

## RESEARCH ARTICLE

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# Determinants of Quit Attempts and Short-Term Abstinence among Smokers in India: Global Adult Tobacco Survey, 2016-17

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### Abstract

**Objective:** The objective was to study the determinants of quit attempts and abstinence among smokers in India using nationally representative data from the Global Adult Tobacco Survey (GATS-2). **Methods:** Data from GATS-India, (2016-17) was analysed. Key outcome variables included quitting attempts in the previous 12 months among smokers and duration of abstinence among those who attempted quitting. The receipt of messages through mass media, warning labels and quit advice by doctors or healthcare providers were key exposure variables for both outcomes. The use of cessation methods was an exposure variable for abstinence. Logistic regression analyses were employed to identify determinants of quit attempt and survival analysis for the duration of abstinence. **Result:** The adjusted analyses showed that those who received quit advice from doctors or healthcare providers had higher odds (2.11; CI 1.88-2.37) of quit attempts. Exposure to anti-smoking messages through media and warning labels was associated with higher quit attempt odds of 1.53 (1.33-1.77) and 1.63 (1.38-1.92), respectively, when the anti-smoking messages made the smokers think about quitting. The use of counselling as a cessation method had a lower risk (Hazard Ratio 0.80; 0.69-0.93) of relapse compared to the non-use of cessation aids. The use of counselling and modern pharmacotherapy also had a lower risk of relapse (Hazard Ratio 0.77; 0.59-0.99). However, only 6.0% had used counselling, and another 2.0% had used a combination of modern pharmacotherapy and counselling as cessation aids. Addiction to tobacco and higher consumption of smoked sticks were negatively associated with both outcomes. **Conclusion:** Quit advice by healthcare providers is associated with a higher likelihood of quit attempts. Counselling can help increase the period of abstinence in pragmatic settings, and there is a need to improve the access of smokers to counselling services.

**Keywords:** Cessation- counselling- smoking- warning label- India

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### Introduction

Smoking remains one of the major preventable risk factors for global ill-health. Tobacco control interventions especially the Framework Convention for Tobacco Control (FCTC) has enabled a global environment conducive to control this menace however the countries vary widely in their policies and programmes in its implementation with resultant disparities. India ratified FCTC in 2004 and implemented a series of measures in line with the MPOWER strategy promoted by WHO. The effects are visible with reduction in prevalence of smoking among adults aged 15 and above from 14.0% in first round of the Global Adult Tobacco Survey, India (2009-10) to 10.7% in second round (2016-17)(TISS and MoHFW, GoI, 2018). In 2016-17, prevalence of smoking among men was 19% and among women was 2%; nearly 90% of smokers were men. Bidi was the most common product smoked (about 70% of the smokers smoked bidi).

The government of India (GOI) implemented several

policies and strategies for tobacco control during this period aimed at encouraging smokers from quitting. These include warning about dangers of smoking through various mass media and changes in the warning labels. Additionally, cessation methods have been introduced through tobacco cessation centres with face-to-face counselling, and through quit line and m-cessation where telephone and mobile messaging are the media used.

Most literature has examined effect of single intervention in quasi-experimental designs on encouraging and sustaining quit attempts. Literature points out that warning labels are expected to increase awareness and motivate quitting but studies show that the ones used in India in past were inadequate to convey the health impact of tobacco use(Arora et al., 2012; Karinagannanavar et al., 2011). Warning labels were not always field tested before implementation. In 2015, the warnings covered 85% of the packaging prior to the second round of GATS(Balhara and Gupta, 2015). Analysis from first round of GATS showed that intention to quit was significantly higher

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among those who received anti-smoking messages through media (Reddy et al., 2018). Advice from motivated healthcare providers has also been known to encourage quit attempts (Venkatesh and Sinha, 2012).

With respect to the cessation methods, the pharmaceutical products have been tested for efficacy and safety in clinical trials. Effectiveness of counselling has also been demonstrated through couple of randomised controlled trials (Thankappan et al., 2013; Thankappan et al., 2014; Savant et al., 2013). A systematic review in Low- and Middle-Income Countries (LMICs) settings found that nicotine replacement therapy, behavioural counselling and brief advice were efficacious for smoking cessation (Akanbi et al., 2018). A network meta-analysis pooled data from 159 randomized controlled trials found pharmacotherapy useful in smoking cessation (Shang et al., 2022). This recent evidence has emerged from experimental studies in trial settings. However, key research gaps remain in knowledge regarding reach and effectiveness of the interventions that encourage and/or assist quitting at population level (Sarkar and Reddy, 2012).

