Prevalence and Risk Factors of E-cigarette Users in Thai College Student

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Abstract: Background: Electronic cigarette (E-cigarette) has gained popularity internationally. It was claimed to be a novel way of smoking cessation. Previous reports regarding E-cigarette in Thai college student were limited. We investigated the prevalence, characteristics, and risk factors of e-cigarette smoking in Thai college students. Method: This is a descriptive cross-sectional study of prevalence, characteristics and risk factors of E-cigarette user in college students in Bangkok in January 2018. We used simple random sampling method and self-interviewed anonymous online questionnaire. The primary outcome was the prevalence of E-cigarette user. Secondary outcome were the characteristics and risk factors of E-cigarette users. Result: There were 1302 college students which 535 students (41.1%) were male, and 767 students (58.9%) were female. 289 students (22.2%) were E-cigarette users. 223 students had history of both cigarette and E-cigarette used. History of cigarette used in 30 days, history of cigarette used not in 30 days, water pipe user, marijuana user and male were risk factors of using E-cigarette by adjusted odds ratio 24.59 (95% CI 13.31- 45.43), 15.12 (95% CI 9.06 – 25.23), 10.08 (95% CI 6.38 – 15.92), 11.59 (95% CI 4.61 – 29.14), 1.90 (95% CI 1.25 – 2.90) respectively. Studying in non-health faculties was the risk factor for E-cigarette used with adjusted odds ratio of 2.07 (95% CI 1.05 – 4.10). Conclusion: Prevalence of E-cigarette users in Thai college student was high. Risk factors included male, history of cigarette smoking, marijuana use, water pipe and studying in non-health associated faculty. Effective control and education are needed.

Keywords: E-cigarette, Prevalence, Risk Factors, College Student

1. Introduction

Electronic cigarette (E-cigarette) is a device that use heat energy to vaporize nicotine and flavor. It was advertised to be less dangerous than cigarette and a novel method of smoking cessation. Appearance and specification of E- cigarette are varied depending on physical property of the device such as disposable e-cigarette, rechargeable e-cigarette, tank style and pen style [1].

Prevalence of E-cigarette user has been increased around the world. In United States, the prevalence was increased from 3.3% in 2010 to 8.5% in 2013 [2]. In Europe, the prevalence of ever used e-cigarette was increased from 7.2% in 2012 to 11.6% in 2014 [3]. In Asia, the study of the prevalence of e-cigarette user in Taiwan was 6.5% [4]. Prevalence of E-cigarette user ranges from 4.9% to 74.9% [5-7] around the world.

The consequence of E-cigarette used has been reported

worldwide. Recently, E-cigarette was reported to be associated with pulmonary illness which could result from severe respiratory symptom to death [8]. Moreover, carcinogenicity in lung and bladder was also reported but limited to the animal study [9]. Psychologically, E-cigarette users were found more likely to have problem in attention deficit, low self-esteem, post-traumatic stress disorder, gambling disorder, anxiety, and impulsivity. [10]

College students have been known to be targeted population of cigarette smoking. [11] In Thailand, E-cigarette is considered illegal. The prevalence of E-cigarette user Thailand was 3.3% in young adult aged 13-15 years [12]. Another reports found that the highest proportion of E-cigarette users was adult aged 19-24 years and work as business employee respectively [13, 14]. There was no report regarding the prevalence and risk factors of E-cigarette user in college students in Thailand. Therefore, we reported the prevalence of E-cigarette user and risk factors in Thai college students.

2. Method

2.1. Study Design and Population

This study was a descriptive cross-sectional study of prevalence and characteristics of electronic-cigarette user and non-user in college student in single university in Bangkok, Thailand. We recruited students from 19 faculties that range from 1st year to 6th year in the campus in January 2018. The youngest age was 17 years old. We used simple random sampling method and approached student by face-to-face or using LINE application (Naver, Japan). Then, students were provided a QR code of self-interviewed anonymous online questionnaire which created specifically for this study. The questionnaire never been published elsewhere.

