RESEARCH ARTICLE

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Factors Influencing Tobacco Cessation in India: Findings from the Global Adult Tobacco Survey-2

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Abstract

Objective: The study aimed to assess the socio-demographic and other correlates of cessation behavior across tobacco products among the adult population in India. **Methods:** We used data of adults (aged ≥15 years) who were current or former tobacco users (smoking and/or smokeless tobacco) from the Global Adult Tobacco Survey (GATS) India, conducted during 2016-17. The detailed analysis was done for current daily smokers (N=7,647), former daily smokers (N=1,353), and current daily smokeless tobacco users (N=1,2721). Multivariate logistic regression was separately performed to find the associated factors with attempts to quit, successful quitting, different cessation methods of smoking, and smokeless tobacco use. **Results:** The findings of the study indicated that daily smokers, higher educated, urban residents and employed were more likely to quit smoking compared to their counterparts. Successful quitting of smoking was higher for employed, higher educated, current users of smokeless tobacco and older adults. For smokeless tobacco users, non-daily users, highly educated, urban residents, and employed were more likely to attempt to quit compared to their counterparts. Successful quitting of smokeless tobacco was higher for unemployed, highly educated, urban residents and current non-smokers, and higher age group adults. **Conclusion:** The findings of this study suggest a need for professionally channelized cessation interventions to reduce the prevalence and relapse of tobacco use and increase the quit rate. Well-designed, large-scale research into specific tobacco cessation methods is needed to establish the association between different tobacco cessation methods and increased quit rates.

Keywords: Tobacco cessation- quit attempt- GATS- India

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Introduction

Tobacco control encompasses a multi-pronged approach. The World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) laid the platform for demand and supply reduction strategies for countries to achieve a significant reduction in tobacco use. In spite of evidenced-based strategies, tobacco control has yet to achieve the desired result, particularly in low and middle-income countries. The net result is that an estimated 8 million lives are lost annually across the globe, and tobacco remains the second leading risk factor for the global disease burden (Lim et al., 2012; WHO, 2022). One of the critical components of a comprehensive tobacco control program is tobacco cessation. In the FCTC, articles 6 to 14 emphasize demand reduction, while article 14 relates to tobacco dependence and cessation. Tobacco cessation assumes significance considering the fact that quitting tobacco improves the health of the public which in turn could compensate for more spending per capita on medical care related to tobacco use. However, the process of tobacco cessation often involves unsuccessful quit attempts, subsequently leading to long-term abstinence (Zhou et al., 2009). High motivation to quit results in quit attempts leading to cessation. Resilience, self-control, and an efficient support system to direct the person in the process of quitting are essential perquisites in this regard.

India is the second-largest consumer and the third-largest producer of tobacco in the world. In India, tobacco use takes various forms such as smoking and smokeless tobacco use, particularly chewing. Currently, 28.6% of Indian adults use tobacco in some form (TISS, 2018). Tobacco chewing is the most popular method practiced in India (199 million) followed by smoking (100 million) and a combination of smoking and smokeless tobacco use (32 million). The findings of the second

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round of the Global Adult Tobacco Survey (GATS) in India point to the fact that unassisted quitting was the most common cessation method adopted by smokers. On the other hand, it was reported that unassisted quit attempts fail to achieve the expected outcome and have a success rate of 3 to 5% (Veeraiah et al., 2020). However, earlier literature evidenced that smoking cessation aid is better than no aid (Zhu et al., 2000). Several methods of evidence are available for smokers and smokeless tobacco users who want to quit. The ultimate aim of all cessation methods is the successful quitting of tobacco. Quit advice by healthcare providers was found to help quit tobacco attempts (Al-ssabbagh et al., 2022) as well as successful quitting in India (Thankappan et al., 2014). In India, information on tobacco cessation methods and its association with quit outcomes is scarce, leading to a failure to fully capture the effect of different cessation methods on tobacco control. In this background, an attempt was made to comprehend the association between different tobacco cessation methods and tobacco quit outcomes. The overall objective of the study was to assess the socio-demographic and other correlates of cessation behavior across tobacco products among the adult population in India.