Papers based upon secondary analyses of data have attempted to identify determinants of smoking cessation. Studies have also looked into sociodemographic determinants of cessation (Binnal et al., 2013; Corsi et al., 2014). The intention to quit in future has been found to be associated with interventions such as quit advice from doctors, anti-smoking messages in media and warning labels (Surani et al., 2012; Dhumal et al., 2014; Kar et al., 2020). However, determinants of quit attempts in recent past have received less attention. Srivastava et al. (2013) attempted it but covered all historical quitters and hence effectiveness of interventions in recent past cannot be deduced (Srivastava et al., 2013). Pradhan and Patel (2019) have used NFHS data (2015-16) to conclude that anti-smoking messages are effective (Pradhan and Patel, 2019). However, the dataset does not include questions on exposure to methods that help quit and their reach or effectiveness cannot be determined. This paper attempts to examine determinants of quit attempts in previous year among smokers using GATS India (2016-17) data. Data on cessation aids was collected for those who smoked during year prior to survey and the paper examines whether use of cessation methods helped in abstinence for longer time. With the national programme planning to invest heavily in cessation services, such evidence on reach and effectiveness may help decide policies.

## Materials and Methods

The data from Global Adult Tobacco Survey, India (2016-17) was analysed. GATS used multi-stage, geographically clustered stratified sampling to produce representative data at national as well as state level. The dataset included 74037 individuals aged 15 and above. Chapter 2 of the GATS-2 India report has details of the survey methodology (TISS and MoHFW, GoI, 2018). There were 9499 current smokers and additional 258 who smoked in previous year and reported to have quit at the time of survey. Data reported by these 9757

individuals has been analysed for identifying exposure to the tobacco control interventions and effect of the same on quit behaviours.

**Outcome variables:** Two outcome variables were created (Table 1). First variable was dichotomous; attempted or did not attempt to quit smoking in previous year. The variable was created using question 'during past 12 months, have you tried to stop smoking' for current smokers whereas for past smokers who quit smoking during previous year, data was captured through questions on time since quitting. If time since quitting was less than 12 months, they were included among those who attempted to quit smoking during previous year. Second variable was duration of abstinence at the last attempt and it was captured through question 'thinking about the last time you tried to quit, how long did you stop smoking'. For those who had quit smoking during the previous year, the period of abstinence since quitting was noted.

**Independent variables:** Key independent variables include four variables that measure exposure to tobacco control interventions (Table 2). First variable was exposure to anti-smoking messages (model 1/3) or exposure to anti-smoking messages leading to thinking about quitting (model 2/4). Second was exposure to warning labels (model 1/3) or warning labels (model 2/4) leading to thinking about quitting. The third variable, a dichotomous one was created based upon whether the person received a quit advice or did not receive a quit advice irrespective of visit to doctors/ healthcare providers. Data on use of cessation methods was captured through several questions; a composite variable (fourth exposure variable) was created to create mutually exclusive and exhaustive categories of 'used counselling alone' (any or combination of face-to-face, m-cessation, quitline), 'used modern medicine alone' (either or both of nicotine replacement therapy and prescription medicines), 'used traditional medicine alone', 'switching to smokeless tobacco alone', 'combination of methods where both counselling and modern medicine is used' and 'all other combination of methods' and 'no use of any of these cessation methods'.

Other variables can confound the effect of exposure to tobacco control intervention and include the following. Variables on gender and residence were selected from the questionnaire without modifications. Age and education were re-categorised into four categories each, and marital status into three categories. Knowledge and perception variables were selected from the questionnaire without change. Frequency of sticks smoked per day was created by adding number of sticks smoked every day of all kinds of smoked products and then it was categorised into less than five sticks a day, 5-9, 10-14, 15-24 and 25 or more sticks. Time to tobacco use in the morning was created by pooling data from questions for both smoked and smokeless products. The less than daily users were categorised as 'less than five sticks a day' and 'used tobacco more than 60 minutes after getting up'.

**Analytical approach:** Descriptive analysis includes presenting distribution of smokers during the previous year (including current smokers and those who smoked during previous year but were not current smokers at the time of survey) by the independent variables. The

proportion of quit attempters among smokers in each category of independent variables has been calculated along with confidence intervals. Logistic regression approach was chosen to identify factors that determine quit attempts (model 1 and 2) and survival analysis was employed to study duration of abstinence (model 3 and 4). Model 1 and 3 included all smokers who smoked during previous year including those who were abstaining at the time of survey. Data on number of sticks smoked, messages/warning labels leading to think about quitting, perception that smoking has already harmed and time to use of tobacco in morning were not captured for those who were abstaining and hence these variables are not part of models 1 and 3. Models 2 and 4 include all variables but these analyses were limited to current smokers. While the first three exposure variables were in the equation for all the models; the fourth variable on use of cessation methods was relevant only for those who attempted to quit and therefore has been reflected in model 3 and 4 only. Analyses were performed using weights with SPSS version 20.0® (IBM Corp.) the survival analysis was unweighted.

## Results

Socio-demographic characteristics of smokers has been presented in Table 3. Nine out of 10 smokers were men and four out of 10 were aged 25-44 years. Three fourths of the smokers were residing in rural areas and one third did not have any formal schooling. Overall, 38.5% of the smokers attempted to quit smoking in previous year. Unadjusted analyses showed that urban residents (OR 1.19) were more likely than rural to attempt quitting smoking (Supplementary Table 1). Compared to those with no formal education, persons with formal schooling but not completed primary (OR 1.33), primary completed but not secondary (OR 1.32) and secondary or higher education (OR 1.19) had higher odds.

