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보건학 석사학위논문

**Attempt to Quit Smoking**  
**by Electronic Cigarette Use**  
**among Smoking Adolescents in Korea**

청소년 흡연자의 전자담배이중사용에 따른  
금연 시도 연구

2017년 8월

서울대학교 보건대학원

보건학과 보건학 전공

육 은 우

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지도교수 조성일

이 논문을 보건학 석사학위논문으로 제출함

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육은우

육은우의 석사학위논문을 인준함

2017년 6월

위원장 조영태 (인)

부위원장 유승현 (인)

위원 조성일 (인)

## **ABSTRACT**

# **Attempt to Quit Smoking by Electronic Cigarette Use among Smoking Adolescents in Korea.**

**Eunu Yuk**

**Department of Epidemiology**

**The Graduate School of Public Health**

**Seoul National University**

### **Introduction**

Adolescent smoking has remained as major challenge in public health worldwide. Strengthening of smoking policy, adolescent smoking rates in Korea have consistently declined over the past decade. In contrast, the use of electronic cigarette increased because tobacco companies promoted the e-cigarette as smoking cessation aid. There is a controversial whether e-cigarettes have an effect on quitting smoking. This study examines whether e-cigarette is effective as a smoking cessation aid.

## **Method**

This study used Korea Youth Risk Behavior Web-based Surveys(KYRBS) in 2015 ~ 2016. KYRBS is a nationwide cross-sectional survey conducted annually. For the study analysis, types of smokers were categorized into 2 groups; cigarette only user and dual user. For the response variable, experience of attempting to quit smoking were used. To examine the association between attempt to quit smoking and e-cigarette use among cigarette smoker, frequency analysis, Chi-square test and logistic regression were used.

## **Result**

The lower school performance, the higher the weekly allowance, the more alcohol they drink and stress perceived, the more smoking friends, the higher frequency of attempt to quit smoking among dual users. As the smoking use increases, the proportion of attempt to smoking cessation increased among dual user. The association of smoking cessation among dual user versus cigarette user by frequency was 2.299(95% CI = 1.76-3.002) at 20-29 days. When smoking 6-9 amount a day, the association of attempt to smoking cessation was the highest(OR=2.04 95% CI = 1.900-2.636).

## **Conclusion**

As cigarette use increased, attempt to smoking cessation was also higher. Cigarette smoking days were higher in dual users even though they tried to quit smoking. It means e-cigarette actually works synergy with the use of smoking conventional cigarettes and has little effect on smoking cessation. To prevent the spread of wrong cessation culture in social experience such as part-time work and smoking friends, right education on smoking cessation is necessary.

Smoking prevention and smoking cessation education should be expanded in school and more emphasis should be put on right smoking cessation methods.

**Keyword**

Smoking cessation, Dual user, Electronic cigarette, Smoking behavior

**Student Number**

2015-24079

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# I. INTRODUCTION

## 1.1. Background

According to the World Health Organization (WHO), smoking is one of the major risks to public health worldwide and is associated with an estimated 600 million deaths per year (WHO, 2016). In Korea, the number of deaths related to smoking has increased steadily in 1985, 2003 and 2012, and its deaths in 2012 are estimated to be about 60,000. Diseases most commonly associated with smoking deaths are known as lung cancer and also associated with the death of a variety of diseases, including cerebrovascular disease, ischemic heart disease, and chronic obstructive pulmonary disease.

It is widely known that the harmful effects of smoking are serious that public awareness has changed and related policies have been strengthened. In 2015, cigarette price was increased by 2,000 won from 2,500 won to 4,500 won. Non-smoking areas have been expanded and smoking areas are abolished in restaurants. The number of cessation support such as general medical service support expanded. (Korea Health Promotion Institute, 2016) In December 2016, warning signs were issued to inform consumers about the harmfulness of smoking. That is a representative non-price smoking policy recommended by WHO in 101 countries around the world, including 28 EU countries, since it was first introduced in Canada in 2001 (Ministry of Health and Welfare, 2016). For adolescents, there is a slogan "Healthy and Happy School without Cigarettes" as part of smoking prevention project, which is to prevent smoking

in schools and create a smoking cessation environment(Korea Health Promotion Institute, 2016).

As a result of smoking policy, the its rate of Korean adults has been steadily decreasing since 1998, and the smoking rate of adult males decreased from 66.3% in 1998 to 39.3% in 2015, Compared with 3.8% in the same period last year, it is believed that the smoking policy, including the increase of cigarette prices in 2015 and the expansion of smoking cessation areas, has affected the smoking rate. On the other hand, the smoking rate for adult women is 5.5% in 2015 from 6.5% in 1998. (Korea Health Promotion Institute, 2016)

According to KYRBS(Korea Youth Risk Behavior Web-based Survey), the smoking rate of adolescents in Korea has been steadily decreased. Since the survey, the smoking rate of boys has been lowered to less than 10% for the first time in 2016. Boys' smoking rate was higher than girls' smoking rate. Boys' smoking rate decreased by about 5% over the past 11 years. The smoking rate of female student has decreased by about 6% in the past 11 years, and the smoking rate of female students in 2016 is reported as 2.7% (Korea Health Promotion Institute, 2016).

New cigarette appeared to replace the existing cigarettes as the smoking policy strengthened. It is not developed lately, but has long been used in other countries. It has recently been introduced in Korea and defined as a new cigarette. There are electronic cigarettes, snus, snuff, chewing tobacco, rolling tobacco, and hookah(National Evidence-based Healthcare Collaborating Agency, 2015). Among them, electronic cigarettes are the most demanded.

Electronic Nicotine Delivery Systems (ENDS), also called electronic cigarette, were developed in China in 2003 and launched in Korea 10 years ago(Korea

Institute for Health and Social Affairs, 2014; Korea Health & Medical Research Institute, 2015). The primary parts that make up an e-cigarette are a mouthpiece, a cartridge (tank), a heating element/atomizer, a microprocessor, a battery, and possibly a LED light on the end. An atomizer comprises a small heating element that vaporizes e-liquid and wicking material that draws liquid onto the coil. When the user pushes a button, or (in some variations) activates a pressure sensor by inhaling, the heating element then atomizes the liquid solution. The e-liquid reaches a temperature of roughly 100-250 °C within a chamber to create an aerosolized vapor. The user inhales the aerosol, commonly called vapor, rather than cigarette smoke. The aerosol provides a flavor and feels similar to tobacco smoking(Korea Institute of Public Finance, 2015).

