RESEARCH ARTICLE

Editorial Process: Submission:00/00/0000 Acceptance:00/00/0000

Factors Associated with Knowledge and Attitude towards E-Cigarettes among Undergraduate Students in Thailand: A Cross-Sectional Study

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Abstract

Background: Thailand government has enacted a ban on vaping for eight years, but the number of vapers has continued to increase, particularly among teenagers. This study aimed to evaluate undergraduate pharmacy students' knowledge and attitudes toward e-cigarette use in Thailand. **Method:** This descriptive cross-sectional study was performed between January and March 2022. The participants were selected from 14 universities of Thailand. For data collection, a questionnaire was developed online using Google Form. The participants had to complete the questionnaire within 5 to 10 days the via s. Chi-square and binary logistic analysis were used to assess the association between variables. **Results:** A total of 507 participants were recruited, The participants' mean age was 20.6 ± 1.9 years. About 98.6% of the participants knew about e-cigarette, and 74.4% had never heard of e-cigarettes. Moreover, 68.8% of the participants declared that people around them were smokers. Logistic regression analysis indicated that the participants who declared that they were not sure if e-cigarettes contains nicotine or not were 10.5 more likely to consume e-cigarettes (AOR = 10.5; 95 % CI 3.130-35.181; P <0.001). Male participants who were at the academic year of three and four were more likely to use e-cigarettes than female students who were at the academic year of five and six (AOR 2.9; 95 % CI 1.599-5.214; P <0.001; AOR = 4.5; 95 % CI 1.412-14.571; P <0.001; AOR = 3.9; 95 % CI 1.263-12.511; p = 0.018). **Conclusion:** OOur study findings showed that pharmacy students lacked knowledge about e-cigarettes and misunderstood about e-cigarettes substances. Future research is necessary to develop educational programs for health professionals to be ready to advise patients about e-cigarettes.

Keywords: E-cigarette- knowledge- attitude- pharmacy students

Asian Pac J Cancer Prev, **24 (1)**, 353-361

Introduction

Electronic cigarette (e-cigarette) is powered by rechargeable battery, mimics a real cigarette, and produces nicotine that is vaporized to replicate cigarette smoke (Caponnetto et al., 2012). It was first advertised in China in 2004, then in Europe in 2006 and the United States (U.S.) in 2007 (Henningfield and Zaatari, 2010; Riker et al., 2012). E-cigarettes are now the most popular ones among teenagers in several regions of the world (Cole et al., 2021). The incidence rate of e-cigarette use among U.S. teenagers, for instance, increased from 0.6 % and 1.5 % in 2011 to 10.5 % and 27.5 % in 2019 (Wang et al., 2019). In Thailand, based on the results of a cross-sectional study on 6,045 students , the prevalence of e-cigarette use among Thai middle school students was 3.3% in 2015 and 7.2% in 2021 (Patanavanich et al., 2021).

The emergence of e-cigarette leads to a new generation of cigarette smokers. Investigations indicate that e-cigarette significantly increases the chance of cigarette initiation among younger generations who would rather not get to be addicted to smoking (Pierce et al., 2021) .

Significant aspects correlated with the perceptions and awareness of e-cigarette in high-income countries where e-cigarette selling are not prohibited (Romijnders et al., 2018). A literature review of seventeen articles on teenagers in high income countries discovered that sweetened e-cigarettes were deemed as less dangerous, less expensive, more stylish, and better flavoured than tobacco products (Romijnders et al., 2018). Previous investigations also revealed that the usage of e-cigarette among adolescence was correlated with male gender

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(Robert et al., 2019; Park et al., 2017), younger age (Robert et al., 2019), studying medicine (Al-Sawalha et al., 2021), living in urban regions (Park et al., 2017), poor educational attainment (Jiang et al., 2016), ethnicity (Robert et al., 2019), and having smoking friends or roommates (Fang et al., 2022) . However, there have been few investigations on the use of e-cigarette among adolescence in low- and middle-income nations, particularly in those countries, where e-cigarette use is prohibited (Ofuchi et al., 2020).

Since 2015, the government of Thailand has banned the selling and exporting of e-cigarette (Patanavanich and Glantz, 2020). A nationwide study of e-cigarette usage among Thai students in primary and secondary school found that 3.3 % were already e-cigarette users (Chotbenjamaporn et al., 2017). Another study in 2019 which was done on teenagers aged between 13 and 18 in Thailand discovered that 6.7% of the students were former users of e-cigarette (Ofuchi et al., 2020).

