FACTORS AFFECTING SMOKING CESSATION SUCCESS IN INDIVIDUALS WHO APPLIED TO A SMOKING CESSATION CENTRE

Türkan Günay[1], Nur Acar[2], Duygu Lüleci[3], Fatma Seven[4], Nurcan Şentürk Durukan[5], Hakan Baydur[6], Oğuz Kilinç[7], Şafak Taner[8]

[1]Department of Public Health, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey
[2]Dr. Ersin Arslan Training and Research Hospital, Gaziantep, Turkey
[3]Uzunmehmet Chest and Occupational Diseases Hospital, Zonguldak, Turkey
[4]Department of Public Health, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey
[5]Izmir Provincial Health Directorate, Izmir, Turkey
[6]Department of Social Work, Faculty of Health Sciences, Manisa Celal Bayar University, Manisa, Turkey
[7]Department of Chest Diseases, Faculty of Medicine, Dokuz Eylul University, Izmir, Turkey
[8]Department of Public Health, Faculty of Medicine, Ege University, Izmir, Turkey

SUMMARY

Objectives: This study aims to assess the frequency of smoking cessation and to identify the factors affecting smoking cessation success among individuals seeking assistance at a smoking cessation centre.

Methods: This cross-sectional study included 1,570 individuals who applied to the smoking cessation centre in Izmir, Turkey, between 2009 and 2018, and completed three follow-ups. Data were obtained from the centre's records. Factors affecting smoking cessation success were analysed using logistic regression in multivariate analysis.

Results: The median age to start smoking was 19 (17–22), and the median number of cigarettes consumed per day was 20 (20–30). Among the participants, 59.9% exhibited a high/very high level of nicotine dependence, and 79.6% had attempted to quit smoking previously. The median number of patient follow-ups was 7 (5–10). Of the patients, 34.0% successfully quit smoking for one year. According to the multivariate analysis results, smoking cessation success increased with being married by 2.26 times (95% CI: 1.51–3.38, $p < 0.001$), the absence of other smokers in the household by 1.38 times (95% CI: 1.01–1.88, $p = 0.04$), having a low level of nicotine dependence by 1.75 times (95% CI: 1.23–2.48, $p = 0.002$), and more patient follow-ups by 1.61 times (95% CI: 1.52–1.72, $p < 0.001$).

Conclusions: Smoking cessation success is increased by the support and follow-up provided by healthcare professionals, the absence of other smokers in the household, and a low level of nicotine dependency.

Key words: smoking cessation, cigarette smoking, nicotine dependence, treatment

Address for correspondence: D. Lüleci, Uzunmehmet Chest and Occupational Diseases Hospital, Mithatpasa, Hayribey St. 37, 67020 Zonguldak, Turkey. E-mail: duygululeci@gmail.com

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INTRODUCTION

The World Health Organization (WHO) states that tobacco causes the deaths of more than eight million people worldwide each year, 1.2 million of whom are due to passive smoking (1). While the rate of adults aged 15 years and older using tobacco in the world was 33.3% in 2000 (males 50.0%, females 16.7%), it decreased to 23.6% (males 38.6%, females 8.5%) in 2018 (2). The main targets of the Framework Convention on Tobacco Control are to prevent the initiation of smoking, promote smoking cessation, and prevent passive exposure (3). It is predicted that tobacco use among males will remain above 35% until 2025 unless tobacco control policies are adequately implemented. Most tobacco users live in low- and middle-income countries, and 80% of tobacco-related deaths occur in these countries (2). According to the Global Adult Tobacco Surveys (GATS), the prevalence of tobacco use in Turkey decreased between 2008 and 2012. However, global tobacco use among individuals aged 15 years and older increased to 31.6% in 2016 (males 44.1%, females 19.2%) (4, 5). In 2018, the prevalence of tobacco use in Turkey was 29.3%, standardized for individuals aged 15 years and older, as reported by the World Health Statistics 2020 (2).

According to the GATS 2016, 32.8% of smokers in Turkey stated that they intended to quit smoking, with a success rate of 13.6% (5). Behavioural interventions implemented with the advice of healthcare professionals, individual and group counselling, and telephone or mobile communication tools (WhatsApp, short messages, mobile phone applications, etc.) have proven successful either alone or when combined with medication. There is sufficient evidence to support the effectiveness of all drugs used

in smoking cessation treatment, including nicotine replacement therapy, varenicline, and bupropion (6).

