

# Prevalence and Predictors of Hardcore Smoking in India:- Findings from the Global Adult Tobacco Survey (2016–2017)

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## Abstract

**Background:** Hardcore smokers are of significant public health concern having a greater risk of developing tobacco-related diseases. **Objective:** This study aimed to identify burden of hardcore smokers, its distribution, and determinants in India. **Subjects and Methods:** Analysis of Global Adult Tobacco Survey India 2016–2017 data was carried out. Hardcore smoking was defined when the following criteria were fulfilled – current daily cigarette smoking for at least 5 years, no quit attempt in past 12 months, no intention to quit in next 12 months, and time to first smoke within 30 min of waking up. Independent variables included sociodemographic, knowledge of side effects, indoor smoking policy, and age of smoking initiation. Multivariable logistic regression was carried out, with adjustment for clustering, stratification, and sampling weight. **Results:** Proportion of hardcore smoking among the general population and current daily smokers were 3.43% and 32.3%, respectively. In the adjusted model, it was found to be significantly associated with increasing age, earlier initiation of daily smoking, tribal caste, and unfavorable indoor smoking policy. **Conclusion:** Tobacco control strategies should be modified to tackle these issues, especially early age of initiation of daily smoking and indoor smoking policy.

**Keywords:** Current daily smoker, Global Adult Tobacco Survey, hardcore smoker, indoor smoking policy

## INTRODUCTION

Tobacco use is a global public health threat, killing yearly around 7 million people.<sup>[1]</sup> The World Health Organization highlighted India as a high tobacco burden country attributing 9.5% of all global tobacco-related death.<sup>[2,3]</sup> Prevalence of adult smoking is showing a decreasing trend in India, i.e., 14% in Global Adult Tobacco Survey (GATS)-1 versus 10.7% in GATS-2.<sup>[3,4]</sup> which may be the result of legislative measures (the Cigarettes and Other Tobacco Products Act, 2003 [COTPA])<sup>[5]</sup> and National Tobacco Control Programme.<sup>[6]</sup> Evidence shows that with a decline in smoking prevalence, there is a possibility that certain subpopulations continue to smoke at disproportionately high rates.<sup>[7]</sup> This phenomenon may be explained by the hardcore hypothesis which suggests that as smoking prevalence decreases in a population, lighter smokers will quit first, leaving more “hardcore” smokers.<sup>[8]</sup> However, counter arguments also exist on this hypothesis.<sup>[9]</sup> “Hardcore” smoker is generally referred to as the proportion of smokers who are completely unwilling or unable to quit and are likely to remain so,<sup>[10]</sup> having similar characteristics as those of pre-contemplators in the “Trans-theoretical Model

of behaviour change.”<sup>[11]</sup> Nicotine dependence, intention to quit, self-efficacy, and motivation to quit are frequently used constructs to define hardcore smoking.<sup>[12]</sup> They are identified as having a significantly higher risk for themselves, their family, and community.<sup>[12]</sup> Most of the studies on hardcore smoking were conducted in western countries<sup>[8,13]</sup> where stages of tobacco epidemics are advanced;<sup>[14]</sup> but there is a research gap on studies conducted in India, where the tobacco epidemic seemed to be delayed. In the Indian context, Kishore *et al.*<sup>[15]</sup> analyzed GATS-1 dataset to understand the burden of hardcore smokers in India. However, only a few sociodemographic factors were used as covariates. Now, after almost 10 years of implementation of National Tobacco

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Control Programme and COTPA, it is of utmost importance to identify this at-risk population and their characteristics so that this subpopulation can be targeted using specific interventions. With this background, this study was undertaken to assess the prevalence of hardcore smoking in India and identify the factors associated with it using nationally representative tobacco survey data (GATS-2).

