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Factors Affecting Smoking Cessation Success of Heavy Smokers Registered in the Intensive Care Smoking Cessation Camp
(Data from the National Tobacco Control Center)

Hansol Yeom [a], Hee-Sook Lim [a,b], Jihyun Min [c], Seoni Lee [c], Yoon-Hyung Park [a,c,*]

[a] Department of Preventive Medicine, Soonchunhyang University, Cheonan, Korea
[b] Department of Food and Nutrition, Yeonsung University, Anyang, Korea
[c] Chungnam Tobacco Control Center, Cheonan, Korea

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ABSTRACT

Objectives: The purpose of this study was to investigate the factors involved in the success of smoking cessation in heavy smokers enrolled in an intensive care smoking cessation camp program.
Methods: Heavy smokers enrolled in the program were classified into a success (n = 69) or failure (n = 29) group, according to whether they maintained smoking cessation for 6 months after the end of the program. Demographics, smoking behaviors, and smoking cessation-related characteristics were analyzed.
Results: Statistically significantly more participants in the success group had a spouse (98.6%; p = 0.008) compared with participants in the failure group (82.8%). However, multivariate logistic regression analysis indicated that having a spouse was not an independent factor in smoking cessation (p = 0.349). A significant difference in the frequency of counseling between the success and failure groups was observed (p = 0.001), with 72.5% of those who received counseling on 3-5 occasions for 6 months after the end of program successfully quit smoking, indicating that those who received more counseling had a higher likelihood of smoking cessation success. This was confirmed as an independent factor by multivariate logistic regression (p < 0.005). Furthermore, a graduate school level of education or higher, indicated a statistically greater success rate compared to those that were less well educated (p = 0.043). This was also observed as a significant independent factor using multivariate logistic regression (p = 0.046).
Conclusion: Education level, marital status, and the number of counseling sessions were significant factors contributing to smoking cessation success.

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Introduction

In 2015, approximately 6 million deaths worldwide were attributed to smoking, with this figure expected to rise annually reaching approximately 8 million deaths by 2030 [1].

Smoking is a leading cause of cardiovascular disease and cancers (such as pulmonary cancer, laryngeal cancer, esophageal cancer, oral cancer, and bladder cancer). Smoking is a preventable cause of these diseases [2]. The smoking population in 2014 (15 years or older) for advanced countries in the Organization for Economic Co-operation and Development (OCED) was an average of 18.9%, compared to South Korea which was 20.0% [3]. The National Health and Nutrition Examination Survey of South Korea in 2015 reported that 22.6% of the population were smokers [4]. According to the World Bank [5], if current smoking trends continue, approximately 500 million smokers in the global population will die from smoking-related diseases. Half of these individuals are

*Corresponding author: Yoon Hyung Park
Department of Preventive Medicine, Soonchunhyang University, Cheonan, Korea
E-mail: parky@sch.ac.kr

currently reported to be children or teenagers, therefore, developing solutions to prevent children and adolescents from starting smoking at an early age needs to be addressed [6].

The goals of South Korea's smoking cessation policy, is also to protect non-smokers by creating non-smoking environments [7]. Cigarettes were first regulated through the enactment of the National Health Promotion Act in 1995. After signing up to the WHO Framework Convention on Tobacco Control (FCTC) in 2003, which was ratified in 2005, South Korean smoking cessation policies gained further traction [8]. In addition, smoking cessation support programs for smokers in public health centers, amongst military personnel, as well as riot police and conscripted policemen were expanded in 2005, and also included telephone counseling. These efforts resulted in a 36.2% smoking cessation success rate in 2005 which continued to rise and by 2008 had reached 46.5% [8,9]. However, in 2010, the success rate of smoking cessation plateaued at approximately 40%. Smoking rates amongst women and teenagers were rising but there were no notable smoking cessation policies targeted at these groups. Action was taken by the Ministry of Health and Welfare in 2015 and Tobacco Control Centers over 18 regions of the country were set up. Regional Tobacco Control Centers primarily targeted individuals who were traditionally considered as being in a "blind spot" from receiving support to cease smoking. These individuals included women, teenagers not under school supervision, college students, and heavy smokers. Regional Tobacco Control Centers considered these key groups and provided "on-call smoking cessation support services" and operated "smoking cessation programs" [10]. Despite various programs having been implemented following the establishment of regional Tobacco Control Centers, conclusive studies regarding its effectiveness have not been widely reported.

