

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

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Abstract

Objective: Smokeless tobacco is the preponderant form of tobacco in India. The cessation indicators are weaker for smokeless tobacco users than smokers. There is a dearth of literature on the effectiveness of the interventions that motivate and assist smokeless tobacco users in quitting in program settings. **Methods:** Data from Global Adult Tobacco Surveys (GATS), 2016-17, was analysed. Quit attempts in the previous 12 months among SLT users and duration of abstinence were the two outcome variables. The chief exposure variables were the receipts of various interventions that warned about the dangers of smokeless tobacco or encouraged quitting. Logistic regression analyses were employed to identify determinants of quit attempts. For the hazard of relapse to tobacco use, survival analysis was used. **Results:** The odds of quit attempts among SLT users in the previous 12 months were more among those who received advice from healthcare providers (OR 2.09; 1.87-2.34), noticed messages from media that made them think about quitting (OR 1.67; 1.50-1.86) and noticed a warning label that made them think about quitting (OR 1.39; 1.25-1.55). Those who used counselling (HR 0.81; 0.70-0.93) or medication (HR 0.79; 0.66-0.95) sustained abstinence from smokeless tobacco for a longer duration compared to those who did not use any cessation method. **Conclusion:** Quit advice by healthcare providers is an influential determinant of a quit attempt, and this intervention needs to be scaled up. The media messages and warning labels were effective among those who considered quitting after noticing them. Cessation methods can help prolong the abstinence from smokeless tobacco, but the reach of cessation methods is limited.

Keywords: Smokeless tobacco- Counselling- Cessation- Warning label- India

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Introduction

Smokeless tobacco (SLT) use is more common than smoking in India. Nationally representative data from the Global Adult Tobacco Survey (GATS) in 2016-17 found that three-fourths of tobacco users used at least one type of smokeless tobacco [1]. Only 5.8% of ever-daily smokeless tobacco users reported quitting the use of smokeless tobacco. The ever-daily smokers had a relatively better quit ratio (16.8%). Nearly one-third of the smokeless tobacco users had attempted quitting in the previous 12 months, but most of them had relapsed. These data underline minimal tobacco cessation among smokeless tobacco users in India.

Knowledge, attitudes and behavioural intentions are mediators of quit attempts and sustenance of cessation. Mass media messaging, warning labels, and advice by healthcare providers have been three chief interventions under the national tobacco control program (NTCP). A significant change in the warning labels on smokeless

tobacco products came into force in 2015. The law mandated that the warning labels cover 85% of the label area and bear pictorial warnings. A four-state study conducted before the 2015 regulations did not find a change in the effectiveness of the warning labels despite the revisions [2]. Mass media messages had focussed on smoking in the past. In the last few years, specific messages for smokeless products were added to the mass media campaigns. Their effectiveness in motivating a quit attempt and sustaining the behaviour needs to be measured at the population level. There is evidence globally and in India that interventions by health professionals help quit smokeless tobacco [3]. A recent meta-analysis found behavioural interventions to be efficacious for smokeless tobacco cessation [4]. This evidence is from experimental studies, but the reach and effectiveness of the 'advice by healthcare professionals' remain to be determined.

The use of cessation methods to aid in quitting is a relatively new phenomenon in India. Analysis from the first GATS round 2009-10 found that the cessation

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methods were ineffective in ensuring quitting among tobacco users [5]. The number of tobacco cessation centres and district-level tobacco control cells increased after 2010. Quitline and mobile-based messaging have been initiated and scaled up in the last decade. A systematic review of smokeless tobacco cessation experimental studies, including four Indian ones, concluded that behavioural interventions had high efficacy; quitlines and pharmacotherapy were beneficial [6]. However, these studies assessed efficacy in trial settings, and little is known about their effectiveness in program settings. Before the GATS 2016-17, there has been no nationally representative data on the reach of nicotine replacement therapy, prescription medicine and m-cessation (mobile-based cessation services). The reach and effectiveness of the cessation methods in enhancing abstinence from smokeless tobacco use have not been studied at the national level.

