

# BMJ Open Theoretical constructs of smoking cessation among current tobacco smokers in India: a secondary analysis of Global Adult Tobacco Survey-2 (2016–2017)

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## ABSTRACT

**Background** Quitting tobacco smoking is a complex process, and the transtheoretical model describes the various stages of behaviour change that smokers experience to stop smoking. Predictors of intention to quit and stage of behavioural change could assist policy-makers in establishing tailor-made strategies to offer support.

**Objective** In the current study, we analysed the determinants of cessation among 9499 current smokers of India recorded during the second Global Adult Tobacco Survey (2016–2017).

**Methods** Bivariate analysis, multivariate analysis (binary logistic regression was performed for past quit attempts and intention to quit smoking in the future; multinomial logistic regression to understand predictors of various stages of change determining cessation behaviour of current smokers) was undertaken.

**Results** The majority of the smokers was men (91.0%), in 25–44 years age group, (42.3%), daily wagers (37.4%) and resided in the rural area (73.3%), with bidi being the most commonly smoked product (72%). Nearly 72% tried to quit without any assistance with 36.6% (precontemplation), 27% (contemplation), 28% (preparation (or action)) and 8.1% in (relapse) stage. Men ((1.049; 95% CI 1.047 to 1.051), the primary (1.192; 95% CI 1.190 to 1.193) as well as higher education, being married (1.231; 95% CI 1.229 to 1.234) and urban residence (1.167; 95% CI 1.165 to 1.168) were found to be associated with higher prevalence of previous quit attempts. The regression modelling found out that intent to quit reduced with increasing age and was similarly prevalent with any level of education.

**Conclusion** Understanding stages of behavioural change could assist the stakeholders in developing individualised interventions along with the development of intensive cessation protocols in clinical and public health settings.

## BACKGROUND

Smoking cessation at any age is associated with substantial health and economic benefits<sup>1</sup> along with the addition of considerable longevity.<sup>2</sup> In comparison to non-smokers, smokers who start smoking early in adulthood

## Strengths and limitations of this study

- This analysis provides an understanding of the stage of behavioural change among current smokers of India.
- It addresses the key determinants of quit attempts and intention to quit that would support the design of individual and population-based tobacco cessation programmes in India.
- The article provides specific recommendations for policy and practice for increasing awareness about cessation services at various points of patient contact.
- The study design does not permit us to establish a temporal relationship, and the responses collected during the survey are susceptible to recall bias.
- The predictors of quit attempt and intention to quit may vary for various forms of tobacco consumption which was not included in this analysis.

lose a decade of life expectancy. Smoking cessation, especially before the age of 40, leads to a substantial decrease in mortality risk.<sup>3</sup> Due to nicotine dependence, the smoker is required to make multiple quit attempts to quit finally.<sup>4</sup> A prospective cohort study of smokers estimated that it might take 30 or more quit attempts before quitting permanently.<sup>5</sup> Apart from this, evidence suggests a varied number of quit attempts ranging from 8 to 10 (The American Cancer Society),<sup>6</sup> 12–14 (Australian Cancer Council),<sup>7</sup> 8–11 (The Centers for Disease Control and Prevention)<sup>8</sup> before quitting forever.

Quitting tobacco smoking is a complex process.<sup>9</sup> The transtheoretical behavioural change model (TTM) describes the process of change that smokers experience to be able to stop smoking. As per the TTM, the smoker evolves through pre-contemplation, contemplation, preparation, action, maintenance

and termination stages in the smoking cessation.<sup>10</sup> A key element in achieving 'quit status' is the intention to quit smoking.<sup>11</sup> This element before cessation has been stated as a determinant of whether the smoker would engage in a cessation programme, attempt to quit smoking and succeed in quitting. During the preparatory stage, the intent to quit may be higher than the latter, but it is not easy to demonstrate behavioural change.<sup>12 13</sup> Thus, it is crucial to analyse the factors influencing the intention to quit smoking in order to evaluate the diverse underlying contextual factors that influence a smoker's intention to quit smoking.

Global Adult Tobacco Survey (GATS), round-2 conducted in India in the year 2016–2017 recorded that almost two in five (38.5%) adult smokers had attempted to quit smoking tobacco in the last 12 months prior to the survey. However, the proportion of smokers who made a quit attempt during GATS-1 (2010) and GATS-2 (2017) remained similar (38.4% vs 38.5%). Further, nearly half of the cigarette (47.4%) and bidi smokers (48.7%) who made a quit attempt in the past 12 months were able to maintain a quit status for less than a month.<sup>14</sup> However, the proportion of current smokers interested or planning to quit smoking increased from 46.6% (GATS-1) to 55.4% (GATS-2).<sup>14</sup>

India is a signatory to WHO's—Framework Convention on Tobacco Control (WHO-FCTC) and has been implementing Article 14 of WHO-FCTC concerning tobacco dependence and cessation.<sup>15</sup> Further, the Government of India (GoI) launched National Tobacco Control Programme in 2007–2008 with one of the key objective of helping people quit tobacco use in conformance to Article 14 of WHO-FCTC.<sup>16</sup> The GoI established Tobacco Cessation Centers (in 2002) at district hospitals.<sup>17</sup> Further, m-cessation (December, 2015) and national tobacco quit-line services were launched in 2016 and further expanded to satellite centres in 2018<sup>18 19</sup> to support tobacco users for quitting.