This study was undertaken to provide the basic materials to develop efficient smoking cessation programs for the National Tobacco Control Centers to increase smoking cessation rates. This study examined the smoking behaviors of heavy smokers and the factors that affect smoking cessation success rates amongst individuals registered in the intensive care smoking cessation camps by the "C region" Tobacco Control Center.

Materials and Methods

1. Study participants and data collection

Data was collated from the "National Tobacco Control Center" for years 2015 to 2016 for heavy smokers registered in the intensive care smoking cessation camps operated by the "C region" Tobacco Control Center. Individuals who agreed to participate in this study were given registration cards and surveys to complete. Those with difficulty reading were provided with assistance from counselors to complete the forms. Heavy smokers were defined as current smokers afflicted by smoking-related diseases (malignant tumors, chronic pulmonary diseases, cardiocerebrovascular diseases and etc.) or smokers of 20 years or more who have tried and failed to stop smoking more than twice. Of the 131 individuals who had registered for the program, 33 were excluded due to treatment of diseases, death, moving to other regions, or transfer to other centers. The remaining 98 individuals were included in the study for analysis. Depending on the participants smoking cessation success recorded 6-month post-program they were categorized into success (69 individuals) or failure (29 individuals, Figure 1) groups. This study was approved by the Soonchunhyang University Institutional Review Board (201709-SB-039-01) and was undertaken with the consent of the individuals in this study.

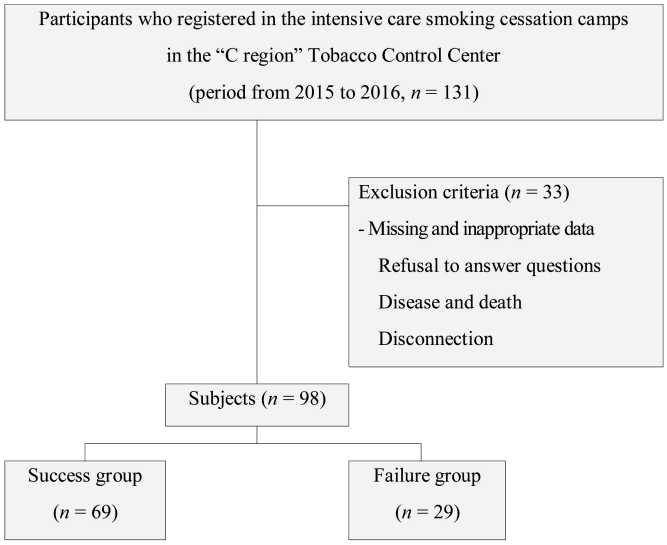

Figure 1. Overview of study population.

2. Overview of the intensive care smoking cessation camps programs

The intensive care smoking cessation camp was a 5-day program that provided health checkups, professional smoking cessation education, and intensive psychological counseling at the Regional Tobacco Control Centers for those who wanted to stop smoking but found it difficult. Individuals who wanted to participate in the program applied online or visited the center.

Candidates for the program were screened at the first interview and were selected for the study following a physical and mental health check and willingness to stop smoking.

Table 1. Inpatient treatment program for nicotine dependence at the smoking cessation camp.

Task	Timepoint	Contents
Application	1wk before camp	(1) Referral letter from hospital or clinic (2) Submission of application to smoking camp (on site visit, online) (1) Evaluation of application to smoking cessation camp (2) Prescreening (telephone & visit) (3) Selection of participation
Registration	Day 1	(1) Rule for smoking cessation camp participation, informed consent for participation, and informed consent for personal information (2) Registration card: smoking status evaluation, smoking habit, self-efficacy, contraindications for nicotine replacement therapy, nicotine dependence test, etc.
Participation	Day 1	(1) Health status check and basic fitness test (2) Smoking cessation consultation: prescription-based smoking status evaluation (3) Psychological counseling: motivation for camp participation
	Day 2	(1) Smoking cessation education: education on smoking cessation medication, harms of smoking (2) Exercise program: health status check, muscle power (3) Psychological counseling: consolidation of motivation for smoking cessation (4) Healing program: laughter therapy
	Day 3	(1) Rounding: check smoking status (carbon monoxide monitoring), craving for smoking, etc. (2) Counseling about health check (3) Smoking cessation education: diet therapy after smoking cessation (Ⅰ) (4) Healing program: yoga (5) Psychological counseling: dealing with ambivalence in smoking cessation
	Day 4	(1) Rounding: check smoking status (carbon monoxide monitoring), craving for smoking, etc. (2) Smoking cessation education: diet therapy after smoking cessation (Ⅱ) (3) Psychologic counseling: stress management, anger management, nutrition consultation (4) Healing program: meditation, OX quiz of smoking cessation
	Day 5	(1) Rounding: check smoking status (carbon monoxide monitoring), craving for smoking, etc. (2) Psychological counseling: developing a support system for smoking cessation (family, friends), mental health clinic (3) Program evaluation, graduation

