

Korean college students' attitudes toward a tobacco-free campus: a cross-sectional descriptive study

Min Sohn¹, Boae Im², Minhee Suh¹, Hun Jae Lee³

¹Professor, Department of Nursing, Inha University, Incheon; ²Researcher, Department of Nursing, Inha University, Incheon; ³Professor, College of Medicine, Inha University, Incheon, Korea

Purpose: A tobacco-free campus (TFC) is the most advanced tobacco-control policy for college campuses, but it has rarely been explored in Korea. This study aimed to explore Korean college students' attitudes toward TFC and related factors. **Methods:** This cross-sectional descriptive study enrolled college students who were taking an elective course on smoking cessation and a healthy lifestyle at a university located in Incheon, Korea. Data were collected from March 1 to December 31, 2019 using a structured questionnaire, and study participants were recruited using convenience sampling. **Results:** Data on 309 college students were analyzed. Of those participants, 6.1% supported the TFC policy. Multiple logistic regression analysis showed that female gender (adjusted odds ratio [aOR]=5.80, 95% confidence interval [CI]=1.47-22.95), taking the course to quit smoking oneself (aOR=11.03, 95% CI=1.04-117.05), anxiety in the past month (aOR=4.27, 95% CI=1.06-17.31), and being a current smoker (aOR=0.06, 95% CI=0.01-0.70) were statistically significant independent predictors of TFC support. **Conclusion:** Women, students taking the course to quit smoking themselves, nonsmokers, and students who felt anxious in the past month were more likely to support TFC. Further research with more representative samples is required to examine the characteristics of people who favor TFC.

Key words: Attitude; Universities; Korea; Smoking; Smoke-free policy

Corresponding author

Min Sohn

Department of Nursing, Inha University,
100 Inha-ro, Incheon 22212, Korea
TEL: +82-32-860-8212
FAX: +82-32-874-5880
E-MAIL: sohnmin@inha.ac.kr

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INTRODUCTION

According to national statistics, Korea has shown a rapid decrease in the rates of smoking among adults [1]. However, these rates differ by gender and age. Compared with 2015, the smoking rate in 2019 among men aged 30-39 years dropped by 8.8%, but the decrease was only 0.9% in men aged 19-29 years, and it increased by 3.3% in women aged 19-29 years [1]. These statistics indicate that further efforts are needed to promote smoking cessation in Korea, particularly among young men and women.

The Korean Statistical Information Service reported data from the Korea Population Census in 2015, including the most current rates of completing higher education by gender and age groups. According to this report, 78.7% of adults aged from 20 to 34 years old had graduated from a college-level

school [2]. College students comprise a large population of young adults in Korea. Studies indicate that many young adults become regular smokers at college, even if they first took up the habit at a much younger age [3]. Thus, tobacco control efforts for college students could effectively decrease smoking rates among young adults.

Smoking bans have been shown to be a powerful tobacco-control strategy [4]. In 2012, the Korean government banned smoking in public facilities and in elementary, middle, and high schools, both indoors and outdoors [5]. However, college campuses adopted only a ban on indoor smoking, which seems to offer insufficient protection. Despite the ban on indoor smoking, 19% of college students reported that they did smoke on campus, and 68% reported that they had experienced secondhand smoke [6]. Clearly, bans on indoor smoking are less likely than complete bans to restrict tobacco use

(and smokeless tobacco products) in student lounges and dormitories [7].

Since the American College Health Association advocated for a 100% tobacco-free environment [6,8], the tobacco-free campus (TFC) policy has been hailed as the most advanced tobacco-control strategy on college campuses. TFC refers to colleges and universities that have completely banned all types of tobacco products for both indoor and outdoor environment and the ban includes smokeless tobacco, whereas smoking bans restrict cigarette smoking only [9]. Enforcement of a TFC policy has been known to reduce smoking rates, the risk of exposure to secondhand smoke [10], and the use of alternative tobacco products [11].

