Global Journal of Medicine & Public Health

Awareness and usage of digital tools for cessation of smoking among college going smokers in Ernakulam, Kerala: A cross-sectional survey in 2022

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ABSTRACT

Despite numerous studies reporting on tobacco use prevalence, there's a dearth of secondary data addressing the willingness, reasons for reluctance, and utilization of digital technologies for tobacco cessation counselling. Objectives were to understand the prevalence of tobacco smoking among college students in Ernakulam, to understand the awareness and willingness to use digital technology for tobacco cessation. A cross-sectional survey included undergraduate and postgraduate students from six colleges in Ernakulam district, Kerala, covering fields such as Medical, Dental, Nursing, Engineering, Arts, and other sciences. Purposive sampling was employed. Descriptive analysis and multiple logistic regression were used to explore internet usage prevalence and its correlates. The study found that 40% of participants were smokers, while only 32% were familiar with digital technologies. However, 55% expressed a strong willingness to use digital tools for quitting smoking, particularly smartphone apps and text-based services. Over half (53.7%) had attempted to quit, with those aged 23 to 26 in arts and sciences showing the highest inclination, citing health and financial reasons. Despite multiple attempts, success rates were low, with reasons for reluctance including confidence in self-management, doubts about digital tools, and lack of motivation to quit. The study examined how digital technologies can aid smoking cessation efforts. These tools have the potential to foster behavior change and support quitting. With the widespread adoption of digital technology in India, particularly in urban and rural areas where internet usage is rising, there's an opportunity to utilize these tools effectively for smoking cessation.

Keywords: Smoking, Tobacco, Digital technologies, Cessation, Students.

GJMEDPH 2025; Vol. 14, issue 3 | OPEN ACCESS

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Conflict of Interest—none | Funding—none

INTRODUCTION

Over 80% of the world's 1.3 billion tobacco users live in low- and middle-income countries, experiencing the heaviest toll of tobacco-related illness and death [1]. Tobacco is a leading cause of preventable deaths globally. India's tobacco scenario is particularly complex, featuring a wide array of smoking and smokeless tobacco products, along with various mixtures. The National Mental Health Survey (2016) found that 12.5% of individuals aged 18 to 29 and 20.9% of the overall population in India exhibit patterns of reliant tobacco use[2].According to the Global Adult Tobacco Survey- India (GATS 2), there are 27 crore tobacco users in India, with India being the world's second largest producer and consumer of tobacco products [3]. Smoking raises the risk of noncommunicable diseases (NCDs) like cardiovascular disease, respiratory issues, and cancer, while also adversely impacting the economy [4]. Nicotine in tobacco is highly addictive and contributes to various health issues, including cardiovascular disease, respiratory ailments, cancer, and other conditions. Tobacco use results in over 8 million deaths annually [5]. Tobacco use is deadly for both smokers and non-smokers exposed to second-hand smoke. Smoking also harms health in numerous ways, affecting organs such as the gums and teeth, compromising the immune system, accelerating skin aging, and reducing bone density [6].Early tobacco use correlates with increased severity, longer dependence duration, and reduced efforts to seek cessation assistance. Interventions in younger populations prove more effective before addictive behaviors become entrenched [7]. Tobacco use is a leading cause of preventable deaths. Prevention strategies include higher taxation on tobacco products, stricter regulations on purchase and usage, such as smoke-free policies in public areas, advertising restrictions, and health warnings on packaging. Institutional-level education can also deter potential smokers.The Ministry of Health and Family Welfare and the World Health Organization established 13 tobacco cessation clinics in 2002 to tackle tobacco addiction. However, usage remains low, particularly in rural areas. Regional resource centers for tobacco cessation training at the district level are essential [8]. These efforts are part of national health programs focusing on cancer, tuberculosis, noncommunicable diseases, mental health, and rural healthcare. During the COVID-19 lockdown, the government banned the sale of tobacco products to curb the spread of the virus. State governments also issued warnings about the link between tobacco use and COVID-19 at the onset of the lockdown [9]. There are quite a few studies that attest to the efficacy of digital interventions for smoking cessation, this includes reviews on web-based interventions as well as mobile applications, suggesting that they have been quite handy to help in cessation of this fatal habit [10]. The studies have been in controlled setting, hardly any studies have tried to understand the use of digital tools for this purpose, especially in countries like India where technology is becoming an essential part of an individual's life, understanding how people interact with technology for tobacco cessation can help clinicians, public health professionals and policy makers design more effective behavioural modification strategies to curb tobacco consumption. This study aims to understand the attempts for tobacco cessation and the reasons for the same, the awareness, and the usage of digital technology for tobacco cessation among college going tobacco smokers in Ernakulam, Kerala.

