tobacco products must be brought under a standardised packaging policy. The sale of single cigarettes also circumvents the mandatory pack health warnings.[40] Adopting and implementing tobacco-free educational institution guidelines can contribute to a tobacco-free generation.

Conclusions

This study highlights the increasing age of tobacco initiation in India across different products and demographics. While positive trends are observed, challenges like affordability, accessibility and awareness persist. The findings underscore the need for comprehensive policies, stricter regulations and targeted awareness campaigns to reduce tobacco initiation among minors and youth, promoting a healthier society.

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