Understanding the sociodemographic variables and other factors in facilitating or restraining quit behaviour of tobacco users is essential for designing and implementing a focused tobacco control intervention. Furthermore, awareness of these factors may also promote tobacco cessation initiatives to establish a staged progression of smoking cessation. A data analysis of GATS-1 (2010), from India, demonstrated significant association of socio-demographic characteristics with quit attempts indicating the need to re-examine their effect on cessation.<sup>20</sup> Another study conducted among Italian adults reported an association of successful quit attempts with higher education level and young age.<sup>21</sup> Further, it is important to understand the factors that may influence different tobacco smokers by their personal characteristics (gender, age, caste, education and occupation) in order to optimise and strategise effective cessation campaigns. This understanding is solicited for tailoring the content of the message as per aforementioned classification so as to increase the message's relevance and ability to persuade.<sup>22</sup>

Evidence states that lower socioeconomic status (SES) is predictive of a lower probability of quit intention, quit attempts and successful quitting. A study conducted among Italian smokers found an association of successful recent quit attempts with higher educational level, absence of economic difficulties and younger age.<sup>21</sup> An analysis of data from a population-based prospective study from Switzerland concluded that the determinants of behavioural change vary according to the smoking status.<sup>23</sup> Besides, relapse often occurs even after multiple quitting attempts. Therefore, cessation interventions that support abstinence during this phase are important.<sup>24</sup> There is a limited evidence from Low Middle Income Countries (LMICs) regarding the association between smoking cessation behaviour and SES.<sup>25</sup>

Determining the factors that influence quit intentions opens the door to developing effective policies and programmes to help Indian smokers quit. In smoking addiction, TTM measurement tools have a potential for evaluation of smoking cessation and planning quit-behaviour. TTM is a significant tool for smoking cessation with its ability to use different models of behaviour changes.<sup>26</sup> Further, literature suggests that research on the predictors of the transition from preparation to action stage is warranted, which is largely missing in Indian population despite leading the tobacco use statistics globally.<sup>27</sup> Therefore, in the current study, we undertook the secondary data analysis of GATS-2 to analyse the determinants of smoking cessation and intent to quit smoking among current tobacco smokers of India.

## METHODS

### Study settings

The nationwide representative survey of GATS (round 2) was carried out in the Indian sub continent during years 2016–2017<sup>14</sup> covering a population of 1029 million (Census 2011).<sup>28</sup>

### Study design and data sources

This study is secondary data analysis of GATS-2, India, 2016–2017 which is being conducted under the Global Tobacco Surveillance System.<sup>29</sup> GATS is a nationwide cross-sectional household survey, which uses standardised methodology for monitoring tobacco use as well as tracking changes in key measures of tobacco control among adults aged 15 or above.<sup>30</sup> The GATS-2 out in 2016–2017 using a standardised methodology. Survey was a project of the Ministry of Health and Family Welfare, GoI and it designated Tata Institute of Social Sciences, Mumbai as the nodal implementing agency for the survey. The data collection fieldwork was conducted was carried out in all 30 states including Union Territories (Chandigarh and Puducherry) between August 2016 and February 2017 with a sample of 84047 households (30821 from urban areas and 53226 from rural areas) The survey used probability proportional to size sampling technique, with adoption of three stage sampling design

**Table 1** Distribution of sociodemographic and tobacco smoking-related attributes among current tobacco smokers in India, GATS 2016–2017

Characteristic	Category	n (%)
Total		9499
Age in years	15–24	661 (8.4)
	25–44	4552 (42.3)
	45–64	3304 (37.0)
	65 and above	982 (12.2)
Sex	Male	8434 (91.0)
	Female	1065 (9.0)
Education (n=9495)*	No formal schooling	2754 (35.3)
	Up to primary	2909 (28.8)
	Up to secondary	3314 (31.1)
	Graduation and above	518 (4.8)
Occupation (n=9496)*	Daily wager	3220 (37.4)
	Self employed	3148 (34.1)
	Retired/unemployed/homemaker	1603 (14.9)
	Govt. and Non-govt. employee	1351 (12.0)
	Student	174 (1.5)
Marital status	Married	8133 (84.2)
	Single	882 (10.2)
	Separated/divorced/widowed	484 (5.6)
Caste (n=9437)*	Scheduled caste/scheduled tribe	4235 (33.6)
	Other backward class	2895 (42.3)
	General (none of above)	2307 (24.2)
Area of residence	Rural	6980 (73.3)
	Urban	2519 (26.7)
Age of initiation of tobacco smoking (n=8128)†	<15 years	707 (8.1)
	15–25 years	5130 (60.4)
	>25 years	2291 (31.5)
Smoking frequency	Daily	7647 (80.5)
	Less than daily	1852 (19.4)
Type of smoking tobacco used (n=11 936)‡	Bidi	6070 (72.3)
	Cigarette	3338 (32.6)
	Rolled tobacco	1297 (7.9)
	Hukkah	699 (6.6)
	Cheroot	329 (2.9)
	Others	203 (1.3)
Quit attempt within past 12 months	No	6296 (63.7)
	Yes	3203 (36.3)
Intent to quit tobacco in future	Interested in quitting	5382 (55.3)
	Not interested in quitting	4117 (44.7)
Source of information about harms or quitting tobacco smoking	Haven't noticed	2331 (25.0)
	≤3 sources	4201 (42.5)
	>3 sources	2967 (32.5)