Against this backdrop, this study aimed to determine the frequency of smoking cessation and the factors affecting smoking cessation among individuals seeking assistance at a smoking cessation centre.

MATERIALS AND METHODS

The data of this cross-sectional study were obtained from the records of the smoking cessation centre (SCC), established within the scope of a project within a district municipality by the Department of Public Health of Faculty of Medicine at a University in Izmir, Turkey. The project coordinator was a faculty member from the Department of Public Health, and faculty members from the Departments of Respiratory Diseases and Psychiatry also served on the project's consultant team. The project was conducted from July 2009 to April 2010. Following the conclusion of the project, the centre continued to operate under the responsibility of the Department of Public Health until June 2018, accepting admissions from all districts of Izmir.

Each patient was monitored for one year. After setting a quit date during the initial visit, the physician conducted four follow-up sessions within the first month. Subsequent follow-ups were carried out through monthly phone calls and included physician evaluations when necessary. The approach to the patient visiting the smoking cessation centre is presented in Figure 1.

Counselling, behavioural therapy, and treatment options (including bupropion, varenicline, nicotine patches, and nicotine gum) were utilized as interventions for smoking cessation. Each patient received behavioural therapy. Behavioural therapy was administered to the patient in an average session of 20 minutes during each follow-up in the first month. Subsequently follow-ups were conducted by telephone, but the individual had the option to continue therapy face-to-face upon request. The behavioural therapy approach focused on modifying smoking behaviours and replacing them with functional alternatives. The drugs (bupropion, varenicline) were provided free of charge by the Ministry of Health. However, there were occasional delays in the supply of the drugs. Patients classified as having received drug treatment took medication for 1–3 months.

In this study, 1,570 individuals who received at least three follow-up sessions were included from a total of 3,278 individuals who applied to the SCC between 2009 and 2018, to determine the success of smoking cessation among patients who had reached the stage of attempting to quit, out of all the behavioural stages.

The data were collected through the Smoking Cessation Polyclinic Patient Evaluation Form and the Smoking Cessation Counselling Guide, both developed during the project and utilized in counselling. Written informed consent was obtained from all the participants. All the patient data were processed and stored in a computer database specially prepared for the centre. After March 2015, the patient data were also entered into the Tobacco Addiction Treatment and Monitoring System maintained by the Ministry of Health. The form includes socio-demographic characteristics, questions about smoking habits, the Fagerstrom Test for Nicotine Dependence, the Hospital Anxiety–Depression Scale (HADS), and questions determining smoking-related factors. In the Fagerstrom test, there are six questions, and the answers are scored from 0 to 1 or 0 to 3. According to the total score, 0–2 points are classified as very low, 3–4 points as low, 5 points as moderate, 6–7 points as high, and 8–10 points as very high dependence (7). Based on the total score obtained by scoring each response between 1 and 4 in the HADS, a score of 7 and above was considered indicative of the presence of depression, while a score of 10 and above indicated the presence of anxiety (8).

The dependent variable of the study was smoking cessation status. After one year of follow-up, individuals who remained nonsmokers were considered to have successfully quit smoking. Abstinence was validated by telephone. Independent variables included socio-demographic characteristics (such as age, sex, marital status, educational status, working status, regular income status), the presence of chronic disease, and factors related to tobacco use (age of starting to smoke regularly, daily consumption of cigarettes, reasons that increase the desire to smoke, motivations for quitting, previous quit attempts, use of other tobacco products, presence of other smokers in the household, nicotine