## SUBJECTS AND METHODS

This study is an analysis of the GATS-2 India 2016–2017 data. GATS is a nationally representative survey for systematically monitoring adult tobacco use and tracking key tobacco control indicators. The current household survey (GATS-2) was conducted among persons 15 years of age or older in 30 states and two Union Territories of India, between August 2016 and February 2017 where a total of 74,037 individuals were interviewed.<sup>[16]</sup>

The outcome variable “hardcore smoking” was said to be present when all the following four criteria were present: Current daily cigarette smoking for at least 5 years, no quit attempt in the past 12 months of survey, no intention to quit in next 12 months or not interested in quitting, and time to first smoke within 30 min of waking up. The items are identified based on the conceptual framework described by Darville and Hahn.<sup>[12]</sup> Nonhardcore smoker was a current daily cigarette smoker who did not meet any of the defining criteria of hardcore smoking. The number of cigarettes smoked per day was not included as criteria, due to significant variation in rod length and nicotine content per gram of cigarette. Duration of smoking tobacco use was calculated by subtracting the age at smoking from the age of the participants. This variable was dichotomized (<5 years and ≥5 years) to define criteria for the outcome variable. Quit attempt was assessed from the question “During the past 12 months, have you tried to stop smoking?” Time to first smoke was assessed by “How soon after you wake up do you usually have your first smoke?” Quit intention in the next 12 months was ascertained by the following question: “Which of the following best describes your thinking about quitting smoking?” Those who were willing to quit within 12 months were considered as having quit intention. Other respondents were clubbed together as “not having quit intention.”

The independent variables included in this study were sociodemographic characteristics, knowledge of side effects, indoor smoking policy, and age of initiation of daily smoking. Sociodemographic characteristics included region, age, sex, residence, religion, caste, marital status, educational status, and wealth index.

Educational status was categorized as less than primary, primary completed, secondary completed, and higher secondary and above. Marital status was categorized into three categories as currently married, single, and separated/divorced/widow. Occupation was categorized as employed in gainful occupation, daily wage workers, homemakers/students/retired/unemployed – unable to work, and unemployed – able to work.

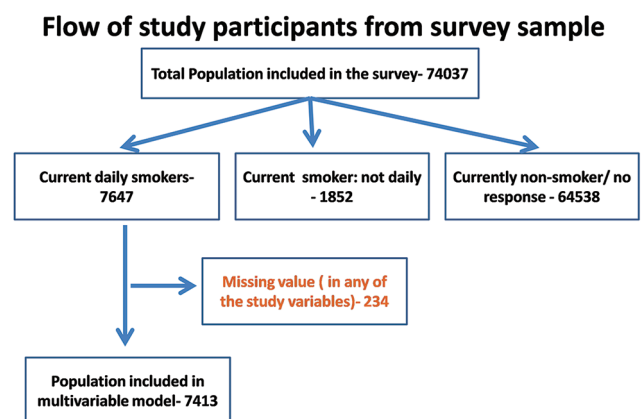
Wealth index was estimated by assigning weights according to the inverse of the proportion of the population owning the item. Subsequently, households were categorized into five economic groups, the lowest 20% referring to the poorest quintile, while highest 20% is the richest quintile.<sup>[17]</sup> Indoor smoking policy was categorized into three: favorable (smoking never allowed indoor), partially favorable (not allowed but exception), and unfavorable (smoking allowed, no smoking rules, don’t know or refused). Awareness about the health consequences of smoking was assessed by the question: “Based on what you know or believe, does smoking tobacco cause serious illness?” Age at initiation of daily smoking was assessed from the question “How old were you when you first started smoking tobacco daily?” [Table 1].