Continued

Table 1 Continued

Characteristic	Category	n (%)
Noticed advertisements or signs promoting tobacco smoking	None	7495 (76.4)
	≤2 sources	1080 (11.4)
	<2 sources	924 (12.2)
Noticed any type of cigarette promotion	No	8736 (91.9)
	Yes	763 (8.1)
Noticed any type of bidi promotion	No	8580 (89.0)
	Yes	919 (11.0)
Has smoking already done harm to your body (n=9488)*	No	4133 (47.9)
	Yes	4933 (49.3)
	Don't know	422 (2.8)
Whether smoking tobacco causes serious illness (n=9494)*	Yes	8632 (91.3)
	No	684 (6.9)
	Don't know	178 (1.8)
Whether smoking tobacco causes no, one or multiple illnesses	No illness	361 (3.7)
	Up to 3 illnesses	3400 (38.0)
	>3 illnesses	5738 (58.3)
Cessation behaviour based on stages of change model	Pre-contemplation	3446 (36.6)
	Contemplation	2850 (27.0)
	Preparation/action!	2532 (28.2)
	Relapse	671 (8.1)

(All percentage is weighted).

\*Some participants refused to answer to that particular question, reflecting as changed denominator for analysis.

†Information not available for all current less than daily tobacco smokers.

‡Multiple responses per participant (n=frequency of responses and not respondents).

GATS, Global Adult Tobacco Survey.

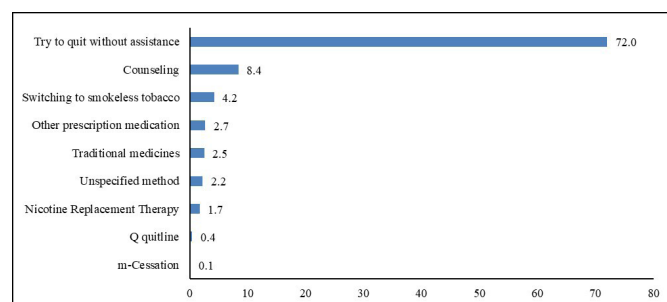
for rural areas (Villages-Households-Respondent) and a four stage was for urban areas (Wards- Census Enumeration Block- Households- Respondent).<sup>14</sup>

### Sample size

Out of the total sample, we extracted the sample of 9499 respondents who were current tobacco smokers (daily and less than daily).

### Patient and public involvement

No patient involved



**Figure 1** Cessation methods used by the current smokers who attempted to quit smoking in last 12 months, GATS 2016–2017. GATS, Global Adult Tobacco Survey.

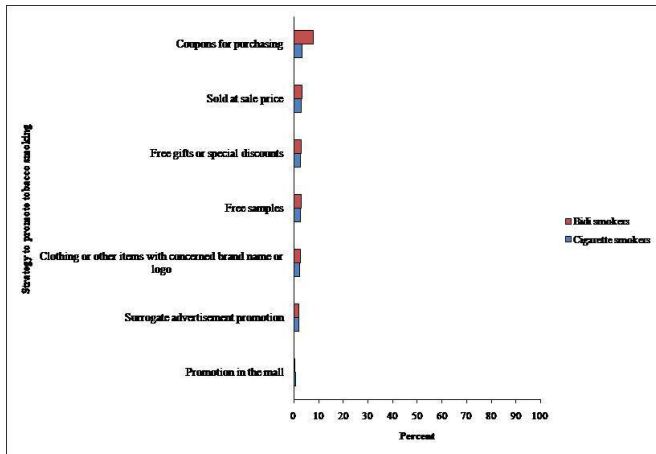
### Operational definitions

The following operational definitions were used in GATS for variables under the study:

- ▶ **Current tobacco smoker:** An individual who currently smokes any tobacco product, either daily or occasionally.
- ▶ **A quit attempt in the survey** was defined as current tobacco smokers who tried to quit during the past 12 months and former tobacco smokers and smokeless tobacco users who have been abstinent for <12 months. In this analysis, we included the former one.
- ▶ **Intention in quitting smoking in the future** was defined as current tobacco smokers planning or thinking about quitting smoking within the next month, 12 months or someday.<sup>14</sup>
- ▶ **Stage of Change:** Based on the tobacco smoking cessation behaviour, the current tobacco smokers were classified into following stages of change.

**Precontemplation:** The current tobacco smokers who neither made a quit attempt in the past nor intend to quit in the future.

**Contemplation:** The current tobacco smokers who did not make a quit attempt in past but intend to do so in future.



**Figure 2** Distribution of promotional strategies encouraging smoking noticed by the current tobacco smokers in past 30 days, GATS 2016–2017. GATS, Global Adult Tobacco Survey.

**Preparation (or action!):** The current tobacco smokers who made a quit attempt in the past and intend to quit in the future (apparently because their past quit attempt could not yield success).