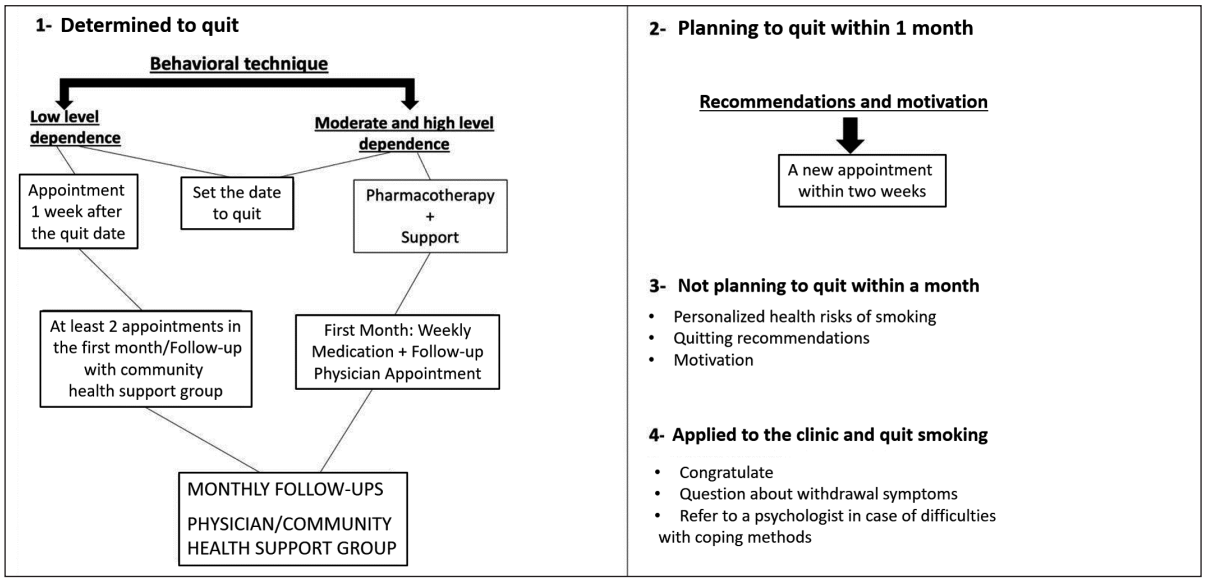

Fig. 1. *Approach to patients visiting smoking cessation centre.*

dependence level, presence of depression or anxiety, and total number of follow-ups for smoking cessation treatment).

The data analysis was conducted using SPSS 22.0. Normal distribution was evaluated using the Kolmogorov-Smirnov test. Descriptive findings for categorical data were presented as numbers and percentages, while continuous data were reported as median (interquartile range, 25%–75%) values. The Pearson's chi-square test, Fisher's exact test and Mann-Whitney U test were used in univariate analysis. In multivariate analysis, logistic regression was used to analyse the factors affecting smoking cessation success. A significance level of $p < 0.05$ was considered for all the statistical tests.

Ethical Considerations

Written informed consent was obtained from the participants. Ethical approval was obtained from the Dokuz Eylul University Ethics Committee (File No. 6400-Non-Interventional Research, No. 2021/16-22, of 27 May 2021). This study is derived from the master's thesis of the first author (TG), supervised by the last author (ST).

RESULTS

The socio-demographic characteristics and chronic diseases of the participants are presented in Table 1.

Table 1. *Socio-demographic characteristics and chronic diseases of the participants (N = 1,570)*

Characteristics		n	%
Sex	Female	722	46.0
	Male	848	54.0
Marital status	Single	258	16.4
	Divorced/widow	145	9.2
	Married	1,167	74.3
Education status	Illiterate-literate	39	2.5
	Primary school graduate	372	23.7
	Secondary school graduate	216	13.7
	High school graduate	509	32.5
	University graduate	432	27.6
Working status	Working	718	45.8
	Not working	849	54.2
Regular income	Yes	990	63.2
	No	577	36.8
Chronic diseases*	Hypertension	263	39.1
	Hypercholesterolemia	262	39.0
	Cancer	151	22.5
	Chronic obstructive pulmonary disease	149	22.2
	Diabetes mellitus	113	16.8
	Coronary heart disease	89	13.2
	Stroke	62	9.2

*The proportion of each disease among chronic diseases is given.

Table 2. *Tobacco use characteristics of the participants (N = 1,570)*

Characteristics		n	%
Use of tobacco products other than cigarettes (pipe, waterpipe, cigar, etc.)	Regularly	6	0.4
	Occasionally	129	8.2
	Ex-smoker	12	0.8
	Never smoked	1,423	90.6
Previous attempt to quit smoking	Yes	1,241	79.6
	No	319	20.4
Presence of other smokers in the household	Yes	820	53.2
	No	721	46.8
Nicotine dependence level	Very low (0–2)	157	10.0
	Low (3–4)	253	16.1
	Moderate (5)	220	14.0
	High (6–7)	499	31.8
	Very high (8–10)	441	28.1
Presence of depression	Yes (a score of 7 or above)	373	33.7
	No	733	66.3
Presence of anxiety	Yes (a score of 10 or above)	264	23.9
	No	841	76.1
Factors increasing the desire to smoke*	After meal	1,297	82.6
	Stress	1,248	79.5
	Drink coffee	917	58.4
	Drink tea	916	58.3
	Drink alcohol	574	36.6
Smoking cessation status	Did not quit	304	19.4
	Quit for 1–5 months	521	33.1
	Quit for 6–11 months	212	13.5
	Quit and completed 1 year	533	34.0
Treatment	Varenicline	547	34.8
	Behavioural therapy only	436	27.8
	Bupropion	431	27.5
	Nicotine patch	98	6.2
	Nicotine gum	58	3.7

*Multiple responses available

The median age of starting to smoke was 19 (17–22), with a daily consumption of 20 (20–30) cigarettes. The tobacco use characteristics of the group are presented in Table 2. Of the participants, 59.9% were found to be highly/very highly dependent.