Regardless of the reality that e-cigarettes are a global trend and the prevalence rate of e-cigarette vaping has increased significantly in recent years, there is scarcity of information and data on e-cigarette users' knowledge and attitudes toward -ecigarette vaping, particularly among adolescent in Thailand. Furthermore, understanding pharmacy students' knowledge and attitude toward e-cigarette vaping would be beneficial for the advancement of e-cigarette control strategies. Hence, the present study aimed to identify pharmacy undergraduate Thai students' knowledge and attitude toward e-cigarette vaping and discover factors associated with the use of e-cigarette .

Materials and Methods

This cross-sectional was done using a self-reported online questionnaire to investigate pharmacy undergraduate Thai students' knowledge and attitudes toward e-cigarette vaping. This research was from March to April 2022. The participants were selected from 14 pharmacy schools from 14 different universities in Thailand. Thailand is categorized into 4 geographical areas, namely the north, middle, south, and east, and each area includes several institutions. Pharmacy undergraduate students who aged≥ 18 were included in this study. While postgraduate students and those with missing data were excluded from the study. This study was approved by the Human Research Ethics Committee of Walailak University.

Sample size

The study sampi size was estimated to be 284 using the following formula:

$$n = Z_2 \times P (1 - P) / d_2$$

However, we included 507 participants considering % participants dropout.

Measures and data collection

Questionnaires were distributed among the participants and filled out via Google Forms and gathered as quickly as possible as they were finished. All the participants were given 5–10 days to complete the questionnaires, and a reminder notice was sent to them after two weeks via text message, line, e-mail, or Facebook application. Furthermore, all the participants were assured that their participation in this research was optional, the data provided by them would be reported anonymously, all the gather data would be used for scientific purposes, and they would receive no penalty in case of withdrawing from the study. The questionnaires were available in both English and Thai to accommodate the participants' language of choice. It was derived from Franks et al., (2017), and Patchaya and Prompiriya (2021). Two validation studies were conducted: one for the original survey to guarantee the accuracy of both versions of the questionnaires , and the second for the attitude and awareness scale alone to verify its efficacy in accurately reporting respondents' understanding level of e-cigarettes. To enable restoration, handling, and analytical techniques, questionnaires were tabulated and entered into a laptop. The survey was first evaluated by five experts (i.e. one community pharmacist, one hospital pharmacist, and three pharmacy lecturers). The suggested changes were made based on the experts' opinions. A pilot version of the questionnaire was administered on 30 pharmacy students from Walailak University who were chosen through a simple random sampling technique.

The pilot study was conducted to detect the suitability of the collected data and aid in determining whether the format of the questionnaire was understandable or not. The pilot study results were not included in the main study. A Cronbach's alpha of 0.709 was used to test the reliability of the standardized instrument for both knowledge and attitude.

The final version of this questionnaire consisted of 3 sections as follows:

Section 1:

The first section (socio-demographic profile) included 12 items included information on gender, age, type of university, academic year, monthly income, alcohol consumption, and their own or family and friends' smoking status (both cigarette and waterpipe). In addition, the participants were asked about their knowledge about e-cigarettes and their source of information regarding e-cigarettes (i.e. friends, family, social media, teaching, and lovers).

The participants were divided into three age groups of 16-19, 20-24, and over 25. Academic year included three groups of years 1 and 2, years 3 and 4, and years 5 and 6. University location was also classified into three areas of a) Northern + Northeast Thailand which included Chaingmai University, Naresuan University, Payap University, Unniversity of Phayao, Khon Kean University, Ubon Ratchathani University, Mahasarakham University, b) Central which included Chulalongkorn University, Mahidol University, Silpakorn University, Huachiew Chalermprakiet University, Siam University, and Eastern Asia University, and C) which included University of Prince of Songkla and Walailak University.

