e - ISSN – 2349-0691

AMERICAN JOURNAL OF ADVANCES IN NURSING RESEARCH

Journal homepage: www.mcmed.us/journal/ajanr

FACTORS AFFECTING THE USE OF ELECTRONIC CIGARETTE AMONG ADOLESCENTS IN KOREA

HyeonSuk Kim

Professor, School of Nursing, Shinhan University, Gyeonggi-Do, Republic of Korea.

Article Info

Received 25/05/2016
Revised 15/06/2016
Accepted 17/06/2016

Key word: Adolescent, Electronic cigarette, Smoking.

ABSTRACT

The use of e-cigarettes among adolescents has been increasing gradually in Korea. An electronic cigarette (e-cigarette), also called an electronic delivery system (ENDS) is a battery-powered device which is similar to a cigarette and delivers vaporized nicotine. This study investigated the prevalence of e-cigarette use and basic characteristics of adolescents using e-cigarettes in the local community in Korea. This study is a cross-sectional study conducted from July 1st 2011 to July 15th 2011 in the Korean local community. Questions were asked about demographic characteristics, the satisfaction with school life and perceived academic performance. The chi-square test with Fisher's exact test to examine categorical variables and multivariate logistic regression were performed to estimate the odds ratios and 95% confidence interval for e-cigarette use. All data were analyzed using SPSS version 19.0.A total of 1872 students participated in this study. Of them, 6.3% previously experienced e-cigarettes and 17.3% reported having experienced smoking cigarettes more than once in their life. In multivariate logistic regression analysis, female students had less frequent use of e-cigarettes (OR 0.39 95% CI 0.21-0.70); the experience of smoking was strongly associated with e-cigarette use (OR 31.64 95% CI 17.52-57.14). The prevalence of e-cigarette experience had been markedly increased in Korea. Male students with smoking experience tend to have more experience of e-cigarette use than female students without smoking experience. Despite this rapid growth of e-cigarette use, studies and regulations of e-cigarettes are not sufficient. Proper assessment is important and further research will be necessary.

INTRODUCTION

Smoking is a major public health concern worldwide. Especially, adolescent smoking is important because most smokers start smoking in the adolescent period and it usually continues into adulthood [1]. An electronic cigarette (e-cigarette), also called an electronic delivery system (ENDS) is a battery-powered device which is similar to a cigarette [2] and delivers vaporized nicotine.

Corresponding Author

HyeonSuk Kim
Email:- wisdomk@gmail.com

The safety and efficacy of e-cigarettes have not been precisely documented and the scientific evidence is limited. A recent study reported that e-cigarette users tended to have high levels of nicotine dependence and use e-cigarettes as nicotine replacement devices. Also there are concerns about a bridge effect of real cigarette smoking in non-smokers or interruption of bans on smoking in public places. Since 2007, e-cigarettes have been imported to South Korea and their use rapidly increased in a few years, mostly through the online internet market. Nicotine contained in e-cigarette devices had not been regulated early on even though adolescents

consumed it [3]. E-cigarette sales to adolescents were prohibited in 2011, considered as harmful devices for adolescents (Ministry of gender equality and family, 2011). In adults, several studies had reported the prevalence of e-cigarette use or characteristics of users previously but those were rarely determined in adolescents [3].

A recent Polish study documented about one-fifth of Polish youth have tried e-cigarettes, and most have had previous smoking experiences. In addition, 3.2% of non-smoking students reported use of e-cigarettes. Related to Korean adolescents, Cho et al. [5] reported that the experiences of e-cigarettes were 0.5% and 10.2% of students had heard e-cigarette smoking. However, as this study used the data from 2008, the recent prevalence of e-cigarette use would have changed in Korea. Therefore, this study was implemented to investigate factors affecting the use of electronic cigarette and provide baseline data for prevention of e-cigarette use in adolescents

METHODS

Study subjects

This study is a cross-sectional study conducted from July 1st 2011 to July 15th 2011 in a Korean local community, which has a population of about 440,000. A health center in the local community and Shinhan University performed "the Survey on the smoking behavior of adolescents in a local community". To represent the adolescents of this community, ten middle and high schools were selected to be investigated. Trained interviewers visited the schools and explained the study recruiting the participants. A total of 2,112 students including 1,023 middle school students and 1,089 high school students were interviewed. Finally, the data of 1872 students was used and the response rate was 88.6%.

Variables

All participants provided informed consent and agreed to answer the questionnaire. Demographic characteristics, smoking experience, e-cigarette use, and the information about school life were obtained using a standardized questionnaire. The questionnaire was based on the National Longitudinal Study of Adolescent Health (Add health data**)** [6].