2.2. Ethics

The ethical committee approval was determined unnecessary by the authors because this study was an anonymous observational study with minimal risk to subject. This study met the criteria of Exemption from International Ethical Guidelines for health-related research Involving Human 2016 [15]. The participant was informed about objectives, confidentiality, study project and giving the consent. Then, the participant did the online questionnaires via the link. The data was kept anonymous without name or contact of the participants.

2.3. Variable

Our primary outcome was the prevalence of E-cigarette users in college students. Secondary outcome of this study was the characteristics of the E-cigarette user and risk factor of using E-cigarette.

2.4. Sample Size Measurement

In previous study, there was 23% of population that used E-cigarette. With 95% confidentiality, we determined accepted error rate of 2% and non-response rate of 10%. The calculated sample size was 1890 participants.

2.5. Data Measuring

Characteristic of E-cigarette used and the demographic including biological sex, faculty, academic performance determined by Grade Point Average (GPA), income, frequency of smoking (pack per week) and another illicit drug use were included in questionnaire. GPA were categorized into <3, 3-3.50, >3.50. The higher GPA indicated the better academic performance. We defined past user as the person who stopped E-cigarette more than 30 days. The current user was defined as the person who currently use E-cigarette or stopped using E-cigarette less than 30 days. Both current users and past users were called E-cigarette users. We use same definition as above in cigarette to define smoker and past smoker.

We used IBM SPSS statistical 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp) to analyze demographic data and express data in percent.

We used multiple logistic regression with adjusted covariates and reported in Odds ratio (95% confidence interval) in order to determine the odds between E-cigarette and other factors. Confounders in calculation included gender, history of smoking cigarette, marihuana use, water pipe use, other illicit drug use and studying in health faculties.

2.6. Biases

We tried to avoid inclusive bias by assigning our team member to 10 areas in the university to recruit students. This assignment will cover all faculties in the university. Procedural bias was reduced by giving unlimited time to answer questionnaire. Anonymous questions were used to avoid measurement bias in stigma question.

3. Result

There were 1302 college students which shows 68.9% response rate. 535 students (41.1%) were male and 767 students (58.9%) were female. The demographic data was reported in Table 1.

Table 1. *Demographic data of included college student n = 1302.*

Variables	Number of Students (Percent)
Gender	
Male	535 (41.1%)
Female	767 (58.9%)
Faculties	
Faculty of Engineering	198 (15.1%)
Faculty of Science	163 (12.4)
Faculty of Commerce and Accountancy	122 (9.3%)
Faculty of Education	90 (6.9%)
Faculty of Medicine	87 (6.6%)
Faculty of Law	78 (5.9%)
Others	564 (43.7%)
Academic performance	

Variables	Number of Students (Percent)
<3.00	506 (38.9%)
3.01-3.50	490 (37.6%)
3.51-4.00	306 (23.5%)
Monthly income	
0-5,000	207 (15.8%)
5,001-10,000	592 (45.1%)
10,000-15,000	318 (24.2%)
>15,000	185 (14.9%)
History of using Cigarette	
Never	1021 (78.4%)
Smoking in the past 30 days	141 (10.8%)
Smoked but not in the past 30 days	140 (10.8%)
Frequency of Smoking cigarette (pack/week)	
Never	1088 (83.5%)
0-1	146 (11.2%)
1-2	39 (3.0%)
3-4	14 (1.1%)
>4	15 (1.2%)
History of E-cigarette smoking	
Never	1013 (77.8%)
Smoking in the past 30 days	109 (8.4%)
Smoked but not in the past 30 days	180 (13.8%)

There were 289 (22.2%) E-cigarette users. In this group, 182 students (63%) and 107 students (37%) were male and female, respectively. 109 students (8.4%) were current users, and 180 students (13.8%) were past users. The highest incidence of E-cigarette user was found in faculty of engineering with 42.5% of all students in the faculty. Among 309 illicit drug users, 218 students use E-cigarette (70.6%). The incidence of E-cigarette in marihuana users and water pipes users were 35 (77.7%) and 172 (71.1%) respectively (Table 2)

Table 2. Combined E-cigarette with another illicit drug use.