Materials and Methods

Data Source and Participants: The second round of the Global Adult Tobacco Survey (GATS-2), India, was conducted from August 2016 to February 2017. The survey was conducted in all 30 states and two union territories (Chandigarh and Puducherry) of India. The survey was conducted in households among persons aged 15 years and above. This nationally representative survey used a multi-stage cluster sampling technique. One person from each household was randomly selected for the survey. The details of the questionnaire used, sampling procedure, and data management were available elsewhere (TISS 2018). A total of 74,037 adults aged 15 years and above were interviewed in GATS-2 (33,772 men), India. There were 47,549 persons from rural areas and the rest from urban areas, with a response rate of 96%. The current study explored the results of GATS-2 based on the analysis of the raw data. Data on current and former adult smokers and smokeless tobacco users were included.

The current smoking prevalence was 10.7% and among them, 80.5% were daily smokers. We included the current daily smokers [N=7,647 (unweighted)/N= ~80 million (weighted sample)] and former daily smokers [N=1,353 (unweighted)/N=~17.1 million (weighted sample)] for detailed analysis. The prevalence of current smokeless tobacco use was 21.4% (~199.4 million). Of them, 85.3% were daily users. For analysis of the present study, we included 12,721 current daily smokeless tobacco users [~170 million (weighted sample)]. Around 1.2% (~10.8 million) of adults were former smokeless tobacco users. We also considered this group for further analysis of their cessation practices.

Measures

Tobacco Product

Tobacco use was broadly classified into two: smoking and smokeless tobacco. Uses of tobacco products at two levels are available: current and former. Among current users, occasional and daily uses were reported. For tobacco smoking, information on the use of manufactured cigarettes, rolled tobacco, bidis, cigars/cheroots/cigarillos, hukkah, and other smoking products was available. For smokeless tobacco use, the use of betel quid with tobacco, khaini, gutka, oral form of tobacco, paan masala, snuff, and other smokeless tobacco products was available.

Cessation Behaviour

For smokers, the common methods utilized for smoking cessation in the past 12 months were: counseling, including counseling at a smoking cessation clinic; nicotine replacement therapy, such as the patch or gum; other prescription medications; traditional medicines; m-Cessation; a Quitline or a smoking telephone support line; switching to smokeless tobacco, etc. All the above details are available for smokeless tobacco users except for 'switching to smokeless tobacco'.

Variables in the Study

Success or failure to quit tobacco use (smoking and smokeless), was one of the outcome variables. Current and former smoker/smokeless tobacco users were defined based on the following criteria as per GATS-2.

Current tobacco smoker

A person who currently smokes any tobacco product, either daily or occasionally.

Current smokeless tobacco user

A person who currently uses any smokeless tobacco product, either daily or occasionally.

Former daily smoker

The person is currently a non-smoker but had previously smoked daily over a period of one month or more.

Former daily smokeless tobacco user

The person does not currently use smokeless tobacco but had previously used smokeless tobacco products daily over a period of one month or more.

Cessation method

The cessation methods used to quit or attempt to quit tobacco.

Quit attempt

Any attempt to quit tobacco in the last 12 months prior to the survey.

Successful quitting

Former tobacco users who successfully quit tobacco in the last 12 months before the survey.

The other variables included in the analyses are age group, gender, type of residence, occupation, education,

frequency of tobacco use, the quantity of use, type of tobacco product used, and details of advice to quit. The details of tobacco products such as bidi, cigarettes, paper leaf, hukkah, cigars, pipe, cigar, and other products like chutta, dhumti and chillum were included in the analysis.

Statistical Analysis

The data was analysed using IBM SPSS Statistics V.21 software for Windows. National sample weights were applied for the national-level estimates during the analysis. Both bivariate and multivariate analyses were performed to find the factors associated with the outcome variables. The association of categorical variables was compared using the Chi-square test. Multivariate logistic regression was separately performed to find the associated factors with attempts to quit, successful quitting, different cessation methods of smoking, and smokeless tobacco use. The significance level was fixed at a p-value<0.05.

Results

Smoking and related quit attempts

The current smoking prevalence among adults in India was 10.7%, which is significantly higher for men than women [men: 19.0%; women: 2.0%]. Among non-smokers, 3.6% were former users. Among the current smokers, 36.3% made an attempt to stop smoking. Among the current male smokers, 81.3% were exclusive users of one product, 14.8% had two products and the remaining 3.9% were users of more than two products. The majority (65.3%) of the current male smokers were users of bidi or cigarettes and 13% of the current male smokers used both bidi and cigarettes. Among bidi users, 23.3% were users of multiple products, and among cigarette users, 41.7% were users of multiple products. The main products used by current female smokers were bidi (58.8%), paper leaf (22.4%), hukkah (14.6%), cigarettes (9.2%), cigars (2.9%), and other products (4.1%).