About three fourths of smokers reported noticing anti-smoking message and four-fifths reported noticing warning labels. But only a quarter of the smokers received quit advice from healthcare providers. Those who received messages regarding dangers of smoking through media/warning labels and those who received quit advice had

higher odds of quit attempts in the unadjusted analysis (Table 4). The effect of all the three exposure variables persisted even after adjusting for other variables in Model 1. Model 2 highlighted that effect of the messages received was more important than only noticing the message. Those who reported thinking about quitting after noticing the messages in media (AOR 1.53) or the warning labels (AOR 1.63) were significantly more likely to attempt quitting. However, those who did not think about quitting after noticing anti-smoking messages in the media were significantly less likely (AOR 0.61) to attempt quitting than those who reported not noticing the messages.

Smokers from urban areas, those with primary or secondary level education and those who were married had better odds of attempting to quit in both the models. Model 1 also showed higher odds of quit attempts among women and among the youth aged 15 to 25; however, the relationship was not significant after adjusting for the smoking pattern in model 2. Quit attempts were significantly lower among those who smoked more than 5 sticks a day compared to those who smoked less than 5 sticks a day. Similarly, the odds were higher for those whose time to first tobacco use was more than 30 minutes in comparison with those who used tobacco within 5 minutes of getting up.

Although 38.5% of smokers attempted to quit smoking in the previous year, the duration varied. Little over half could abstain for at least four weeks. 84.8% of those who attempted to quit smoking did not use any method to help quit. 6.0% reported using counselling alone, 1.8% reported using modern medicines alone (either nicotine replacement therapy or prescription medicines) to help quit, 0.8% used traditional methods alone whereas 3.5% attempted to quit smoking only by switching to smokeless tobacco use. Combinations of methods were used by the rest; 2.0% used both counselling and modern medicine whereas 1.1% used various other combinations.

In both model 3 and model 4, the hazard ratio of relapse was significantly lower with 'counselling' and 'combination of counselling with modern medicinal methods' compared to quit attempt without use of any cessation methods (Table 5). Among socio-demographic variables, female smokers were had higher hazard ratio

Table 1. Computation of Outcome Variables

	Groups	Questions	Coding
Attempted to quit smoking in previous year	Current smokers	D01: during past 12 months, have you tried to stop smoking?	Yes: Attempted to quit in previous year (1) No: Did not attempt quitting in previous year (0) Refused: excluded from analysis (SYSMIS)
	Past smokers	B13: How long it has been since you stopped smoking?	Stopped for less than 12 months: Attempted to quit in previous year (1) Stopped for a year and more: excluded from analysis (SYSMIS)
Duration of abstinence during last attempt	Current smokers	D02: thinking about the last time you tried to quit, how long did you stop smoking?	Duration of abstinence in days
	Past smokers	B13: How long it has been since you stopped smoking?	Duration of abstinence in days

Table 2. Computation of Exposure Variables

Variable	Question	Coding
Anti-smoking messages	G01: In the past 30 days, have you noticed information about the dangers of smoking tobacco or that encourages quitting in any of the following places?	'Yes' response to any of the media: Noticed anti-smoking message (1) Among the remaining, 'Refused' response to any of the media: Excluded from analysis (SYSMIS) Remaining: Did not notice anti-smoking message (0)
Anti-smoking messages leading to thinking about quitting	G01 and GG1: Did any of the information you just reported noticing about the dangers of smoking tobacco in the last 30 days lead you to think about quitting smoking?	'Yes' response to any of the media in G01 and 'Yes' in GG1: anti-smoking messages led to thinking about quitting (2) 'Yes' response to any of the media in G01 and 'No' in GG1: anti-smoking messages did not lead to thinking about quitting (1) Among the remaining, 'Refused' response to any of the media: Excluded from analysis (SYSMIS) Remaining: Did not notice anti-smoking message (0)
Warning labels	G02 and G02b: In the last 30 days, did you notice any health warnings on cigarette/bidi packages?	'Yes' response to either: Noticed warning label (1) Among the remaining, 'Refused' response to either: Excluded from analysis (SYSMIS) Remaining: Did not notice warning labels for both G02, G02b (0)
Warning labels led to thinking about quitting	G02, G02b and G03, G03b: In the last 30 days, have warning labels on cigarette/bidi packages led you to think about quitting?	'Yes' response to either G02/G02b and 'Yes' to G03/G03b: warning labels led to thinking about quitting (2) 'Yes' response to either G02/G02b and 'No' to G03/G03b: warning labels led to thinking about quitting (1) Among the remaining, 'Refused' response to either: Excluded from analysis (SYSMIS) Remaining: Did not notice warning labels for both G02, G02b (0)
Received quit advice from doctors	B17, D07: During any visit to a doctor or health care provider in the past 12 months, were you advised to quit smoking tobacco?	'Yes' response to either B17/D07: Received quit advice (1) 'Refused' response to either B17/D07: Excluded from analysis (SYSMIS) All remaining persons: Did not receive quit advice (including those who did not visit doctors) (0)
Use of cessation method	B18, D03: During the past 12 months, did you use any of the following to try to stop smoking tobacco?	'Yes' to face-to-face and/or m-cessation and/or quitline and 'No' to all other methods: Used Counselling alone (1) 'Yes' to Nicotine replacement therapy and/or prescription medicines and 'No' to all others: Used modern medicine alone (2) 'Yes' to traditional medicine and 'No' to all others: Traditional medicine alone (3) 'Yes' to switching to smokeless tobacco and 'No' to all others – Switching to smokeless tobacco alone (4) 'Yes' to face-to-face and/or m-cessation and/or quitline and 'Yes' to Nicotine replacement therapy and/or prescription medicines and 'No' to all others: Combination methods with both counselling and modern medicine (5) Out of the remaining, 'Yes' to any two or more methods but no 'Refused' to any question: all other combination of methods (6) 'No' to all questions: did not use any method (7)