It is estimated that there are various marketing strategies of electronic cigarette industry in the background of the rapid increase of electronic cigarette use. The famous celebrity appeared in marketing. In addition, the image of electronic cigarette is connected with fun or fashion, and the taste and the fragrance are used to stimulate the curiosity of the `youth (CAMPAIGN for TOBACCO-FREE Kids, Apr. 16 2015).

As the perception of alternative products for smoking cessation has spread, the World Health Organization has presented a negative stance on the use of electronic cigarettes for smoking cessation aid(WHO, 2014). The main reason is the lack of evidence on the safety. In Korea, e-cigarette sales are prohibited in promoting smoking cessation assistance (Ministry of Health and Welfare, 2016).

However, some advocate of electronic cigarette use, suggesting that electronic cigarettes with less harmful components than conventional cigarettes. This is based on the assumption that e-cigarettes will have sufficient utility for smoking cessation, and research has shown that e-cigarette equivalents or some superior smoking cessation effects were observed when the effects of smoking cessation were compared (Brown et al Bullen et al., 2013). In a study of short and long term smoking cessation rates using e-cigarettes, the 6-month cessation rate was relatively good (31%) (Siegel et al., 2011). Based on the results of these studies, there is still no definite basis for the safety of electronic cigarettes. In this context, the American Association of Public Health Physicians (2010) has suggested that smokers who fail to quit for harm reduction may use electronic cigarettes.

According to Grana and Ling(2014), 95% of 59 US websites selling electronic cigarettes were promoting health benefits.(Grana, Popova, & Ling, 2014). Also on the Korean websites, conventional cigarette is toxic, but they promote that there is no electronic cigarette. Under these circumstances, adolescents using electronic cigarettes perceived that electronic cigarettes were less harmful than conventional cigarettes(Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2014).

Of electronic cigarette users, the proportion of dual user is high for boys(75.4%) and girls(67.3%) The higher the grade, the more frequently they use electronic cigarette in general(왕진우, 이철민, & 김은영, 2014). About 75% of current e-cigarette users is dual user by using 2011 Korean Youth Risk Behavior Web-

based Survey(S. Lee, Grana, & Glantz, 2014). These results suggest that dual use is widespread in Korean adolescents. The factors that influence conventional and electronic cigarette smoking in adolescents are personal, exposure to smoking by friends and family, health behavior.

Boys are more likely to smoke than girls, and those who have lower school performance, higher stress (박영숙, 김철환, 2013). The result that boys are more likely to dual use than girls is consistent with the characteristics of conventional cigarette smokers according to KYRBS analysis. Electronic cigarette user had higher school performance than cigarette only user (Goniewicz & Zielinska-Danch, 2012), but dual user had lower school performance. Students who feel more stress were more likely to be a dual user than electronic cigarettes only user(왕진우 et al., 2014).

The allowance for the adolescents showed a different aspect. It was predicted that the less the difficulty in using allowance, the less likely the possibility of smoking behavior(김원경, 2014). In another study, more weekly allowance have, the more likely they are to smoke(박영숙, 김철환, 2013).

In a previous study on adolescents smoker related to smoking exposure, smoking parents and siblings increased experience of their smoking(Karcher & Finn, 2005). Smoking parents also affected adolescents use of electronic cigarettes(Goniewicz & Zielinska-Danch, 2012). The more smoking friends, the higher the smoking behavior for conventional smoking(김지경 & 김균희, 2013). The results of previous studies show that smoking of parents and friends

is a major determinant on conventional cigarette use as well as electronic cigarette use. Drinking alcohol was a predictor of conventional, electronic cigarette and dual use among adolescents(왕진우 et al., 2014).

Since 2010, the rate of attempt to quit smoking among smoking adolescents has remained around 70%(Korea Centers for Diseases Control and Prevention, 2014). Girls, middle school and general high school students and those who have higher school performance are more willing to quit smoking(Sung-Rae Shin, Goo-Churl Jeong, 2007). Smoking amount per days influenced intention to smoking cessation (Thrul, Stemmler, Goecke, & Buhler, 2015). The lower the average smoking amount, the higher the smoking cessation success rate(Yeo-Jin Yi, Kun-Ja Lee & Young-Sook Kim, 2011). Adolescents who smoke a lot of cigarettes tend to use electronic cigarette as smoking cessation aid or indoor smoking(J. A. Lee, Lee, & Cho, 2017). Adolescents who have smoking prevention program experience in school were more likely to quit smoking(박지연, 2016). There was a statistically significant relationship between part-time work experience and smoking(Kim, 2012).

The use of electronic cigarettes for smoking cessation is expected to be high, as the use rate of electronic cigarettes increases. While there is a controversy over the effects of exist electronic cigarette smoking, the use of electronic cigarettes by smoking may lead to quitting smoke, but there is a risk of smoking conventional and electronic cigarettes as a dual user.



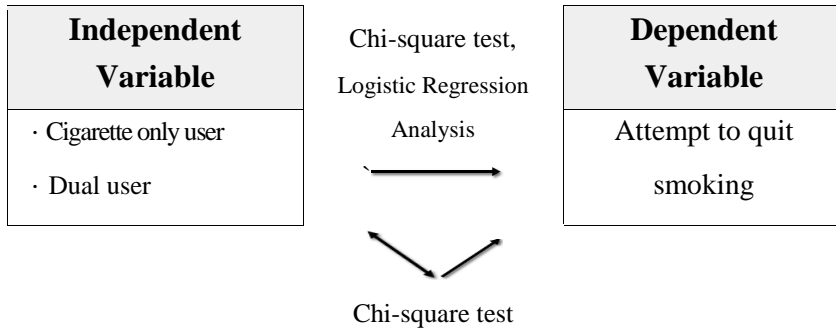
## **1.2. Objectives**

The aim of this study is to investigate the association electronic cigarette use among smoking adolescents and attempt to quit smoking. Study objectives are represented as follows:

1. Investigate the distribution of cigarette only user and dual user on sociodemographic factors, smoking-related factors and smoking behavior.
2. Examine the association between attempt to quit smoking and e-cigarette use among conventional smoker by factors
3. For subgroup analysis which is for dual user with attempt to quit smoking, investigate the distribution of conventional cigarette frequency on smoking electronic cigarette frequency and reason for electronic cigarette use.