Among the current smokers, 36.3% made an attempt to quit smoking (men: 36.9%; women: 31.0%). Among the current male smokers, 40.7% of hukkah users made a quit attempt, and the corresponding percentage for cigarette users was 38.6%, bidi 38.2%, and other smoking products 36.2%. Those who got advice to quit from healthcare personnel were more likely to make a quit attempt. Among current male smokers, nearly 49% went to a health care centre in the last year for any reason of their health. Among them, 56% were asked about their smoking status by a doctor or a healthcare provider. Among those who were asked, 90% were advised to quit smoking.

Among current smokers who attempted to quit, 72% reported that they tried to quit without any assistance. Nearly 9% sought counseling including smoking cessation clinics, m-Cessation, or a quitline approach. Pharmacotherapy was opted by 4.4% of respondents and 4.7% chose other methods to quit the habit. In addition, 4% switched to smokeless tobacco during their attempt to quit smoking. Among the successful quitters (former smokers who succeeded in quitting), 68.5% reported that they had quit without any assistance, 8.8% chose counseling, 4.4% pharmacotherapy and 4.7% other methods. Switching to smokeless tobacco was opted by 4.8% of successful quitters. Those who got advice to quit smoking from healthcare providers were more likely to make any attempt to quit (adjusted odds ratio (OR): 2.49) than those who did not get any advice. The odds of the attempt to quit smoking were higher among daily smokers, higher educated, urban residents, and employed compared to their counterparts (Table 1). Similarly, the odds of quitting smoking habit were higher for employed, higher educated, current users of smokeless tobacco and older adults compared to their counterparts.

Considering the low prevalence of smoking among women, a detailed analysis of smoking cessation was done only for males. Separate analysis of multivariate logistic regression results of different cessation methods of current male smokers who attempt to quit are presented in Table 2. The odds of choosing counseling as a cessation method were higher when a health care provider advised quitting smoking (OR: 3.15) and for those who were not currently using any smokeless tobacco (OR: 1.53). Similarly, those who received quit advice from a healthcare provider had a five times higher chance to choose pharmacotherapy (OR: 5.31). The odds of selecting pharmacotherapy as a cessation method were higher among daily smokers (OR: 1.74), those aged 45 years and above (OR: 1.70), higher educated (OR for primary educators: 1.68; OR for secondary and above education: 1.25), employed (OR: 1.26), age over 45 years (OR: 1.25), daily smokers, (OR: 1.19) and rural residents (OR: 1.04) compared to their

Table 1. Quit Attempt and Successful Quitting of Smoking by Different Characteristics

Characteristics	Attempt to quit* OR (95% CI)	Successful quitting OR (95% CI)
Age		
<45	1.11 (1.11-1.12)	0.27 (0.27-0.27)
>=45	Reference	Reference
Place of residence		
Rural	Reference	Reference
Urban	1.14 (1.14-1.14)	0.76 (0.76-0.76)
Education		
No formal Education	Reference	Reference
Primary Education	1.30 (1.29-1.30)	1.43 (1.43-1,43)
Secondary and above	1.08 (1.07-1.08)	1.13 (1.13-1.14)
Working status		
Unemployed	Reference	Reference
Employed	1.11 (1.11-1.12)	3.51 (3.50-3.51)
Periodicity		
Less than daily	Reference	NA
Daily	1.38 (1.38-1.39)	
Current users of Smokeless tobacco		
Yes	Reference	Reference
No	1.08 (1.08-1.08)	0.45 (1.45-0.46)
Got advice to quit		
No	Reference	NA
Yes	2.49 (2.49-2.49)	

*among current users; OR, Odds Ratio; CI, Confidence Interval; NA, not applicable

Table 2. Logistic Regression Analysis of the Association between Background Characteristics and Current Use of Cessation Methods among Current MALE Smokers who Tried to Quit