History of illicit drug use	E-cigarette use		Total
	Yes	No	
Marijuana	35 (77.8%)	10 (22.2%)	45
Water pipes	172 (71.1%)	70 (28.9%)	242
ETC	11 (27.3%)	11 (72.7%)	22
Total number	218	91	309

223 students with history of cigarette smoking had history of E-cigarette smoking. 61 students of 223 were currently dual smokers. The number of E-cigarette users in GPA < 3.00, 3.01-3.50, 3.51-4.00 were 146, 106, 37 students, respectively. 180 (62.3%) students borrowed E-cigarette from friends and 58 (20.1%) students bought online (Figure 1).
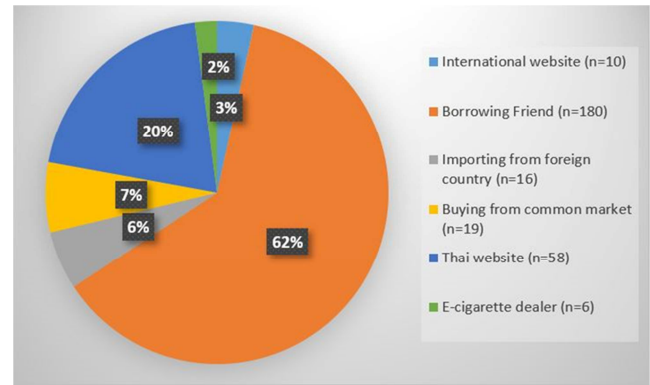

Figure 1. Source of E-cigarette (n = 289).

Most college students received E-cigarette information from friends (32.8%) and television (22.8%) (Figure 2).
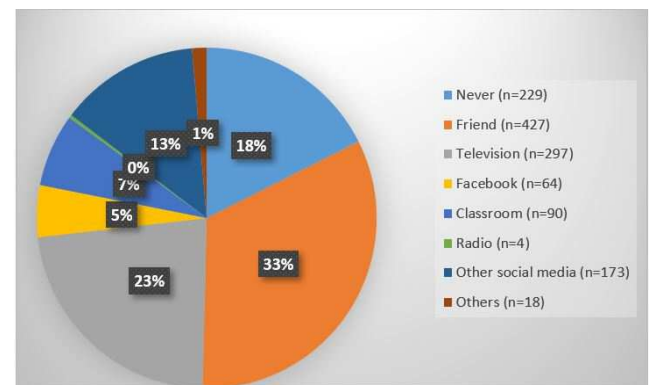

Figure 2. Sources of E-cigarette information (n = 1302).

History of cigarette smoking in 30 days, cigarette smoking not in 30 days, water pipe users, marijuana users and male are risk factors of using E-cigarette by adjusted odds ratio 24.59 (95% CI 13.31- 45.43), 15.12 (95% CI 9.06 – 25.23), 10.08 (95% CI 6.38 – 15.92), 11.59 (95% CI 4.61 – 29.14), 1.90 (95% CI 1.25 – 2.90) respectively. College students who used cigarette, water pipe, marijuana were at risk of E-cigarette using by 25, 10, 12 times higher than college students with none of these factors. The risk factor of using E-cigarette was also studying in non-medicine and non-allied health faculty (All faculties except Medicine, Veterinary science, Dentistry, Pharmaceutical science, and Allied health science) with adjusted odds ratio of 2.07 (95% CI 1.05 – 4.10) (Table 3).

Table 3. Risk factors of characteristics to E-cigarette using.

Factors	E-cigarette use Yes n (%)	E-cigarette use No n (%)	Crude odds ratio	(95% CI)	Adjusted odds ratio	(95% CI)
Gender						
Male	182 (34%)	353 (66%)	3.18	2.42 – 4.17	1.90	1.25 – 2.90
Female	107 (14%)	660 (86%)	1.00	reference	1.00	reference
History of smoking cigarette						
- Smoking in the past 30 days	20 (14.1%)	121 (85.9%)	87.54	51.28 - 149.45	24.59	13.31 – 45.43
- Did not smoke in the past 30 days	38 (27.2%)	102 (72.8%)	38.84	24.81 – 60.81	15.12	9.06 – 25.23
- Never smoke cigarette	66 (6.5%)	955 (93.5%)	1.00	reference	1.00	reference
Marihuana use	35 (77.8%)	10 (22.2%)	14.04	6.86 – 28.75	11.59	4.61-29.14
Water pipe use	172 (71.1%)	70 (29.9%)	20.70	14.73 – 29.09	10.08	6.38-15.92
Using other drugs	11 (50%)	11 (50%)	3.65	1.57 - 8.52	3.24	1.04 – 10.13
Studying in health associated faculties	19 (7.6%)	232 (92.4%)	4.22	2.59 – 6.88	2.07	1.05 – 4.10