METHODS

Study design, setting and participants:

This cross-sectional survey included students from six colleges in Ernakulam district, Kerala, pursuing Medical, Dental, Nursing, Engineering, and Arts/other science streams. Purposive sampling was used [11]. Respondents were selected from diverse courses such as medical, dental, nursing, engineering, and arts/science in Ernakulam, Kerala, to account for variations in smoking patterns despite similar socio-cultural backgrounds. Data collection and participant recruitment occurred between March and May 2022.Students aged 18 to 30 in their final year of undergraduate or first year of postgraduate courses were recruited. After screening for tobacco use, smokers were given a separate questionnaire. Inclusion criteria were willingness to participate, being a smoker, student status, and ownership of a cell phone. Exclusion criteria were age below 18 or above 30, non-tobacco

users, smokeless tobacco consumers, non-students, and those not in the final year of UG or first year of PG programs.Prevalence on willingness to quit tobacco(52 percent) was taken based on a previous study [12]. A sample size of 267, with 95%CI and 6% margin of error was calculated using epi info [13] for the district of Ernakulam. Accounting for non-response (10%) and unwillingness to take part in the study, a final sample size of 300 smokers was used.

Data collection:

Questionnaires were distributed both offline and online via Microsoft Forms, facilitated by the investigator and college principals/staff. Fifteen educational institutions were approached for the study based on the courses or streams relevant to the research. The study commenced after obtaining approvals from the Institutional Ethics Committee at the Indian Institute of Public Health-Delhi. The participant chart has been given in Figure 1. Screening: Participants provided age and smoking status. The following information were collected from the participants socio-demographic details, tobacco history, alcohol history, and digital tools.

Statistical analysis:

Data were analyzed using Stata (v.14.1). Participant characteristics were described with descriptive statistics: mean and standard deviation (SD) for continuous variables, and frequency and percentages for categorical variables. Prevalence of tobacco use, and proportions of those willing to use digital technology were described as percentage. Multivariate logistic regression examined associations between covariates, adjusting for each other, for willingness to quit and use digital tools for cessation.

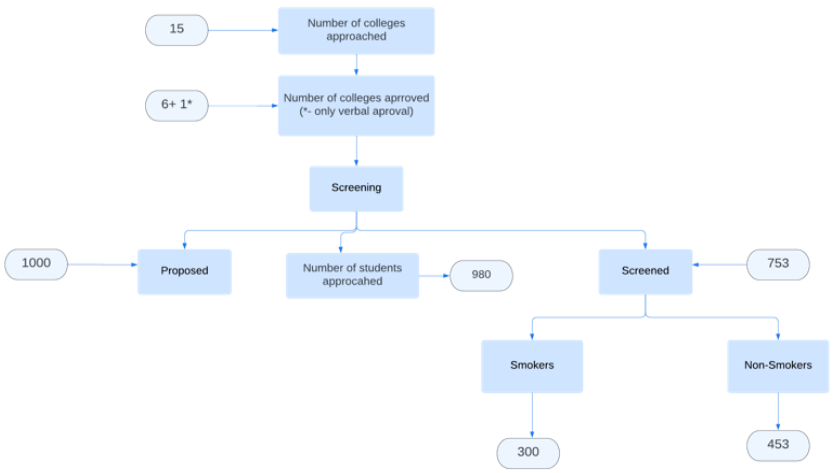


FIGURE 1. Participant flow chart

RESULTS

Sample profile

The participants' mean age was 22.9 (SD 2.1). The majority of respondents pursued arts and sciences (89, 29.7%), followed by engineering (83, 27.7%), medical (49, 16.3%), dental (48, 16%), and nursing (31, 10.3%). Regarding religion, most respondents were Hindus (154, 51.3%), followed by Christians (98, 32.7%), Muslims (25, 8.3%), and others (23, 7.7%). As most participants were undergraduates, the majority reported their educational status as secondary school/intermediary (215, 71.7%), followed by graduate/professional degree (73, 24.3%).