Section 2 2:

The second section of the questionnaire consisted of 7 items and included information about knowledge of e-cigarettes. In order to evaluate the participants' smoking habits, the following questions were asked: Q1: Is e-cigarettes smoke caused by burning? Q2: Does e-cigarette solution consist of nicotine? Q3: Are e-cigarettes approved by U.S.FDA for smoking cessation? Q4: Is e-cigarette normally reusable? Q5: Do e-cigarettes produce second hand smoke? Q6: Do e-cigarettes cause addiction? Q7: Can e-cigarettes be sold or legally possessed in Thailand? These questions were rated through a three-point Likert scale, correct, not sure / don't know, and incorrect. Questions 1 and 4 were true and Q 2, 3, 5, 6, and 7 were false. Knowledge level about e-cigarette was determined by assigning one point for each correct response. Total score range from 0 to 7. Score > 80 % (6/7) was considered as high level of knowledge, score> 60% (4-5/7) was considered as fair level of knowledge , and score < 60% (4/7)) was considered as poor level of knowledge et al., (2021).

Section 3:

The third section assessed the participants' attitude toward e-cigarettes. It consisted of 6 sub-sections names as a) Health affect and addiction which consisted of 3 items,b) Smoking cessation which consisted of 2 items, c) Personality image which covered 4 items, d) Cost which contained only one question, and finally e) Law which covered 2 items. In this section, the questions were rated through 5-point Likert scale(ranging from 1= absolutely disagree to 5= absolutely agree). The higher the score, the better and more supportive the attitude toward e-cigarettes. We merged absolutely disagree, disagree, and neutral to become disagree / neutral. In addition we merged absolutely agree and agree to become agree.

Data Analysis

Data were analysed using SPSS (version 23). The data were summarized as frequency and percentages, and chi-square test was used to analyse data. The binary logistic regression analysis was performed to examine the significant differences in scores of respondent across multiple parameters. Pearson's Correlation Coefficient was used to estimate the level of relationship between pharmacy students' perceptions and awareness toward e-cigarettes. For all inferential statistics, the p-value was set at 0.05.

Results

Socio-demographic analysis

Among 507 students, 379 (74.8%) were female and 128 (25.2%) were males. Majority of the participants fell in the age group of 20-24) n=299 (59%) and the average age of the participants was 20.63 years (range 16-40 years). In addition, 287 (56.6%) of the participants were from South part of Thailand, 122 (24.1%) were from northern region, and 98 (19.3%) were from central region. Furthermore 302 (59.6%) of the participants were first and second year university students 135 (26.6%) participants were third and fourth year university students, and70 13.8%) were at educational year five and six. Regarding monthly income, it was found that the majority of participants received < 10,000 BTH 429 (84.6%) and 10 (2%) received > 20,000 BTH . The majority of the participants(500 (98.6% had heard about e-cigarette, and 368 (72.6%) got to know e-cigarettes by their friends and social media. Approximately, 377 participants (74.4%) declared that e-cigarettes or e-cigarettes cessation was not included in the university curriculum (Table 1).

Perception and knowledge towards the harmful effects of e-cigarette

The mean score of knowledge was 3.80 ± 1.71 (mean +SD) ranging from 0 to 7. Approximately, 227 (44.8%) participants declared that e-cigarettes smoke was not caused by burning and 164 (32.3%) were not sure if e-cigarettes contained nicotine or not. In addition, most of the participants were not sure whether FDA approved cessation of e-cigarettes (60%) or not. Furthermore, the vast majority of the participants (75.7%) were aware that e-cigarettes were normally reusable, and 100 (19.7%) declared that e-cigarettes did not produce second hand smoke. Moreover, 397 (87.3%) and 307 (60.6%) knew that e-cigarettes cause addiction and cannot be sold legally in Thailand, respectively (Table 2).

Results of chi-square test indicated that those participants who were not smokers were aware that smokes from e-cigarette was not caused by burning (p= 0.12). Further, smokers or ex-smokers had a low knowledge that e-cigarette contained nicotine (p = 0.000), and logistic analysis results confirmed that non-smokers were 2.351 time more aware than smokers / ex-smokers about this issue that e-cigarettes contains nicotine (Table 3). Moreover, according to Table 3, non-smokers knew that e-cigarette could not be sold in Thailand legally (p= 0.008).

Attitude towards the harmful effects of e-cigarette

Approximately, 228 (44.9%) of the participants agreed that e-cigarettes were less harmful to health and 275 (54.2%) agreed that e-cigarette produced less second-hand smoke when compared to regular cigarette. In addition, only 147 (28.9%) accepted the fact that e-cigarette could cause addictions and 154 (30.3%) replied that e-cigarette helped to cigarette cessation. Further, 218 participants (42.9%) agreed to switch to e-cigarette and 75 ones (14.7%) declared that e-cigarette made smokers looked cooler and more acceptable by the society. Regarding the cost, the vast majority of participants (83%) disagreed about the fact that e-cigarettes would save more money than smoking cigarettes when it came to long term smoking. On the other hand, 447 participants (88.1%) agreed tha,t similar to regular smoking, e-cigarette was prohibited in public areas.