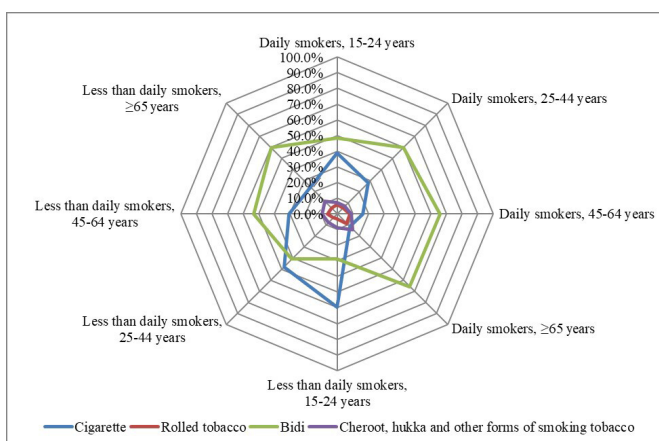
**Relapse:** The current tobacco smokers who made an unsuccessful quit attempt in the past do not intend to quit in the future.

### Study variables

Outcome variables included past quit attempts and intention to quit tobacco smoking in future. The exposure variables included sociodemographic characteristics, smoking history and pattern, exposure to media advertisements for and against tobacco smoking, and knowledge about the health effects of tobacco smoking. The questions used for analysis along with codes are added to online supplemental file 1.

### Data analysis

We performed univariate analysis (frequency distribution), bivariate analysis ( $\chi^2$ ), and multivariate



**Figure 3** Agewise distribution of smoking tobacco product use among current daily and less than daily tobacco smokers, GATS 2016–2017. GATS, Global Adult Tobacco Survey.

analysis (binary logistic regression for outcome variables mentioned above; and; multinomial logistic regression to understand predictors of various stages of change determining cessation behaviour of current tobacco smokers. The analysis was performed in SPSS software, V.16 (SPSS, released 2007) (with  $p < 0.05$ ).

### RESULTS

A total of 9499 current tobacco smokers were identified. The sociodemographic distribution of current smokers is presented in table 1. Sixty-three per cent of the current smokers had made a quit attempt within past 12 months from the survey. Around 44% of participants had no intention to quit tobacco smoking in the near future. More than 90% tobacco smokers were aware about serious illnesses caused by smoking tobacco. Further, 11% reported to have witnessed one or other type of promotion of bidi smoking. Based on the cessation behaviour of current smokers, they were classified into four groups using the stages of change model.<sup>10</sup> The analysis revealed that 36.6% of current tobacco smokers were in the precontemplation stage (table 1).

Nearly 72% of current tobacco smokers tried to quit without any assistance, whereas counselling was sought by 8.4% of tobacco smokers. Further, 4.2% switched to smokeless tobacco as well. Nicotine replacement was sought by an even lesser proportion (1.7%) (figure 1).

Maximum promotion was noticed for bidi products in the form of coupons for purchasing (7.8%), followed by sale at low price (3.4%) or as free gifts (3.2%) in comparison to cigarette promotion. However, the surrogate advertisement promotion was more for cigarettes (2.2%) than bidis (2%) (figure 2).

The age-related distribution of various tobacco smoking products was assessed for current tobacco smokers based on smoking frequency. Daily bidi smoking was practised by 45 years and above age group. This was represented using spider diagram to highlight the age wise difference in daily and non-daily use of smoking tobacco in various forms (figure 3).

The males, primary as well as higher education (graduation and above), being employed (or retired), married, higher caste and urban residence were found to be associated with higher prevalence of previous quit attempts among current smokers. Further, exposure to regular smoking during early adulthood, perception and awareness about ill effects of smoking on body, and smoking being able to cause a multitude of health effects was also associated with increased quit attempts (table 2).

### Factors affecting intent to quit tobacco in near future

The regression modelling revealed that intent to quit reduced with increasing age and was similarly prevalent with any level of education. Having an occupation with monetary outcomes (ie, except being student), being married, initiation after the age of 25 years, experience of ill health effect due to smoking, perception about