## Statistical analysis

The proportion and characteristics of hardcore smokers were described using descriptive statistics as applicable. A logistic regression model was built using SPSS version 19.0 (Statistical Package for the Social Sciences Inc., Chicago, IL, USA), where the dependent variable was hardcore smoking (yes/no). The independent variables with  $P \leq 0.2$  in bivariate analysis were entered into a multivariable logistic regression model (binary logistic) by the forced entry method. We tested for multicollinearity between the covariates using the variance inflation factor. Sampling weights were applied and weighted estimates were calculated to account for the complex study design. Clustering and stratification were also accounted for by using complex sample analysis. The following variables were used to apply weights and adjust for clustering and stratification: gatscluster, gatsstrata, and gatsweight. This analysis was restricted to the individuals having non-missing data. A total of 234 (3.1%) participants, having missing data for one or more variables used in this study, were excluded from the multivariable analysis [Figure 1].

## Ethical issues

The research is expected to be having less than minimal risk.<sup>[18]</sup> Ethical clearance was obtained from the concerned Institutional Ethics Committee.



**Figure 1:** Flow of study participants recruited in the Global Adult Tobacco Survey India 2016–2017

**Table 1: Items of the questionnaire used for defining outcome and independent variables**

Variables/questions	Code name (as written in codebook)	Calculation/coding (if applicable)
Outcome variable		
Current daily cigarette smoking for at least 5 years	“Current daily smoking”: B01 “How old were you when you first started smoking tobacco daily”: B04# “What is the age of the selected person”: HH4B	Duration of smoking tobacco use=Age of the participants–age at smoking Dichotomized (<5 years and ≥5 years)
No quit attempt in the past 12 months of survey	“During the past 12 months, have you tried to stop smoking?": D01	
No intention to quit in next 12 months or not interested in quitting	“Which of the following best describes your thinking about quitting smoking?": D08	Two responses “Quit within the next month” and “Thinking within the next 12 months” clubbed together
Time to first smoke within 30 min of waking up	“How soon after you wake up do you usually have your first smoke? Would you say within 5 min, 6-30 min, 31-60 min, or >60 min?": B07	Two responses: “Within 5 min” and “6-30 min” clubbed together
Region	“National region”: Regionid	
Age	“What is the age of the selected person?": HH4B	
Sex	“Record the gender of the selected person, for verification if necessary”: HH4D	
Residence	“Residence Status”: Residence	
Religion	“What is your religion?": A10	
Caste	“Do you belong to a scheduled caste, scheduled tribe, other backward caste, or none of these groups?": A09	
Marital status	“What is your marital status? Would you say single, married, separated, divorced, or widowed?": A11	
Educational status	“What is the highest level of education you have completed?": A04	
Occupation	“Which of the following best describes your main work status over the past 12 months?": A05	
Wealth index	A06A to A06N	Weights according to the inverse of the proportion
Knowledge of side effects of tobacco	“Based on what you know or believe, does smoking tobacco cause serious illness?": H01	Knowledge present if answers “yes,” and absent if they answered “no” or “do not know” or “refused”
Indoor smoking policy	“Which of the following best describes the practices about smoking inside of your home?": E01	Favorable: Never allowed Partially favorable: “Not allowed, but exceptions” Unfavorable: “Allowed”/“no rule”/“don’t know”/“refused”

#In the database there is one direct question: “How many years ago did you first start smoking tobacco daily?” (B05). It has not been considered for calculation because of very low response rate (valid case only 126)

**Table 2: Distribution of current daily smokers according to hardcore smoking and its components (n=7647)**

Components of hardcore smoking	Yes, n (%), [95% CI]#	No, n (%), [95% CI]#	Nonresponse/refused
1. Current daily smoking for last 5 years	7001 (90.0) [88.6-91.2]	455 (7.0) [6.0-8.2]	191 (3.0) [2.2-3.9]
2. No quit attempt in the past 12 months of survey	5146 (64.9) [62.7-67.0]	2497 (35.1) [33.0-37.3]	4 (0.001) -
3. No intention to quit in next 12 months or not interested in quitting	6309 (79.5) [77.8-81.1]	1338 (20.5) [18.9-22.2]	-
4. Time to first smoke within 30 min of waking up	4560 (61.2) [59.1-63.3]	3083 (38.7) [36.6-40.8]	4 (0.01) [0.0-0.2]
Hardcore smoking (all four components present)	2541 (32.3) [30.3-34.4]	4907 (64.6) [62.6-66.6]	199 (3.0) [2.3-4]

