



Short Communication

Factors associated with electronic cigarette use among current cigarette-smoking adolescents in the Republic of Korea

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HIGHLIGHTS

- Of 6,307 current cigarette users in adolescence, 20% and 42% were former and current e-cigarette users, respectively.
- Among current cigarette smokers, both former and current e-cigarette use were significantly associated with gender, grades, weekly allowance, residential areas, friends' smoking, and characteristics of cigarette use.
- Among current cigarette smokers, current e-cigarette use was significantly associated with other health risk behaviors: drinking, drug use, and sexual intercourse.

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ABSTRACT

Objective: Despite a rapid increase in electronic cigarette (e-cigarette) use and substantial dual use of cigarettes and e-cigarettes among adolescents, little is currently known about adolescent e-cigarette use. Thus, this study aimed to investigate (a) rates of e-cigarette use and (b) significant factors associated with e-cigarette use among current cigarette users in adolescence.

Methods: We analyzed secondary data collected from a nationally representative sample of Korean adolescents. Our study sample included 6307 current smokers. Our dependent variable was e-cigarette use and consisted of three categories (nonuse, former use, and current use); independent variables included demographics, perceived stress, parental and friends' smoking, three characteristics of cigarette smoking, and other health risk behaviors. Descriptive statistics was used for the first aim; multinomial logistic regression analysis was performed for the second aim.

Results: Of current cigarette users, 20% smoked e-cigarettes in their lifetime but not within the past 30 days (former users), and 42% smoked e-cigarettes in their lifetime and within the past 30 days (current users). Both former and current e-cigarette use were significantly associated with male gender, higher grades, higher weekly allowance, residence in urban areas, friends' smoking, daily smoking, a higher number of cigarettes smoked, and quit attempts. In addition, current e-cigarette use was significantly associated with at-risk drinking, lifetime drug use, and lifetime sexual intercourse.

Conclusions: E-cigarette use should be included in intervention strategies for smoking prevention and cessation. Strict regulations should be implemented in order to prohibit easy access to e-cigarettes and forbid advertising of e-cigarettes as well.

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1. Introduction

Recent statistics have shown a steep increase in adolescent electronic cigarette (e-cigarette) use (Centers for Disease Control and Prevention [CDC], 2013; White, Li, Newcombe, & Walton, 2015): 9%–10% of adolescents in Korea and the U.S. self-reported e-cigarette use in recent studies

(CDC, 2013; Lee, Grana, & Glantz, 2014). Moreover, a substantial number of adolescents smoke both cigarettes and e-cigarettes: in Korea and the U.S., 75%–76% of e-cigarette users have been found to be dual users (CDC, 2013; Lee et al., 2014).

Consistently, empirical studies have shown higher risk of e-cigarette use among current cigarette smokers than among never or non-current smokers in adolescence (Grana, Benowitz, & Glantz, 2014; Pepper et al., 2013). However, currently not much is known about factors strongly associated with e-cigarette use among current cigarette smokers. In current literature, factors strongly associated with adolescent e-cigarette

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use can be divided into three categories. The first category includes higher perceived stress levels, parental smoking, and friends' smoking (Hanewinkel & Isensee, 2015; Khoury et al., 2016). The second category includes characteristics of cigarette use: the frequency and amount of cigarette smoking, and quit attempts (Dutra & Glantz, 2014; Lee et al., 2014). These factors deserve further investigation because researchers have not reached a consensus on the association between e-cigarette and cigarette smoking. In current literature, e-cigarette users are at greater likelihoods of heavy cigarette smoking as well as cigarette smoking cessation (Lee et al., 2014; Siegel, Tanwar, & Wood, 2011). The final category includes other health risk behaviors, such as alcohol and cannabis use, and sexual behavior (Kim, Wang, Lee, & Rhim, 2013; Wills, Knight, Williams, Pagano, & Sargent, 2015). These risk behaviors are found to be interrelated and thus can play an important role in explaining dual use (Jessor & Jessor, 1977).

Thus, we aimed to investigate rates of e-cigarette use and factors associated with e-cigarette use among current cigarette smokers in adolescence. In particular, we investigated two types of e-cigarette use (former and current use) because information on specific types of heterogeneous e-cigarette smoking behaviors can be useful in developing tailored interventions (Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2014).