Nonetheless, TFC is still a matter of debate on university campuses. Bartington and colleagues [12] surveyed attitudes toward campus-wide tobacco control policies and reported that 66.3% of students and staff members supported a smoke-free campus, but only 47.3% of them supported TFC, which would also include bans on electronic cigarettes and vaping. Previous studies have attempted to explore characteristics of students and staff members related to attitudes toward TFC. According to these studies, negative attitudes toward TFC tended to be found among ever smokers and male students [12,13]. Psychosocial characteristics might also be related to attitudes toward TFC. Adults with depressive mood, anxiety, and stress are more likely to relapse after smoking cessation and use electronic cigarettes [14]. Users of electronic cigarettes have more negative attitudes toward electronic cigarettes and vaping restrictions on campuses [15]. The attitudes of university students towards TFC can be a key component of achieving successful tobacco control using the TFC policy. Consequently, this study was designed to elicit Korean college students' attitudes about TFC and to identify factors related to their attitudes.

METHODS

Ethics statement: This study was approved by the institutional review board of Inha University (No. 180514-2). Informed consent was obtained from the participants.

1. Study Design and Participants

This was a cross-sectional descriptive study. Participants were college students enrolled in an online class called "Smoking Cessation and a Healthy Life". This course, which was a three-credit elective, was open to registered full-time or part-time undergraduate students at a university in Incheon, South Korea. We excluded only students who were younger than 19 years old. We calculated the sample size based on the

results of the study by Mamudu and colleagues [16], which examined students' attitudes toward TFC. We calculated the sample size using the odds ratio of female gender as a predictor of TFC support (1.72), with an α of .05 and power of .08; these settings yielded a sample size of 255 in G*Power [17].

During the study period, a total of 1,163 students registered in the course for two consecutive semesters. Among them, 311 students (26.7%) participated in the study, but the data of two students were excluded from the data analysis due to incomplete responses. At the time of the study, although the university had a ban on smoking, it permitted smoking in designated booths outdoors, and convenience stores were permitted to sell cigarettes on campus.

2. Measurements

Data were collected using a structured questionnaire that gathered information on demographics (including researcher-specific questions), attitudes about TFC, and health-related characteristics. Health-related characteristics were assessed using questions from the Korea Youth Risk Behavior Web-Based Survey [18], the National Health and Nutrition Examination Survey [19], and the Behavioral Risk Factor Surveillance System Questionnaire [20].

Demographic characteristics included age, gender, living status, grade point average, and the reason for taking the course. Attitudes toward the TFC policy were assessed using the following question from the North Carolina Tobacco Free College Assessment Survey: "Which type of college tobacco-use policy do you believe would be best for the college community?" Cooper and colleagues [21] used this question in their study and investigated its associations with gender, smoking status, and understanding of the current tobacco use policy on campus. The options were a policy that (a) allows smoking inside campus buildings, (b) allows smoking outdoors on campus in all locations, (c) allows smoking outdoors at specific locations only, (d) prohibits smoking anywhere on campus at all times, or (e) prohibits all tobacco use anywhere on campus at all times. Students were categorized as either a "supporter" of TFC if they answered (e) or a "nonsupporter" if they answered any of the other options.

Health-related characteristics included perceived health in general, psychosocial characteristics, and health behaviors. For general health, we asked, "Would you say that in general your health is: ___", and students could respond with "very good", "good", "fair", or "not healthy". Psychosocial characteristics included happiness, stress, loneliness, depression, and anxiety. We asked participants how happy or stressful they felt and how often they felt lonely, depressed, or too anx-

ious to function. Students could respond with “never”, “yes (in the last 2 weeks, 30 days, or 12 months)”, or “yes (but not in the last 12 months)”. Health behaviors included smoking status, the frequency of alcohol drinking, the number of days they engaged in moderate-to-vigorous exercise for at least 30 minutes in the past 7 days, and the numbers of nights in a week they got enough sleep. For smoking status, we asked, “Do you smoke cigarettes every day, some days, or not at all?” If students answered “every day or some days”, they were considered to be current smokers. The results of the psychometric evaluation of these question items have been presented previously [18,19].

3. Data Collection

Data were collected from March 1 to December 31, 2019 after the Institutional Review Board at the researchers’ university approved this study (No. 180514-2). At the beginning of the semester, the researchers posted information about the study on the course’s online platform and provided contact information for the research assistant. Students who contacted the research assistant received in return an email with an informed consent form and a link to a survey. Signed informed consent could be returned by email, standard mail, or in person. The research assistant managed the process of obtaining informed consent and data collection for study participants, and she was not involved in any part of teaching or grading of the course. Students were asked to complete and return the survey within the first 2 weeks of the semester. They received \$4 for participating in the study.