## II. METHODS

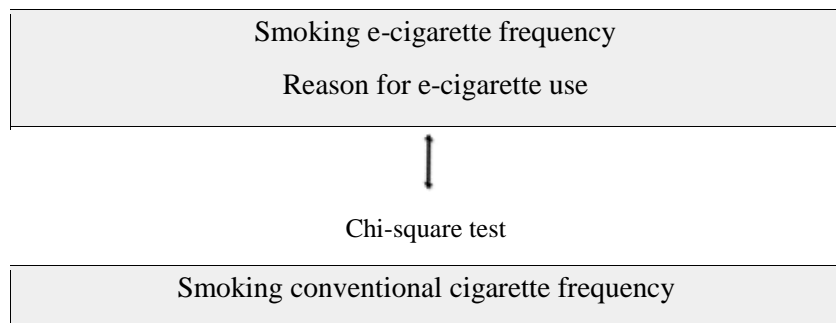
### 2.1. Study design



Sociodemographic factors	Smoking-related factors
<ul style="list-style-type: none"> <li>· Sex</li> <li>· School performance</li> <li>· Weekly allowance</li> <li>· Part-time work experience</li> </ul>	<ul style="list-style-type: none"> <li>· Perceived stress</li> <li>· Drinking alcohol</li> <li>· Smokers among friends</li> <li>· Smokers in family</li> <li>· Passive smoking</li> <li>· Smoking prevention program experience</li> </ul>

#### 2.1.1. Subgroup analysis

Subgroup study participants: Dual user experienced attempt to quit smoking



## **2.2. Data sources**

This study used data collected 11th ~ 12th Korea Youth Risk Behavior Web-based Surveys(KYRBS) in 2015~2016. KYRBS is a nationwide cross-sectional survey conducted annually since 2005 by Ministry of Education, Ministry of Health and Welfare, and Korea Centers for Disease Control and Prevention. This survey is designed to measure health behaviors of Korean adolescent and the survey questions consist of health related sections. The purpose of this survey is to generate statistics of Korean adolescents health behaviors in order to provide evidence on health policies for youth. About 400 middle school and 400 high schools are annually selected for this survey, and one class is randomly selected from each school. The survey is anonymous self-administered online survey. The students in the selected middle and high school conduct survey by themselves with computer provided in school.

### **2.3. Statistical analysis**

To attain the study objectives, data analysis including frequency analysis and multiple logistic regression analysis were conducted by using SAS 9.4. First of all, frequency analysis was conducted in order to examine the Sociodemographic factors of all participants. This study examined the relationship of sociodemographic, smoking related factors, smoking behavior and attempt to quit smoking by chi-square test. Logistic regression analysis was conducted to examine sociodemographic, smoking related factors, smoking behavior have an effect on attempt to quit smoking among cigarette only user and dual user.

To find out characteristics of dual user in detail, subgroup analysis was conducted among dual users who have experienced smoking cessation. In this part, smoking e-cigarette frequency and reason for smoking e-cigarette were examined by chi-square test.

## **2.4. Study hypothesis**

1. As the frequency and amount of conventional cigarette use increase, the frequency of attempt to quit smoking would increase.
2. As the frequency and amount of conventional cigarette use increase, the likelihood of attempt to quit smoking would increase.
3. As the frequency of conventional cigarette smoking days increases, the frequency of electronic cigarette smokers would increase among dual user with attempt to quit smoking

## **2.5. Measures**

### **2.5.1 Independent variable: Cigarette only user and dual user**

For the study analysis, types of smokers were categorized into 2 groups. The question “In the last 30 days, on how many days did you smoke at least one cigarette?” were used to identify conventional cigarette smokers. To classify cigarette only user and dual user, the question “In the last 30 days, on how many days did you smoke at least one electronic cigarette?” were used among current cigarette smoker. If they answered the question to yes, it means dual user. Otherwise if they answered to no, it means cigarette only user.

### **2.5.2 Dependent variable**

To figure out distribution and association of attempt to quit smoking among study population, the question “have you ever tried to quit smoking last 12 months?” was used.

### **2.5.3 Smoking behavior**

To figure out smoking behavior, this study used two kinds of questions. The question “In the last 30 days, on how many days did you smoke at least one cigarette?” were used to identify smoking frequency and another is “In the last 30 days, how many cigarettes did you smoke on a day?” which were used to

identify smoking amount per day.

#### **2.5.4 Sociodemographic factors**

This study included sex, school type, and school performance, weekly allowance, part-time work experience as sociodemographic factors. School type referred to middle school, general high school, and specialized high school. School performance referred to achievement of students in school categorized as 'high', 'upper high', 'middle', 'lower middle' and 'low'. Those five categories on school grade were reclassified as 'high(high and upper high)', 'middle', and 'low(lower middle and low)'. Subjects were asked "how much their allowance per week is" and the given responses were sixteen categories from '0-9,999 won' to '150,000 won'. Those categories were modified into four categories as '<10,000 won', '10,000-49,999 won', '50,000-99,999 won' and '≥100,000 won'.

#### **2.5.5 Smoking-related factors.**

To figure out perceived stress, the question "how often do you feel stress?" was settled and participants responded to 'high', 'upper high', 'middle', 'lower middle' and 'low'. Those five categories were reclassified as 'high(high and upper high)', 'middle', and 'low(lower middle and low)'. To identify adolescents who drink alcohol, they were asked "In the last 30 days, how many days did you drink at least one glass of alcohol?". If participants responded to '1-2', '3-5' '6-9' '10-19' '20-29' 'daily', they categorized as an alcohol drinker. For smokers in closest friends, the question "Do any of your closest friends

smoke” were asked to participants, and they responded to ‘None’, ‘Some’, ‘Most’, ‘All’. For smoking family member, they were asked if smokers are in your family. Participants were answered to ‘none’, ‘father’, ‘mother’, ‘siblings’. To define passive smoking in house, participants were asked to “In last 7 days, how many days have you been around with someone(family or guest) smoking in your house?”. They were answered to ‘not within 1 week’, ‘1-2’, ‘3-4’ ‘5-6’, ‘everyday’. For smoking prevention program experience, they were asked “In last 12 months, have you ever been trained in smoking prevention and smoking cessation at school?” and answered to ‘yes’ and ‘no’.