The program provided logical smoking cessation education that covered smoking cessation drugs, the harmfulness of tobacco, dietary management after smoking cessation, smoking cravings and coping with stress [11]. To provide motivation for smoking cessation, counseling sessions (5 group psychological counseling sessions and 4 individual sessions) were provided that covered psychological and individual nutritional counseling, dealing with feelings about smoking cessation, preparation for stress management, anger control training, and smoking cessation maintenance. Telephone or clinic visit follow-up was carried out with the center manager counselor and occurred after 6 months of having taken part in the smoking cessation program. Details of the program are shown in Table 1.

3. Covariates

To uncover differences in smokers that succeeded or failed to stop smoking demographic characteristics, smoking behaviors, related characteristics, and smoking cessation-related characteristics were studied as independent variables.

3.1. Demographic characteristics

The demographic characteristics included gender, age, highest level of education, occupation, social security, and marital status. Participants (adult heavy smokers ≥ 20 years) were divided into: 1) male and female; 2) ≤ 40 years, those in their 50s, ≥ 60 years; 3) high school graduate or lower, or college graduate or higher; 4) white-collar workers (managers, experts and those in related fields of work, office workers, service sector workers and sales workers), blue-collar workers (agriculture and fisheries workers, technical service workers and those in related fields of work, device and machinery operations and assembly-line workers, military personnel and others) and those with no occupation; 5) with National Health Insurance, those with a medical allowance, and others; 6) those that presently had spouses and those who did not have spouses.

3.2. Smoking behaviors related characteristics

Individuals gave the age at which they began smoking, smoking duration, number of cigarettes smoked daily, score of dependence of nicotine, carbon monoxide (CO) expiration levels, and cotinine test results. The age at which the individuals began smoking was further classified into ≤ 20 years and > 20 years. The total smoking duration was further classified ≤ 30 years, 30 to 39 years, and ≥ 40. The daily average cigarettes smoked was further classified into "one pack (20-cigarettes) or less" and "more than one pack (20-cigarettes)." Regarding the nicotine dependency test, the Fagerstrom test for nicotine dependence (FTND-K) was applied. Low dependency was considered as 0-3 points, intermediate dependency was considered as 4-6 points, and high dependency was considered as ≥ 7 points. Expiration CO levels were further classified as < 10 ppm, 10-19 ppm, and ≥ 20 ppm. The cotinine test results were classified as either positive or negative.

3.3. Smoking cessation-related characteristics

Smoking cessation-related characteristics included attempts to stop smoking, the status of supporters who assisted the individual with smoking cessation, the type of motivation that led to program registration, and the attendance at smoking cessation counseling. Participants answered either "yes" or "no" to the attempts to quit smoking and the smoking status of supporters who assisted with smoking cessation characteristics. Motivation for program registration was further classified into 3 categories: TV and radio advertisements, recommendations from others, and other. The frequency of smoking cessation counseling attendance was further classified into ≤ 2 times, 3-5 times, and ≥ 6 times.

4. Statistical analysis

To understand the differences in the success of smoking cessation according to each of the smokers' characteristics, a frequency analysis and a chi-squared test were performed. To establish the relevance between the characteristics of smokers and the success of smoking cessation, a multivariate logistic regression with corrected control variables, was performed and the results were presented in odds ratios (OR) at a 95% confidence interval. The data analysis was performed using SPSS 18.0 for Windows (SPSS, Inc. Chicago, IL, USA) at a significance level of 5%.

Results

Of the 98 individuals (90 males, 8 females) in the total study population, 69 individuals were successful and 29 individuals failed to give up smoking. In terms of smoking cessation success rates, the smoking cessation success rate for males was 92.8% (n = 64), and 7.2% (n = 5) for females. In terms of age within the successful group, those in their 60s and older constituted 40.6%, those in their 50s constituted 36.2%, and those in their 40s or younger constituted 23.2% of the successful group. In terms of age within the failure group, those in their 50s constituted 48.3%, those in their 40s or younger constituted 31.0%, and those in their 60s and older constituted 20.7%. With respect to the highest level of education, for those in the successful group, 65.2% of the individuals responded as having completed a college education or higher and 34.8% responded as having completed a high school education or lower. For those in the failure group, 41.4% of the individuals responded as having completed a college education or higher

Table 2. Comparison of demographic characteristics between success and failure groups.

