ORIGINAL ARTICLE

Perceptions and Perspectives on Electronic Cigarette among Non- and Health Care Professionals - Implications for Public Health Policy

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Background: Electronic (e-)cigarettes have become an undermining factor for tobacco control in Thailand, particularly among youth. Healthcare professionals are expected to provide knowledge and promote healthy behavior, but information regarding e-cigarettes is somewhat conflicting, unavailable and subjective.

Objective: The present study aimed to gain insight regarding perceptions and perspectives on e-cigarettes and their use in society to determine whether there were any difference in perceptions and perspectives among healthcare and non-healthcare professionals.

Materials and Methods: This observational study was conducted among Thai adults aged >18 years stratified by occupation into non- and healthcare professionals using an internet-based questionnaire developed for the study. Data regarding demographic characteristics, perceptions about e-cigarettes and perspectives on e-cigarettes use were collected. The participants were classified into professional groups based on occupation and perceptions. The perspectives data was compared using Chi-square tests. The p-value of <0.05 was used to indicate statistical significance.

Results: A total of 500 participants (296 women, 59.2%) with age mean ± SD of 30.49±12.6 years were included. Healthcare professionals comprised 26.2% of participants. Tobacco smoking and e-cigarette use were reported in 15.6% and 13.6% of respondents, respectively. The majority of participants perceived harm and risks posed by e-cigarettes to be similar to those generally perceived for tobacco smokers. The healthcare professionals perceived and viewed e-cigarettes relatively similar to non-healthcare professionals except for some aspects, such as health harm and the factors that influence e-cigarette use behavior.

Conclusion: Perception and perspectives on e-cigarette use were, in general, similar to already notable perceptions about tobacco. Much of the uncertainty in perspectives could be attributable too limited official information and lack of educational programs provided in Thailand. Healthcare professionals did not possess different perceptions or perspectives on e-cigarettes from other occupations. Therefore, development of formal educational programs for healthcare professionals and the population at risk of using e-cigarette is urgently needed.

Keywords: E-cigarette; Perception; Perspective; Tobacco smoking; Healthcare professional; Health risk

Received 21 June 2024 | Revised 12 August 2024 | Accepted 24 September 2024

J Med Assoc Thai 2024;108(Suppl.1):S87-97

Website: http://www.jmatonline.com

Tobacco use remains as one of the major public health threats globally, as a leading cause of preventable death and accounts for more than 8 million deaths annually. Further, approximately 1.2 million non-smokers lost their lives as a result of being exposed to secondhand smoke[1]. Tobacco smoke is a known cause of various diseases and morbidities including cardio- and cerebrovascular disease, chronic obstructive pulmonary disease, respiratory tract infections, diabetes, osteoporosis, reproductive dysfunction and has associated factors for many other conditions such as rheumatoid arthritis and tuberculosis[2]. According to the National Statistical Office of Thailand, more than 70,000 deaths in 2021 were caused by smoking[3].

With the introduction of MPOWER, a technical policy package provided by the World Health Organization (WHO), which represents 6 key strategies to facilitate the national-level reduction of tobacco consumption including monitoring tobacco use, protecting people from tobacco smoke, offering help to quit tobacco use, warning about the dangers of tobacco, enforcing bans on tobacco advertising

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How to cite this article:

Ittiphisit S, Boonchuay N, Thuncharoon P, Kunanupatham P, Jessadavanis P, Silairatana S. Perceptions and Perspectives on Electronic Cigarette among Non- and Health Care Professionals - Implications for Public Health Policy. J Med Assoc Thai 2025;108(Suppl.1):S87-97.

DOI: 10.35755/jmedassocthai.2025.S01.S87-S97

and raising taxes on tobacco in 2008, many countries have experienced declines in smoking prevalence along with reducing the incidence of secondhand smoke-related diseases among non-smokers[4]. However, the decrease in prevalence was observed mostly, if not all in high-income countries, while the opposite trends were observed in low- and middle-income countries where more than 80% of the world's users live[5]. Over the years, Thailand has implemented several tobacco control measures aimed at reducing smoking rates and related mortality. These measures include increasing taxes on tobacco products, implementing smoke-free policies in public spaces, banning tobacco advertising and promotion, and implementing graphic health warnings on cigarette packaging. With the adoption of MPOWER, Thailand is widely seen as a global leader in tobacco control with the strong tobacco control policies such as the MPOWER package recommended by the WHO[6]. According to data from the WHO and National Health survey data, the prevalence of tobacco use among adults (age 15 years or older) has been decreasing yearly since 1991. Specifically, prevalence decreases from 19.5% in 2019 to 18.7% in 2020 with a decreased proportion of male smokers but no change in female population[7,8]. However, it should be noted that the decreasing trend observed did not apply to the younger population. In many countries, including Thailand, the population aged 13 to 17 years of age is poorly covered by national health survey data. The trend in cigarette usage among youths has not followed those observed among adults. In a series of survey research titled Global Youth Tobacco Survey which was conducted among people aged 15 years or less in 2005, 2008, and 2015, respectively found that the prevalence of tobacco use increased from 11% in 2005 and 2009 to 15% in 2015[9]. Another nationally representative survey reported that between 2005 and 2008 the prevalence of cigarette smoking increased from 12% to 18.5% of students aged 13 to 15 years. Interestingly electronic cigarettes or e-cigarettes have emerged for the first time as a tobacco product currently used by adolescents with a prevalence of 3.3%[10].