**Table 2** Factors affecting tobacco quitting attempts within past 12 months among the current smokers, GATS 2016–2017

Factor	Quit attempt		
	% (n=3203)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
<b>Age in years</b>			
15–24	34.4	1.033 (1.031 to 1.035)	1.391 (1.387 to 1.395)
25–44	37.9	1.202 (1.200 to 1.203)	1.082 (1.080 to 1.083)
45–64	35.9	1.106 (1.104 to 1.107)	0.941 (0.939 to 0.942)
65 and above	33.7	Ref	
<b>Sex</b>			
Male	36.9	1.297 (1.295 to 1.299)	1.049 (1.047 to 1.051)
Female	31.0	Ref	
<b>Education (n=9495)*</b>			
Up to primary	39.8	1.377 (1.375 to 1.378)	1.192 (1.190 to 1.193)
Graduation and above	37.7	1.260 (1.258 to 1.263)	1.115 (1.112 to 1.118)
Up to secondary	37.3	1.239 (1.238 to 1.241)	0.993 (0.992 to 0.994)
No formal schooling	32.5	Ref	
<b>Occupation (n=9496)*</b>			
Govt. and non-govt. employee	41.0	2.076 (2.068 to 2.084)	1.269 (1.262 to 1.276)
Self employed	38.7	1.885 (1.878 to 1.892)	1.292 (1.285 to 1.299)
Daily wager	34.7	1.511 (1.586 to 1.597)	1.097 (1.091 to 1.104)
Retired/unemployed/homemaker	32.7	1.450 (1.445 to 1.456)	1.113 (1.107 to 1.119)
Student	25.1	Ref	
<b>Marital status</b>			
Married	37.2	1.335 (1.332 to 1.337)	1.231 (1.229 to 1.234)
Single	32.0	1.059 (1.056 to 1.061)	0.789 (0.787 to 0.791)
Separated/divorced/widowed	30.8	Ref	
<b>Caste (n=9437)*</b>			
Other backward class	41.0	1.461 (1.460 to 1.462)	1.461 (1.460 to 1.462)
General	33.5	1.062 (1.061 to 1.063)	1.062 (1.061 to 1.063)
Scheduled caste/scheduled tribe	32.2	Ref	
<b>Area of residence</b>			
Urban	39.3	1.187 (1.186 to 1.188)	1.167 (1.165 to 1.168)
Rural	35.3	Ref	
<b>Smoking frequency</b>			
Less than daily smoking	41.4	1.303 (1.301 to 1.304)	1.303 (1.301 to 1.304)
Daily smoking	35.1	Ref	
<b>Age of initiation of regular smoking(n=8128)†</b>			
<15 years	37.3	1.090 (1.089 to 1.092)	1.095 (1.093 to 1.097)
>25 years	36.9	1.069 (1.068 to 1.070)	1.109 (1.108 to 1.110)
15–25 years	35.3	Ref	
<b>Has smoking already done harm to your body</b>			
Yes	39.8	2.428 (2.421 to 2.435)	2.322 (2.314 to 2.330)
No	33.7	1.867 (1.862 to 1.873)	1.808 (1.802 to 1.815)
Don't know	21.4	Ref	
<b>Whether smoking tobacco causes serious illness</b>			
Yes	37.1	3.155 (3.142 to 3.168)	2.121 (2.111 to 2.131)
No	31.2	2.424 (2.413 to 2.434)	1.947 (1.937 to 1.957)

Continued

Table 2 Continued

Factor	Quit attempt		
	% (n=3203)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Don't know	15.8	Ref	
Whether smoking tobacco causes no, one or multiple illnesses			
>3 illnesses	38.4	1.830 (1.826 to 1.834)	1.435 (1.431 to 1.439)
Up to 3 illnesses	34.3	1.530 (1.527 to 1.534)	1.244 (1.240 to 1.248)
No illness	25.4	Ref	

(All percentage is weighted).

\*Some participants refused to answer to that particular question, reflecting as changed denominator for analysis.

†Information not available for all current less than daily tobacco smokers.

GATS, Global Adult Tobacco Survey; PR, prevalence ratio.

smoking being able to cause serious and multitude of illnesses and those who recently noticed more than two advertisements about tobacco products was associated with higher odds of intention to quit in future (table 3).

The sociodemographic profile of current smokers and their smoking related attributes were tested to find out predictors of being in any of the stages of TTM.<sup>10</sup> Younger age, female sex, non-exposure to advertisements promoting smoking, were common predictors of being in contemplation and preparation stage. Further, experience of ill health effects because of smoking was a common predictor to contemplation, preparation and relapse stage.

The perception about tobacco being able to cause serious health effects (contemplation); education up to primary level, daily wage, other backward class caste, being married (preparation); lack of formal education, self-employment, any caste other than general, initiation of tobacco use at age less than 25 years, noticing information encouraging tobacco use as well as quitting, perception about tobacco not being able to cause serious health effects (relapse) were additional predictors (table 4).

## DISCUSSION

The focus of this paper was to look for the determinants of two major aspects of tobacco smoking cessation—quit attempts and intent to quit as they can help us in understanding smokers' attitude and behaviour towards smoking cessation. We utilised the TTM for a cyclic representation of factors influencing behavioural change of a smoker which will facilitate tailored health promotion strategies that are individualised and easily adapted. The purpose of TTM is to delineate smoker's behaviour under the five stages and describe how smokers move dynamically through them. The TTM model used in the study has aptly proved that smokers not only perceive more benefits as they move in later stages but are also being influenced by a different set of determinants for smoking cessation. This view has been supported by other studies on physical activity,<sup>31</sup> sedentary behaviour,<sup>32</sup> nutritional interventions,<sup>33</sup> etc. The TTM's ability to customise its

constructs to an individual's readiness to initiate cessation behaviour is a major strength, making individually based interventions applicable at the population level. The TTM is flexible enough to be employed by almost any sort of practitioner or researcher, which adds to the possibility of a population-based intervention strategy. The TTM can combine clinical and public health strategies to increase the likelihood of successful health behavioural change.<sup>34</sup>