Variable	Smoking cessation		p
	Success group (N = 69)	Failure group (N = 29)	
Gender			
Male	64 (92.8)*	26 (89.7)	
Female	5 (7.2)	3 (10.3)	
Age (y)			
≤ 49	16 (23.2)	9 (31.0)	0.168
50-59	25 (36.2)	14 (48.3)	
≥ 60	28 (40.6)	6 (20.7)	
Education			
≤ High school graduate	24 (34.8)	17 (58.6)	0.043
≥ Graduate school	45 (65.2)	12 (41.4)	
Occupation			
White color	42 (60.9)	16 (55.2)	0.128
Blue color	17 (24.6)	4 (13.8)	
No occupation	10 (14.5)	9 (31.0)	
Social security			
Health insurance	44 (63.8)	15 (51.8)	0.595
Medical allowance	6 (8.7)	2 (6.9)	
Others	19 (27.5)	12 (41.3)	
Married			
Yes	68 (98.6)	24 (82.8)	0.008
No	1 (1.4)	5 (17.2)	

*Number of subjects (frequency %).

and 58.6% responded as having completed a high school education or lower. In addition, the level of education was found to be a significant factor (p = 0.043), therefore the more educated individuals were in the successful smoking cessation group. With respect to occupations, there were no significant differences despite the success group having constituted a relatively higher proportion of white-collar and blue-collar workers while the failure group constituted a relatively higher proportion of individuals with no occupations. As for social security status, both the success and failure groups presented high enrollment rates of National Health Insurance and no significant differences were found. In regard to the success rate of smoking cessation according to spouse status, 98.6% and 82.8% of individuals reported the presence of a spouse in the success group and failure group, respectively. Statistical significance was observed in the success group who reported being married (p < 0.008; Table 2). However, when being married was assessed as an independent factor, it did not influence the individual giving up smoking (p < 0.349; Table 5)

Table 5. Multivariate logistic regression analysis of variables that affect the success for tobacco cessation.

Variable	Adjusted OR (95% CI)	p
Age (y)		
≤ 49	1 (Ref.)	
50-59	1.26 (0.34 - 4.74)	0.731
≥ 60	2.35 (0.48 - 11.45)	0.291
Education		
≤ High school graduate	1 (Ref.)	
≥ Graduate school	3.19 (1.02 - 9.98)	0.046
Spouse status		
Yes	1 (Ref.)	
No	3.48 (0.26 - 47.27)	0.349
Frequency of smoking cessation counseling	1.87 (1.21 - 2.89)	0.005

CI = confidence interval; OR = odds ratio.

Table 3. Comparison of smoking behaviors related characteristics between success and failure groups.

Variable	Smoking cessation		p
	Success group (N = 69)	Failure group (N = 29)	
Starting smoking age (y)			
≤ 20	46 (66.7)*	15 (51.7)	0.178
20	23 (33.3)	14 (48.3)	
Total smoking duration (y)			
< 30	24 (34.8)	17 (58.7)	0.092
30-39	27 (39.1)	7 (24.1)	
≥ 40	18 (26.1)	5 (17.2)	
Amount of daily smoking (number)			
≤ 1 pack (20-cigarettes)	48 (69.6)	19 (65.5)	0.812
> 1 pack (20-cigarettes)	21 (30.4)	10 (34.5)	
Dependence of nicotine (score)			
0-3	16 (23.2)	3 (10.3)	0.314
4-6	22 (31.9)	12 (41.4)	
≥ 7	31 (44.9)	14 (48.3)	
Expiration CO level (ppm)			
< 10	44 (63.8)	18 (62.1)	0.425
10-19	19 (27.5)	6 (20.1)	
≥ 20	6 (8.7)	5 (17.2)	
Cotinine test			
Negative (-)	6 (8.7)	0	0.175
Positive (+)	63 (91.3)	29 (100.0)	

*Number of subjects (frequency %).