#### **2.5.6 Electronic cigarette use**

For smoking e-cigarette frequency, participants were asked “In the last 30 days, on how many days did you smoke at least one electronic cigarette?” and they respond to ‘1-2’, ‘3-5’ ‘6-9’ ‘10-19’ ‘20-29’ ‘daily’. Reason for use electronic cigarette and smoking electronic cigarette frequency was used to identify characteristics of dual user. The question “what is the main reason for using electronic cigarette?” were asked to participants, and they answered to ‘less harmful’, ‘smoking cessation aid’, ‘indoor use’, ‘easy to get’, ‘taste better’, ‘good flavor’, ‘curiosity’, ‘others’.



### III. RESULTS

#### 3.1. General characteristics and smoking related factors of the study population

Sociodemographic and smoking related factors for all participants are presented in **Table 1**. Total study population analyzed were 9,135, with 80.00% being boys and 20.00% being girls. The percentage of middle school student was 19.14%, while 55.50% and 25.36% were in general high school and specialized high school. The proportion of participants who had average school performance was the highest(51.67%). There was a weekly allowance distribution also identified. The highest proportion of study population who perceived 10,000~49,999 won per week was more than half(55.37%) of them. The percentage of participants who experienced part-time work(50.36%) was higher than those who had not. For smoking related factors, the percentage of perceived stress high was 4.04% and low was 43.71%. Percentage of participants who were drinking alcohol was 67.89%. The more friends who smoke, the higher proportion of participants except all friends are smoke. Father's smoking is highest(39.67%) proportion among participants. of those who are exposed to passive smoking in house, '1 ~ 2 days' and 'everyday' are high proportion, smoking prevention program experience. For smoking prevention program experience in school, proportion of smoking adolescents who experienced smoking related program is higher than those who are not.

**Table 1. General characteristics smoking related factors of the study participants (N=9,135)**

		<b>Study participants</b>	
		<b>N</b>	<b>( % )</b>
<b>Sex</b>	Boy	7,257	( 80.00 )
	Girl	1,878	( 20.00 )
<b>School type</b>	Middle school	1,947	( 19.14 )
	General high school	4,677	( 55.50 )
	Specialized high school	2,393	( 25.36 )
<b>School performance</b>	High	2,166	( 23.46 )
	Middle	4,724	( 51.67 )
	Low	2,245	( 24.86 )
<b>Weekly allowance</b>	0 ≤ < 9,999	1,255	( 13.71 )
	10,000 ≤ < 49,999	5,107	( 55.37 )
	50,000 ≤ < 99,999	1,606	( 17.68 )
	≥ 100,000	1,167	( 13.24 )
<b>Part-time work experience</b>	Yes	4,616	( 50.36 )
	No	4,519	( 49.64 )
<b>Perceived stress</b>	High	353	( 4.04 )
	Middle	4,773	( 52.26 )
	Low	4,009	( 43.71 )
<b>Drinking alcohol</b>	Yes	6,183	( 67.89 )
	No	2,952	( 32.11 )
<b>Smokers among friends</b>	None	530	( 5.56 )
	Some	3,297	( 35.27 )
	Most	3,927	( 43.57 )
	All	1,381	( 15.60 )
<b>Smokers in family</b>	Father	3,271	( 39.67 )
	Mother	444	( 5.14 )
	Siblings	1,455	( 17.58 )
	None	2,973	( 37.61 )
<b>Passive smoking in house</b>	Not within 1 week	4,968	( 55.32 )
	1 ~ 2 days	1,323	( 14.01 )
	3 ~ 4 days	1,042	( 11.34 )
	5 ~ 6 days	539	( 5.97 )
	Everyday	1,263	( 13.36 )
<b>Smoking prevention program experience</b>	Yes	5,648	( 60.36 )
	No	3,487	( 39.64 )

### **3.2. General characteristics and smoking related factors by e-cigarette among smoking adolescents**

For sex, the proportion of cigarette only user and dual user were 62.81% and 37.19% respectively in male, while 65.79% cigarette only user and 34.21% dual user in girl. The proportion of cigarette only user in specialized high school(65.47%) and dual user in general high school(37.41%) was high. For school performance, proportion of dual user increased with low school performance(39.57%). In general, proportion of dual user increased as weekly allowance(45.96%) and smokers among friends(57.62%) increased. Participants who have perceived stress high(46.98%) and drink alcohol(41.00%), the proportion of dual user increased to 46.98% and 41.00% respectively. The more they experienced part-time work, the higher proportion of dual user(41.19%). smokers in family. The proportion of dual user increased in order of siblings(40.90%), mother(38.22%), father(34.71%). The more often exposed to secondhand smoke. proportion of dual user increased except everyday. There is little difference for smoking prevention program experience among cigarette user and dual user.

**Table 2. Frequency of general characteristics and smoking related factors among cigarette only user and dual user**

		Cigarette Only User		Dual User		Total	Pr > ChiSq
		N	( % )	N	( % )		
<b>Sex</b>							
	Boy	4,634	( 62.81 )	2,623	( 37.19 )	7,257	0.059
	Girl	1,254	( 65.79 )	624	( 34.21 )	1,878	
<b>School type</b>							
	Middle school	1,253	( 63.19 )	694	( 36.81 )	1,947	0.2015
	General high school	2,967	( 62.59 )	1,710	( 37.41 )	4,677	
	Specialized high school	1,606	( 65.47 )	787	( 34.53 )	2,393	
<b>School performance</b>							
	High	1,408	( 63.35 )	758	( 36.65 )	2,166	0.0052
	Middle	3,095	( 64.87 )	1,629	( 35.13 )	4,724	
	Low	1,385	( 60.43 )	860	( 39.57 )	2,245	
<b>Weekly allowance</b>							
	0≤9,999	862	( 67.94 )	393	( 32.06 )	1,255	<.0001
	10,000≤49,999	3,385	( 65.38 )	1,722	( 34.62 )	5,107	
	50,000≤99,999	996	( 60.75 )	610	( 39.25 )	1,606	
	≥100,000	645	( 54.04 )	522	( 45.96 )	1,167	
<b>Part-time work experience</b>							
	Yes	2,770	( 58.81 )	1,846	( 41.19 )	4,616	<.0001
	No	3,118	( 68.07 )	1,401	( 31.93 )	4,519	
<b>Perceived stress</b>							
	High	193	( 53.02 )	160	( 46.98 )	353	0.0007
	Middle	3,095	( 63.87 )	1,678	( 36.13 )	4,773	
	Low	2,600	( 63.82 )	1,409	( 36.18 )	4,009	
<b>Drinking alcohol</b>							
	Yes	3,716	( 59.00 )	2,467	( 41.00 )	6,183	<.0001
	No	2,172	( 72.73 )	780	( 27.27 )	2,952	
<b>Smokers among friends</b>							
	None	441	( 83.14 )	89	( 16.86 )	530	<.0001
	Some	2,453	( 73.88 )	844	( 26.12 )	3,297	
	Most	2,375	( 59.95 )	1,552	( 40.05 )	3,927	
	All	619	( 42.38 )	762	( 57.62 )	1,381	
<b>Smokers in family</b>							
	None	2,038	( 67.68 )	935	( 32.32 )	2,973	<.0001
	Father	2,183	( 65.29 )	1,088	( 34.71 )	3,271	
	Mother	272	( 61.78 )	172	( 38.22 )	444	
	Siblings	872	( 59.10 )	583	( 40.90 )	1,455	
<b>Passive smoking in family</b>							
	Not within 1 week	3,443	( 68.28 )	1,525	( 31.72 )	4,968	<.0001
	1 ~ 2 days	861	( 63.90 )	462	( 36.10 )	1,323	
	3 ~ 4 days	569	( 54.00 )	473	( 46.00 )	1,042	
	5 ~ 6 days	287	( 53.12 )	252	( 46.88 )	539	
	Everyday	728	( 55.33 )	535	( 44.67 )	1,263	
<b>Smoking prevention program experience</b>							
	Yes	3,655	( 63.60 )	1,993	( 36.40 )	5,648	0.6903
	No	2,233	( 63.12 )	1,254	( 36.88 )	3,487	