4. Data Analysis

Using SPSS for Windows version 25.0 (IBM Corp., Armonk, NY, USA), the researchers performed descriptive statistics using mean values with standard deviations and frequencies with percentages. Crude odds ratios (cORs) were estimated to assess the bivariate associations between dichotomous variables. Multiple logistic regression analysis was then performed to estimate adjusted odds ratios (aORs) including all variables; the results were presented with 95% confidence intervals (CIs). The dependent variable was attitude toward TFC. The dependent variable was coded “1, supporter” if students answered that an ideal tobacco control policy would “prohibit all tobacco use anywhere on campus at all times”. All other responses were considered to be “nonsupporter” and coded “0”. The independent variables were dichotomized using the mean, mode, or meaningful categories in context or suggestions in previous research.

RESULTS

1. Demographics and Attitudes of College Students toward a Tobacco-Free Campus

Data on 309 college students were analyzed (Table 1). The participants were in their early 20s (22.4 ± 2.3 years old). More than half were men (58.3%), and one-fourth (24.3%) reported that their grade point average was in the range of an “A”. Fewer than half of the participants (46.0%) lived with family, and only 17.2% reported that their reason for taking the course was to quit smoking. A small percentage (6.1%) of students reported that the campus should prohibit all tobacco use at all times.

2. Health-related Characteristics

The participants’ health-related characteristics are presented in Table 2. Large percentages reported that they were healthy (53.0%), happy (66.3%), and stressed (35.6%). The percentages of those who reported having felt lonely, depressed, and anxious within the past 12 months were 35.6%, 11.0%, and 22.7%, respectively. The proportion of current smokers was 33.6% (men 47.2%, women 14.7%, $\chi^2=35.53$, $p<.001$). Most of the participants (70.6%) reported that they drank alcohol four or more times a month. The average number of days on which participants engaged in moderate-to-vigorous exercise for at least 30 minutes per week was 1.8 ± 2.0 . On average, they slept enough on 3.3 ± 1.9 nights a week.

3. Predictors of Supporting a Tobacco-Free Campus

The results of multiple logistic regression analysis to identify predictors of being a TFC supporter among demographic variables, psychosocial characteristics, and health behaviors are presented in Table 3. In the bivariate analysis, only female gender (cOR=4.22, 95% CI=1.49-12.15, $p=.007$), anxiety (cOR=2.67, 95% CI=1.03-6.94, $p=.043$), and being a current smoker (cOR=0.22, 95% CI=0.05-0.96, $p=.044$) were associated with being a TFC supporter. However, after including all variables, the adjusted ORs revealed that female gender (aOR=5.80, 95% CI=1.47-22.95, $p=.012$), registering in the course to quit smoking oneself (aOR=11.03, 95% CI=1.04-117.05, $p=.046$), anxiety (aOR=4.27, 95% CI=1.06-17.31, $p=.042$), and being a current smoker (aOR=0.06, 95% CI=0.01-0.70, $p=.025$) were statistically significant independent predictors of TFC support.

DISCUSSION

TFC has been an effective policy in reducing all types of to-

Table 1. Demographics and Attitudes of College Students toward a Tobacco-Free Campus (N=309)

Characteristics	Categories	n (%) or M±SD
Age		22.4±2.3
Gender	Male	180 (58.3)
	Female	129 (41.7)
Living status	Live with family	142 (46.0)
	Live in dormitory	40 (12.9)
	Live in campus housing	127 (41.1)
Grade point average*	A	75 (24.3)
	B	204 (66.0)
	C	29 (9.4)
	D or F	1 (0.3)
Reason for taking the course	To quit smoking onself	53 (17.2)
	To help family to quit smoking	56 (18.1)
	To learn about smoking cessation	123 (39.8)
	To earn credits conveniently	73 (23.6)
	Others	4 (1.3)
Attitude toward a tobacco-free campus	Smoking should be allowed inside campus buildings	3 (1.0)
	Smoking should be allowed outdoors on campus in all locations	4 (1.3)
	Smoking should be allowed outdoors at specific locations only	236 (76.4)
	Smoking should be prohibited anywhere on campus at all times	17 (5.5)
	All tobacco use should be prohibited anywhere on campus at all times	19 (6.1)
	Missing	30 (9.7)

*Grade point average is assigned as follows: A ≥ 4.0, B ≥ 3.0, C ≥ 2.0, D ≥ 1.0, F=0.