The proportion of those having responded that the age at which they started smoking was in their 20s was 66.7% in the success group and 51.7% in the failure group. In regard to the total duration of smoking for the success group, 39.1% responded as having smoked for a period of 30 to 39 years, 34.8% responded as having smoked for a period of fewer than 30 years, and 26.1% responded as having smoked for 40 years or more. For the failure group, 58.7% responded as having smoked for a period less than 30 years, 24.1% responded as having smoked for a period of 30 to 39 years, and 17.2% responded as having smoked for 40 years or more. With respect to smoking duration, the success group had reported the highest proportion of individuals in the category of 30 to 39 years while the failure group had reported the highest proportion of individuals in the same category of 30 years or less. In spite of these findings, there were no significant differences between the two groups. As for the average daily number of cigarettes smoked, those having responded ≥ 1 pack were among those in the success group (69.6%). This figure was similar for those in the failure group (65.5%). Regarding nicotine dependency, for the success group 44.9% scored ≥ 7 points, 31.9% scored between 4 and 6 points, and 23.2% scored between 0 and 3 points. For the failure group 48.3% scored ≥ 7 points, 41.4% scored between 4 and 6 points, and 10.3% scored between 0 and 3 points. Although these figures indicated no significant differences, a higher ratio of nicotine dependency was observed in the failure group. In regard to expiration CO levels, 63.8% of individuals in the success group presented levels < 10 ppm while 62.1% of individuals in the failure group presented the same levels. For the cotinine tests, the success group presented a 91.3% positive response, whereas a 100% positive response was presented by the failure group and no significant differences were found (Table 3).

With regard to the answers about whether an individual had experience attempting to stop smoking, 56.5% of individuals in the success group and 41.4% of individuals in the failure group answered “yes”. This indicated a relatively higher proportion of individuals to have attempted to stop smoking in the success group. As for the existence of supporters who assisted in smoking cessation, 95.7% of individuals in the success group answered “yes” as opposed to the 89.7% answering “yes” in the failure group. Regarding the motivation to register in the program, for the success group, 42.0% responded as having registered on the recommendation of others, 34.8% responded as having registered for other reasons, and 23.2% responded as having registered due to TV and radio advertisements. For the failure group, 48.3% responded as having registered on the recommendation of others, 27.6% responded as having registered due to TV and radio advertisements, and 24.1% responded as having registered due to other reasons. No notable differences between the two groups were found in this category. In regard to the frequency of smoking cessation

Table 4. Comparison of smoking cessation related characteristics between success and failure groups.

Variable	Smoking cessation		*p*
	Success group (*N* = 69)	Failure group (*N* = 29)	
Attempted to quit			
Yes	39 (56.5)*	12 (41.4)	0.190
No	30 (43.5)	17 (58.6)	
Supporter smoking status			
Yes	66 (95.7)	26 (89.7)	0.357
No	3 (4.3)	3 (10.3)	
Registered motivation			
TV & Radio	16 (23.2)	8 (27.6)	0.584
Inducement	29 (42.0)	14 (48.3)	
Others	24 (34.8)	7 (24.1)	
Frequency of smoking cessation counseling			
≤ 2	2 (2.9)	20 (69.0)	< 0.001
3-5	50 (72.5)	7 (24.1)	
≥ 6	17 (24.6)	2 (6.9)	

*Number of subjects (frequency %).

counseling attendance, the two groups presented a significant difference where the attendance frequency was higher in the success group ($p < 0.001$; Table 4).

Upon establishing the significant differences in the success and failure groups through chi-square test in terms of the demographic characteristics, smoking-related characteristics, and smoking cessation-related characteristics, those variables with a significant difference were independently tested using multivariate regression analysis. These data indicated that smoking cessation success rates for those having a college education or higher was statistically significantly compared to those having a high school education or lower ($p = 0.046$). In addition, the average number of smoking cessation counseling sessions attended by the success group was found to be a mean of 4.83 sessions compared to a mean of 2.55 sessions in the failure group. This indicated that the higher the attendance at counseling sessions, the higher the success rate of smoking cessation ($p = 0.005$; Table 5).

Discussion

This study was performed on individuals who were heavy smokers, registered for intensive care smoking cessation camps operated by the "C region" Tobacco Control Center. The purpose of the study was to analyze individuals' smoking behavior and the factors that affect the success of smoking cessation.