Global literature, advocacy, and control measures are all smoking-centred. Relatively much less is known about the effectiveness of smokeless tobacco control measures. A recent analysis based upon GATS surveys of India attempted to identify determinants of smokeless tobacco quit attempts but did not study risk of relapse [7]. Given the paucity of knowledge on determinants of quit attempts among smokeless tobacco users and whether the cessation methods are of use, this paper examines determinants of quit attempts among smokeless tobacco users during the previous year using the GATS, 2016-17 data, from the latest round. NFHS-5 (2021) provides recent-most data but lacks variables that were needed for this analysis. The paper also covers determinants of short-term abstinence from smokeless tobacco and whether the use of cessation methods is of value in the same.

Materials and Methods

Source of data: The data from the Global Adult Tobacco Survey, India (2016-17) was analysed. GATS used multi-stage, geographically clustered stratified sampling to produce representative data at the national and state levels. The dataset included 74037 individuals aged 15 and above. 15489 persons reported using smokeless tobacco during the previous year. These 15489 users also included some who also reported smoking during the previous year. Such smokers were excluded from the study as it intended to examine quit attempts among smokeless tobacco users and the effectiveness of interventions among them. Data collected from 12435 smokeless tobacco users were analysed for their exposure to tobacco control interventions and the effect of such exposures on their quit behaviours.

Outcome variables: Two outcome variables were created (Table 1). The first variable was dichotomous; attempted or did not attempt to quit smokeless tobacco in the previous year. For the current smokeless tobacco users, the variable was created using the question, 'During past 12 months, have you tried to stop using smokeless tobacco?' For the past users, data was captured from the questions on 'time since quitting'. The second variable, duration of abstinence at the last attempt, was captured

through the question, 'Thinking about the last time you tried to quit, how long did you stop using smokeless tobacco?' The period of abstinence since quitting was noted for those who had quit smokeless tobacco use the previous year.

Independent variables: Key independent variables included four variables that measure exposure to tobacco control interventions (Table 2). GATS survey captured information on exposure to anti-smokeless tobacco messages through various media. The first variable was exposure to messages about the dangers of smokeless tobacco or one that encourages quitting smokeless tobacco. Second was exposure to warning labels on smokeless tobacco products. The third variable, a dichotomous one, was created based on whether the person received quit advice or did not receive quit advice during a visit to a doctor/ healthcare provider. Data on the use of cessation methods were captured through several questions on using individual methods; some used combination of methods. There were very few persons who had used any cessation methods. The variable was created with four categories, used counseling, used medicines, used other methods and did not use cessation method.

Key confounding variables collected in GATS 2 dataset were listed. Age and education were re-categorised into four categories, and marital status into three. We used categories from the questionnaire for four variables without any modification. These four variables were gender, residence and perception that smokeless tobacco use has already harmed, and time of first use of smokeless tobacco after waking up. The frequency of use of smokeless tobacco per day was created by adding the number of times each of the smokeless tobacco products was used every day and then categorised into less than five times a day, 5-9,10-14, 15-24 and 25 or more times. The less-than-daily users were classified into the first category of fewer than five times use a day.

Analytical approach: The distribution of smokeless tobacco users by categories of independent and confounding variables was prepared. The proportion of quit attempters among smokeless tobacco users in each category of independent variables was calculated along with confidence intervals. Since the first outcome variable on quit attempts was dichotomous, the logistic regression approach was chosen to identify factors that determine quit attempts (models 1 and 2). The survival analysis method was used for the second outcome variable of 'duration of abstinence from smokeless tobacco use' (models 3 and 4). The hazard in the survival analysis was defined as a 'relapse' to smokeless tobacco use. Models 1 and 3 included all smokeless tobacco users during the previous year, including those who had quit during the year. Data on the number of times of use of smokeless tobacco, messages/warning labels leading to think about quitting, the perception that smokeless tobacco has already harmed, and time to use tobacco in the morning were not captured for those who were abstaining at the time of survey (188 out of 12435). Hence, models 1 and 3 did not include these confounding variables. Models 2 and 4 included these confounding variables but had to exclude the 188 smokeless tobacco users who attempted to quit in the

previous 12 months and continued to abstain at the time of the survey. While the first three exposure variables were in the equation for all the models, the fourth variable on the use of cessation methods was relevant only for those who attempted to quit and therefore has been reflected in models 3 and 4 only. Descriptive analyses were performed using weights and inferential analyses without weights; SPSS version 20.0® (IBM Corp.) was used.