Of the participants, 34.0% quit smoking for one year, while 13.5% quit for 6–11 months and restarted (relapsed). Varenicline was the most frequently received treatment (34.8%). The median number of patient follow-ups was 7 (5–10). The most common reason for intending to quit smoking was the fear of future illness (Table 3).

The results of univariate analyses are presented in Table 4. The median age of the individuals who quit smoking was 48 years (37–57), compared to 44 years (35–54) for the individuals who did not. The median age to start smoking was 20 years (17–23)

Table 3. *Reasons for intention to quit smoking of the participants (N = 1,570)*

Reasons	n	%
Fear of future illness	1,231	79.5
Desire not to harm the environment	1,097	70.8
Aspiration to be a good example for the community	1,056	68.2
Financial reasons	922	59.5
Disgusted by the smell of tobacco	881	56.9
Physician's recommendation	626	40.5
Presence of a disease	583	37.6
Social pressure	522	33.7
Indoor smoking ban	488	31.7
Shame	422	27.2
Personal beliefs	372	24.0
Workplace pressure	173	11.3

*Multiple responses available

for quitters and 19 years (17–21) for non-quitters. The median number of cigarettes consumed per day at the time of presentation to the centre was 20 (15–30) among quitters and 20 (20–30) among non-quitters. The median number of outpatient follow-ups was 10 (8–12) among those who quit smoking, significantly higher than the 6 follow-ups (4–7) observed among those who did not quit ($p < 0.001$). Significantly higher smoking cessation success rates were observed among individuals who were older ($p < 0.001$), married ($p < 0.001$), had a regular income ($p = 0.017$), started smoking at a later age ($p = 0.005$), did not share the house with a smoker ($p = 0.003$), had low nicotine dependence ($p = 0.003$), were not considered to be in depression ($p = 0.035$), and received more outpatient follow-ups ($p < 0.001$). Variables that were found to significantly increase smoking cessation success in the univariate analyses were subsequently included in the multivariate analysis.

The factors associated with smoking cessation success, as identified by logistic regression analysis, are presented in Table 5. In Model 1, smoking cessation success increased by 1.02 times (95% CI: 1.01–1.03, $p < 0.001$) with increasing age and by 1.63 times (95% CI: 1.25–2.13, $p < 0.001$) for those who were married. In Model 2, which included variables related to tobacco use, smoking cessation success increased by 1.01 times (95% CI: 1.01–1.02, $p = 0.019$) with increasing age, by 1.66 times (95% CI: 1.26–2.17, $p < 0.001$) for being married, by 1.02 times (95% CI: 1.01–1.04, $p = 0.021$) for starting to smoke at a later age, by 1.32 times (95% CI: 1.06–1.65, $p = 0.012$) in the absence of other smokers in the household, and by 1.41 times (95% CI: 1.01–1.81, $p = 0.008$) for having low nicotine dependence. In Model 3, which included the presence of depression and the number of outpatient follow-ups, smoking cessation success increased by 2.26 times (95% CI: 1.51–3.38, $p < 0.001$) for those who were married, by 1.38 times (95% CI: 1.01–1.88, $p = 0.04$) in the absence of other smokers in the household, by 1.75 times (95% CI: 1.23–2.48, $p = 0.002$) for individuals with low nicotine dependence, and by 1.61 times (95% CI: 1.52–1.72, $p < 0.001$) with an increasing number of outpatient follow-ups. In this model, the effects of age and the age of smoking initiation were no longer significant (Table 5).