Characteristics	Counseling	Pharmacotherapy	Switching to smokeless tobacco	Others	Without any assistance
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age					
<45	Reference	Reference	Reference	Reference	Reference
>=45	1.25 (1.25-1.26)	1.70 (1.69-1.70)	0.78 (0.77-0.78)	1.55 (1.54-1.56)	0.83 (0.83-0.84)
Place of residence					
Urban	Reference	Reference	Reference	Reference	Reference
Rural	1.04 (1.04-1.05)	0.41 (0.41-0.42)	1.41 (1.40-1.42)	0.71 (0.70-0.71)	0.81 (0.82-0.82)
Education					
No formal Education	Reference	Reference	Reference	Reference	Reference
Primary Education	1.68 (1.68-1.69)	1.18 (1.17-1.18)	1.82 (1.81-1.83)	1.31 (1.31-1.32)	1.16 (1.15-1.16)
Secondary and above	1.25 (1.24-1.25)	1.05 (1.05-1.06)	1.33 (1.32-1.34)	1.30 (1.29-1.31)	1.23 (1.23-1.24)
Working status					
Unemployed	Reference	Reference	Reference	Reference	Reference
Employed	1.26 (1.25-1.27)	0.78 (0.78-0.79)	0.50 (0.50-0.51)	0.93 (0.93-0.94)	1.45 (1.45-1.46)
Periodicity					
Less than daily	Reference	Reference	Reference	Reference	Reference
Daily	1.19 (1.19-1.20)	1.74 (1.74-1.76)	0.72 (0.72-0.73)	0.78 (0.78-0.79)	1.08 (1.08-1.09)
Current users of Smokeless tobacco					
Yes	Reference	Reference	Reference	Reference	Reference
No	1.53 (1.52-1.53)	0.93 (0.93-0.94)	0.11 (0.11-0.12)	1.16 (1.16-1.17)	0.80 (0.80-0.81)
Got advice to quit					
No	Reference	Reference	Reference	Reference	Reference
Yes	3.15 (3.14-3.16)	5.31 (5.29-5.34)	1.04 (1.04-1.05)	2.50 (2.49-2.51)	1.29 (1.28-1.29)

*Among current male smokers who attempted to quit; OR, Odds Ratio; CI, Confidence Interval

Table 3. Quit attempt and successful quitting of smokeless tobacco by different characteristics

Characteristics	Attempt to quit*	Successful quitting
	OR (95% CI)	OR (95% CI)
Age		
<45	1.51 (1.51-1.51)	0.63 (0.62-0.63)
>=45	Reference	Reference
Place of residence		
Urban	1.08 (1.08-1.09)	1.28 (1.28-1.29)
Rural	Reference	Reference
Education		
No formal Education	Reference	Reference
Primary Education	1.41 (1.41-1.41)	1.12 (1.12-1.13)
Secondary and above	1.62 (1.62-1.62)	1.37 (1.37-1.38)
Working status		
Unemployed	Reference	Reference
Employed	1.06 (1.05-1.06)	0.63 (0.63-0.63)
Periodicity		
Daily	Reference	NA
Less than daily	1.38 (1.38-1.39)	
Current Smokers		
Yes	Reference	Reference
No	1.38 (1.38-1.39)	1.05 (1.05-1.06)
Got advice to quit		
No	Reference	NA
Yes	2.59 (2.58-2.59)	

*among current users, NA, not applicable; OR, Odds Ratio, CI, Confidence Interval

counterparts (See Table 2). Similarly, those who received quit advice from a healthcare provider had a five times higher chance to choose pharmacotherapy (OR: 5.31). The odds of choosing pharmacotherapy as a cessation method were higher among daily smokers (OR: 1.74), those aged 45 years and above (OR: 1.70), and higher educated. Contrary to counseling, employed, non-users of current smokeless tobacco and rural residents reported lower odds of choosing pharmacotherapy as a cessation method. A similar trend was seen for choosing "other methods" for smoking cessation, except for the significant association between daily smokers and current smokeless tobacco

Table 4. Logistic Regression Analysis of the Association between Background Characteristics and Current Use of Cessation Methods among Current Smokeless Tobacco Users who Tried to Quit