of relapse compared to male smokers in both the models. The risk of relapse was higher for those who smoked 5 or more sticks a day compared to those who smoked less than 5 sticks a day. The risk of relapse was significantly lower for those whose first smoke was after 30 minutes of waking up compared to those who smoked within 5 minutes of waking up.

## Discussion

This paper provides empirical evidence that the

exposure to anti-tobacco messages in media, warning labels and quit advice from doctors or healthcare providers is positively associated with likelihood of quit attempts among smokers. Use of counselling as a cessation method was associated with likelihood for longer abstinence and lesser risk of relapse. These are of significance as the data is nationally representative and it captures the effect of interventions under usual programme conditions (effectiveness) rather than trial conditions (efficacy). Since exposure to these interventions have been found to be effective, improving their reach to masses should remain

Table 3. Socio-Demographic Characteristics, Smoking Pattern, Exposure to Anti-Smoking Messages and Knowledge Regarding Ill-Effects of Smoking among Smokers and Proportion of Smokers who Attempted to Quit Smoking in Previous Year (GATS India 2016-17)\*

Variables		Distribution of smokers (Proportions)	Proportion who attempted to quit smoking in previous year (Confidence interval)
Overall		100.0	38.5 (38.5-38.5)
Age	15-24 years	8.9	39.8 (39.7-39.8)
	25-44 years	41.9	39.4 (39.4-39.5)
	45-64 years	36.9	38.0 (38.0-38.0)
	65 years and above	12.3	36.2 (36.1-36.2)
Gender	Male	90.7	38.8 (38.8-38.8)
	Female	9.3	35.5 (35.5-35.6)
Residence	Urban	26.8	41.5 (41.5-41.5)
	Rural	73.2	37.4 (37.4-37.5)
Education	No formal schooling	35.3	34.8 (34.7-34.8)
	Less than primary school completed	14.9	41.5 (41.5-41.5)
	Primary school completed but less than secondary school completed	29.8	41.3 (41.3-41.4)
	Secondary school completed or more	20.0	38.8 (38.8-38.8)
Marital status	Married	83.8	39.1 (39.0-39.1)
	Single	10.5	36.6 (36.6-36.6)
	Divorced/widow/separated	5.7	34.3 (34.3-34.4)
Number of sticks smoked daily#	Less than 5	44.8	39.3 (39.3-39.3)
	5-9	18.4	30.4(30.4-30.4)
	10-14	14.7	34.5 (34.4-34.5)
	15-24	11.8	37.5 (37.4-37.5)
	25 and above	10.3	36.0(36.0-36.0)
Time to tobacco use after waking up in morning#	Within 5 minutes	16.1	33.6 (33.6-33.7)
	6 to 30 minutes	33.2	33.4 (33.4-33.4)
	31 to 60 minutes	14.7	37.9 (37.9-38.0)
	More than 60 minutes	36.0	39.6 (39.6-39.6)
Information about dangers of smoking in past 30 days from media	Did not receive information	25.4	32.7 (32.7-32.8)
	Received information	74.6	40.5 (40.5-40.5)
	- Information led to think about quitting smoking#	61.6	49.0 (48.9-49.0)
	- Information did not lead to think about quitting smoking#	38.4	22.2(22.2-22.3)
Noticed warning on cigarette/bidi packet in past 30 days	Did not notice a warning label	17.1	31.4 (31.4-31.4)
	Noticed warning label in past 30 days	82.9	40.0 (40.0-40.0)
	- Warning label led to think about quitting smoking#	73.4	44.5 (44.4-44.5)
	- Warning label did not lead to think about quitting smoking#	26.6	21.5(21.5-21.5)
Doctor/ healthcare provider advice in past year	Doctor/ healthcare provider did not advise to quit smoking or no visit to doctor	75.5	33.5 (33.5-33.5)
	Doctor/ healthcare provider advised to quit smoking	24.5	54.1 (54.0-54.1)
Knowledge	Smoking causes major illness	97.8	38.9 (38.9-38.9)
	Smoking does not cause major illness	2.2	21.7 (21.6-21.7)
Perception that smoking has already harmed#	Definitely no	30.9	33.2 (33.2-33.2)
	Probably no	17.0	34.6 (34.5-34.6)
	Don't know	2.8	21.6 (21.6-21.7)
	Probably yes	30.7	37.5 (37.5-37.6)
	Definitely yes	18.6	43.4 (43.4-43.5)