About 82.9 % of non-smokers agreed that e-cigarette was less harmful to health, and 85.1% agreed that e-cigarette produced less second-hand smoke than cigarettes (p< 0.00) (Table 4). On the other hand, the majority of non-smokers (90.3%) disagreed that e-cigarette caused addiction less than cigarettes and 93.5% of them also disagreed that e-cigarette helped in cigarette cessation (p <0.05). Logistic regression results showed

Table 1. Socio-demographic Characteristics of the Study Participants (n= 507)

Variables		N (%)
Gender	Females	379 (74.8)
	Males	128 (25.2)
Age	Mean 20.63 (SD 0.09112)	
	16-19	199 (39.3)
	20-24	299 (59)
	≥ 25	9 (1.8)
Enrolment Year	Year 1 and 2	302 (59.6)
	Year 3 and 4	135 (26.6)
	Year 5 and 6	70 (13.8)
University Location	Southern Thailand	287 (56.6)
	Central Thailand	98 (19.3)
	Northern Thailand	122 (24.1)
Monthly Income	< 10,000 BTH	429 (84.6)
	10,000 – 20, 000 BTH	68 (13.4)
	> 20,000 BTH	10 (2)
Have you ever heard of e-cigarette?		
	Yes	500 (98.6)
	No	7 (1.4)
How did you get familiar with e-cigarette?		
	Friends	368 (72.6)
	Family	37 (7.3)
	Lovers	40 (7.9%)
	Teachers	159 (31.4)
	Social media	368 (72.6)
Have you ever been taught about e-cigarettes cessation through your university curriculum?		
	Yes	130 (25.6)
	No	377 (74.4)
Do you smok?		
	Yes / Ex-smoker	62 (12.2)
	No	445 (87.8)
Do people around you smoke?		
	Yes	349 (68.8)
	No	158 (31.2)
Do you drink alcohol?	No	177 (34.9)
	Yes	330 (65.1)

that non-smokers were 2.26 times more likely to be aware that e-cigarette helped to cigarette cessation (Table 3). Approximately, 79.8% of non-smokers accepted to switch to e-cigarettes and 80% also agreed that e-cigarette could make smokers look cooler and more acceptable by the society when compared to regular smoking. Furthermore, 80.4% of non-smokers declared that e- cigarettes do not give a bad scent and logistic regression showed that non-smokers were 3.4 times significantly more likely to agree that e- cigarettes may not cause a bad sent (Table 4). Moreover, only 23.3% of smokers/ex-smokers agreed that e- cigarettes may cause dark lips, yellow teeth when compared to normal cigarettes ($p < 0.05$). Finally, non-smokers were 3.9 times more likely that smokers/ex-smokers to disagree that E-cigarette should be legal and possess able the same as cigarettes ($p < 0.05$), (Table 4).

Factors associated with increased prevalence of e-cigarettes

The chi-square and binary logistic regression analysis indicated that e-cigarette smoking was significantly and positively related to female gender (AOR 2.88. % CI: 1.599-5.214), decreased age (AOR 0.223 .% CI: 0.33-1.510), academic year (AOR 4.5% CI: 1.412-14571), and alcohol consumption (AOR 18.25% CI: 4.349-76.602).

Furthermore, the results of chi-square test revealed that monthly income could be a determinant of increased use of e-cigarette (p 0.05). On the hand, it was found that university location did not have any significant association with e-cigarettes status (Table 5).

Table 2. Smoking Status of the Participants (n =507)

		(%)
Smoke of E-cigarettes is not caused by burning.	Incorrect	63 (12.4)
	Correct	227 (44.8)
	Not sure	217 (42.8)
E-cigarettes solution does not consist of nicotine.		
	Incorrect	63 (12.4)
	Correct	280 (55.2)
	Not sure	164 (32.3)
E-cigarettes are approved by FDA for smoking cessation.		
	Incorrect	107 (21.1)
	Correct	96 (18.9)
	Not sure	304 (60)
E-cigarettes are normally reusable.		
	Incorrect	16 (3.2)
	Correct	384 (75.7)
	Not sure	107 (21.1)
E-cigarettes do not produce second-hand smoke.		
	Incorrect	100 (19.7)
	Correct	237 (46.7)
	Not sure	170 (33.5)
E-cigarettes does not cause addiction .		
	Incorrect	27 (5.3)
	Correct	397 (87.3)
	Not sure	83 (16.4)
E-cigarettes can be sold legally in Thailand.		
	Incorrect	49 (9.7)
	Correct	307 (60.6)
	Not sure	151 (29.89)