Characteristics	Counseling OR (95% CI)	Pharmacotherapy OR (95% CI)	Others OR (95% CI)	Without any assistance OR (95% CI)
Age				
<45	Reference	Reference	Reference	Reference
>=45	1.29 (1.29-1.30)	0.62 (0.62-0.63)	1.22 (1.22-1.23)	1.26 (1.26-1.27)
Place of residence				
Rural	Reference	Reference	Reference	Reference
Urban	1.29 (1.29-1.30)	1.17 (1.16-1.17)	1.26 (1.26-1.27)	0.79 (0.79-0.79)
Sex				
Men	Reference	Reference	Reference	Reference
Women	1.18 (1.18-1.19)	0.47 (1.46-0.47)	0.97 (0.96-0.97)	0.81 (0.81-0.82)
Education				
No formal Education	Reference	Reference	Reference	Reference
Primary Education	1.02 (1.02-1.03)	0.75 (0.75-0.76)	0.60 (0.60-0.61)	0.74 (0.74-0.74)
Secondary and above	1.03 (1.03-1.04)	1.08 (1.08-1.09)	0.65 (0.64-0.65)	0.95 (0.95-0.96)
Working status				
Unemployed	Reference	Reference	Reference	Reference
Employed	1.03 (1.03-1.04)	0.43 (0.43-0.44)	2.25 (2.24-2.26)	1.12 (1.12-1.12)
Periodicity				
Less than daily	Reference	Reference	Reference	Reference
Daily	0.89 (0.89-0.90)	0.61 (0.61-0.62)	0.70 (0.70-0.71)	0.94 (0.94-0.95)
Current Smokers				
No	Reference	Reference	Reference	Reference
Yes	1.38 (1.37-1.38)	1.34 (1.33-1.35)	2.13 (2.12-2.14)	1.36 (1.36-1.37)
Got advice to quit				
No	Reference	Reference	Reference	Reference
Yes	2.60 (2.60-2.61)	2.72 (2.72-2.74)	2.76 (2.75-2.77)	0.99 (0.99-0.10)

*Among current smokeless tobacco users who attempted to quit; OR, Odds Ratio; CI, Confidence Interval

users in choosing the other method.

Even though switching to smokeless tobacco is not a safe cessation method, many users switched to smokeless tobacco. Younger aged (<45 years), highly educated, rural residents, unemployed, non-daily smokers, and those who got advice to quit smoking from healthcare personnel were more likely to switch to smokeless tobacco in their current attempt to quit smoking. Odds ratios for quitting without any assistance were higher for those who were employed, highly educated, daily smokers, and who were advised to quit by a healthcare provider compared to their counterparts.

Smokeless Tobacco

Current use of the smokeless form of tobacco was reported by 21.4% (men: 29.6%, women: 12.8%, p<0.001). Among non-users, former use of smokeless tobacco was reported by 1.5% (men: 2.0% women: 1.0%). Among the current users, the main product used was khaini or tobacco lime mixture (52.7%) followed by gutka/areca nut (26.9%), oral tobacco (16.2%), paan masala with tobacco (9.7%), nasal use of snuff (1.5%) and others (0.7%). Among former users, the main product used was gutka/areca nut (32.9%), followed by khaini (30.0%), betel quid with tobacco (22.2%), oral tobacco (12.4%), paan masala with tobacco (11.4%), nasal use of snuff (1.5%) and other products (0.9%). Multiple product use was reported by 25% of current users and 41% of former users.

Among current smokeless tobacco users, 32.0% attempted to quit smokeless tobacco in the past 12 months. Around 75% tried quitting smoking without any assistance, 7.6% through counseling, 3.3% through pharmacotherapy, and 5.2% through other methods. Those who got advice to quit were more likely to make any attempt to quit smokeless tobacco (OR 2.59) than those who did not get any advice. Higher education, lower age group, less than daily use, non-smokers, employed, and urban residents were more likely to make any attempt to quit their smokeless tobacco (Table 3). Successful quitting of smokeless tobacco was higher for unemployed, higher educated, urban residents and current non-smokers, and higher age group adults compared to their counterparts.

Logistic regression analysis was performed separately for each of the smokeless tobacco cessation methods (Table 4). The odds of choosing counseling as a cessation method were higher among those who received advice to quit smokeless tobacco (OR: 2.60), urban residents (OR: 1.29), and those aged 45 years and above (OR:

1.29). Gender differences were seen with higher odds for females to choose counseling. Current smokers were more likely to choose counseling to quit smokeless tobacco. A similar pattern was observed for pharmacology (except women and older ages were less likely to choose). "Other" methods were opted more by those who got advice to quit from health care providers current smokers, and employed adults. Advice from a health care provider and current smoking were the most significant factors associated with the attempt to quit smokeless tobacco. More information is presented in Table 4.