\*All figures represent percentages



Table 4. Determinants of Quit Attempt among Smokers during Previous Year: Logistic Regression (GATS India 2016-17)

Variables		Unadjusted OR (CI)	Adjusted OR (CI) Model 1	Adjusted OR (CI) Model 2
Sociodemographic variables				
Age	65 years and above (Ref)			
	15-24 years	1.17 (0.85-1.61)	1.46(1.14-1.87)*	1.08 (0.83-1.41)
	25-44 years	1.15 (0.91-1.46)	1.14(0.97-1.34)	1.09 (0.92-1.30)
	45-64 years	1.08 (0.85-1.38)	1.01(0.86-1.18)	0.99 (0.84-1.18)
Gender	Male (Ref)			
	Female	0.87 (0.64-1.12)	1.23(1.02-1.47)*	1.13 (0.92-1.38)
Residence	Rural (Ref)			
	Urban	1.19 (1.01-1.39)*	1.13(1.01-1.26)*	1.19 (1.06-1.34)*
Education	Formal schooling (Ref)			
	Less than primary school completed	1.33 (1.06-1.67)*	1.24(1.08-1.44)*	1.22 (1.04-1.42)*
	Primary school completed but less than secondary school completed	1.32 (1.10-1.59)*	1.24(1.10-1.41)*	1.18 (1.03-1.35)*
	Secondary school completed or more	1.19 (0.97-1.46)*	1.07(0.92-1.23)	0.91 (0.78-1.06)
Marital status	Married (Ref)			
	Single	0.90 (0.71-1.15)	0.79(0.66-0.96)*	0.73 (0.59-0.90)*
	Divorced/widow/separated	0.82 (0.59-1.13)	0.91(0.73-1.13)	0.84 (0.66-1.07)
Received antismoking information				
Information about dangers of smoking in past 30 days from media	Did not receive information (Ref)			
	Received information	1.40 (1.26-1.55)*	1.16(1.03-1.31)*	N/A
	Information did not lead to think about quitting smoking	0.69 (0.60-0.79)*	N/A	0.61 (0.52-0.71)*
	Information led to think about quitting smoking	2.31 (2.05-2.59)*	N/A	1.53 (1.33-1.77)*
Noticed warning on cigarette/ bidi packet in past 30 days	Did not notice a warning label (Ref)			
	Noticed warning label	1.46 (1.29-1.65)*	1.20(1.04-1.37)*	N/A
	Warning label did not lead to think about quitting smoking	0.77 (0.65-0.91)*	N/A	0.87 (0.72-1.05)
	Warning label led to think about quitting smoking	2.25 (1.96-2.58)*	N/A	1.63 (1.38-1.92)*
Doctor/ healthcare provider advice in past year	Doctor/ healthcare provider did not advise to quit smoking or no visit to doctor (Ref)			
	Doctor/ healthcare provider advised to quit smoking	2.34 (1.98-2.76)*	2.37(2.13-2.63)*	2.11 (1.88-2.37)*
Knowledge and Perception				
Knowledge	Smoking does not cause major illness (Ref)			
	Smoking causes major illness	2.30 (1.28-4.14)*	2.01(1.39-2.93)*	1.63 (1.10-2.43)*
Perception that smoking has already harmed	Definitely yes (Ref)			
	Definitely no	1.06 (0.85-1.34)	N/A	0.79 (0.68-0.91)*
	Probably no	0.56 (0.32-0.95)	N/A	0.79 (0.67-0.93)*
	Don't know	1.21 (1.00-1.47)	N/A	0.50 (0.35-0.71)*
	Probably yes	1.55 (1.25-1.92)*	N/A	0.79 (0.68-0.91)*
Smoking Pattern				
Number of sticks smoked daily	Less than 5 (Ref)		N/A	
	5-9	0.67 (0.55-0.83)	N/A	0.63 (0.55-0.73)*
	10-14	0.81 (0.65-1.02)	N/A	0.81 (0.69-0.94)*
	15-24	0.92 (0.73-1.18)	N/A	0.95 (0.80-1.12)
	25 and above	0.87 (0.67-1.12)	N/A	0.80 (0.67-0.95)*
Time to tobacco use after waking up in morning	Within 5 minutes (Ref)		N/A	
	6 to 30 minutes	1.06 (0.85-1.31)	N/A	1.11 (0.96-1.28)
	31 to 60 minutes	1.36 (1.05-1.75)*	N/A	1.48 (1.25-1.75)*
	More than 60 minutes	1.35 (1.08-1.68)*	N/A	1.41 (1.21-1.65)*
Constant			0.15	0.21

\* p &lt; 0.05

Table 5. Determinants of Relapse among Those who Attempted to Quit Smoking in Previous Year: Cox proportional hazards analysis (GATS India 2016-17)