Results

The sociodemographic characteristics of smokeless tobacco users are presented in Table 3. Young adults aged 25-44 comprised the single largest group. One-third of smokeless tobacco users were female. Three-fourths of the smokeless tobacco users were residing in rural areas, and more than one-third had no formal schooling. About 30% of smokeless tobacco users attempted to quit during the previous year. The proportion of those who attempted to quit was 36%, 37% and 50% among those who noticed warning labels, noticed anti-smokeless tobacco messages and received quit advice from healthcare providers, respectively. 49% of those who thought of quitting after noticing the anti-smokeless tobacco message had a quit attempt, compared to 21% who noticed the message but did not think of quitting. Similarly, 44% of those who thought of quitting after noticing warning labels had a quit attempt compared to 19% who noticed the warning label but did not think of quitting.

Unadjusted analyses showed a relationship between most independent variables and quit attempts (Table 3). Adjusted analysis (model 1) found that all three exposure variables, namely information on media about the dangers of smokeless tobacco, warning labels, and quit advice from doctors/ healthcare providers, were significantly associated with quit attempts. Those aged 15-44 years and those with formal education had higher odds of quitting attempts. Adjusted analysis (model 2) showed an exciting finding. As expected, those who thought of quitting due to warning labels were more likely to attempt quitting compared to those who did not notice warning labels. However, those who reported that noticing warning labels did not make them think of quitting had lower odds of quit attempts compared to those who did not notice the warning labels. A similar phenomenon was observed for exposure to anti-smokeless tobacco media messages.

Quit advice by doctors or healthcare providers continued to have higher odds of quit attempts. Quit attempts were significantly lower among those smokeless tobacco users who consumed products 5 to 24 times a day compared to those who consumed less than 5 times a day. The odds for quit attempts were higher for those whose time to first tobacco use was more than 60 minutes in comparison with those who used tobacco within 5 minutes of getting up. Those who believed that smokeless tobacco had not harmed them and those who were not sure about it were less likely to attempt quitting compared to those who definitely believed that smokeless tobacco had already affected their health (Table 4).

89.8% of those who attempted to quit smokeless tobacco did not use any method to help quit. 5.7% reported using counseling alone, 1.7% reported using modern medicines alone, and 0.7% used traditional methods alone. The rest, 2.2%, had used more than one cessation aid. Counseling was associated with a longer duration of abstinence (Table 5). Hazard ratios associated with counseling as a cessation method were 0.84 (0.72-0.97) and 0.81(0.70-0.93) for models 3 and 4. The use of medicines was more effective than not using any cessation method in model 4 (hazard ratio 0.79; 0.66-0.95). Females were less likely to sustain abstinence, and so were those who used smokeless tobacco 5-24 times compared to users who used smokeless tobacco less than 5 times a day. Those who received quit advice from doctors or other healthcare providers were likelier to stay abstinent.

Discussion

The study highlights that exposure to warning labels, anti-smokeless tobacco messages, and quit advice by healthcare providers were associated with a higher probability of quit attempts among smokeless tobacco users. GATS report (2016-17) showed that 72% of the smokeless tobacco users reported noticing warning labels, and 63% reported noticing anti-smokeless tobacco messages in the media during the previous 30 days. Corresponding indicators for smoking were better. Smokeless tobacco products are often sold without a warning label or with a faded image of the warning [2].

Although the warning label had a positive association with quit attempts, smokeless tobacco users who did not think about quitting after noticing warning labels had

Table 1. Computation of Outcome Variables

	Groups	Questions	Coding
Attempted to quit smokeless tobacco in the previous year	Current smokers	D09: During past 12 months, have you tried to stop using smokeless tobacco?	Yes: Attempted to quit in the previous year (1) No: Did not attempt quitting in the previous year (0) Refused: excluded from analysis (SYSMIS)
	Past smokers	C13: How long it has been since you stopped using smokeless tobacco?	Stopped for less than 12 months: Attempted to quit in the previous year (1) Stopped for a year and more: excluded from analysis (SYSMIS)
Duration of abstinence during the last attempt	Current smokers	D10: Thinking about the last time you tried to quit, how long did you stop using smokeless tobacco?	Duration of abstinence in days
	Past smokers	C13: How long it has been since you stopped using smokeless tobacco?	Duration of abstinence in days