DISCUSSION

In this study, one year of smoking cessation success rate was found to be 34.0% among the patients seeking assistance in the SSC. Health institutions offering professional smoking cessation support play a critical role, given that only 4% of cessation attempts succeed without assistance, while success rates double when healthcare professionals and medication are involved (9). A one-year follow-up of the individuals receiving pharmacotherapy (varenicline, bupropion) at SCC revealed a smoking cessation success rate of 45.3% (10). Arslan et al. reported a cessation success rate of 32.8% among patients who applied to an SCC (11). Similarly, Yaşar et al. observed a smoking cessation rate of 37.3% among patients under their follow up (12). In GATS 2016, conducted on a population basis in Turkey, 13.6% of daily smokers successfully quit smoking (5). The smoking cessation rate observed in our study is consistent with the outcomes reported by SCCs which employ similar strategies, including behavioural therapy and pharmacological treatments.

The success rates of smoking cessation reported in international literature range between 26% and 40%. In a cohort study involving data from centres in Norway, Iceland, Denmark, Estonia, and Sweden, the smoking cessation success rate was 39%, with a 10-year cessation rate of 44.9 per 1,000 person-years at follow-up (13). In a telephone follow-up study conducted in Taiwan, the smoking cessation rate was reported to be 37.7% sixth month after the smoking cessation intervention (14). In a population-based study conducted in a rural area of Shanghai, 15.3% of participants were reported to have quit smoking (15). The higher smoking cessation success rate observed in this study, compared to the results of population-based studies, can be attributed to the fact that the study group consisted of individuals who actively sought assistance from a smoking cessation centre. Raising public awareness about the harms of smoking is the first step in motivating individuals to decide to quit and take action.

The median age of starting to smoke among the research participants was 19, and the median number of daily cigarette consumption was 20. According to GATS 2016, 57.5% of individuals in the 15–34 age group in Turkey who smoked daily had started using tobacco before the age of 18. The mean age of starting tobacco use was 17 (5). Starting to smoke at an early age is critical, as it increases the risk of tobacco-related diseases and mortality, while also significantly reducing the likelihood of smoking cessation. In line with findings from other studies (12, 16), the participants in this study reported that their urge to smoke was strongest after meals, during periods of stress, and while drinking tea or coffee.

In this study, sex, education level, working status, regular income, daily cigarette consumption, previous quit attempts, presence of chronic disease, presence of anxiety, and receiving pharmacological treatment were not found to have a significant impact on smoking cessation.

In the multivariate analysis, being married, the absence of other smokers in the household, low nicotine dependence, and a higher number of outpatient follow-ups were found to increase smoking cessation success. The positive impact of being married on cessation success may be attributed to a more regular lifestyle and increased social support. Van den Brand et al. also reported that the absence of a smoker in the household and the partner support

Table 4. *Smoking cessation status by various characteristics of the participants (N = 1,570)*

Variables		Smoking cessation				p-value**
		Yes		No		
		n	%*	n	%*	
Sex	Female	230	31.9	492	68.1	0.129
	Male	301	35.5	547	64.5	
Marital status	Single	61	23.6	197	76.4	**<0.001**
	Divorced/widow	36	25.0	108	75.0	
	Married	433	37.1	734	62.9	
Education status	High school and below	375	33.0	761	67.0	0.246
	University and above	156	36.1	276	63.9	
Working status	Working	226	31.5	492	68.5	0.064
	Not working	305	35.9	544	64.1	
Regular income	Yes	357	36.1	633	63.9	**0.017**
	No	174	30.2	403	69.8	
Previous attempt to quit smoking	Yes	427	34.4	814	65.6	0.544
	No	104	32.6	215	67.4	
Presence of other smokers in the household	Yes	253	30.9	567	69.1	**0.003**
	No	274	38.0	447	62.0	
Nicotine dependence level	Low	166	40.5	244	59.5	**0.003**
	Moderate	73	33.2	147	66.8	
	High	292	31.1	648	68.9	
Chronic diseases	Yes	236	35.1	436	64.9	0.380
	No	293	33.0	595	67.0	
Depression	Yes	116	31.1	257	68.9	**0.035**
	No	275	37.5	458	62.5	
Anxiety	Yes	82	31.1	182	68.9	0.092
	No	309	36.7	532	63.3	
Treatment	Varenicline	193	35.6	349	64.4	0.305
	Behavioural therapy only	165	35.4	301	64.6	
	Bupropion	132	30.8	296	69.2	
	Nicotine replacement therapy (nicotine patch/gum)	41	30.6	93	69.4	

*Percent of rows; **chi-square test. Numbers in bold indicate statistically significant values.