Out of the current tobacco smokers who made a quit attempt in past, majority reported (72%) to have attempted to quit without any assistance. This could be due to various reasons such as lack of awareness among users about the available treatment options (pharmacotherapy and nicotine replacement therapy, quitlines and mCessation), concerns about their safety and perceiving that unassisted is a better choice.<sup>35 36</sup> The lower odds of quit attempt among the older age groups in the study may be attributed to higher nicotine addiction level,<sup>37</sup> beliefs about quitting, believing that 'the damage had been done' so they see no point in attempting to quit later in life,<sup>38</sup> beliefs of healthcare providers (HCPs) reluctance to give cessation advice or to provide medication, type, location and visibility of smoking cessation services,<sup>39 40</sup> reluctance to use telephone or online support such as m-cessation.<sup>41</sup> Only after they contract some illness due to smoking, they think and perhaps attempt to quit (or reduce) smoking,<sup>42</sup> as indicated in this paper as well. Prevalence of quit attempt was higher (prevalence ratio (PR) 2.32) among those who experienced tobacco-related harm to their body or perceived that tobacco smoking can cause serious illness (PR: 2.121). Those who started smoking regularly after the age of 25 years had higher odds of quit attempts than those who started at the age of less than 15 years. Similar findings have been reported by previous studies as well.<sup>43 44</sup> It is possible that a young adult, who started late, had comparatively more information on the ill effects of tobacco smoking. We found that the odds of quit attempts and intent to quit were higher among those who had experience of ill health due to tobacco smoking, or believed that tobacco smoking can cause serious illness. This may

**Table 3** Factors affecting intention to quit tobacco in future among the current smokers, GATS 2016–2017

Factor	Intention to quit in future		
	% (n=5382)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
<b>Age group</b>			
15–24	58.3	1.796 (1.793 to 1.799)	1.478 (1.474 to 1.482)
25–44	59.1	1.855 (1.852 to 1.857)	1.457 (1.455 to 1.459)
45–64	54.0	1.506 (1.504 to 1.508)	1.225 (1.224 to 1.227)
65 and above	43.8	Ref	
<b>Sex</b>			
Male	56.1	1.478 (1.476 to 1.480)	0.789 (0.787 to 0.790)
Female	46.4	Ref	
<b>Education</b>			
Graduation and above	64.8	2.129 (2.124 to 2.133)	1.378 (1.374 to 1.381)
Up to secondary	61.1	1.822 (1.820 to 1.823)	1.307 (1.305 to 1.309)
Up to primary	58.3	1.617 (1.615 to 1.619)	1.304 (1.302 to 1.305)
No formal schooling	46.3	Ref	
<b>Occupation</b>			
Govt. and Non-govt. employee	65.0	2.206 (2.202 to 2.209)	1.359 (1.356 to 1.362)
Student	59.6	1.749 (1.744 to 1.755)	1.079 (1.073 to 1.084)
Daily wager	55.8	1.498 (1.496 to 1.500)	1.276 (1.274 to 1.278)
Self employed	55.3	1.469 (1.467 to 1.471)	1.225 (1.223 to 1.227)
Retired/unemployed/ homemaker	45.7	Ref	
<b>Caste</b>			
General	58.5	1.328 (1.326 to 1.329)	1.146 (1.145 to 1.148)
Other backward class	56.3	1.212 (1.211 to 1.213)	1.184 (1.182 to 1.185)
Scheduled caste/scheduled tribe	51.5	Ref	
<b>Marital status</b>			
Married	56.1	1.800 (1.797 to 1.803)	1.227 (1.225 to 1.230)
Single	55.5	1.751 (1.747 to 1.755)	0.901 (0.898 to 0.904)
Separated/divorced/widowed	41.6	Ref	
<b>Residence</b>			
Urban	61.0	1.379 (1.378 to 1.380)	1.146 (1.144 to 1.147)
Rural	53.2	Ref	
<b>Smoking frequency</b>			
Less than daily smoking	64.7	1.623 (1.622 to 1.625)	1.917 (1.913 to 1.921)
Daily smoking	53.0	Ref	
<b>Age of initiation of regular smoking tobacco use</b>			
>25 years	55.1	1.152 (1.150 to 1.154)	1.159 (1.157 to 1.161)
15–25 years	53.3	1.073 (1.071 to 1.075)	0.982 (0.981 to 0.984)
<15 years	51.6	Ref	
<b>Noticed information about the dangers of smoking tobacco or that encourages quitting</b>			
More than three sources	63.0	2.193 (2.190 to 2.195)	1.562 (1.560 to 1.564)
Up to three sources	56.2	1.656 (1.655 to 1.658)	1.380 (1.379 to 1.382)
Haven't noticed	43.7	Ref	
<b>Noticed any advertisements or signs promoting smoking tobacco products</b>			

Continued



Table 3 Continued

Factor	Intention to quit in future		
	% (n=5382)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Haven't seen any such promotion	55.5	1.067 (1.065 to 1.068)	1.309 (1.307 to 1.311)
More than two sources promoted tobacco smoking	54.7	1.033 (1.031 to 1.034)	0.873 (0.871 to 0.874)
Up to two sources promoted tobacco smoking	54.0	Ref	
Whether noticed any type of cigarette promotion			
One or other type of promotion seen	61.5	1.321 (1.319 to 1.323)	1.051 (1.049 to 1.053)
No promotion seen	54.7	Ref	
Whether noticed any type of bidi promotion			
One or other type of promotion seen	57.5	1.107 (1.105 to 1.108)	1.144 (1.142 to 1.146)
No promotion seen	55.0	Ref	
Has smoking already done harm to your body			
Yes	58.7	1.977 (1.972 to 1.982)	2.242 (2.235 to 2.249)
No	52.5	1.535 (1.531 to 1.539)	1.863 (1.858 to 1.869)
Don't know	41.8	Ref	
Whether smoking tobacco causes serious illness			
Yes	56.5	4.378 (4.362 to 4.393)	2.924 (2.911 to 2.936)
No	46.8	2.957 (2.946 to 2.968)	2.468 (2.457 to 2.479)
Don't know	41.8	Ref	
Whether smoking tobacco causes no, one or multiple illnesses			
>3 illnesses	59.0	1.938 (1.934 to 1.942)	1.259 (1.256 to 1.263)
Up to 3 illnesses	50.8	1.389 (1.386 to 1.392)	1.041 (1.038 to 1.043)
No illness	42.6	Ref	