Table 2. Computation of Exposure Variables

Variable	Question	Coding
Anti-smokeless tobacco messages	G201: In the past 30 days, have you noticed information about the dangers of using smokeless tobacco or that encourages quitting in any of the following places?	'Yes' response to any of the media: Noticed anti-smokeless tobacco message (1) Among the remaining, 'Refused' response to any of the media: Excluded from analysis (SYSMIS) Remaining: Did not notice anti-smokeless tobacco message (0)
Anti-smoking messages leading to thinking about quitting	G201 and GG2: Did any of the information you just reported noticing about the dangers of using smokeless tobacco in the last 30 days lead you to think about quitting the use of smokeless tobacco?	'Yes' response to any of the media in G01 and 'Yes' in GG1: anti-smokeless tobacco messages led to thinking about quitting (2) 'Yes' response to any of the media in G01 and 'No' in GG1: anti-smokeless tobacco 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-smokeless tobacco message (0)
Warning labels	G02a: In the last 30 days, did you notice any health warnings on smokeless tobacco products?	'Yes' response: Noticed warning label (1) 'Refused' response: Excluded from analysis (SYSMIS) Did not notice warning label G02a(0)
Warning labels led to thinking about quitting	G02a and G03a: In the last 30 days, have warning labels on smokeless tobacco products led you to think about quitting?	'Yes' response to G02a and 'Yes' to G03a: warning labels led to thinking about quitting (2) 'Yes' response to G02a and 'No' to G03a: warning labels led to thinking about quitting (1) 'Refused' response to either: Excluded from analysis (SYSMIS) Remaining: Did not notice warning labels for G02a (0)
Received quit advice from doctors	C17, D15: During any visit to a doctor or health care provider in the past 12 months, were you advised to stop using smokeless tobacco?	'Yes' response to either C17/D15: Received quit advice (1) 'Refused' response to either C17/D15: Excluded from analysis (SYSMIS) All remaining persons: Did not receive quit advice (including those who did not visit doctors) (0)
Use of cessation method	C18, D11: During the past 12 months, did you use any of the following to try to stop using smokeless tobacco?	'Yes' to face-to-face counselling and/or m-cessation 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 face-to-face counselling and/or m-cessation 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)

significantly less likelihood of quit attempts. This study found that 37% of those who noticed warning labels reported that the warning labels did not make them think of quitting. Smokeless tobacco is marketed with packaging designs that can undermine the warning content of the label. Even when warning labels are prescribed, there is evidence that actual printing can reduce the impact of the image, which means there is no uniform warning label that all smokeless tobacco users see [8]. Another reason is that in a multi-linguistic, multi-culture nation with poor literacy, different persons may interpret the same label differently. Hence field testing of the labels needs to be an ongoing activity, as the labels are expected to rotate every couple of years. It is equally important to enforce regulations about warning labels.

Most smokeless tobacco users did not get quit advice during visits to healthcare providers. Quit advice by doctors was found to be effective in previous studies and

the present secondary analysis. Sensitising healthcare providers and making tobacco history a routine part of clinical consultation is necessary. If all doctors ask questions regarding smokeless tobacco use, it would improve the reach and assist in cessation [9].

The study highlights those sociodemographic variables such as education, younger age, urban residents, and men are more likely to attempt quitting. What could be the underlying reasons? Are the messages, warning labels and quit advice reach them differentially? Their effect was observed even after adjusting for these exposure variables. Does that indicate differential comprehensions and interpretations of the warning messages in society with the underprivileged being at a disadvantage? or that privileged people have better self-efficacy and access to resources which makes them attempt quitting? It could also be due to variance in the type of products used. The elderly use Khaini (which comes in unpackaged form

Table 3. Socio-Demographic Characteristics, Smokeless Tobacco Use Pattern, Exposure to Anti-Smokeless Tobacco Messages among Smokeless Tobacco Users and Proportion of the Smokeless Tobacco Users who Attempted to Quit in the Previous Year (GATS India 2016-17)*