In terms of demographic characteristics, statistically significant differences were observed for final education and marital status between success and failure groups. Those with higher levels of education were more successful in smoking cessation, which supports previous studies with similar findings [12-14]. Regarding the health risks associated with smoking among those with lower education levels, they may be less health aware leading to a higher likelihood of starting to smoke. These less well-educated individuals also have a lower success rate at stopping smoking too [15,16]. In addition, in this current study it was observed that those with a higher level of education tended to change their behavior. In light of this, it increased motivation to stop smoking must be increased amongst those with lower levels of education. Furthermore, the success rates of smoking cessation were found to be higher among those with spouses. This finding supports the results of an all-male adult study that also found the chance of success was higher amongst those with spouses [17].

Upon examining the differences in the success of smoking cessation with respect to demographic, smoking behaviors-related, and smoking cessation-related characteristics through chi-squared tests, those variables that showed statistical significance between the groups were assessed using multivariate logistic regression. The results of this analysis indicated that the highest level of education and the frequency of smoking cessation counseling attendance were significant factors influencing the success of smoking cessation. Higher education levels and more frequent participation in smoking cessation counseling were found to present higher success rates of smoking cessation. The most statistically significant factor with regard to the success of smoking cessation was found to be the frequency of participating in smoking cessation counseling sessions through the smoking cessation 5-day program. This indicated that the greater the number of counseling sessions with a smoking cessation counselor the higher the smoking cessation success rate. The success of counseling reflected the high rate of smokers who had participated in 3-5 smoking cessation counseling sessions (72.5%), applied theories regarding motivation enhancement therapy and cognitive behavioral therapy and were successful. The finding in this study was similar to results reported from previous studies that a greater frequency in the number of visits to smoking cessation clinics or participation in counseling sessions resulted in higher success rates of smoking cessation [18-20]. By participating in counseling sessions based on the psychological tests (regarding smoking, mental health, and available resources) performed on the individuals admitted to the intensive care smoking cessation camps over the course of 5 days and 4 nights, the motivation of the individuals to stop smoking was strengthened. Additionally, cognitive behavioral therapeutic approaches were applied to highlight irrational expectations regarding smoking and explore individuals' internal thought processes. In addition, the individuals were provided with stress and anger management training and were given additional training to maintain their modified behaviors through a total of 5 group therapy sessions and 4 individual psychological and nutritional counseling sessions. Therefore it can be argued that offering group/individual psychological and nutritional counseling sessions during the intensive care smoking cessation camps as well as follow-up counseling for 6 months increases rate of the smoking cessation. It can also be concluded that the individuals, over the course of those 6 months, had adequately followed the recommendations of their smoking cessation counselors and the advice from their in-person counseling and telephone counseling sessions.

This study has several limitations. First, the results of this study are limited in its ability to be generalized as the data used in this study was based on information collected from the "C region" Tobacco Control Center (heavy smokers registered in the intensive care smoking cessation camps) involving many group heads. This study cannot represent smokers because it is an analysis of all smokers. Second, many of the factors affecting the success of smoking cessation as examined in this study regarded factors that were already a part of the individuals' everyday lives prior to their participation and therefore not

implemented by the study. Considering this, the changes during the period of smoking cessation maintenance were not adequately monitored and reflected in the analysis. Therefore, additional studies must be performed to cover the 6-month duration of the individuals' smoking cessation as part of the study. The factors that affect the success of smoking cessation are also affected by the individuals' everyday life activities prior to participating in the intensive care smoking cessation camps. Further research is needed to follow up the changes observed during the period of smoking cessation and to reflect on the analysis .

The findings of this study confirmed that the individuals' highest level of education and the spouse status had a significant effect and the frequency of participation in smoking cessation counseling sessions was extremely important to increase the success rate. These conclusions carry significance in terms of the results of a study that analyzed heavy smokers residing within the "C region." This study is expected to enhance the success rates of smoking cessation by presenting the smoking cessation programs of regional Tobacco Control Centers. In addition, this study can be utilized as the basis for developing efficient smoking cessation programs by analyzing the factors of success and the smoking behaviors of smokers. Existing smoking cessation clinics in public health centers that operate male-targeted smoking cessation support services need to enhance the success rates by providing systematic and professional support services for heavy smokers as well as for those individuals who are part of the most socially vulnerable groups who otherwise cannot receive such support.

It is necessary to establish a cooperative system of supportive services for community-based smoking cessation to develop and roll out effective smoking cessation programs considering regional characteristics, and to find effective measures. The continued undertaking of analyses capable of reflecting the activities of the Regional Tobacco Control Centers is planned to be carried out in the future.

Conflicts of Interest

All the authors of this study declare no conflicts of interest.

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