Proportion of attempt to quit smoking is higher among cigarette only user than dual user. For male dual user, frequency of attempt to quit smoking is higher than male dual user. Of general high school dual user, proportion of attempt to quit smoking increased. The more weekly allowance they receive more, the higher attempt to quit smoking among dual user. Proportion of dual user with attempt to quit smoking who receive less than 9,999 won is 32.84%, more than 10,000 and less than 49,999 won is 36.39%, more than 50,000 and less than 99,999 won is 40.88 and more than 100,000won is 44.02%. For part time work experience, proportion of dual user with attempt to quit increased to 41.98%. The more stress they received, the higher attempt to quit smoking among dual user. The proportion increased from 28.82% to 41.82% in dual user with attempt to quit smoking who were not drinking than those who drank alcohol. In a dual user without friends who smoke, proportion of attempt to quit smoking is 16.68%. As the number of friends who smoke increases, the proportion of attempt to quit smoking increased, and the proportion of attempt to quit smoking is 56.69% in all friends who smoke. In siblings, mother and father, the proportion of attempt to quit smoking was 40.48%, 40.15%, 36.09% respectively. For passive smoking in family, the frequency of attempt to quit smoking is highest(50.23%) in dual user exposed for 5-6 days. Regardless of smoking prevention program experience, proportion of attempt to quit smoking is similar among cigarette only user and dual user

**Table 3. Frequency of general characteristics with attempt to quit smoking among cigarette only user and dual user**

	Cigarette Only User		Dual User		Total	Pr > ChiSq
	N	( % )	N	( % )		
<b>Sex</b>						
Boy	3,243	( 61.54 )	1,925	( 38.46 )	4,127	0.0278
Girl	884	( 65.60 )	447	( 34.40 )	2,372	
<b>School type</b>						
Middle school	902	( 63.63 )	499	( 36.37 )	1,401	0.3319
General high school	2,056	( 61.33 )	1,234	( 38.67 )	3,290	
Specialized high school	1,122	( 63.65 )	594	( 36.35 )	1,716	
<b>School performance</b>						
High	930	( 62.70 )	513	( 37.30 )	1,443	0.0111
Middle	2,233	( 63.81 )	1,237	( 36.19 )	3,470	
Low	964	( 58.96 )	622	( 41.04 )	1,586	
<b>Weekly allowance</b>						
0≤9,999	587	( 67.16 )	279	( 32.84 )	866	<.0001
10,000≤49,999	2,418	( 63.61 )	1,312	( 36.39 )	3,730	
50,000≤99,999	684	( 59.12 )	451	( 40.88 )	1,135	
≥100,000	438	( 55.98 )	330	( 44.02 )	768	
<b>Part-time work experience</b>						
Yes	2,031	( 58.02 )	1,407	( 41.98 )	3,438	<.0001
No	2,096	( 67.23 )	965	( 32.77 )	3,061	
<b>Perceived stress</b>						
High	123	( 51.74 )	114	( 48.26 )	237	0.0007
Middle	123	( 62.28 )	123	( 37.72 )	246	
Low	1,834	( 63.34 )	1,018	( 36.66 )	2,852	
<b>Drinking alcohol</b>						
Yes	2,606	( 58.18 )	1,791	( 41.82 )	4,397	<.0001
No	1,521	( 71.18 )	581	( 28.82 )	2,102	
<b>Smokers among friends</b>						
None	260	( 83.32 )	54	( 16.68 )	314	<.0001
Some	1,727	( 72.94 )	616	( 27.06 )	2,343	
Most	1,734	( 58.02 )	1,216	( 41.98 )	2,950	
All	406	( 43.31 )	486	( 56.69 )	892	
<b>Smokers in family</b>						
None	1,014	( 66.04 )	1399	( 33.96 )	688	0.0087
Father	1,556	( 63.91 )	822	( 36.09 )	2,378	
Mother	183	( 59.85 )	121	( 40.15 )	304	
Siblings	614	( 59.52 )	400	( 40.48 )	1,014	
<b>Passive smoking in family</b>						
Not within 1 week	2,416	( 66.65 )	1,154	( 33.35 )	3,570	<.0001
1 ~ 2 days	608	( 63.41 )	327	( 36.59 )	935	
3 ~ 4 days	420	( 53.62 )	354	( 46.38 )	774	
5 ~ 6 days	199	( 49.77 )	200	( 50.23 )	399	
Everyday	484	( 56.11 )	337	( 43.89 )	821	
<b>Smoking prevention program experience</b>						
Yes	2,794	( 62.35 )	1,589	( 37.65 )	4,383	0.9988
No	1,333	( 62.36 )	783	( 37.65 )	2,116	

Overall, frequency of attempt to quit smoking is higher among cigarette only user than dual user. The more smoking days, the higher frequency of attempt to quit smoking among dual user. The lowest frequency(19.85%) was observed in the lowest smoking days(1 ~ 2 days), and the highest frequency(43.50%) was observed in the daily smoking among dual user. As the smoking amount increases, the proportion of attempt to quit smoking increased among dual user. The proportion of attempt to quit smoking in cigarette only user is higher than dual user from 'under 1 cigarette'(17.39%) to 'more than 6 less than 9 cigarettes'(42.60%). On the other hand, the percentage of attempt to smoking cessation in 'more than 10 less than 19 cigarettes' is 51.77% and 'more than 20 cigarettes' is 62.80% among dual user.