Discussion

The current study provided an overview of cessation behaviour practices of smokers and smokeless tobacco users in India using nationally representative data. In general, self-determination was reported as the main factor for quitting and attempting to quit. Also, a significant association of advice to quit by healthcare providers with different cessation methods was found in the study. These results can be attributed to the tobacco-related disease, which could have influenced the person to quit the habit. Further, healthcare providers' advice also had been a part of counseling, which could have helped tobacco users to quit tobacco.

Our result of 28% of current smokers who had used any cessation method for their smoking cessation was similar to that reported from the United States (US) that less than one-third of adult cigarette smokers use cessation counseling or medications to quit smoking (CDC, 2023). Our findings indicate that receiving advice from a healthcare professional was the most important predictor of all cessation methods for smoking and smokeless tobacco use. Advice from health care professionals is a cessation method, which was evidenced by the successful quitting of tobacco among patients (Thankappan et al., 2014) and in the general population (Gawde et al., 2023; CDC, 2023). Among the 5 A's (Ask, Advise, Assess, Assist, Arrange) of tobacco cessation used by health professionals, asking and advising were reported to increase tobacco cessation rates (Russell et al., 1979). The service of a health care provider is usually utilized for personal health problems, and subsequent advice may result in the cessation of the habit. The study among diabetes patients in India reported that a brief intervention by doctors resulted in a smoking quit rate of 10-13%, and an additionally supported intervention by a non-doctor health professional resulted in an increased quit rate of 52% (Thankappan et al., 2014). Our results also necessitate an urgent need for strengthening population-based tobacco cessation interventions in the country.

In India, evidence is limited to support the use of m-Cessation for smoking cessation. The Government of India, in association with the World Health Organisation and the International Telecommunications Union, started mobile technology for tobacco cessation in 2016, known as the m-Cessation program (Quit tobacco for life) (NTCP 2023). The government has been running tobacco cessation centres under the National Tobacco Control Programme (NTCP) all over the country. covering nearly 429 centres in almost all states (NTCP 2018). Furthermore, there are around 178 Tobacco Cessation facilities other than the centres under NTCP. In addition, national tobacco quitline services are being implemented and functioning with options for regional languages (NTCP 2023). Our finding that a low level of use of m-cessation for smoking and smokeless tobacco cessation points to the fact that the availability of the services was not appropriately utilized. So, there is a need to reconsider further expansion of these types of cessation services and diversion of such services to a more used way for successful tobacco cessation in the country. On the other hand, tobacco users have to be informed about the availability of cessation services, which results in the increased utilization of tobacco cessation services and would reduce the risk of tobacco use among adults in India. India, being a country with a diverse population, equitable provision of tobacco cessation services with culturally appropriate messages, especially in rural areas, would be more decisive. In 2020, tobacco-related cancers accounted for 27% of all cancers in India (ICMR 2020). The northeast region was at higher risk of tobacco-related cancers, where tobacco prevalence was also the highest (ICMR, 2020; TISS 2018). Strengthening region-specific tobacco cessation programs is warranted consideration the magnitude of the problem.

Our findings identified that smokeless tobacco cessation was chosen more by dual users (smoking and smokeless tobacco) compared to exclusive smokeless tobacco users. Even though in the Indian scenario, tobacco cessation clinics (meant for smoking and smokeless forms of tobacco) are offered, cessation practices are mainly happening for smoking only. Our results indicate that 'advice to quit' by a healthcare person was the most significant component of successful quitting and the attempt to quit. Although healthcare providers are supposed to provide tobacco cessation, all healthcare providers are not asking their patients about tobacco use (Thankappan et al., 2009), which highlights the need to ask about tobacco use and advise them to quit in their routine practices.

The most frequent method of cessation was counseling. Overall, advice to quit smoking or smokeless tobacco from a healthcare provider was the most significant predictor of all counseling methods. The finding that the 'use of smokeless tobacco as a cessation method' to quit smoking is of interest. Users might have considered shifting to a smokeless form as a harm reduction method. Since smokeless tobacco is as harmful as smoking, this needs to be considered seriously. The substitution of smokeless tobacco with smoking has been reported previously (Mini and Thankappan, 2016). Further research is warranted to investigate the explanation for the substitution of smokeless tobacco as a smoking cessation method. In addition, even among educated individuals in India, there is still a lack of awareness regarding the detrimental effects of smokeless tobacco products (Wickramasinghe et al., 2021).