Variables		Distribution of smokeless tobacco users (Proportions)	The proportion who attempted to quit in the previous year (Confidence interval)
Overall		100.0	30.7 (30.7-30.7)
Age	15-24 years	13.6	38.9 (38.8-38.9)
	25-44 years	44.3	37.5 (37.5-37.5)
	45-64 years	29.9	28.2 (28.2-28.2)
	65 years and above	12.1	24.5 (24.5-24.5)
Gender	Male	66.2	35.8 (35.8-35.8)
	Female	33.8	28.4 (28.4-28.5)
Residence	Urban	25.1	36.5 (36.5-36.5)
	Rural	74.9	32.3 (32.3-32.3)
Education	No formal schooling	36.1	26.5 (26.4-26.5)
	Less than primary school completed	12.7	32.2 (32.2-32.2)
	Primary school completed but less than secondary school completed	31.5	37.2 (37.1-37.2)
	Secondary school completed or more	19.7	40.7 (40.7-40.7)
Marital status	Married	78.6	33.3 (33.3-33.3)
	Single	11.2	40.1 (40.1-40.1)
	Divorced/widow/separated	10.2	26.4 (26.4-26.4)
Number of times smokeless tobacco was used#	Less than 5	52.6	36.2 (36.2-36.2)
	5-9	31.1	27.7(27.7-27.7)
	10-14	10.4	24.7(24.6-24.7)
	15-24	4.8	30.8 (30.8-30.9)
	25 and above	1.2	47.1 (47.0-47.2)
Time to tobacco use after waking up in morning#	Within 5 minutes	13.1	29.3 (29.3-29.3)
	6 to 30 minutes	35.0	26.5 (26.5-26.5)
	31 to 60 minutes	18.1	30.2 (30.1-30.2)
	More than 60 minutes	33.9	40.4 (40.3-40.4)
Information about the dangers of smokeless tobacco in the past 30 days from media	Did not receive information	37.7	27.9 (27.9-27.9)
	Received information	62.3	36.6 (36.6-36.6)
	- Information led to think about quitting#	53.0	48.8 (48.8-48.9)
	- Information did not lead to thinking about quitting#	47.0	20.7 (20.7-20.7)
Noticed warnings on smokeless tobacco packets in the past 30 days	Did not notice a warning label	28.2	27.2 (27.2-27.2)
	Noticed a warning label in the past 30 days	71.8	35.7 (35.7-35.7)
	- Warning label led to think about quitting#	63.4	44.1 (44.1-44.1)
	- Warning label did not lead to thinking about quitting#	36.6	18.6 (18.6-18.6)
Doctor/ healthcare provider advice in the past year	Doctors/ healthcare providers did not advise to quit or not visited a doctor	85.2	30.5 (30.5-30.5)
	Doctors/ healthcare providers advised quitting	14.8	49.6 (49.6-49.6)
The perception that smokeless tobacco use has already harmed#	Definitely no	44.8	29.7 (29.6-29.7)
	Probably no	18.3	27.8 (27.8-27.8)
	Don't know	3.0	22.2 (22.2-22.3)
	Probably yes	21.2	37.9 (37.9-37.9)
	Definitely yes	12.8	40.5 (40.5-40.5)

predominantly) more often, whereas youth are more likely to consume gutkha/pan masala with tobacco (usually packaged). These are important areas for further investigation.

Global literature is in support of the use of cessation methods for smokeless tobacco as well. Cochrane review [10] concluded that behavioural interventions might help, but there was considerable heterogeneity in the