Table 2. Health-related Characteristics of College Students (N=309)

Variables	Characteristics	Categories	n (%) or M±SD
Health in general		Very good	19 (6.1)
		Good	145 (46.9)
		Fair	116 (37.5)
		Not healthy	29 (9.5)
Psychosocial characteristics	Perceived happiness	Very happy	44 (14.2)
		Happy	161 (52.1)
		Fair	86 (27.8)
		Unhappy	17 (5.5)
		Very unhappy	1 (0.4)
	Perceived stress	Very stressed	6 (1.9)
		Stressed	104 (33.7)
		Fair	181 (58.6)
		Rarely stressed	18 (5.8)
	Felt loneliness in the past month	Yes	110 (35.6)
		No	199 (64.4)
	Felt depressed in the past month	Yes	34 (11.0)
		No	275 (89.0)
	Felt anxious in the past month	Yes	70 (22.7)
No		239 (77.3)	
Health behaviors	Current smoker	Yes	104 (33.6)
		No	205 (66.3)
	Drinking alcohol ≥ 4 (times/month)	Yes	218 (70.6)
		No	91 (29.4)
	Numbers of days the respondent engaged in moderate-to-vigorous intense exercise for 30 minutes in the past week		1.8±2.0
Numbers of nights the respondent slept enough in the past week		3.3±1.9	

Table 3. Multiple Logistic Regression Analysis to Predict Support of a Tobacco-Free Campus (N=309)

Characteristics		cOR (95% CI)	p	aOR (95% CI)	p
Demographics	Female gender	4.22 (1.49 – 12.15)	.007	5.80 (1.47 – 22.95)	.012
	Age ≥ 22 years old	0.66 (0.26 – 1.69)	.387	1.23 (0.40 – 3.78)	.719
	Living with family	0.67 (0.26 – 1.75)	.413	0.52 (0.18 – 1.47)	.215
	GPA*, A	0.82 (0.26 – 2.56)	.736	0.78 (0.21 – 2.89)	.711
	Taking the course to quit smoking	0.90 (0.25 – 3.21)	.871	11.03 (1.04 – 117.05)	.046
Psychosocial characteristics	Perceived health, good or very good	0.68 (0.31 – 1.99)	.608	0.97 (0.32 – 2.95)	.950
	Perceived happiness, happy or very happy	0.68 (0.27 – 1.75)	.424	0.48 (0.15 – 1.56)	.221
	Perceived stress, stressed or very stressed	1.68 (0.66 – 4.28)	.273	0.63 (0.17 – 2.34)	.486
	Loneliness, yes in the past month	0.83 (0.31 – 2.24)	.706	0.35 (0.09 – 1.44)	.145
	Depressed, yes in the past month	1.57 (0.43 – 5.68)	.495	0.66 (0.12 – 3.66)	.637
	Anxious, yes in the past month	2.67 (1.03 – 6.94)	.043	4.27 (1.06 – 17.31)	.042
Health behaviors	Current smoker	0.22 (0.05 – 0.96)	.044	0.06 (0.01 – 0.70)	.025
	Drinking alcohol more than 4 times a month	0.70 (0.27 – 1.84)	.468	0.99 (0.33 – 2.94)	.985
	Engaging in a moderate level of exercise ≥ 30 min/week	1.87 (0.66 – 5.32)	.243	3.20 (0.98 – 10.46)	.054
	Sleeping enough ≥ 3 nights/week	0.58 (0.23 – 1.46)	.246	0.51 (0.16 – 1.57)	.238
Model summary			R ² = .241, p = .017		

*Grade point average is assigned as follows: A ≥ 4.0, B ≥ 3.0, C ≥ 2.0, D ≥ 1.0, F=0; aOR, adjusted odds ratio; cOR, crude odds ratio; GPA, grade point average.

bacco use and minimizing exposure to secondhand smoking among college students in many countries [7,22]. In this study, we found that most participants agreed with the university’s current tobacco policy allowing smoking in designated booths. The proportion of students who supported TFC was much lower than that found in previous studies. In a systematic review and meta-analysis of studies published through June 2013, Lupton and Townsend found that the acceptability of TFC ranged from 43% to 66% on average [22].

One of the possible reasons for the low proportion of TFC supporters is that the students were not very aware of the hazards of electronic cigarettes and did not consider it necessary to restrict their use. Although the course lectures included information about electronic cigarettes, that content might be not have been sufficient to change students’ perceptions about electronic cigarettes. Previous studies have reported that smokers considered electronic cigarettes to be less harmful than traditional cigarettes and often used them to aid smoking cessation [23].