Discussion

This study was a pioneer in evaluating factors related to knowledge, perceptions, and attitudes towards e-cigarettes among pharmacy students. The participants were selected from 14 universities in Thailand. Similar to a previous study (Aghar et al., 2020), almost all the participants (98.6%) were aware of e-cigarettes. However, in our setting, the level of knowledge regarding e-cigarettes was low. The government of Thailand has prohibited the sale and distribution of e-cigarettes since 2015 primarily to protect teenagers from addictive behaviours (Patanavanich and Glantz, 2020). The persistent low use of e-cigarettes among the participants of this study may be due to the prohibition as consumption of e-cigarettes was not statistically different from the prevalence found in the 2015 report. Gravely et al., (2014) and Gravely et al., (2019) also found that the change in incidence of e-cigarette consumption was extremely slow in nations where the e-cigarettes were prohibited than in nations where the e-cigarettes were permitted. Furthermore, the majority of the participants (72.6 %) in this study got acquainted with e-cigarettes mainly by friends and social media and by teachers (31.4 %). Our results were compatible with previous research on e-cigarette users done in Lebanon (Aghar et al., 2020) and Georgia (Berg et al., 2014), in which the majority of the participant reported that they got familiar with e-cigarettes by friends and social media (Berg et al., 2014). However, our findings differed from other studies which found that social media was the most popular information source about e-cigarettes (Al-Sawalha et al., 2021). These discrepancies could be attributed to family influence and friends' support , both of which are more prevalent among the younger generation. The finding of this study revealed that less than half of the participants (44.8%) believed that e-cigarettes was not caused by burning, while mostly thought that e-cigarette contained nicotine. About 60%of the participant were not sure whether e-cigarette was approved for smoking cessation by FDA or not. In addition, two third of the participants (75.7%) thought that e-cigarettes were normally reusable. In addition, 19.7 % of the participants assumed that e-cigarettes did not produce second-hand smoke and 87% of the participants declared that e-cigarettes could cause addiction. These findings contradicted with another study conducted by Fang et al., (2022) in China who indicated that only 42% of the participants believed that e-cigarette contained nicotine and 66% thought that e-cigarette was addictive. On the other hand, out finding was in consistent

Table 3. Perception and Knowledge about E-cigarettes with Respect to Smoking Status (n = 507)

		E-Cigarette Smoking Status n (%)				
		No (%)	Yes / Ex-smokers (%)	P-value	B	AOR (95% CL)
The smoke from e-cigarettes is not caused by burning.	Incorrect	50 (79.4)	13 (20.6)	0.012*		
	Correct	195 (85.9)	32 (14.1)			
	I am not sure	200 (92.2)	17 (7.8)			
E-Cigarette solution does consist of nicotine.	Incorrect	60 (95.2)	3 (4.8)	0.000*		Reference
	Correct	224 (80)	56 (20)		0.876	2.4 (0.467-12.333)
	I am not sure	445 (87.8)	62 (12.2)		2.351	10.494 (3.130-35.181)
E-Cigarettes are approved by FDA for smoking cessation.	Incorrect	91 (85)	16 (15)	0.347*	2.596	
	Correct	88 (91.7)	8 (8.3)			
	I am not sure	266 (87.5)	38 (12.5)			
E-cigarettes do not produce second-hand smoke.	Incorrect	82 (82)	18 (12.2)	0.085*		
	Correct	208 (87.8)	29 (12.2)			
	I am not sure	155 (91.2)	15 (8.8)			
E-cigarettes do not cause addiction.	Incorrect	22 (81.5)	5 (18.5)	0.216*		
	Correct	346 (87.2)	51 (12.8)			
	I am not sure	77 (92.8)	62 (12.2)			
E-cigarettes can be sold legally in Thailand.	Incorrect	42 (85.7)	7 (14.3)	0.008*		
	Correct	260 (84.7)	47 (15.3)			
	I am not sure	143 (94.7)	8 (5.3)			

Notes, *Significant at P ≤ 0.05. P value based on chi-square or Fisher Exact test.

with a study conducted in Lebanon which revealed that the majority of the participants were sure that e-cigarette contained nicotine (Aghar et al., 2020).