Table 4. Determinants of Quit Attempt among Smokeless Tobacco Users during the 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	1.96 (1.69-2.27)*	1.61 (1.31-1.98)*	1.46 (1.17-1.82)*
	25-44 years	1.85 (1.63-2.09)*	1.43 (1.22-1.67)*	1.40 (1.19-1.65)*
	45-64 years	1.21 (1.06-1.38)*	1.23 (1.05-1.44)*	1.22 (1.03-1.44)*
Gender	Male (Ref)			
	Female	0.71 (0.66-0.77)*	0.89 (0.87-0.97)*	0.84 (0.76-0.92)*
Residence	Rural (Ref)			
	Urban	1.20 (1.11-1.31)*	1.22 (1.11-1.34)*	1.22 (1.11-1.35)*
Education	Formal schooling (Ref)			
	Less than primary school completed	1.32 (1.17-1.49)*	1.15 (1.01-1.31)*	1.10 (0.96-1.26)
	Primary school completed but less than secondary school completed	1.64 (1.50-1.80)*	1.18 (1.06-1.31)*	1.07 (0.95-1.20)
	Secondary school completed or more	1.91 (1.72-2.11)*	1.36 (1.21-1.54)*	1.15 (1.01-1.31)*
Marital status	Married (Ref)			
	Single	1.35 (1.20-1.50)*	0.82 (0.70-0.97)*	0.82 (0.69-0.97)*
	Divorced/widow/separated	0.72 (0.63-0.82)*	1.04 (0.89-1.22)	1.09 (0.92-1.29)
Received anti-smokeless tobacco information				
Information about the dangers of smokeless tobacco in the past 30 days from media	Did not receive information (Ref)			
	Received information	1.49 (1.38-1.61)*	1.32 (1.21-1.44)*	N/A
	The information did not lead to thinking about quitting	0.72 (0.65-0.79)*	N/A	0.78 (0.69-0.87)*
	The information led to think about quitting	2.64 (2.42-2.87)*	N/A	1.67 (1.50-1.86)*
Noticed warnings on smokeless tobacco packets in the past 30 days	Did not notice a warning label (Ref)			
	Noticed warning label	1.49 (1.37-1.62)*	1.05 (0.96-1.15)	N/A
	The warning label did not lead to thinking about quitting	0.66 (0.59-0.74)*	N/A	0.53 (0.46-0.60)*
	Warning label led to think about quitting	2.28 (2.08-2.49)*	N/A	1.39 (1.25-1.55)*
Doctor/ healthcare provider advice in the past year	Doctors/ healthcare providers did not advise to quit or not visited a doctor (Ref)			
	Doctors/ healthcare providers advised quitting	2.24 (2.03-2.47)*	2.43 (2.19-2.70)*	2.09 (1.87-2.34)*
Perception of harm				
The perception that smokeless tobacco use has already harmed	Definitely yes (Ref)			
	Definitely no	0.62 (0.55-0.69)*	N/A	0.71 (0.63-0.80)*
	Probably no	0.57 (0.50-0.65)*	N/A	0.62 (0.53-0.71)*
	Don't know	0.42 (0.32-0.54)*	N/A	0.64 (0.49-0.82)*
	Probably yes	0.90 (0.79-1.01)	N/A	0.87 (0.76-0.99)*
Smokeless tobacco use Pattern				
Number of times smokeless tobacco was used	Less than 5 (Ref)		N/A	
	5-9	0.68 (0.62-0.74)*	N/A	0.84 (0.76-0.93)*
	10-14	0.58(0.51-0.66)*	N/A	0.77 (0.66-0.89)*
	15-24	0.79(0.66-0.94)*	N/A	0.73 (0.59-0.90)*
	25 and above	1.57(1.14-2.116)*	N/A	1.28 (0.89-1.84)
	Time to tobacco use after waking up in the morning	Within 5 minutes (Ref)		N/A
6 to 30 minutes		0.87(0.77-0.98)*	N/A	0.90 (0.78-1.03)
31 to 60 minutes		1.04(0.91-1.19)	N/A	1.04 (0.89-1.22)
More than 60 minutes		1.63(1.45-1.84)*	N/A	1.26 (1.09-1.46)*
Constant			0.21	0.31

*p<0.05

kind of behavioural interventions from trial to trial [10]. There was no efficacy for nicotine patches or gum, and

evidence for prescription drugs was mixed with evidence for varenicline but not bupropion. Nevertheless, all these