Demographic characteristics included gender, the level of school, types of high school, religion, and the educational level of parents. In addition, questions about the satisfaction with school life and perceived academic performance were asked. Levels of depressions were reported using a single question. 'Smoking cigarettes' was defined if a participant had experience more than one puff in his/her whole life. Regarding the use of e-cigarettes, students were asked the following: 'Have you ever used e-cigarettes?' If they answered 'yes', several questions followed: 'Was the e-cigarette helpful to stop smoking?', 'How did you take the e-cigarette?', and 'Have you ever used the e-cigarette without smoking?' Additionally, we asked a question to evaluate thoughts on the effect of using e-cigarettes: 'Do you think that e-cigarettes can help to stop smoking?'

Statistical analysis

The chi-square test with Fisher's exact test to examine categorical variables was used. Multivariate logistic regression models were used to estimate the odds ratios and 95% confidence interval for e-cigarette use. $P<0.05$ was accepted as indicating significance. All data were analyzed using SPSS version 19.0.

RESULTS

General characteristics of the study subjects

A total of 1872 students participated in this study. Among them, 48.3% were middle school students and 51.7% were high school students. For the type of high school, 78.7% attended general high schools and 21.0% attended technical high schools. Students with smoking experience were 17.0%. Students' fathers had more education than students' mothers. More than one third of students reported that they had poor academic performance (< lower 50%).

Prevalence of e-cigarette use

Adolescents who had experienced e-cigarettes were 6.3%, and 17.3% of them reported an experience of smoking cigarettes more than once in their life. The prevalence of e-cigarette use among students with smoking experience was 31.8% and 1% of students without smoking experience had the experience of e-cigarettes. It was much higher compared to that of students without smoking experience. Male students were more likely to use e-cigarettes. Students who had been dissatisfied with their school life and had poor academic performance showed higher rates of e-cigarette use. The level of school and type of high school was not significantly different according to e-cigarette use (Table 1).

Factors related with e-cigarette use and pathway obtaining e-cigarettes

Multivariate logistic regression analysis was performed using all potential variables (Table 2). Female students used e-cigarettes less frequently than male participants (OR 0.39 95% CI 0.21-0.70); the experience of smoking was strongly associated with e-cigarette use (OR 31.64 95% CI 17.52-57.14). A total of 98 students (83.8%) of 117 students related how they obtained e-cigarettes.

Among them, 33.3% adolescents obtained e-cigarettes from their acquaintances such as friends, brothers, fathers, or relatives; 21.4% purchased from the offline e-cigarette market, and 9.4% bought e-cigarettes from internet markets. As for the thought on the effect of e-cigarettes, 34.2% students answered that they believe e-cigarette use could help stop smoking. There were no differences in thought on the e-cigarette use according to the presence of smoking experiences (p=0.26) and e-cigarette use (p=0.95).

Table 1. Experiences of e-cigarettes based on socio-demographic characteristics

Variable		N (%)	Previous experience	P value*
Total		1872(100)	117(6.3)	
Gender	**Male**	1036(55.3)	96(9.3)	<0.001
	Female	836(44.7)	21(2.5)	
Level of school	**Middle**	905(48.3)	56(6.2)	0.92
	High	967(51.7)	61(6.3)	
Type of high school	**General**	761(78.7)	52(6.8)	0.41
	Technical	203(21.0)	9(4.4)	
Smoking experience	**No**	1554(83.0)	16(1.0)	<0.001
	Yes	318(17.0)	101(31.8)	
Monthly smoking	**No**	1609(86.0)	22(1.4)	<0.001
	Yes	263(14.0)	95(36.1)	
Educational level of father (year)	**≤9**	78(4.5)	10(12.8)	0.07
	9~12	806(46.3)	50(6.2)	
	>12	858(49.3)	53(6.2)	
Educational level of mother (year)	**≤9**	61(3.5)	6(9.8)	0.29
	9~12	1018(58.5)	66(6.5)	
	>12	661(38.0)	35(5.3)	
Religion	**Protestant**	583(31.1)	37(6.3)	0.06
	Catholic	156(8.3)	7(4.5)	
	Buddhist	284(15.2)	26(9.2)	
	Others	768(41.0)	42(5.5)	
Satisfaction for school life	**Yes**	1362(72.8)	73(5.4)	0.016
	No	488(26.1)	42(8.6)	
Perceived academic performance	**<30%**	527(28.2)	19(3.6)	<0.001
	30-50%	590(31.5)	21(3.6)	
	>50%	685(36.6)	75(10.9)	
Depressed mood	**No**	1152(61.5)	63(5.5)	0.2
	Yes	707(37.8)	53(7.5)	
* P value from chi-square test.				