**Table 4. Frequency of smoking behavior with attempt to quit smoking among cigarette only user and dual user**

	Cigarette Only User		Dual User		Total	Pr > ChiSq
	N	( % )	N	( % )		
<b>Smoking days per month</b>						
1 ~ 2	806	( 80.15 )	205	( 19.85 )	1,011	<.0001
3 ~ 5	357	( 67.47 )	172	( 32.53 )	529	
6 ~ 9	290	( 64.05 )	154	( 35.95 )	444	
10 ~ 19	412	( 61.29 )	255	( 38.71 )	667	
20 ~ 29	450	( 59.82 )	287	( 40.18 )	737	
Daily	1,812	( 56.50 )	1,299	( 43.50 )	3,111	
<b>Smoking amount per day</b>						
<1	777	( 82.61 )	168	( 17.39 )	945	<.0001
1	390	( 69.40 )	163	( 30.60 )	553	
2 ~ 5	1,548	( 64.85 )	805	( 35.15 )	2,353	
6 ~ 9	864	( 57.40 )	615	( 42.60 )	1,479	
10 ~ 19	394	( 48.23 )	392	( 51.77 )	786	
≥ 20	154	( 37.20 )	229	( 62.80 )	383	



Overall, proportion of attempt to quit conventional smoking is higher among cigarette only user than dual user. Of dual user, the frequency increased because of ‘parents and teachers hate’(48.54%) and ‘friends hate’(42.96%). The frequency of attempt to smoking related to health such as “become unhealthy’(62.44%) and ‘not good for health’(32.42%) was high in cigarette only user. The reason ‘unacceptable for adolescents to smoke’(70.01%) was highest in cigarette only user.

**Table 5. Frequency of reason for attempt to quit smoking among cigarette user and dual user**

	Cigarette Only User		Dual User		Total	Pr > ChiSq
	N	( % )	N	( % )		
<b>Reasons for attempt to quit smoking</b>						
become unhealthy	1,046	( 62.44 )	592	( 37.56 )	1,638	
not good for health	1,353	( 67.58 )	637	( 32.42 )	1,990	
parents and teachers hate	309	( 51.46 )	274	( 48.54 )	583	
friends hate	180	( 57.04 )	129	( 42.96 )	309	<.0001
smell	170	( 60.14 )	111	( 39.86 )	281	
price	547	( 56.71 )	393	( 43.29 )	940	
unacceptable for adolescents to smoke	196	( 70.01 )	79	( 29.99 )	275	

### **3.3. Association between cigarette smoking behavior and attempts to quit**

Model 1 of **Table 6** indicates the logistic regression examining the association between general characteristics with attempt to quit smoking. School type, perceived stress and drinking alcohol showed no significant association with attempt to quit smoking. Compared to 'high' of school performance, the OR of 'middle' was 1.279(95% CI=1.131-1.446), and 'low' was 1.157(95% CI=0.999-1.34). For weekly allowance, the highest OR was '10,000≤49,999' compared to '0≤9,999'. For part time work experience, the OR was 1.456 (95% CI=1.309-1.62) compared to no part time experience.

Model 2 of **Table 6** shows the association between general characteristics and smoking related factors with attempt to quit smoking. For school performance, part-time work experience, there was increased OR compared to model 1. The OR of 'middle' was 1.294(95% CI=1.095-1.405), and 'low' was 1.230(95% CI=1.063-1.397). The OR of part-time work experience was 1.462 (95% CI=1.286-1.600) compared to no part time experience. For smoking related factors, there was significant association on smokers among friends and smoking prevention program experience in school. Compared to none smokers among friends, OR of 'some' was 1.599(95% CI=1.234-1.964) and 'most' was 1.887(95% CI=1.507-2.40). Without experienced smoking prevention program, the OR of attempt to quit smoking among dual user than cigarette only user was 2.133(95% CI=1.507-2.40).

**Table 6. Association of general characteristics and smoking related factors with attempt to quit smoking**

		model 1			model 2		
		Odds Ratio	95% CI		Odds Ratio	95% CI	
<b>Sex</b>							
	Girl	1			1		
	Boy	1.019	( 0.894	1.162 )	1.036	( 0.845	1.108 )
<b>School type</b>							
	Middle school	1			1		
	General high school	0.825	( 0.72	0.945 )	0.797	( 0.722	0.957 )
	Specialized high school	0.873	0.736	1.036	0.818	0.723	1.03
<b>School performance</b>							
	High	1			1		
	Middle	1.279	( 1.131	1.446 )	1.294	( 1.095	1.405 )
	Low	1.157	( 0.999	1.34 )	1.230	( 1.036	1.397 )
<b>Weekly allowance</b>							
	0≤9,999	1			1		
	10,000≤49,999	1.236	( 1.063	1.437 )	1.235	( 0.999	1.361 )
	50,000≤99,999	1.103	( 0.921	1.321 )	1.117	( 0.879	1.277 )
	≥100,000	0.873	( 0.728	1.046 )	1.007	( 0.783	1.137 )
<b>Part time work experience</b>							
	No	1			1		
	Yes	1.456	( 1.309	1.62 )	1.462	( 1.286	1.600 )
<b>Perceived stress</b>							
	Low	1			1		
	Middle	0.975	( 0.879	1.081 )	0.938	( 0.839	1.041 )
	High	0.772	( 0.598	0.997 )	0.725	( 0.631	1.056 )
<b>Drinking Alcohol</b>							
	No	1			1		
	Yes	0.933	( 0.829	1.047 )	0.961	( 0.829	1.05 )
<b>Smokers among friends</b>							
	None				1		
	Some				1.599	( 1.234	1.964 )
	Most				1.887	( 1.507	2.4 )
	All				1.145	( 0.955	1.593 )
<b>Smokers in family</b>							
	None				1		
	Father				1.007	( 0.883	1.148 )
	Mother				0.833	( 0.643	1.079 )
	Siblings				0.941	( 0.803	1.103 )
<b>Passive smoking in family</b>							
	Not within 1 week				1		
	1 ~ 2 days				0.904	( 0.764	1.07 )
	3 ~ 4 days				0.957	( 0.791	1.158 )
	5 ~ 6 days				0.937	( 0.728	1.205 )
	everyday				0.705	( 0.591	0.842 )
<b>Smoking prevention program experience in school</b>							
	Yes				1		
	No				2.133	( 1.917	2.374 )