The other possible reason for the low proportion of TFC supporters might have been the high proportion of male students in the study. According to Kang and Cho [24], normalization of tobacco use is associated with negative attitudes about total bans of tobacco use. The proportion of male students at the study site was almost 10 percentage points higher than average at Korean universities [25]. Of note, the smoking rate of young adults aged from 19 to 29 years old in Korea was 37.8% in men and 10.2% in women in 2019[1]. Our results are consistent with previous studies, which noted that nonsmoking status and female gender were statistically significant predictors of supporting TFC [12,21]. In our study, participants

had higher smoking rates and a lower proportion of female gender than reported in previous studies [12,13,21,26].

Our study result showed that female gender, nonsmokers, and students who experienced anxiety in the past month were more likely to support TFC. Nonsmokers and women might be more aware of the health risks of secondhand smoke. Gong and colleagues indicated that nonsmokers strongly supported TFC because they were more aware of the risks of secondhand smoke than smokers [27]. In their descriptive study of 790 college tobacco users, Mamudu and colleagues [28] found that demographic factors were usually not associated with attitudes about TFC, but knowledge about the harms of secondhand smoke did increase TFC support. However, our study showed a somewhat unexpected finding regarding the association between anxiety and support for TFC. Previous studies reported that smokers with psychological difficulties such as depression and anxiety were more likely to use tobacco products as remedies and to relapse after quitting. In contrast, our study results showed that participants who reported being anxious in the past month were more likely to be TFC supporters. Although researchers have found that people with health issues such as asthma were more in favor of TFC [26], an association between anxiety and support of TFC has not previously been documented. Although our study did not attempt to assess the types and intensity of anxiety or to explain how anxiety is associated with TFC support, students with anxiety may be more worried about the health hazards of secondhand smoke, and this uneasiness may affect students with various health concerns.

Lastly, registering in the course to quit smoking oneself was an independent predictor of being a TFC supporter after ad-

justing for potential confounding factors. This finding is consistent with the results of previous studies that identified an association between intention to quit smoking and positive attitudes toward smoking bans in public places [29]. Lykke and colleagues [29] reported that smokers who are motivated to quit smoking could receive benefits from stronger smoking bans that would reduce their risk of relapse.

Our study has some limitations. Since all of our participants were Koreans, our sample is not representative of other races and countries. The cross-sectional nature of this study precludes causal associations from being derived from the study results. We did not fully examine the relationship between attitudes toward TFC and potential confounding factors such as use of new or emerging tobacco products and types or severity of anxiety. Glasgow and colleagues [30] reported that users of electronic cigarettes were barriers to TFC policies, since TFC policies ban electronic cigarettes while smoking bans do not. Our participants might already have been familiar with electronic cigarette use, and the number of electronic cigarette users could have been substantial. Further studies are necessary to include a more comprehensive assessment of potential confounding factors.

CONCLUSION

This study was conducted to elucidate the attitudes of college students toward TFC policies in Korea, where the smoking rate is high and the gender difference in smoking is significant in young adults. We found that most participants did not agree with the TFC policy. Considering that we enrolled students in a course about smoking cessation, agreement with TFC might be much lower among the general campus population. We found that gender and smoking status were associated with attitudes toward TFC. Further research is needed to explore other characteristics of people who favor TFC, such as their use of various tobacco products, mental health status, and diverse academic pursuits, with more representative samples. Such studies may help people to build organizations and regulations to work towards TFC policies that better fit their needs.

Health experts on campus, including school nurses, should participate in developing programs to expand awareness of the benefits of TFC. They could provide for-credit courses that focus on healthy behaviors, including smoking cessation. Experts could also support student initiatives, campaigns, and workshops on TFC. Researchers who aim to prove the effectiveness of a TFC policy on smoking rates and tobacco use should assess all related variables prior to its implementation. Such an approach will validate the effectiveness of this advanced tobacco-control policy.

ORCID

Min Sohn <https://orcid.org/0000-0003-4021-2051>
Boae Im <https://orcid.org/0000-0002-8544-5695>
Minhee Suh <https://orcid.org/0000-0002-4964-7978>
Hun Jae Lee <https://orcid.org/0000-0002-0163-6815>

Authors' contribution

Conceptualization: all authors; Data collection, Formal analysis: all authors; Writing-original draft, Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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