Table 2. Multivariate logistic regression for experiences of e-cigarettes

Variable		Odds ratio (95% CI)	P value
Female		0.39(0.21-0.70)	0.002
Level of school	**Middle**	1	
	High	0.95(0.59-1.56)	0.86
Smoking experience		31.64(17.52-57.14)	<0.001
Education status of father (year)	**>12**	1	
	9~12	0.70(0.40-1.22)	0.21
	≤9	0.89(0.31-2.59)	0.83
Education status of mother (year)	**>12**	1	
	9~12	1.43(0.81-2.53)	0.22
	≤9	2.75(0.76-9.94)	0.12

Religion	**Protestant**	1	
	Catholic	0.67(0.25-1.75)	0.41
	Buddhist	0.95(0.49-1.84)	0.87
	Others	0.74(0.42-1.30)	0.30
Satisfaction for school life		1.31(0.77-2.22)	0.32
Perceived academic performance	**< 30%**	1	
	30-50%	0.55(0.26-1.18)	0.13
	> 50%	1.53(0.82-2.87)	0.19
Depressed mood		1.16(0.70-1.92)	0.55

DISCUSSION

This study investigated the e-cigarette experience and basic characteristics of adolescents using e-cigarettes in a local community in Korea. The prevalence of ever having used e-cigarettes was 6.3% and this was markedly increased when compared with a previous report, 0.5% in 2008 [5]. The report of CDC in Korea found that adolescent experiences of e-cigarettes in 2013 were 9.1%: 14.5% in male students and 3.3% in female students [7]. This trend showed that e-cigarette smoking experiences among adolescents are gradually increasing in Korea.

Male students with smoking experience reported more e-cigarettes use than female students without smoking experience. Among those who had never smoked, 1% of the students answered that they had the experience of e-cigarette use. According to a meta-analysis, non-smoking adolescents who used e-cigarettes have more than 2 times increased odds of intention to cigarette smoking (OR = 2.21, 95% CI: 1.86-2.61) compared to those who never used. Additionally, e-cigarette use among non-smoking adolescents was related to the increased smoking intention. Thus, electronic cigarettes use is likely to be gradually increasing both non-smoking and smoking adolescents [8].

The prevalence of e-cigarette use in this study was remarkably increased compared with 0.5% in a previous study in 2008, which also investigated e-cigarette use among South Korean adolescents [5]. This phenomenon could be related with rapidly increased e-cigarette sales in South Korea. Since e-cigarettes were first imported to South Korea in 2007 [3], the use of e-cigarettes rapidly increased. However, the regulation has lagged behind the market increase. E-cigarettes containing nicotine have been registered as cigarette products in 2010, but e-cigarette devices without containing nicotine did not have any restrictions for selling to adolescents until 2011. Adolescents could purchase e-cigarettes elsewhere without any limitations. In November 2011, the Ministry of Welfare designated e-cigarettes as harmful devices for adolescents and prohibited selling to adolescents [4]. In addition, the internet sales of e-cigarettes could make adolescents easily access them. A recent study which was performed in Poland reported that 23.5% among adolescents aged 15 to 19 years had used e-cigarettes [9]. This was almost three times higher than the 6.3% experienced in this study.

In this study, male students with smoking experience had more experience of e-cigarettes. These findings were consistent with previous studies [5, 9]. Specifically, the odds ratio of e-cigarettes use among adolescents who had smoking experiences (OR=31.8) was thirty higher than that of adolescents without smoking experiences (OR=1.0). According to a study using meta-analysis, current smokers highly used e-cigarette compared to non-smokers (OR: 14.89, 95% CI: 7.70–28.78). This proposed that the cigarette smoking is a robust predictor of e-cigarette use among adolescents [10]. Meanwhile, the use of e-cigarettes was associated with movement toward traditional cigarette smoking [11]. The cohort study in Southern California, e-cigarette users who have never smoked a traditional cigarette have 6.17 times more risk of initiation of cigarette (95% confidence interval: 3.30-11.6) than never e-cigarette users. The 40.4% of e-cigarette users initiated cigarette and 10.5% of never users followed [12]. These results encourage making regulations to control advertisement and sales for decrease of e-cigarette uses among adolescents.

In addition, concerns about dual use of e-cigarettes and traditional cigarettes were supposed by previous studies. Adolescents who have used cigarettes could be more familiar with e-cigarettes and some adolescents could use e-cigarettes to avoid the restrictions of their smoking in schools. Moreover, as market advertisements of e-cigarettes are usually focusing on assistance for smoking cessation, a number of adolescents may use e-cigarettes as aids of smoking cessation. However, there is no evidence that e-cigarettes are beneficial as aids for stopping smoking. In addition, the appropriate regulation of those advertisements of e-cigarettes was still insufficient. Notably, 1% of adolescents who did not experience smoking had experience of e-cigarettes. This could support a contention that e-cigarettes could play a role as a bridge to real cigarette use.