#Absolute number and weighted percentage used. CI: Confidence interval

## RESULTS

A total of 74,037 participants were part of the GATS, of whom 7647 (10.3%) were current daily smokers (CDS). Background information of the CDS revealed that majority of the participants came from Central India (1168 [32.3%]), aged between 31 and 45 years age group (2982 [34.9%]),

males (6821 [90.5%]), residing in rural areas (5718 [74.6%]), Hindus (4988 [79.6%]), belonging to other backward class (2284 [41.7%]), married (6671 [87.3%]), having less than primary education (3551 [53.6%]), and belonging to the poorest quintile of wealth index (1879 [26.9%]). In most of the participants, indoor smoking policy was unfavorable (5159 [63.9%]). More than 90% (6998)

participants were aware of the health consequences of tobacco consumption. Mean (standard deviation) duration of smoking was 26.26 (0.4) years. Around 60% of the CDS initiated their smoking during 15–24 years of age.

A total of 2541 participants were hardcore smokers. The proportion of hardcore smoking among the general population and among CDS was found to be 3.4% and 32.3%, respectively. The proportion of CDS fulfilling different criteria of hardcore smoking is detailed in Table 2. State-wise distribution revealed that its proportion was considerably high in Goa (63.5%), Sikkim (60%), Jharkhand (51.5%) Punjab (44.3%), and Mizoram (43.6%), whereas it was much lower in Karnataka and Pondicherry (<20%).

Univariable analysis revealed that hardcore smoking was significantly associated with increasing age, marital status, educational status, wealth index, and indoor smoking policy. Multivariable logistic regression model was a good fit as revealed by the significant omnibus Chi-square and nonsignificant Hosmer–Lemeshow statistic. In adjusted model, hardcore smoking was found to be significantly higher with an increase of age and earlier initiation of daily smoking. Tribal caste and unfavorable indoor smoking policy were also found to be predictors of hardcore smoking [Table 3].

## DISCUSSION

This study revealed that one-third of CDS were hardcore smokers. The prevalence of hardcore smoking among CDS in India varied between 4.5% and 28.7% in studies using GATS-1 data.<sup>[15,19,20]</sup> This variation may be explained by different operational definitions. Despite this variation, it is clear that a substantial proportion of CDS are hardcore users which cannot be ignored. The proportion of hardcore smoking was alarmingly high in Goa, Punjab, Jharkhand, Sikkim, Mizoram, and Tripura. The high prevalence of smoking can drive hardcore behavior, which is seen in the northeastern states.<sup>[21]</sup> Another speculation could be the early initiation of smoking habit in those states, which was found to be significantly associated with hardcore smoking in this study. Sinha *et al.* found high rates of smoking among younger adolescents in the northeast states.<sup>[21]</sup> In this study, no association was found between education and hardcore smoking which contradicts results of several studies.<sup>[22,23]</sup> However, Normative Aging Study and a multicentric Asian study did not find any such association.<sup>[15,24]</sup> Increasing age was significantly associated with hardcore smoking which supports the findings from other studies.<sup>[8,12,15]</sup> Several studies including analysis from the previous GATS in India highlighted male gender as significant predictor for hardcore smoking.<sup>[15,20]</sup> However, this study does not report such an association. The disappearance of gender difference in predicting hardcore smoking within a span of one decade may be explained by the social and economic changes that the society witnessed during the same period. Indoor smoking policy was a significant predictor for hardcore smoking. There is a strong and consistent population-level

**Table 3: Factors associated with hardcore smoking among current daily smokers in the global adult tobacco survey India 2016-2017 using a multivariable logistic regression (n=7413)<sup>#</sup>**