In contrast to studies conducted in New Zealand (Wamamili et al., 2018) and Malaysia (Goh et al., 2017), our investigation reported participants' lower level of awareness and knowledge about e-cigarettes. In our study, the majority of smokers and ex-smokers disagreed about whether it is legal to use e-cigarette or not. According to a logistic regression analysis results, the participants who agreed with the legislation were 3.9 times more likely than non-smokers to be aware of e-cigarettes. Furthermore, the majority of the participates were unsure about whether the smoke from e-cigarettes was caused by burning. Furthermore, we found that non-smokers were more aware of the content of e-cigarettes than smokers / ex-smokers. They had enough information about e-cigarette substances. This result was similar to studies conducted in Philippine (Palmes et al., 2021) and USA (Arrazola et al., 2015).

Gender differences were discovered to be a significant factor affecting e-cigarette use. Female participants were found to be 2.8 times more knowledgeable towards e-cigarette than males. This finding was in agreement with another study reporting that female participants had significantly higher knowledge on e-cigarettes than the male (Nurul 'Izzati et al., 2016). Our results; however, contradicted with two other previous studies by Jaafar et al., (2021) and Ghazal et al., (2016) who reported that young females had a poor understanding of smoking habits. This difference in findings is most likely due to variation in the perception of risk and threat behaviour (Reniers et al., 2016). It could also be attributed to the gender differences regarding perception and practice of risk-taking behaviour (Reniers et al., 2016).

Most of the participants in this analysis were between the age of 20 and 24, with a mean age of 20.63. Similarly, Goniewicz et al., reported that e-cigarette consumers were often young people (Goniewicz et al., 2013). Since e-cigarette is a recently developed equipment, the young generation is more interested in adhering to it. Our data showed a significantly increased use of e-cigarette among the participants at the senior level compared to those at junior levels. In contrast, studies conducted among health and non-health students in France (Wamamili et al., 2010) and Spain (Tavolacci et al., 2016) found a decrease in e-cigarette use among senior students.

We also found that the participants who used to drink alcohol were 18.2 times more likely to use e-cigarette than non-alcohol consumers. This finding was supported by a meta-analysis done by Rothrocket al., (2020), who showed that alcoholic consumers were more likely to use e-cigarettes than non- alcoholic consumers. According to findings of a study by Frie et al., (2021), using e-cigarettes increased alcohol dependence and directly led to harmful consequences and excessive drinking. Compared to e nonusers, e-cigarette users had a higher risk of developing problematic alcohol usages, such as alcohol misuse, disease-related to alcohol use, and excessive alcohol drinking (Frie et al., 2021).

Despite e-cigarette ban in Thailand since 2015, the number of vapers has increased substantially. There has been a dearth of research on the factors associated with e-cigarette knowledge and attitudes among students. In this cross-sectional study, it was found that e-cigarette use was significantly associated with male gender and senior

Table 4. Attitude about E-cigarettes with Respect to Smoking Status (n = 507)