Variables		Adjusted Hazard Ratio (CI) Model 3	Adjusted Hazard Ratio (CI) Model 4
Use of cessation methods	None of the methods (Ref)		
	Counselling alone	0.79 (0.68-0.91)*	0.80 (0.69-0.93)*
	Modern medicine alone	0.94 (0.75-1.19)	0.91 (0.72-1.15)
	Switch to smokeless tobacco alone	0.81 (0.66-0.99)*	0.89 (0.73-1.09)
	Traditional medicine alone	1.02 (0.70-1.49)	1.09 (0.75-1.59)
	Combination including counselling and modern medicines both	0.75 (0.58-0.97)*	0.77 (0.59-0.99)*
	Other combinations	0.67 (0.46-0.99)*	0.72 (0.49-1.06)
Sociodemographic variables			
Age	65 years and above (Ref)		
	15-24 years	0.94 (0.77-1.16)	1.00 (0.81-1.22)
	25-44 years	1.09 (0.96-1.24)	1.02 (0.90-1.16)
	45-64 years	1.02 (0.90-1.15)	0.95 (0.84-1.08)
Gender	Male (Ref)		
	Female	1.19 (1.04-1.35)*	1.36 (1.19-1.55)*
Residence	Rural (Ref)		
	Urban	0.97 (0.89-1.05)	1.00 (0.92-1.08)
Education	Formal schooling (Ref)		
	Less than primary school completed	0.97 (0.87-1.09)	1.06 (0.94-1.19)
	Primary school completed but less than secondary school completed	0.91 (0.82-1.00)	0.98 (0.89-1.08)
	Secondary school completed or more	0.92 (0.82-1.02)	1.04 (0.93-1.16)
Marital status	Married (Ref)		
	Single	0.91 (0.78-1.06)	1.04 (0.89-1.21)
	Divorced/widow/separated	0.91 (0.76-1.09)	0.89 (0.75-1.07)
Received antismoking information			
Information about dangers of smoking in past 30 days from media	Did not receive information (Ref)		
	Received information	0.94 (0.85-1.04)	0.93 (0.84-1.03)
Noticed warning on cigarette/ bidi packet in past 30 days	Did not notice a warning label (Ref)		
	Noticed warning label	1.29 (1.14-1.45)*	1.02 (0.91-1.15)
Doctor/ healthcare provider advice in past year	Doctor/ healthcare provider did not advise to quit smoking or no visit to doctor (Ref)		
	Doctor/ healthcare provider advised to quit smoking	0.99 (0.91-1.07)	0.96 (0.89-1.04)
Knowledge and Perception			
Knowledge	Smoking does not cause major illness (Ref)		
	Smoking causes major illness	1.04 (0.75-1.43)	1.17 (0.85-1.62)
Perception that smoking has already harmed	Definitely yes (Ref)	N/A	
	Definitely no	N/A	0.97 (0.88-1.07)
	Probably no	N/A	1.06 (0.95-1.19)
	Don't know	N/A	0.89 (0.70-1.14)
	Probably yes	N/A	0.88 (0.80-0.97)*
Smoking Pattern			
Number of sticks smoked daily	Less than 5 (Ref)	N/A	
	5-9	N/A	1.14 (1.03-1.27)*
	10-14	N/A	1.10 (0.99-1.23)
	15-24	N/A	1.17 (1.03-1.32)*
	25 and above	N/A	1.31 (1.14-1.51)*
Time to tobacco use after waking up in morning	Within 5 minutes (Ref)	N/A	
	6 to 30 minutes	N/A	0.95 (0.86-1.06)
	31 to 60 minutes	N/A	0.86 (0.76-0.97)*
	More than 60 minutes	N/A	0.74 (0.66-0.83)*

\* p < 0.05

a policy priority.

GATS 2 report has already highlighted that the reach of the interventions had significantly improved from the previous round. However, almost one fourth of the smokers did not notice anti-smoking messages in previous 30 days and 17% did not notice warning labels. Warning labels need to be engaging and longer period of abstinence depends upon the effect it can cast on smoker's mind. India started using pictorial warnings covering 85% of the label and significantly more smokers thought about quitting smoking in GATS 2 than in GATS 1. Similar evidence has been observed in nationally representative data in Bangladesh (Turk et al., 2018). Pictorial warnings using real images have been more effective in other countries (Brennan et al., 2016; Agaku et al., 2015). This study found that the odds of attempting to quit were higher only when the media messages and warning labels made smokers think about quitting. The smokers who did not think about quitting after noticing warning labels or media messages were less likely to attempt quitting. Most of the persons who bought cigarettes reported buying loose ones and the packaging of many other smoked products is less regulated. This means that there is a need to emphasize the importance of warning labels on all the smoked products especially bidi and need to have strict regulations to prevent sale of loose sticks. Almost a quarter of smokers who noticed warning labels reported that the labels did not make them think about quitting. It is crucial to determine underlying reasons of the same and whether rotation of warning labels or plain packaging would help improve quit intention. Previous literature found cessation methods to be of no value in sustained abstinence in programme settings (Srivastava et al., 2013; Kim, 2014). Both the studies used nationally representative survey data and helped determined effectiveness in field realities but these studies compared all-time successful quitters with current smokers who relapsed. These two groups may have experienced different kinds of cessation services. The Indian study (Srivastava et al., 2013) did not record exposure to cessation methods among those who had quit a year prior and the Korean one did not consider the possibility that current successful quitters might have relapsed in the past. In our paper, we limited analysis of exposures, quit attempts and sustained abstinence during the previous year. Although, it is not possible to comment upon long-term sustained abstinence, our study demonstrates effectiveness of counselling and that of combination of counselling and modern medicines over short time period.