2. Methods

2.1. Secondary data and sample

We analyzed secondary data obtained from the 10th Korea Youth Risk Behavior Web-Based Survey (KYRBS) (Korea Centers for Disease Control and Prevention [KCDC], 2014). The 10th KYRBS is a cross-sectional survey conducted in 2014, and used a nationally representative sample of Korean adolescents ($N = 72060$) (KCDC, 2014). As a sample of our study, we selected 6307 current smokers defined as students who smoked on at least one day during the past 30 days. In our study, 79% were male and 75% were high school students (Table 1). For more detailed sample characteristics, refer to Table 1.

2.2. Measures

2.2.1. E-cigarette use

Respondents were asked two questions about lifetime and past 30-day e-cigarette use. Based on responses to these questions, respondents were grouped into non-users of e-cigarettes in their lifetime (nonusers), lifetime users of e-cigarettes but non-users during the past 30 days (former users), and e-cigarette users during the past 30 days (current users).

2.2.2. Demographics

Demographics included gender (male or female), school year (7th through 12th grades), paternal and maternal education (“ \leq high school graduation” and “ \geq college graduation”), perceived economic status (high, middle, and low), average weekly allowance (“ $\leq 9,999$,” “10,000–49,999,” and “ $\geq 50,000$ ” KRW), residential area (“suburban or rural” and “urban”), and co-residence with both parents (yes and no).

2.2.3. Perceived stress level

Respondents rated perceived stress levels in ordinary life (high, middle, and low).

2.2.4. Parental and friends' smoking

Respondents were asked if they had a parent or close friend who smoked, in which case the response to the question was “yes,” or “no” if none of them smoked.

Table 1
Sample characteristics ($N = 6307$).

Factor	Unweighted frequency (weighted %)
Gender	
Male	4859 (79.20)
Female	1448 (20.80)
School year	
7th	205 (2.70)
8th	477 (7.50)
9th	931 (14.12)
10th	1301 (20.89)
11th	1600 (25.39)
12th	1793 (29.39)
Paternal education	
High school graduation or lower	2577 (52.10)
College graduation or higher	2300 (47.90)
Maternal education	
High school graduation or lower	2925 (60.00)
College graduation or higher	1937 (40.00)
Perceived economic status	
High	1775 (28.47)
Middle	2786 (43.65)
Low	1746 (27.88)
Average weekly allowance	
0–9,999 KRW	883 (13.84)
10,000–49,999 KRW	4186 (66.25)
50,000 or more KRW	1238 (19.92)
Residential area	
Suburban or rural	3625 (58.34)
Urban	2682 (41.66)
Co-residence with both parents	
Yes	4522 (72.71)
No	1742 (27.29)
Perceived stress level	
High	2881 (45.19)
Middle	2380 (38.09)
Low	1046 (16.72)
Parental smoking	
No	2889 (45.68)
Yes	3418 (54.32)
Friends' smoking	
No	286 (4.32)
Yes	6021 (95.68)
At-risk drinking	
No	3450 (54.08)
Yes	2857 (45.92)
Lifetime drug use or butane gas	
No	6095 (96.73)
Yes	212 (3.27)
Lifetime sexual intercourse	
No	4727 (73.99)
Yes	1580 (26.01)
Electronic-cigarette use	
Nonuse	2514 (38.47)
Former use	1269 (19.95)
Current use	2524 (41.58)
Daily cigarette smoking	
Nondaily	3121 (48.28)
Daily	3186 (51.72)
Number of cigarettes smoked per day	
<1	1002 (15.17)
1–9	3933 (62.37)
10 or more	1372 (22.46)
Attempt to quit smoking	
No	1820 (28.65)
Yes	4487 (71.35)

2.2.5. Characteristics of cigarette use

During the past 30 days, respondents were asked about daily smoking (smoking at least one cigarette every day) and the number of cigarettes smoked per day (“<1,” “1–9,” and “ ≥ 10 ” cigarettes). Finally, respondents were asked about an attempt to quit smoking during the past 12 months: “yes” in case when respondents made a quit attempt and “no” in case when respondents did not make any attempt.

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