**Table 7** indicates logistic regression models that are adjusted general characteristics and smoking related factors. For smoking days per month, there was no statistically significant association on the lowest frequency(OR=1.202 95% CI=0.967-1.494). The higher smoking days per month, the higher association of attempt to quit smoke. OR of ‘20~29’ was 2.299(95% CI=1.760-3.002) and ‘daily’ was 1.348(95% CI=1.138-1.597). For smoking amount, there was no statistically significant association on the highest amount(OR=0.993 95% CI=0.758-1.301). The highest association with attempt to smoking is 2~5 amount per day(OR=2.238 95% CI=1.900-2.636).

**Table 7. Association of cigarette smoking behavior and attempts to quit among cigarette only user and dual user**

<b>Model 3</b>					
	<b>Odds Ratio</b>	(	<b>95% CI</b>	)	
<b>Smoking days per month</b>					
1 ~ 2	1				
3 ~ 5	1.202	(	0.967	1.494	)
6 ~ 9	1.387	(	1.085	1.772	)
10 ~ 19	1.683	(	1.353	2.093	)
20 ~ 29	2.299	(	1.76	3.002	)
Daily	1.348	(	1.138	1.597	)
<b>Smoking Amount per day</b>					
<1	1				
1	1.615	(	1.305	2.000	)
2 ~ 5	2.238	(	1.900	2.636	)
6 ~ 9	2.04	(	1.695	2.454	)
10 ~ 19	1.505	(	1.196	1.894	)
≥ 20	0.993	(	0.758	1.301	)

### **3.4. Relation between smoking days of conventional and electronic cigarette among dual user with attempt to quit smoking**

**Table 8** shows the frequency of daily conventional cigarette smoking was highest for each days of smoking electronic cigarette. The frequency of daily smoking conventional cigarette for dual users who use electronic cigarettes for 1-2 days is 15.05%. The smoking electronic cigarette smoking days of 3-5 days were 8.54% of daily conventional smoking, 6-9 days were 5.65%, 10-19 days were 7.08%, 20-29 days were 4.02%. The frequency of smoking both types of cigarettes was highest among dual user(15.46%)

**Table 9** indicates the frequency of daily smokers was high for all reasons. Among them, there was the highest daily smoker smoking cessation aid was the reason(13.06%). Next, 'less harmful' was 10.82%, 'indoor use' was 17.84%, 'taste better' was 11.66%, 'curiosity' was 10.01%, 'good flavor' was 10.01% and 'easy to get' was 2.34.%.

**Table 8. Frequency of smoking conventional and electronic cigarette days among dual user with attempt to quit smoking**

		Smoking conventional cigarette days per month						Pr > ChiSq
		N (%)						
		1 ~ 2	3 ~ 5	6 ~ 9	10 ~ 19	20 ~ 29	Daily	
Smoking electronic cigarette days per month	1 ~ 2	101( 4.09 )	41 ( 1.56 )	16 ( 0.52 )	18 ( 0.67 )	10 ( 0.44 )	19 ( 0.75 )	<.0001
	3 ~ 5	69( 2.76 )	36 ( 1.28 )	25 ( 1.03 )	17 ( 0.61 )	11 ( 0.42 )	14 ( 0.67 )	
	6 ~ 9	43( 1.68 )	24 ( 1.07 )	31 ( 1.33 )	30 ( 1.21 )	14 ( 0.69 )	12 ( 0.52 )	
	10 ~ 19	67( 2.55 )	47 ( 2.01 )	39 ( 1.65 )	47 ( 1.80 )	30 ( 1.42 )	25 ( 1.12 )	
	20 ~ 29	81( 3.38 )	30 ( 1.17 )	39 ( 1.86 )	62 ( 2.77 )	42 ( 1.77 )	33 ( 1.49 )	
	Daily	352( 15.05 )	197 ( 8.45 )	137 ( 5.65 )	166 ( 7.08 )	94 ( 4.02 )	353 ( 15.46 )	

**Table 9. Frequency of smoking conventional days and reason for electronic cigarette use among dual user with attempt to quit smoking**

		Smoking conventional cigarette days per month						Pr > ChiSq
		N ( % )						
		1 ~ 2	3 ~ 5	6 ~ 9	10 ~ 19	20 ~ 29	Daily	
<b>Reasons for electronic cigarette use</b>	less harm	59 ( 2.17 )	37 ( 1.37 )	33 ( 1.39 )	50 ( 2.22 )	59 ( 2.35 )	254 ( 10.82 )	<.0001
	smoking cessation aid	24 ( 1.02 )	27 ( 1.14 )	25 ( 1.08 )	41 ( 1.84 )	41 ( 1.75 )	305 ( 13.06 )	
	indoor use	20 ( 0.74 )	16 ( 0.53 )	18 ( 0.87 )	31 ( 1.35 )	65 ( 3.04 )	253 ( 11.31 )	
	easy to get	4 ( 0.15 )	12 ( 0.52 )	7 ( 0.27 )	13 ( 0.46 )	4 ( 0.18 )	18 ( 0.76 )	
	taste	29 ( 1.21 )	29 ( 1.20 )	22 ( 0.92 )	34 ( 1.34 )	35 ( 1.38 )	125 ( 5.61 )	
	flavor	19 ( 0.71 )	13 ( 0.59 )	17 ( 0.64 )	34 ( 1.32 )	20 ( 0.78 )	82 ( 3.45 )	
	curiosity	19 ( 0.81 )	13 ( 0.48 )	17 ( 0.83 )	25 ( 0.93 )	33 ( 1.50 )	131 ( 5.46 )	
	others	22 ( 0.92 )	19 ( 0.69 )	10 ( 0.33 )	22 ( 0.89 )	21 ( 1.04 )	73 ( 2.76 )	

## IV. DISCUSSION

The purpose of this study was to identify the effect on smoking cessation aid of electronic cigarette use by comparing cigarette only user and dual user. This study was conducted the difference of general characteristics and smoking related factors by attempt to quit smoking using 11th~12th KYRBS.