In the country, among the 267 million (28.6%) tobacco users aged 15 years or above, about 100 million smoked, 199 million used smokeless tobacco, and 32

million used both (TISS 2018). India has shown one of the most significant absolute increases in the number of deaths attributable to tobacco smoking between 1990 and 2019, from 0•6 million to 1•0 million (Goodchild et al., 2018; GBD 2019 Tobacco Collaborators 2021), and its tobacco control program has also faced difficulties with implementing tobacco control and broad-based MPOWER (M: monitor tobacco use and prevention policies; P: protect people from tobacco smoke; O: offer help to quit tobacco smoking; W: warn about the dangers of tobacco; E: enforce bans on tobacco advertising, promotion, and sponsorship; and R: raise taxes on tobacco) policies effectively. A higher proportion of tobacco users choosing no specific cessation method are noticeable, which indicates the necessity of behavioural support for increased tobacco cessation rates. This might be due to the self-efficacy of users on tobacco cessation. Intervention in the form of quitting advice could have impacted the autonomous behaviour of individuals who decided to quit tobacco on their own. Hence, the decision to quit smoking as a result of self-determination may be influenced by the broader dynamics of healthcare provider intervention and a sense of self-realized competence (Williams et al., 2011; Li et al., 2020). The exact reason for this needs to be further explored. An increased preference for quit attempts without any assistance has also been reported in Europe (Filippidis et al., 2019). A combined effort of pharmacotherapy and behavioural intervention would result in higher tobacco cessation rates (Stead et al., 2016). The findings of this study give evidence of the pattern of important cessation methods for successful tobacco cessation among adults in India. This will be relevant for future tobacco cessation planning and policies.

A major strength of this study is that it is based on the national survey in India which utilized a large sample size. The study has the limitation of secondary data which restricts the availability of information on the time of the attempt to quit and successful quitting. The study data are limited by the quality of self-reported information. This could have influenced the responses of the subjects in their reporting pattern of reasons to quit and quit attempts. Information on tobacco-related diseases, quitting self-efficacy and nicotine dependence of subjects, if available, could have given detailed insights into the quit pattern. However, self-report was evidenced as a valid measure of smoking tobacco (Mini et al., 2015; Dhavan et al., 2021). The narrow confidence interval reported in the study was due to the large sample size. The weighted analysis in our study provides more generalizable findings of tobacco cessation in India.

In conclusion, it is well-established that tobacco cessation is an important component of tobacco control programs. However, our study indicates that there is a need to revisit the current tobacco cessation services in India, which are not well utilized. While the different cessation methods we studied could be a successful strategy for increased quit rates, there is a need to evaluate more evidence on the role and efficacy of these interventions on tobacco cessation. The findings of this study suggest that there is a need for professionally channelized cessation interventions to reduce the prevalence and relapse of tobacco use; and increase quit rate. There is currently limited evidence to determine whether specific tobacco cessation methods are effective in increasing the quit rate. Given the effectiveness of doctors' quit messages on successful quitting of tobacco, it is important for healthcare providers to address the 5 A's of tobacco cessation for a successful tobacco control strategy in the country. Conducting well-designed, large-scale research into specific tobacco cessation methods is of utmost importance. The government of India has been actively pursuing effective tobacco control policies, and tobacco cessation is one of the key components. Research in this area could provide valuable insights into which methods are most effective and guide future efforts to curb tobacco use in the country.

Author Contribution Statement

All authors contributed equally in this study.

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References

Al-ssabbagh M, Elango V, Winkler V (2022). What makes people quit tobacco and succeed at it? An exploratory analysis of smoked and smokeless tobacco from India. *Prev Med*, **158**, 107033.

Centre for Disease Control and Prevention (CDC) (2023). Smoking Cessation: Fast Facts | Smoking & Tobacco Use. Available: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/smoking-cessation-fast-facts/index.html

Dhavan P, Bassi S, Stigler MH, et al (2011). Using salivary cotinine to validate self-reports of tobacco use by Indian youth living in low-income neighborhoods. *Asian Pac J Cancer Prev*, **12**, 2551-4.