Although it did not show significant differences in multivariate logistic regression analysis, students who were dissatisfied with their school life and poor academic performance had higher rates of e-cigarette use. Several studies reported that dissatisfied school life or poor academic performance were associated with health-risk behavior in adolescents [13,14]. The strength of this study is the large number of subjects and showed that several socioeconomic factors of the adolescents were associated with experiences of e-cigarettes. In multivariate logistic regression analysis, being male, the lower education status of the father and the perceived lower academic performance showed statistically significant higher odds ratio of e-cigarette use than others. There were several weaknesses of our study. First of all, our study was a cross-sectional study and could not investigate continuous e-cigarette use for a long time. As the study subjects were limited to a local community, they could not represent all Korean adolescents. However, because the subjects were recruited in a large community in Korea and ten middle & high schools participated, selection bias would not be considerably high. Although e-cigarettes are rapidly consumed by many populations and the markets are remarkably growing, scientific evidence is lacking and the regulation is insufficient. E-cigarettes companies insist that the device is safe, but the production of e-cigarettes is not strictly regulated. Additionally, amounts of delivered nicotine or contained chemical products vary by different manufacturers. Several studies reported that e-cigarettes were effective in reducing the smoking desire but those were funded by e-cigarette manufacturers. In addition, long term effects of e-cigarettes are uncertain. Thus, further studies are necessary to evaluate the effects of e-cigarettes and determine the safety of devices.

CONCLUSION

The prevalence of e-cigarette experience had been markedly increased in Korea. Male adolescents with smoking experiences tend to have experience of e-cigarette use more than females without smoking experiences. Despite this rapid growth of e-cigarette use, research and regulations of e-cigarettes are not sufficient. In the future, the appropriate evaluations and policies of e-cigarettes should be implemented and further research will be necessary.

ACKNOWLEDGEMENT: None

CONFLICT OF INTEREST:
The authors declare that no conflict of interest.

REFERENCES

1. Elders MJ, Perry CL, Eriksen MP, Giovino GA. (1994). The report of the Surgeon General: preventing tobacco use amo ng young people. *Am J Public Health,* 84(4), 543-547.
2. Regan AK, Promoff G, Dube SR, Arrazola R. (2011). Electronic nicotine delivery systems: adult use and awareness of th e 'e-cigarette' in the USA. *Tob Control*. 22(1), 19-23.
3. Lee S, Kim H, Yun JE, Jee SH. (2011). Public health challenges of electronic cigarettes in South Korea. *J Prev Med Pub lic Health, 44*(6), 235-241.
4. Ministry of gender equality and family. (2011). Retrieved June, 2012, from http://www.mogef.go.kr/korea/view/policy/p olicy03_02e.jsp?func=view&idx=640633
5. Cho JH, Shin E, Moon SS. (2011). Electronic-cigarette smoking experience among adolescents. *J Adolesc Health,* 49(5), 542-546.
6. Udry JR. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.
7. Korea Centers for Disease Control and Prevention. (2014). The tenth Korea youth risk behavior web-based survey, [http://yhs.cdc.go.kr/new/].
8. Zhong J, Cao S, Gong W, Fei F, Wang M. (2016). Electronic Cigarettes Use and Intention to Cigarette Smoking among Never-Smoking Adolescents and Young Adults: A Meta-Analysis. *Int J Environ Res Public Health*. 13(5), 465.
9. Goniewicz ML, Zielinska-Danch W. (2012). Electronic Cigarette Use Among Teenagers and Young Adults in Poland. *Pediatrics*. 130(4). 879-885.
10. Wang M, Wang JW, Cao SS, Wang HQ, Hu RY. (2016). Cigarette Smoking and Electronic Cigarettes Use: A Meta-Analysis. *Int J Environ Res Public Health.* 13(1), 120.
11. Primack BA, Soneji S, Stoolmiller M, Fine MJ, Sargent JD. (2015). Progression to Traditional Cigarette Smoking After Electronic Cigarette Use Among US Adolescents and Young Adults. *JAMA Pediatr*. 169(11),1018-23.
12. Barrington-Trimis JL, Urman R, Berhane K, Unger JB, Cruz TB, Pentz MA, Samet JM, Leventhal AM, McConnell R. (2016). E-Cigarettes and Future Cigarette Use. *Pediatrics*. 13. 465.
13. Aspy CB, Vesely SK, Oman RF, Tolma E, Rodine S. et al. (2012). School-related assets and youth risk behaviors: alcoh ol consumption and sexual activity. *J Sch Health,* 82(1), 3-10.
14. Park S, Sherry B, Foti K, Blanck HM. (2012). Self-reported academic grades and other correlates of sugar-sweetened sod a intake among US adolescents. *J Acad Nutr Diet,* 112(1), 125-131.