4. Discussion

High prevalence of E-cigarette user in college student was found in our study. Previous reports from France [16] and United States [17] revealed 23% and 37% of college students using E-cigarette. Although the use of E-cigarette in Thailand is considered illegal, the prevalence of E-cigarette user in Thai college students was comparable to other legalized countries. This finding showed the ineffective law enforcement and E-cigarette regulation in Thailand.

We found smoking cigarette, using marijuana as risk factors of E-cigarette use. This finding was consistent with previous report from France [16], USA [17], and Taiwan [18]. The use of E-cigarette was found to be the risk factor of using marijuana [19]. By sharing same device to use both E-cigarette and marijuana, it is convenient for students to use both substances. [20-22]

Studying in health-associated faculty was a protective factor of using e-cigarette with two times less likely to use E-cigarette. This may be related to gain the knowledge in health and understand the effect of health-related problems from using E-cigarette. This finding is not consistent with previous reports [23].

Many previous reports revealed controversy regarding the efficacy of E-cigarette for smoking cessation. Systematic review and meta-analysis found that nicotine containing E-cigarette provide more efficacy for smoking cessation when compared with nicotine-free E-cigarette and nicotine replacement therapy [24, 25]. Another report found that there was not sufficient support for E-cigarette for smoking cessation [26]. In contrast to previous reports, Kalkhoran et al found that the odds of quitting cigarette in E-cigarette user was 28% lower than those who did not use E-cigarette [27]. Our study found E -cigarette user was 25 times likely to smoke cigarette.

Previous reports found strong association of E-cigarette user and cigarette smoking [28, 29]. This research was done on the intention of resisting the pro-electronic nicotine delivery systems (ENDS) which try to create smoking norm society [30] by showing the high prevalence of E-cigarette used with risk factors in university college students. More research needs to be conducted in using of behavioral science or psychology especially in intervention that help prevent these college students from using E-cigarette.

5. Limitation

This study was a cross-sectional study. The causative effects of using E-cigarette may not be concluded. The population from one university was also limitation for generalization. Comorbidities, which may affect the prevalence of E cigarette user, was not included in the study. Example of comorbidities were drug addiction, sexual transmitted disease, and history of family drug use.

6. Conclusion

Prevalence E-cigarette users in Thai college student was high and comparable to foreign legalized countries. Risk factors of E-cigarette used were male, history of cigarette smoking, marijuana use, water pipe use and studying in non-health associated faculties. E -cigarette user was 25 times likely to smoke cigarette. The effective control is needed.

Abbreviation

E-cigarette = Electronic cigarette
GPA = Grade Point Average

Declaration

Ethic approval and consent to participate (more detail in method part ethic)

The ethic committee was thought unnecessary by our group decision due to criteria of Exemption which involved in Anonymous Observational study with minimal risk to subject.

Consent was approved by clicking YES or No in the first page of the questionnaires before start.

Consent for publication

Not applicable

Availability of data and material

The datasets generated during and/or analyzed during the current study are not publicly available due privacy of the university but are available from the corresponding author on reasonable request

Competing Interests

The authors declare that they have no competing interests.

Author contribution

All authors have read and approved the manuscript.

CS: Conceptualization, Data curation, Investigation, Methodology, Visualization, Writing original draft

JJ: Conceptualization, Data curation, Investigation, Methodology

TR: Formal analysis, Methodology
CS : Conceptualization, Resources, Validation, Supervision

TS: Project administration, Supervision, Validation, Writing – review and editing

Additional

1. Questionnaire English version: questionnaire created specifically for this study which translate from Thai

language.

File name - Questionnaire English version

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