contributed to the success (17). In the study by Esen et al., smoking cessation success was significantly higher among females, those with moderate and low dependence, and those using varenicline (10). Sağlam's study identified male gender, physician's recommendation, and a low nicotine dependence level as factors affecting cessation success (16). In the RHINE study, older age, starting to smoke at a later age, and higher education levels were associated with increased smoking cessation success (13). Similarly, Huang et al. found that low nicotine dependence, smoking fewer than 20 cigarettes per day, a higher number of follow-ups, and physician support contributed to greater smoking cessation success (14). In a randomized controlled multicentre trial, smoking cessation between weeks 9 and 24 was significantly lower among younger individuals, those with high nicotine dependence, individuals with psychiatric disorders, those who started smoking at an early age, and those who had previously undergone nicotine replacement therapy. However, no significant differences were observed in smoking cessation success across different medication treatment options (18). Arslan et al. found smoking cessation success to be significantly higher in the group receiving varenicline treatment (42.8%) compared to the group receiving nicotine replacement therapy (24.9%) (11). Yaşar et al. reported that the use of drug therapy for effective periods increases the success of smoking cessation (12). Another study demonstrated that initiating drug treatment early and maintaining regular follow-ups significantly improved cessation outcomes (10). However, unlike previous studies, drug treatment did not have a significant effect on smoking cessation in this study. Concerns about the pharmacological agents used in treatment may have impacted patients' compliance with treatment and the accuracy of the information provided to physicians during follow-ups.

The most notable strength of this research lies in its design as a health promotion project conducted in collaboration with a municipality and a university. The services were provided for

Table 5. *Factors associated with smoking cessation success: logistic regression analysis*

Variables (reference)	Smoking cessation success					
	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Sex (female)	1.06	0.83–1.35	1.06	0.82–1.37	0.95	0.66–1.36
Age (continuous variable)	1.02*	1.01–1.03	1.01***	1.01–1.02	1.00	0.99–1.02
Marital status (not married)	1.63*	1.25–2.13	1.66*	1.26–12.17	2.26*	1.51–3.38
Regular income (no)	1.15	0.89–1.48	1.16	0.90–1.50	1.36	0.94–1.97
Age of starting to smoke (continuous variable)			1.02***	1.01–1.04	1.01	0.98–1.04
Presence of other smokers in the household (yes)			1.32***	1.06–.65	1.38***	1.01–1.88
Nicotine dependence level (high)						
Moderate dependence			1.05	0.76–1.45	0.90	0.56–1.44
Low dependence			1.41**	1.01–1.81	1.75**	1.23–2.48
Depression (yes)					1.18	0.85–1.66
Total number of follow-ups (continuous variable)					1.61*	1.52–1.72

*p < 0.001; **p < 0.01; ***p < 0.05
OR – odds ratio; 95% CI – 95% confidence interval
Model 1: sex, age, marital status, regular income; Model 2: sex, age, marital status, regular income, presence of other smokers in the household, nicotine dependence level, age of starting to smoke; Model 3: sex, age, marital status, regular income, presence of other smokers in the household, nicotine dependence level, age of starting to smoke, presence of depression, total number of follow-ups.

approximately 10 years, offering professional smoking cessation assistance and medication to the community at no cost. A one-year telephone follow-up was conducted, during which participants in need had access to a physician. This SCC was the first municipal SCC to be included in the Ministry of Health service network. Its integration into the network ensured the sustainability of the programme.

This research adopts a cross-sectional study design and consequently exhibits limitations in establishing causal relationships. The study population consisted solely of individuals from a specific SCC, potentially limiting the generalizability of the results to broader populations of smokers. Another primary limitation of the study is the occasional interruptions in the supply of medications to the centre by the Ministry of Health, which led to disruptions in the provision of free medication support. Although the SCC's recording system was carefully developed and all service providers received training, missing data were still identified in the records. Consequently, the number of participants varied across certain variables.

CONCLUSIONS

This study highlighted that one third of the individuals who desired to quit smoking were able to achieve this goal. Being married, the absence of other smokers in the household, low levels of nicotine dependence, and a high number of outpatient follow-ups were identified as the main factors contributing to enhanced success in smoking cessation. Effective treatment requires support from both healthcare professionals and the social environment. To improve accessibility, smoking cessation services should be integrated into primary healthcare services and provided free of charge. Given the highly addictive nature of tobacco products, the strategies outlined in the Framework Convention on Tobacco Control to prevent smoking initiation should be implemented with a strong political commitment.

Conflicts of Interest
None declared

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