Table 5. Determinants of Relapse among Those who Attempted to Quit Smokeless Tobacco Use in the 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	0.84 (0.72-0.97)*	0.81 (0.70-0.93)*
	Medicine alone	0.83 (0.69-1.00)	0.79 (0.66-0.95)*
	Other combinations	0.85 (0.65-1.13)	0.93 (0.71-1.23)
Sociodemographic variables			
Age	65 years and above (Ref)		
	15-24 years	0.94 (0.78-1.12)	1.03 (0.87-1.23)
	25-44 years	0.98 (0.85-1.12)	1.00 (0.87-1.14)
	45-64 years	1.00 (0.87-1.15)	1.00 (0.87-1.14)
Gender	Male (Ref)		
	Female	1.09 (1.01-1.18)*	1.15 (1.06-1.24)*
Residence	Rural (Ref)		
	Urban	1.00 (0.92-1.08)	1.04 (0.97-1.13)
Education	Formal schooling (Ref)		
	Less than primary school completed	1.01 (0.90-1.12)	1.02 (0.92-1.14)
	Primary school completed but less than secondary school completed	0.94 (0.86-1.03)	0.94 (0.86-1.03)
	Secondary school completed or more	0.94 (0.85-1.04)	0.98 (0.88-1.08)
Marital status	Married (Ref)		
	Single	0.97 (0.85-1.10)	0.99 (0.87-1.13)
	Divorced/widow/separated	0.94 (0.82-1.08)	0.97 (0.85-1.12)
Received anti-smokeless tobacco use information			
Information about the dangers of smokeless tobacco in the past 30 days from media	Did not receive information (Ref)		
	Received information	1.01 (0.93-1.09)	0.98 (0.91-1.06)
Noticed warnings on smokeless tobacco packets in the past 30 days	Did not notice a warning label (Ref)		
	Noticed warning label	1.14 (1.05-1.24)*	1.08 (1.00-1.18)
Doctor/ healthcare provider advice in the past year	Doctors/ healthcare providers did not advise to quit or not visited a doctor (Ref)		
	Doctors/ healthcare providers advised quitting	0.91 (0.84-0.99)*	0.91 (0.84-0.99)*
Perception of harm			
The perception that smokeless tobacco has already harmed	Definitely yes (Ref)	N/A	
	Definitely no	N/A	0.93 (0.85-1.03)
	Probably no	N/A	0.99 (0.88-1.11)
	Don't know	N/A	0.96 (0.77-1.20)
	Probably yes	N/A	1.02 (0.93-1.13)
Smokeless tobacco use Pattern			
Number of times smokeless tobacco was used	Less than 5 (Ref)	N/A	
	5-9	N/A	1.18 (1.09-1.28)*
	10-14	N/A	1.24 (1.10-1.40)*
	15-24	N/A	1.20 (1.00-1.43)*
	25 and above	N/A	1.04 (0.79-1.36)
Time to tobacco use after waking up in the morning	Within 5 minutes (Ref)	N/A	
	6 to 30 minutes	N/A	0.95 (0.84-1.06)
	31 to 60 minutes	N/A	0.92 (0.81-1.04)
	More than 60 minutes	N/A	0.83 (0.74-0.93)*

studies were trials in the USA or Scandinavia. Nicotine replacement therapy was successful among Bangladeshi women smokeless tobacco users living in the UK [11].

The use of counseling or medicines had better odds

of abstinence in the present study. However, only 10.2% of smokeless tobacco users who attempted to quit used any method, and the reach of individual interventions was low. The need for expanding cessation services has

been articulated by Murthy and Saddichha [12], calling for various interventions but urging them to focus on wide-reaching ones [12]. Our study is the first to examine national data on the effectiveness of cessation methods on abstinence from smokeless tobacco. There have been studies based on data at cessation clinics [13], workplace [14] and community settings [15] that have demonstrated the effectiveness of programmatic interventions. However, the effect size varies from setting to setting and is based on the intervention. Scaling up these interventions and examining their effectiveness is needed for India. Mowls et al. [16] argue for referral of tobacco users to quitlines as in the observational study, success rates between self-callers and referred persons were comparable [16]. Ensuring follow-up of clients at tobacco cessation centres through outward calls from quitlines may be an approach worth attempting to scale up the behavioural interventions. Mobile text messaging intervention have shown promise [17-19] and could potentially be studied for scale-up. Multi-pronged approach has shown efficacy among patients of non-communicable diseases [20] and there is indeed need of integrating smokeless tobacco cessation in all health programmes [21].

The study has certain limitations. The exposure and outcomes occurred in the same period of a year before the survey; temporality is a limitation. The study uses self-report for exposure to intervention and outcomes; those who did not attempt quitting might have underreported their exposure to interventions. The study was based on secondary analysis, and there is likely heterogeneity in the exposure variables; for example, not all were exposed to the same warning labels. The duration of use of a cessation method is not measured. Exposure to anti-smokeless tobacco messages and warning labels was over the previous 30 days; however, this could be a fair proxy of the exposure to smokeless tobacco users in the previous year. Despite these limitations, the study has its merits in demonstrating the effectiveness of anti-smokeless messages in media, warning labels and quit advice interventions as they helped quit attempts. The use of the cessation method was also found to improve abstinence.

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.

Conflict of Interest

Authors declare that they have no conflict of interest

Ethical Declaration

The study was analyses 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.

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