Filippidis FT, Laverty AA, Mons U, Jimenez-Ruiz C, Vardavas CI (2019). Changes in smoking cessation assistance in the European Union between 2012 and 2017: pharmacotherapy versus counselling versus e-cigarettes. *Tob Control*, **28**, 95-100.

Gawde NC, Quazi Syed Z (2023). Determinants of Quit Attempts and Short-Term Abstinence among Smokers in India: Global Adult Tobacco Survey, 2016-17. *Asian Pac J Cancer Prev*, **24**, 2279-88.

GBD 2019 Tobacco Collaborators (2021). Spatial, temporal,

and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. *Lancet*, **397**, 2337-60.

Goodchild M, Nargis N, Tursan d'Espaignet E (2018). Global economic cost of smoking-attributable diseases. *Tob Control*, **27**, 58–64.

Indian Council for Medical Research (ICMR). Report of National Cancer Registry Programme (2012-2016). ICMR-National Centre for Disease Informatics and Research (2020). Available: https://www.ncdirindia.org/All_Reports/Report_2020/resources/NCRP_2020_2012_16.pdf.

Li WHC, Ho KY, Wang MP, et al (2020). Effectiveness of a Brief Self-determination Theory-Based Smoking Cessation Intervention for Smokers at Emergency Departments in Hong Kong: A Randomized Clinical Trial. *JAMA Int Med*, **180**, 206-14.

Lim SS, Vos T, Flaxman AD, et al (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, **380**, 2224–60.

Mini GK, Nichter M, Nair RR, et al (2015). Confirmation of self-reported non-smoking status by salivary cotinine among diabetes patients in Kerala, India. *Clin Epidemiol Global Health*, **3**, 44–6.

Mini GK, Thankappan KR (2016). Switching to smokeless tobacco, the most common smoking cessation method: results from the Global Adult Tobacco Survey, India. *Public Health*, **136**, 172–4.

National Tobacco Control Programme (NTCP) (2023). Ministry of Health & Family Welfare, Government of India. Available: https://ntcp.mohfw.gov.in/about.

National Tobacco Control Programme (NTCP). Ministry of Health & Family Welfare, Government of India (2018). Details of Tobacco Cessation Centres/Facilities [Online]. Available: https://ntcp.nhp.gov.in/assets/document/Tobacco_Cessation_Centres.pdf.

Russell MAH, Wilson C, Taylor C, et al (1979). Effect of general practitioners' advice against smoking. *BMJ*, **2**, 231–5.

Stead LF, Koilpillai P, Fanshawe TR, et al (2016). Combined pharmacotherapy and behavioural interventions for smoking cessation. *Cochrane Database Syst Rev*, **3**, CD008286.

Tata Institute of Social Sciences (TISS), Mumbai and Ministry of Health and Family Welfare, Government of India (2018). Global Adult Tobacco Survey GATS 2 India 2016-17.

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.

Thankappan KR, Pradeepkumar AS, Nichter M (2009). Doctors' behaviour & skills for tobacco cessation in Kerala. *Indian J Med Res*, **129**, 249–55.

Veeraiah S, Elangovan V, Tripathy JP, et al (2020). Quit attempts among tobacco users identified in the Tamil Nadu Tobacco Survey of 2015/2016: a 3 year follow-up mixed methods study. *BMJ Open*, **10**, e034607.

Wickramasinghe S, Sumithrarachchi S, Rumy A, Jayasinghe R (2021). Prevalence of Tobacco and Areca-nut Use and Awareness of Its Harmful Effects among Non-academic Staff at Faculty of Dental Sciences, University of Peradeniya. *Asian Pac J Cancer Care*, **6**, 425-8.

Williams GC, Patrick H, Niemiec CP, et al (2011). The smoker's health project: a self-determination theory intervention to facilitate maintenance of tobacco abstinence. *Contemp Clin Trials*, **32**, 535-43.

World Health Organization (WHO) (2022). Tobacco [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/tobacco.

Zhou X, Nonnemaker J, Sherrill B, et al (2009). Attempts to quit smoking and relapse: factors associated with success or failure from the ATTEMPT cohort study. *Addict Behav*, **34**, 365–73.

Zhu SH, Melcer T, Sun J, et al (2000). Smoking cessation with and without assistance. *Am J Prev Med*, **18**, 305–11.