1. **Prevalence of Tobacco use and patterns of usage**

Prevalence of smoking was 300 (39.8%), out of those, males constituted 276 (92%) of the smokers and females constituted 24 (8%). While the prevalence of smoking among men was 72.2%, the prevalence among women was just 6%. Out of those who smoked, a vast majority were Hindus 154 (51.3%), belonging to the general category 157 (52.3%), were pursuing arts and sciences 89 (29.7%)

and belonged to the age group 23 to 26 years, 143(47.7%)

TABLE 1. Smoking pattern across various SES

Variable n (%)	Smoking N=300
Sex:	
Female:	24(8)
Male:	276(92)
Religion:	
Christian	98(32.7)
Hindu	154(51.3)
Muslim	25(8.3)
Others	23(7.7)
Category:	
GEN:	157(52.3)
SC:	87(29)
ST:	7(2.3)
OBC:	49(16.3)
Educational status:	
Graduate / Professional degree:	73(24.3)
Post graduate:	12(4)
Secondary School / Intermediary:	215(71.7)
Course:	
Medical	49(16.3)
Dental	48(16)
Nursing	31(10.3)
Engineering	83(27.7)
Arts and sciences	89(29.7)
Age:	
19to22yrs	142(47.3)
23to26yrs	143(47.7)
27to30yrs	15(5)

As far as the cigarette usage per month were concerned, 40 to 100 cigarettes were smoked by 44% of the respondents. This was most predominant among 19- to 22-year-olds 70(49.3%), males 118(42.8%), general category 61(38.9%). When asked if they smoked while consuming alcohol, 97% of the respondents reported that they smoked while drinking. Most of the respondents smoked while consuming alcohol 194(97.5%).

2. Attempts for cessation among smokers

Out of the smokers, close to 161 (53%) have attempted to quit in the past. Quit attempts were highest among 23- to 26-year-old respondents 87 (60.8%), it was more or less equal between males (53.6%) females (54.2%). Attempts to quit were highest among those studying medicine (69.3%), and low among engineering students (39.8%). More number of Hindus 84 (54.6%) and those belonging to general category 71 (45.22) were keen on quitting.

TABLE 2. Willingness to quit

Have you tried to quit? N (%)	Yes
Age:	
19to22yrs	67(47.2)
23to26yrs	87(60.8)
27to30yrs	7(46.7)
Sex:	
Female	13(54.2)
Male	148(53.6)
Religion:	
Christian	48(49)
Hindu	84(54.6)
Muslim	19(76)
Other	10(43.5)
Category:	
GEN	71(45.22)
OBC	31(63.3)
SC	56(64.4)
ST	3(42.9)
Education status:	
Graduate / Professional degree	39(53.4)
Post graduate	3(25)
Secondary School / Intermediary	119(55.4)
Course:	
Medical	32(65.3)
Dental	31(64.6)
Nursing	16(51.61)
Engineering	33(39.76)
Arts and sciences	49(55.1)

When asked about the reasons of quitting smoking, 67.4% of the respondents replied that it is quite important for them because they are worried about their health, while other reasons touted were costs associated with the habit, and concerned friends and family members pressuring them to quit. Most of the participants (64.6%) have attempted to quit 2-4 times, and a large percentage of them have attempted to quit without any help or intervention.