The results from our study parallel the evidence from a Cochrane review of trials for smoking cessation (Lancaster and Stead, 2017). The review included examining and pooling findings from 49 trials. The review concluded that individual counselling was effective in assisting smokers to quit. The authors also concluded that when individual counselling was added to pharmacotherapy there was smaller incremental benefit although the quality of this evidence was not the best. The authors also concluded that intensive counselling offers incremental advantage over brief advice but the magnitude of the increment was small and this conclusion had a moderate quality of

the evidence. GATS data did not capture the intensity or duration of the cessation aid used. Those who received counselling may have received varying 'dose' of the intervention and same can be said about pharmacotherapy. This study that with counselling and counselling plus pharmacotherapy, smokers were able to stay abstinent for longer duration. While, the effectiveness of counselling and use of modern medicinal methods has been proved in this study, the reach of these interventions remains a concern. Most of these persons did not use any cessation support indicating lack of availability of the same. Advice by healthcare providers was strongly associated with the quit attempts but not with sustained abstinence. Same was the case with anti-smoking messages through media and warning labels. About half of the smokers had visited doctors or healthcare providers in the previous year (TISS and MoHFW, GoI, 2018) but less than 10% received counselling intervention. There lies a great opportunity to link smokers with counselling and other cessation interventions. There is strong evidence that utilisation of cessation services is dependent upon availability of cost-covered services (Filippidis et al., 2014). There is a need to decentralise and scale up the tobacco cessation centres. However, the recent literature also points out to limited sustenance through TCCs due to weak follow-up and there have been attempts to use mobile technology for cessation care continuum (Chahar et al., 2018). There is a need of implementation research to improve our understanding of the effectiveness of cessation interventions in programmatic settings and thereby devise strategies for tobacco cessation.

The study has certain limitations. Being of cross-sectional design, temporality is hard to establish. The measurement of exposure to interventions was self-reported and there is likelihood of bias. Since, it is secondary analysis of data and not a trial, the interventions have occurred in natural setting and the study records only whether the intervention was received or not. For example, use of cessation method is recorded but not the duration and intensity of method and smoker's adherence with the same. It is quite possible that different persons who reported having warning labels could have seen different warning labels on different products. Exposure to anti-smoking messages and to warning labels was over previous 30 days; however, this could be a fair proxy of the exposure to smokers in the previous year. In spite of these limitations, the study demonstrates the value of persisting with these key interventions. Association of quit attempts with warning labels, anti-smoking messages and quit advice by doctors calls for improving both the reach and appeal of them to the smokers. The access to cessation methods will be helpful in prolonging abstinence. Out of the various cessation methods counselling either alone or in combination with modern medicinal methods has been found to be successful.

## Author Contribution Statement

NG conceptualized the study in discussion with ZQ. The objectives and methods were designed by NG and the proposal was reviewed by ZQ. The analysis



was conducted by NG and reviewed by ZQ. The final manuscript was prepared by NG and edited/commented by ZQ.

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### Approval

The study was approved by the institutional review board of Datta Meghe Institute of Medical Sciences.

### Ethical Declaration

The study was analysis of secondary data and no primary data collection was involved. The study was approved by the institutional review board of Datta Meghe Institute of Medical Sciences.

### Data Availability

The data underlying this article are available in [Global Tobacco Surveillance System Data (GTSSData) at <https://nccd.cdc.gov/GTSSDataSurveyResources/Ancillary/DataReports.aspx?Country=180&CAID=2&Survey=4&WHORegion=2&Site=3840002016>. The datasets were derived from sources in the public domain. Code is available upon request.

### Study Registration

Not applicable.

### Conflict of Interest

Authors declare that they have no conflict of interest.