Previous studies have shown that friends and parents are related to the use of electronic cigarettes in adolescents. According to Cho(2017), the higher the smoking days of electronic cigarette, the higher smoking days and amount of conventional cigarette.

In this study, attempts to quit smoking among dual user is highly influenced by school performance, part-time work experience, peer groups, smoking prevention programs and smoking behavior. The part-time experience can be a way to get to the wrong way of smoking cessation. It can be interpreted that smoking culture among smoking friends is formed in wrong way.

It can be interpreted that smoking culture among friends who smoke is wrongly formed. There was a high association between smoking cessation and dual user without smoking prevention and cessation education in school. It is necessary to extend educate them about right smoking cessation methods.



As the study hypothesized, for attempt to smoking cessation by smoking amount and frequency, the more smoking days and amount, the higher frequency of attempt to quit smoking among dual user. The increase in cigarette smoking days did not lead a linear increase in association with attempt to smoking cessation.

In subgroup, the number of cigarette smoking days increased with the electronic cigarettes use for the purpose of smoking cessation aid. Also, dual user who tried smoking cessation, the frequency of smoking increased as the frequency of electronic cigarette increased. It can be inferred that electronic cigarette is not used as a means of quitting smoking, but rather a synergy effect of smoking cigarette use.

The number of adolescents smokers were decreased as smoking cessation has been spread and smoking has been strengthened in schools as the regulations and atmosphere. However, the cigarette consumption of electronic cigarettes was increasing in adolescents with high smoking levels.

As electronic cigarette market grows, studies on e-cigarette related to health assessment are progressing gradually. However, there are no studies on longitudinal studies on electronic cigarettes use. To prevent the spread of electronic cigarette use for smoking cessation, longitudinal and clinical studies among dual use should be conducted.

This study will be the basic data that examine the characteristics related to the use of electronic cigarette for smoking cessation aid. However, there are several limitations of this study.

First, the relationship between the factors and attempt to quit smoking was identified. The causality was not known because this study was a cross-sectional study.

Second, the results after attempt to smoking were not known because of the limitations of the questionnaire in this data,

Third, it may be under reporting because of self-reported online survey.

However, KYRBS is a reliable survey conducted on a sample of large-scale sample of adolescents about 800 high and middle school under government approval statistics survey.

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# 청소년 흡연자의 전자담배이중사용에 따른 금연 시도 연구

육은우

보건학과 역학전공

서울대학교 보건대학원

## 연구배경

청소년흡연이 전세계 공중보건의 주요한 도전과제로 남아있다. 청소년 흡연 폐해의 심각성이 대두되며 관련 정책이 강화되고 있는 가운데 청소년 흡연율은 지속적으로 감소되어 오고 있다. 하지만 이와 반대로 전자담배와 관련된 흡연문제가 급부상하고 있다. 전자담배 도입 초기 당시 금연의 수단으로 인식하게 하는 홍보 전략이 강하게 적용되었고 이에 따라 흡연청소년에 있어 전자담배 사용이 관찰되고 있다. 실제 금연의 수단으로 인식되어 온 전자담배가 흡연의 행태에 영향을 주는가에 대한 논란이 지속되어 오고 있다. 따라서 본 연구에서는 흡연청소년에서의 전자담배사용이 금연시도와 연관



성이 있는지 파악하여 흡연청소년의 금연프로그램 및 정책 개선에 근거를 마련하고자 한다.

## 연구방법

본 연구에서 사용한 데이터는 청소년건강행태온라인조사자료이며 2015년과 2016년도의 자료를 통합하여 사용하였다. 청소년건강행태온라인조사는 매년 수행되는 자료로, 청소년의 건강행태를 조사하는 단면연구이다. 본 연구를 수행하기 위해 연구 대상을 두 개의 집단으로 나누었다. 현재 흡연자를 대상으로 전자담배흡연여부에 따라서 쉐련담배흡연자, 쉐련 및 전자담배 이중사용자로 분류하였다. 연구결과를 도출하기 위하여 금연 시도 질문을 분류하여 금연 시도 여부를 나누었다. 흡연행태에 따른 금연 시도율의 차이를 보기 위해 흡연빈도와 흡연량을 보정변수로 사용하였다. 보다 자세한 결과를 위해 연구대상자의 인구, 사회학적 특성, 흡연관련 변수, 추가하였으며 빈도분석, Chi-square, multiple logistic regression을 시행하였다.

## 연구결과

학교 성적이 낮을수록, 일주일 평균 용돈이 높아질수록, 음주하는 청소년일수록, 스트레스를 더 많이 받을수록, 친구 중 흡연자가 많을수록 이중사용자의 금연 시도가 높아졌다. 쉐련 흡연 일수와 흡연량이 증가할수록 이중사용자 중 금연 시도의 빈도가 높아졌다. 이중사용자의 경우 ‘부모와 교수가 싫어해서’ (48.54 %), ‘친구가 싫

어해서' (42.96%)의 이유로 금연시도를 하는 이중사용자가 증가하였다. 흡연의 빈도와 양에 따른 쉼련사용자 대비 이중사용자의 금연 시도 연관성을 보면, 20-29일 흡연자에게서 금연시도와의 연관성이 가장 높았다(OR=2.299 95%CI=1.76-3.002). 하루 6-9일 흡연하는 경우, 금연시도의 연관성이 2.04(95%CI=1.900-2.636)로 가장 높았다. 금연시도를 한 복합흡연자 중, 전자담배 흡연 일수가 많아질수록 쉼련 흡연일수 또한 증가하였다. 금연목적으로 전자담배를 사용하는 군에서 쉼련흡연일수가 가장 높게 관측되었다.

## 결론

본 연구에서는 쉼련담배의 흡연량과 흡연일수가 증가할수록 금연 시도 또한 높아지나 실제로 복합사용자에게서 쉼련흡연일수가 높게 나타나는 것이 관찰되었다. 이는 전자담배를 금연수단으로 사용하지만, 실제 쉼련흡연 이용의 상승효과 작용을 하며 금연에의 효과는 미미하다는 것을 의미한다. 아르바이트와 같은 사회 경험과 흡연하는 친구들 사이에서의 잘못된 금연 문화 확산을 방지하기 위해 올바른 금연방법에 대한 교육이 필요하다. 이를 위해 학교흡연예방 및 금연 교육이 확대되어야 하며 올바른 금연방법에 대한 내용을 더욱 강조해야 한다.

## 주요어

금연, 이중사용자, 전자담배, 흡연행태

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