TABLE 3. Reasons to quit

Reasons to quit	N(%)
Because i am worried about my future health	137(73.26)
Because smoking costs too much	19(10.16)
Because my health is already suffering	8(4.28)
Because other people are pressuring me to	17(9.09)
For my family's health	3(1.60)
Not interested in smoking	1(0.53)
It gives me feelings of anxiety and nauseous	1(0.53)

Because it stinks	1(0.53)

3. **Awareness about digital tools for cessation among smokers**

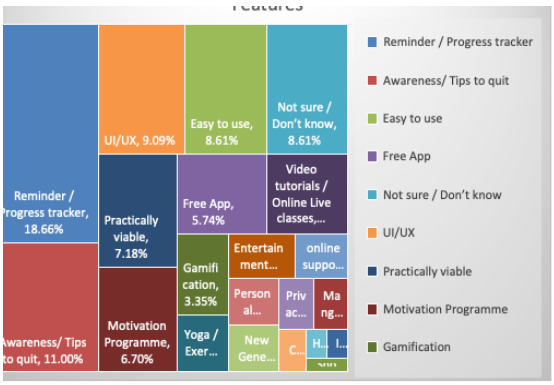
When enquired about awareness of digital tools for cessation, 67.7% of the respondents reported that they are not aware of such tools or apps. Only a small fraction of the respondents had used digital cessation tools before (14.4%). Many of them did not remember the name of the tool used (71.4%), tools like quit and Q were named by a few (Figure 2). Awareness about digital tools was highest among 23- to 26-year-old respondents 55 (38.5%), males 89 (32.3%) and those pursuing medical courses 28(57.1%).

TABLE 4. Awareness about digital tools for quitting across various socio demographic factors

Awareness N=300	No	Yes	Total
Age: n (%)			
19to22yrs	104(73.2)	38(26.8)	142(100)
23to26yrs	88(61.5)	55(38.5)	143(100)
27to30yrs	11(73.3)	4(26.7)	15(100)
Sex:			
Female	16(66.7)	8(33.3)	24(100)
Male	187(67.8)	89(32.3)	276(100)
Religion:			
Christian	70(71.4)	28(28.6)	98(100)
Hindu	105(68.2)	49(31.8)	154(100)
Muslim	15(60)	10(40)	25(100)
Others	13(56.5)	10(43.5)	23(100)
Category:			
GEN	112(71.3)	45(28.7)	157(100)
OBC	36(73.5)	13(26.5)	49(100)
SC	50(57.5)	37(42.5)	87(100)
ST	5(71.4)	2(28.6)	7(100)
Education status:			
Graduate / Professional degree	51(69.9)	22(30.1)	73(100)
Post graduate	8(66.7)	4(33.3)	12(100)
Secondary School / Intermediary	144(67)	71(33.0)	215(100)
Course:			
Medical	21(42.9)	28(57.1)	49(100)
Dental	25(52.1)	23(47.9)	48(100)
Nursing	19(61.3)	12(38.7)	31(100)
Engineering	73(88)	10(12.0)	83(100)
Arts and sciences	65(73.0)	24(27.0)	89(100)

Even though many were not aware, many were willing to use digital services for tobacco cessation 166 (55.3%), when made aware of their existence. It was especially higher amongst 23- to 26-year-olds 82 (57.3%), Hindus 85(55.2%), general category 81(51.6%), and those pursuing engineering 46 (55.4%). When enquired about the modes of digital services, participants suggested apps 146 (86.9%) and text-based services 7(4.2%). The preferred features for a sizable proportion of the participants (18.7%) were was a reminder or a progress tracker, which was followed by tips for quitting (11%) (Figure 3).