		E-Cigarette Smoking Status n (%)				
		No (%)	Yes / Ex-smokers (%)	P-value*	B	AOR (95% CL)
E-cigarette is less harmful to health than cigarettes.	Disagree/neutral	256 (91.8)	23 (8.2)	0.002		
	Agree	189 (82.9)	39 (17.1)			
E-cigarette produces less second-hand smoke than conventional cigrettes.	Disagree/neutral	211 (90.9)	21 (9.1)	0.045		
	Agree	234 (85.1)	41 (14.9)			
E-cigarette causes addiction less than conventional cigarettes.	Disagree/neutral	325 (90.3)	35 (9.7)	0.007		
	Agree	120 (81.6)	27 (18.4)			
E-cigarette helps cigarette cessation.	Disagree/neutral	330 (93.5)	23 (6.5)	0		Reference
	Agree	115 (74.7)	39 (25.3)		0.8	2.266 (1.1-4.6)
Switching to e-cigarettes is better than lifelong cigarette smoking.	Disagree/neutral	271 (93.8)	18 (6.2)	0		
	Agree	174 (79.8)	44 (20.2)			
E-cigarette makes smokers look cooler and more acceptable by the society than conventional cigarettes.	Disagree/neutral	385 (89.1)	47 (10.9)	0.026		
	Agree	60 (80)	15 (20)			
E-cigarette smoke has a better colour, smell, and taste than a conventional cigarette smoke.	Disagree/neutral	160 (97)	5 (3)	0		
	Agree	285 (83.3)	57 (16.7)			
E-cigarettes do not have a bad scent.	Disagree/neutral	264 (96)	11 (22)	0		Reference
	Agree	181 (78)	51 (22)		1.2	3.4 (1.58-7.4)
E-cigarettes cause dark lips and yellow teeth less than conventional cigarettes.	Disagree/neutral	281 (92.7)	22 (7.3)	0		
	Agree	164 (80.4)	40 (19.6)			
E-cigarettes will save more money than conventional cigarettes when it comes to long-term use.?	Disagree/neutral	379 (90)	42 (10)	0.001		
	Agree	66 (76.7)	20 (23.3)			
E-cigarette should be legal and possess able the same as cigarettes?	Disagree/neutral	262 (96.3)	10 (3.7)	0		Reference
	Agree	183 (77.9)	52 (22.1)		1.36	3.9 (1.8-8.5)
E-cigarette, as the same as smoking, is prohibited in public areas.	Disagree/neutral	60 (85.7)	10 (14.3)	0.572		
	Agree	385 (88.1)	62 (6.2)			

Notes, *Significant at P ≤ 0.05. P value based on chi-square or Fisher Exact test.

Table 5. Determinants of Knowledge about E-cigarettes Smoking (n = 507)

		E-Cigarette Smoking Status n (%)		
		No (%)	Yes / Ex-smokers (%)	B - AOR (95% CL)
Gender	Females	347 (91.6)	32 (8.4)	Reference
	Males	98 (76.6)	30 (23.4)	2.888 (1.599-5.214)
Age	16-19	188 (94.5)	11 (5.5)	Reference
	20-24	250 (83.6)	49 (16.4)	0.223 (0.33-1.510)
	≥ 25	7 (77.8)	2 (22.2)	0.709 (0.121-4.172)
Enrolment Year	Year 1 and 2	269 (89.1)	33 (10.9)	Reference
	Year 3 and 4	110 (81.5)	25 (18.5)	4.5236 (1.412-14.571)

year. Furthermore, we found that the participants who stated that they were unsure whether or not e-cigarette contained nicotine were 10.5 times more likely to use e-cigarettes. Accordingly, new strategies for raising awareness of university students about e-cigarette is suggested .

Study strengths and limitations

The inclusion of the entire college student population with a varied age group can be addressed as one of the strengths of this study, making possible the generalizability of findings to other population. One of the limitations of this study was the use of a cross-sectional design since it prevented the researchers to detect the causes of e-cigarette use and its contributing factors.

The findings were relied on self-reported information, which may lead to reporting errors. Another limitation was that we used a retrospective self-reported item about e-cigarettes, which was less rigorous than prospective ones. Furthermore, because the threshold for e-cigarette use was not determined, explanations about whether e-cigarette use was “favourable” or “unfavourable” from

the standpoint of community health were limited.

Overall there is a need for cessation of e-cigarettes as well as conventional cigarettes because of uncertainty about long-term e-cigarette health risks. Misconceptions can lead to incorrect counselling for e-cigarette use. Hence, we suggested the inclusion of courses on e-cigarette in the pharmacy curricula given the importance of awareness about e-cigarette side effects on preventing its use.

In conclusion, Based on the findings of current study, pharmacy students had little knowledge about e-cigarettes. Nonetheless, given the social influence and importance of vaping and e-cigarettes , they should be well versed. However, our research found that female senior pharmacy students had more information about e-cigarettes. Understanding about conventional cigarettes and their negative consequences on health, including e-cigarettes and other types of smoking products, must be imparted in universities, as most people have begun their behaviour patterns since high school. To develop a healthy society, public awareness of e-cigarettes should be increased. The government should enact regulations to decrease the use of e-cigarettes

Author Contribution Statement

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Acknowledgments

The authors would like to thank all of the participants for their assistance and generosity in collecting data.

Ethical Approval

The work was approved by the Human Research Ethics Committee of Walailak University (WUEC-21-324-01).

Availability of data

All data are available upon request from the first author.

Conflicts of interest

The authors declared no conflicts of interest for this article.

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