Categories	OR (95% CI)	Adjusted OR (95% CI)
Age (years)		
15-30	Reference	Reference
31-45	1.74 (1.31-2.31)	1.71 (1.28-2.28)
46-60	2.04 (1.55-2.69)	2.06 (1.55-2.73)
>60	2.02 (1.49-2.74)	2.00 (1.49-2.77)
Caste		
OBC	Reference	Reference
SC	1.18 (0.95-1.46)	1.15 (0.92-1.44)
UR	1.24 (0.99-1.55)	1.31 (1.00-1.66)
ST	1.38 (1.06-1.75)	1.30 (1.03-1.67)
Marital status		
Single	Reference	Reference
Married	1.82 (1.15-2.90)	1.23 (0.77-1.95)
Separated/divorced/widow	2.38 (1.39-4.08)	1.34 (0.77-2.34)
Educational status		
Higher secondary and above	Reference	Reference
Secondary	1.17 (0.79-1.74)	1.08 (0.72-1.64)
Primary	1.29 (0.94-1.81)	1.12 (0.78-1.59)
Less than primary	1.81 (1.33-2.45)	1.35 (0.96-1.92)
Wealth index (quintile)		
5 <sup>th</sup>	Reference	Reference
4 <sup>th</sup>	1.13 (0.85-1.50)	1.04 (0.76-1.41)
3 <sup>rd</sup>	1.24 (0.93-1.65)	1.09 (0.79-1.51)
2 <sup>nd</sup>	1.19 (0.91-1.56)	1.00 (0.74-1.36)
1 <sup>st</sup>	1.54 (1.19-2.00)	1.21 (0.89-1.65)
Indoor smoking policy		
Favorable (never allowed)	Reference	Reference
Partially favorable (not allowed but with exception)	1.08 (0.77-1.51)	1.04 (0.74-1.46)
Unfavorable	1.83 (1.43-2.23)	1.64 (1.27-2.11)
Knowledge of side effects		
Yes	Reference	Reference
No/don't know	1.32 (0.98-1.77)	1.24 (0.89-1.73)
Age of initiation of daily smoking (years)		
≥45	Reference	Reference
35-44	1.73 (0.83-3.59)	2.03 (0.98-4.05)
25-34	1.73 (0.92-3.24)	2.17 (1.16-4.05)
15-24	1.98 (1.07-3.67)	2.74 (1.48-5.09)
≤14	2.45 (1.24-4.79)	3.10 (1.56-6.13)

<sup>#</sup>Logistic regression using independent variables  $P \leq 0.1$  on univariable analysis. Nagelkerke  $R^2=0.061$ . OR: Odds ratio, CI: Confidence interval, OBC: Other backward class, SC: Scheduled caste, ST: Scheduled tribe, UR: Unreserved

evidence that smoke-free homes are associated with increased smoking cessation and decreased cigarette consumption.<sup>[8,25,26]</sup> Consistent with other studies, this study showed early initiation of smoking as strongly related with hardcore smoking.<sup>[8,15,27]</sup>

The main strength of this study was that it analyzed a large nationally representative survey data with globally

standardized methodology and high response rate, leading to generalizability of the study findings. The study had few limitations. First, self-reported responses from the participants might induce social desirability bias. Second, history of alcohol and other drug use and mental disorders was not reported which could act as confounders.

## CONCLUSION

Findings of this study can be used for future evaluation of tobacco control efforts. Tobacco control strategies should try to tackle the early age of initiation of smoking and indoor smoking policy. It should focus on school students and tribal caste. Goa, Jharkhand, and northeastern states should be given special attention, considering high prevalence of hardcore smoking. It is recommended to promote smoke-free homes to change social norms toward smoking inside homes and in other public places. Hardcore smokers need to be identified through community health workers and linked to tobacco cessation and counseling centers.

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## Conflicts of interest

There are no conflicts of interest.

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