FIGURE 2. Most preferred features for digital services



DISCUSSION

Around 753 college going youths, with a mean age of 22, from medical, dental, engineering, nursing colleges were interviewed. Prevalence of smokers was 39.8%, males constituted 92% of the smokers. A study from Ernakulam region with a much larger sample size, published in 2021, suggests that the prevalence of smoking was 8.6% in this age group[14]. A study published recently in 2023 suggested the prevalence of smoking in India is 10.7% [15]. In our study, 53% have attempted to quit in the past. The attempts were more or less equal between both genders. Attempts to quit were highest among those studying medicine and low among engineering students. An Indian study suggests attempts to quit smoking in the past were 36% among cigarette smokers [15]. In a study conducted by More.et.al, more than half of the participants had attempted to quit smoking [16]. In response to inquiries about their motivations for attempting to quit smoking, the predominant reason cited was concern for future health, reported by 126 individuals (67.4%), followed by the increased financial burden of smoking, noted by 19 individuals (10.2%). This corresponds with findings from another study where smokers expressed worry about potential future health consequences to a certain extent and acknowledged spending excessively on cigarettes [16,17]. Most of the participants in the study have tried to quit 2-4 times, suggesting that the failure rate was high. The reason for failure could be because they did not seek any help or assistance for cessation [15,18]. In our study, where willingness to use digital services for tobacco cessation was more than half the number of respondents (55.3%). A study conducted by McCool.et.al on an app used by tobacco consumers for cessation reports the important factors required while creating a digital cessation tool, that a tailored digital tool is important to help smokers quit [18]. In our study when the respondents were asked about preferred features in a digital tool, reminders or a progress tracker, followed by awareness and tips for quitting were suggested. Despite the high prevalence of smoking, the study reveals a notable gap in awareness and utilization of digital technologies for tobacco cessation. Only 32% of participants were familiar with digital tools, indicating a lack of exposure or education regarding available resources for quitting smoking. However, the study also identifies a significant willingness among participants, with 55% expressing a strong inclination to use digital tools for smoking cessation. This finding presents an opportunity for intervention and underscores the potential of digital technologies in supporting tobacco cessation efforts among college students. A research investigation revealed that utilizing digital educational games offers a viable approach to captivate young students. In situations where time and human resources are limited, educators could consider employing these

games to bolster the engagement of students who smoke with materials related to quitting smoking, thereby increasing their motivation to quit. Specifically, digital educational games may serve as a tool to inspire students with varying degrees of nicotine dependence, as determined by the FTND scale, to pursue smoking cessation [19, 20].

A meta-analysis reported that the e-Health intervention, including telephone counselling, text messaging, are more effective in enforcing tobacco cessation, with group intervention and individual counselling following closely behind when compared to standard care, usual care, or no intervention. It is quite evident from our survey that the awareness about digital interventions for tobacco cessation even among educated youths who are handy with digital technology is quite low, making them miss an important, effective, and easily available tool for cessation[21, 22].

The study identifies several factors influencing the utilization of digital tools for tobacco cessation. Age and field of study emerged as significant predictors, with older students and those in arts and sciences demonstrating higher willingness to use digital technologies. This suggests the importance of tailoring interventions to specific demographic groups and academic disciplines. Additionally, the study highlights concerns and barriers related to the effectiveness and trustworthiness of digital tools, as well as a lack of motivation to quit smoking. Addressing these barriers through targeted education and outreach efforts is crucial for maximizing the impact of digital interventions.

Limitations of the study

Our study has a few inherent limitations. Firstly, the students were selected from only one state (district) which might limit the generalisability of the study. The study is conducted using a cross-sectional survey a causal relationship cannot be drawn from the findings of an observational cross-sectional study. The fact that the responses were self-reported, there were possibilities of recall bias and reporting bias.

Strengths of the study

This study is one of the very few studies in India that has surveyed awareness and usage of digital tools for tobacco cessation with a focus on willingness to use digital tools for cessation practices.

Conclusion

Digital tools may be a viable method for promoting behavioural change and assisting in the cessation of smoking. The rise in internet usage in both urban and rural areas of the country and the digital explosion across India presents an opportunity. The awareness and the usage of such tool even among the younger educated smokers who want to get rid of the habit is quite low, while the motivation for tobacco cessation does exist, the lack of awareness about various methods to help seems to affect the success rate. Internet-based therapies have had a significant impact on smoking cessation in a number of countries. In India, research in this area is in its infancy. Focus can be put on advancing this field of study, which has the potential to have positive effects across the country.

IMPLICATIONS FOR BEHAVIOURAL HEALTH

The study emphasizes tailoring tobacco cessation interventions to Ernakulam college students' preferences, leveraging digital tools for accessibility and personalized support. Understanding smokers' demographics aids targeted outreach efforts. Combining digital technologies with traditional interventions maximizes effectiveness. Education campaigns are vital for dispelling doubts about digital tools. Continuous support via digital platforms fosters long-term behavior change. Policymakers should prioritize funding and regulation to integrate digital interventions into public health programs. Overall, utilizing digital tools effectively can significantly contribute to reducing tobacco use among college students in Ernakulam, improving public health outcomes.

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