GATS, Global Adult Tobacco Survey; PR, prevalence ratio.

include witnessing someone with declining health due to tobacco smoking.

Younger age, female sex and non-exposure to advertisements promoting smoking were common predictors of being in contemplation and preparation stages, as explained further. The possibility that societal norms against smoking are significantly stronger among these younger adult smokers, as seen by their high level of desire to quit.<sup>45</sup> Women may have a higher risk of smoking-related morbidity and mortality, and face different barriers to smoking cessation that warrant intervention.<sup>46</sup> Women smokers are more likely to believe that society disapproves of smoking, perceive that the risk of dying from smoking significantly greater among them and have more concerns regarding health than men.<sup>47-49</sup> Further, experience of ill health effects because of smoking was a common predictor to contemplation, preparation and relapse stage. The advancement to later stages in TTM model may be attributed to having experienced an illness due to smoking resulting in compromised health

status, increased treatment costs and implied financial burden.<sup>50 51</sup>

This study has certain limitations. First, it is difficult to establish a temporal relationship between quit attempt/intention to quit with other variables as it was secondary analysis of cross-sectional household survey. Second, the responses are also susceptible to recall bias. Further, as indicated in this paper, the odds of quit attempt were higher among those who experienced tobacco related harm to their body. It is possible that the majority of them were those who already had an episode of smoking-related illness. This theory was not, however, tested by the authors in the present paper due to lack of required information. The predictors of quit attempt and intention to quit may vary for various forms of tobacco consumption which was not included in this analysis. The age of first exposure to tobacco smoking, reasons for doing so and reasons for continuously indulging in tobacco smoking were not asked in GATS survey. Also, reasons for making quit attempts, if asked, could shed some light on potential motivational factors.

**Table 4** Multinomial logistic regression model to assess predictors of stages of change determining current tobacco smokers' cessation behaviour, GATS 2016–2017

Predictor	Category	Stage*		
		Contemplation (n=2850) PR (95% CI)†	Preparation (n=2532) PR (95% CI)†	Relapse (n=671) PR (95% CI)†
Age group	15–24	1.172 (1.168 to 1.176)	1.737 (1.731 to 1.743)	0.800 (0.796 to 0.804)
	25–44	1.449 (1.446 to 1.452)	1.373 (1.371 to 1.376)	0.843 (0.841 to 0.845)
	45–64	1.376 (1.373 to 1.378)	1.078 (1.076 to 1.080)	0.958 (0.956 to 0.961)
	65 and above‡			
Sex	Female	1.338 (1.335 to 1.341)	1.178 (1.175 to 1.181)	0.971 (0.968 to 0.974)
Education	No formal schooling	0.733 (0.731 to 0.736)	0.742 (0.740 to 0.745)	1.112 (1.106 to 1.118)
	Up to primary	0.892 (0.889 to 0.895)	1.008 (1.005 to 1.011)	1.046 (1.040 to 1.051)
	Up to secondary	1.065 (1.062 to 1.068)	0.866 (0.863 to 0.868)	1.095 (1.089 to 1.101)
	Graduation and above‡			
Occupation	Retired/unemployed/homemaker	0.724 (0.722 to 0.725)	0.740 (0.738 to 0.741)	0.974 (0.970 to 0.978)
	Student	0.686 (0.682 to 0.691)	0.735 (0.730 to 0.740)	0.331 (0.325 to 0.336)
	Daily wager	1.021 (1.019 to 1.023)	0.856 (0.855 to 0.858)	0.992 (0.988 to 0.995)
	Self employed	0.907 (0.906 to 0.909)	0.941 (0.939 to 0.943)	1.149 (1.146 to 1.153)
	Govt. and Non-govt. employee‡			
Caste	SCST	0.812 (0.811 to 0.814)	0.909 (0.907 to 0.910)	1.097 (1.095 to 1.100)
	OBC	0.840 (0.839 to 0.841)	1.315 (1.313 to 1.316)	1.577 (1.573 to 1.581)
	General‡			
Marital status	Single	0.953 (0.949 to 0.956)	0.790 (0.787 to 0.793)	0.823 (0.819 to 0.828)
	Married	1.043 (1.040 to 1.046)	1.441 (1.437 to 1.445)	0.926 (0.923 to 0.929)
	Separated/divorced/widowed‡			
Residence	Urban residence	1.037 (1.036 to 1.038)	1.230 (1.228 to 1.232)	0.942 (0.940 to 0.944)
Frequency of smoking	Daily smokers	0.574 (0.573 to 0.576)	0.409 (0.408 to 0.410)	0.646 (0.643 to 0.648)
Initiation of regular tobacco smoking	<15 years	0.978 (0.976 to 0.980)	0.862 (0.860 to 0.864)	1.361 (1.356 to 1.365)
	15–25 years	0.973 (0.971 to 0.974)	0.797 (0.796 to 0.798)	1.228 (1.225 to 1.230)
	>25 years‡			
Noticed information about the dangers of smoking tobacco or that encourages quitting	Haven't noticed	0.625 (0.624 to 0.627)	0.621 (0.620 to 0.622)	0.868 (0.865 to 0.870)
	Up to three sources	0.885 (0.884 to 0.886)	0.952 (0.950 to 0.953)	1.219 (1.216 to 1.221)
	More than three sources‡			
Noticed any advertisements or signs promoting smoking tobacco products	Haven't seen any such promotion	2.114 (2.109 to 2.118)	1.357 (1.354 to 1.359)	1.738 (1.733 to 1.743)
	Up to two sources promoted tobacco smoking	1.660 (1.656 to 1.664)	1.038 (1.036 to 1.041)	1.814 (1.807 to 1.820)
	more than two sources promoted tobacco smoking‡			
Whether noticed any type of cigarette promotion	No promotion of cigarette seen	0.943 (0.940 to 0.945)	0.854 (0.852 to 0.856)	0.714 (0.712 to 0.717)
Whether noticed any type of bidi promotion	No promotion of bidi seen	0.876 (0.875 to 0.878)	0.717 (0.716 to 0.719)	0.608 (0.607 to 0.610)
Has smoking already done harm to your body	No	1.698 (1.692 to 1.704)	2.453 (2.442 to 2.463)	1.548 (1.539 to 1.557)
	Yes	2.034 (2.027 to 2.042)	3.345 (3.330 to 3.359)	2.148 (2.136 to 2.160)
	Don't know‡			
Whether smoking tobacco causes serious illness	Yes	2.773 (2.759 to 2.787)	3.775 (3.751 to 3.800)	1.746 (1.735 to 1.757)
	No	2.708 (2.693 to 2.723)	3.014 (2.994 to 3.035)	2.277 (2.261 to 2.292)
	Don't know‡			
Whether smoking tobacco causes no, one or multiple illnesses	No illness	1.022 (1.019 to 1.025)	0.578 (0.575 to 0.580)	1.098 (1.093 to 1.102)
	Up to 3 illnesses	0.836 (0.835 to 0.837)	0.790 (0.789 to 0.791)	0.926 (0.925 to 0.928)
	>3 illnesses‡			