## References

- Akanbi MO, Carroll AJ, Achenbach C, et al (2019). The efficacy of smoking cessation interventions in low- and middle-income countries: a systematic review and meta-analysis. *Addiction*, **114**, 620-35.
- Agaku IT, Filippidis FT, Vardavas CI (2015). Effectiveness of text versus pictorial health warning labels and predictors of support for plain packaging of tobacco products within the European Union. *Eur Addict Res*, **21**, 47-52.
- Arora M, Tewari A, Nazar GP, Gupta VK, Shrivastav R (2012). Ineffective pictorial health warnings on tobacco products: lessons learnt from India. *Indian J Public Health*, **56**, 61-4.
- Balhora YPS, Gupta R (2015). Revised Size of Pictorial Warning on Cigarette Packages-A Step in Right Direction. *Nicotine Tob Res*, **17**, 1401-2.
- Binnal A, Rajesh G, Ahmed J, Denny C, Nayak SU (2013). Insights into smoking and its cessation among current smokers in India. *Asian Pac J Cancer Prev*, **14**, 2811-8.
- Brennan E, Maloney EK, Ophir Y, Cappella JN (2017). Potential Effectiveness of Pictorial Warning Labels That Feature the Images and Personal Details of Real People. *Nicotine Tob Res*, **19**, 1138-48.
- Chahar P, Mohanty VR, Aswini YB (2018). Designing and validation of text messages for mHealth intervention for tobacco cessation and management. *Indian J Cancer*, **55**, 390-3.
- Corsi DJ, Subramanian SV, Lear SA, et al (2014). Tobacco use, smoking quit rates, and socioeconomic patterning among men and women: a cross-sectional survey in rural Andhra Pradesh, India. *Eur J Prev Cardiol*, **21**, 1308-18.
- Dhumal GG, Pednekar MS, Gupta PC, et al (2014). Quit history, intentions to quit, and reasons for considering quitting among tobacco users in India: Findings from the Tobacco Control Policy Evaluation India Wave 1 Survey. *Indian J Cancer*, **51**, 39-45.
- Filippidis FT, Gerovasili V, Vardavas CI, Agaku IT, Toumtas Y (2014). Determinants of use of smoking cessation aids in 27 European countries. *Prev Med*, **65**, 99-102.
- Kar SS, Sivanantham P, Rehman T, Chinnakali P, Thiagarajan S (2020). Willingness to quit tobacco and its correlates among Indian tobacco users-Findings from the Global Adult Tobacco Survey India, 2016-17. *J Postgrad Med*, **66**, 141-8.
- Karinagannanavar A, Raghavendra B, Hemagiri K, Goud TG (2011). Awareness about pictorial warnings on tobacco products and its impact on tobacco consumers in Bellary, India. *Asian Pac J Cancer Prev*, **12**, 2485-9.
- Kim YJ (2014). Predictors for successful smoking cessation in Korean adults. *Asian Nurs Res (Korean Soc Nurs Sci)*, **8**, 1-7.
- Lancaster T, Stead LF (2017). Individual behavioural counselling for smoking cessation. *Cochrane Database Syst Rev*, **3**, CD001292.
- Pradhan MR, Patel SK (2019). Correlates of tobacco quit attempts and missed opportunity for tobacco cessation among the adult population in India. *Addict Behav*, **95**, 82-90.
- Reddy M, Kanungo S, Naik B, Kar S (2018). Willingness to quit tobacco smoking and its correlates among Indian smokers – Findings from Global Adult Tobacco Survey India, 2009–2010. *J Family Med Prim Care*, **7**, 1353-60.
- Sarkar BK, Reddy KS (2012). Priorities for tobacco control research in India. *Addiction*, **107**, 2066-8.
- Savant SC, Hegde-Shetiya S, Agarwal D, Shirhatti R, Shetty D (2013). Effectiveness of individual and group counseling for cessation of tobacco habit amongst industrial workers in pimpri, pune--an interventional study. *Asian Pac J Cancer Prev*, **14**, 1133-9.
- Shang X, Guo K, E F, et al (2022). Pharmacological interventions on smoking cessation: A systematic review and network meta-analysis. *Front Pharmacol*, **13**, 1012433.
- Srivastava S, Malhotra S, Harries AD, Lal P, Arora M (2013). Correlates of tobacco quit attempts and cessation in the adult population of India: secondary analysis of the Global Adult Tobacco Survey, 2009-10. *BMC Public Health*, **13**, 263.
- Surani NS, Gupta PC, Fong TG, et al (2012). Intention to quit among Indian tobacco users: findings from International Tobacco Control Policy evaluation India pilot survey. *Indian J Cancer*, **49**, 431-7.
- Tata Institute of Social Sciences (TISS), Mumbai and Ministry of Health and Family Welfare, Government of India (MoHFW, GoI) (2018). Global Adult Tobacco Survey GATS 2 India 2016-17.
- Thankappan KR, Mini GK, Daivadanam M, et al (2013). Smoking cessation among diabetes patients: results of a pilot randomized controlled trial in Kerala, India. *BMC Public Health*, **13**, 47.
- Thankappan KR, Mini GK, Hariharan M, et al (2014). Smoking cessation among diabetic patients in Kerala, India: 1-year follow-up results from a pilot randomized controlled trial. *Diabetes Care*, **37**, e256-7.
- Turk T, Newton F, Choudhury S, Islam MS (2018). Predictors

of Quitting Attempts Among Tobacco Users in Bangladesh After a Communication Campaign to Launch Graphic Warning Labels on Packaging. *Health Educ Behav*, **45**, 879-87.

Venkatesh S, Sinha DN (2012). Involvement of health professionals in tobacco control in the South-East Asia Region. *Indian J Cancer*, **49**, 327-35.



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