\*Reference category: precontemplation stage.

†Adjusted.

‡Redundant parameter.

GATS, Global Adult Tobacco Survey; OBC, Other backward class; PR, prevalence ratio; SCST, scheduled caste/scheduled tribe.

We propose the following recommendations for policy-makers, implementers, HCPs, researchers, academia and civil society advocates enhancing the quit attempts and promoting cessation among current smokers. Understanding the stage of behavioural change among these smokers could assist the stakeholders in developing such interventions that cater to the individual stages and facilitate the desired outcome. Dedicated cessation programmes addressing women and younger age groups could help the smoker's progress from contemplation to preparation and action stages. Checks on surrogate advertisements of tobacco products need to be strengthened along with steering of increased taxes on bidis to impact the affordability of the product. Further, concrete and aggressive mass media campaigns along with advertising mCessation and quitline services with wider coverage, especially for motivating smokers residing in rural areas, need to be implemented. Integrated capacity building initiatives on cessation for HCPs providing services under various national health programmes (non-communicable disease control, oral health, maternal and child health, tuberculosis control, mental health, etc) may be introduced.

Further, building the motivation of HCPs to uptake and deliver cessation support (identification of smokers, sharing benefits, addressing barriers, coping strategies) is of paramount importance. Qualitative research must be conducted to understand the reasons for preferring not to make another quit attempt so that the causes of relapse can be addressed via individual counselling programmes. Also, research is necessary to understand the difference in cessation practices across different cross-cultural settings. Inclusion of smoking cessation as part of the medical curriculum that prioritises the need to ask about smoking habits and offer support to each user could be helpful. Civil society could mobilise community support for the uptake of cessation services and facilitate the exchange of good practices in cessation.

## Conclusion

This study encapsulates and demonstrates that TTM approach is highly applicable in the current context. The factors influencing different stages of TTM were younger age, female sex, non-exposure to advertisements promoting smoking, for contemplation and preparation both. In addition, experience of ill health effects because of smoking was a common predictor to contemplation, preparation and relapse stage. This indicates that there is a need for designing stage-based cessation interventions at individual and population levels that caters and focuses on aforementioned groups and hard to engage groups such as older age groups. Given that experience of ill health effects because of smoking emerged to be a key predictor in later stages, it is essential to develop and implement intensive cessation treatment protocols in clinical settings utilising the flexibility of TTM model. Besides, India being an LMIC and a resource-constrained economy, it is vital to integrate cessation services into

all possible national health programmes and policies to expand the outreach and the accessibility of cessation services. This could provide 'one stop solution' to many diseases, whether communicable or non-communicable, strengthening the health systems to support and achieve Sustainable Development Goals.

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