E-cigarette or electronic nicotine delivery system (ENDS) is probably one of the significant factors undermining the progress of tobacco control in many countries. Since their first introduction in China in 2003, e-cigarette had evolved into devices of different shapes and forms, from a disposable or rechargeable e-cigarette lookalike to a modifiable tank-style or, even less conspicuous, USB-like device or as popular comic or console-game characters. These devices have become particularly popular among teens and young adults, probably because the devices are more acceptable socially, can be used discreetly, sleek and customizable design, user-friendly function, provide a less aversive smoking experience and a have vast amount of flavor options[11]. With ever increasing availability and being promoted as a socially acceptable, safer alternative to cigarette, the prevalence of e-cigarette use is recently risen. According to the Global School-based Student Health Survey, the use of e-cigarettes among school children (aged 13 to 15 years) in Thailand has increased in recent years from 3.3% in 2015 to between 7.2 to 9.5% in 2021[12-14].

Evidence from various studies indicate that individuals who use e-cigarettes tended to express more positive beliefs towards e-cigarettes than non-users[15]. The positive attitude may be attributable to claims about e-cigarettes as a safer alternative to tobacco cigarettes, conferring a lower risk of adverse health conditions such as cancer or its usefulness as an aid for smoking cessation. Perceptions about e-cigarette in terms of safety, potential harm and health risk among people in society and their viewpoints on using e-cigarette therefore could be a very important factor for the development and maintenance of e-cigarette use behavior.

Healthcare professionals (HCPs) are expected to advocate for the best interest of their patients by screening their health risk behavior, assessing its significance, counseling and supporting behavioral changes as needed and educating to increase awareness. To achieve these tasks, HCPs need to clearly understand the topic so that any misunderstanding or misconception can be corrected. Their perspectives on the issue can also influence what and how the information will be delivered and perceived by patients. To date, there is very limited information regarding the perception and perspectives on e-cigarette among HCPs. This study aimed to gain knowledge about the perceptions & perspectives among HCPs and determine whether they are different from those non-HCPs in Thailand.

Materials and Methods

Study design and participants

The present study was a cross-sectional observational study conducted from August to December 2020 in Thailand to collect data regarding perceptions about and perspectives on e-cigarettes among non- and HCP using an electronic questionnaire developed specifically for the study. Respondents of the survey were 18 years of age and over, able to understand Thai language used in the questionnaire, have Thai nationality and currently reside within the country. The sample size required to be representative of the general population was calculated using data from previous study. With the estimated prevalence of 50% and type I error of 0.05, a total of 384 respondents would be required. However, because the response rate was expected to be low due to the inherent characteristics of the study design, 30% of the initially obtained sample size was added to acquire the final collective number of 500 respondents.

Participants in the study were all voluntary and anonymous. By agreeing to respond in the questionnaire, each respective respondent was considered agreed to participate. The informed consent for participation in the study was waived in the light of involving no more than minimal risk to the participants. The study protocol was approved by the Institutional Review Board of Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand (COA No. 111/2563; dated Aug 20, 2020).

Study instrument

The structured questionnaire was developed by the authors specifically for the present study. The questionnaire consisted of 3 parts as follows: The respondent's demographic, perceptions about possible or known benefits and harms, and perspectives on e-cigarette use. Twelve questions regarding possible or known benefits and harms were generated based on current available evidence regarding potential harm, acclaimed benefits, known adverse effects and possible risks as well as some unclear issues. In the perspective section, 10 statements were used to inquire the respondents about their viewpoints on whether e-cigarettes should be used as a tobacco cessation aid or a tobacco replacement, social acceptability, as well as the possibility of potentially escalating to tobacco smoking.

All questions used in the questionnaire were tested for content validity by 3 independent experts (2 pulmonologists and a social science researcher). The question with a validity index of less than 0.7 was corrected and reviewed. The final validity index was 1.0 for all questions. The questionnaire reliability was determined using the test-retest reliability method in two groups: a group of 15 postgraduate medical residents which represented healthcare professionals and a group of 15 people which represented the general population. Both groups were not included in the study. The Cronbach's alpha coefficient for reliability was 0.774 and 0.795 for the perception and attitude questions, respectively which are considered acceptable as an instrument. The questionnaire was then constructed using Google Form and distributed via online network through different channels in order to reduce bias and increase diversity of participants from various platforms. These included sending invitations via e-mails, sharing invitation messages and a link to the questionnaire on social media platforms such as Facebook and Twitter (currently known as X), and posting an invitation to the study on the official webpage of the Department of Medicine, Faculty of Medicine Vajira Hospital.

Data collection

In addition to responses to the questionnaire, the following demographic data was inquired: gender, age, current area of residence, occupation, highest educational level, smoking status, sources of obtained information about e-cigarette, and the number of e-cigarette user in close contact.

Statistical analysis

Descriptive variables were analyzed and presented using frequency and percentage for categorical and ordinal variables, mean ± standard deviation (SD) for parametric continuous variables and median ± interquartile range (IQR) for non-parametric continuous variables. For comparison of independent continuous variables between two groups (HCPs vs. non-HCPs) were calculated using Student t-test or Mann-Whitney U-test. For comparison of categorical variables between two groups, Chi-square test was employed. Statistical significance for inference was based on the criterion of $p<0.05$. All collected data was analyzed using IBM SPSS Statistics for Windows version 29.0. (IBM, Armonk, NY, USA).

Results

Demographic characteristics of study sample

A total of 500 participants (296 women, 59.2%) with age mean±SD 30.49±12.6 years were included in the study. Most respondents resided in Bangkok (n=291, 58.2%) and central Thailand (n=81, 16.2%). The remainders were reported as residing in the Northeast, East, South, North and Western regions of the country. The occupations most reported included healthcare personnel (n=131, 26.2%), students (secondary school and college/university, n=131, 26.2%), service providers in private sectors (n=89, 17.8%), and government officers (80, 16%). Entrepreneurs, freelancers, retired persons, and unemployed individuals comprised about 14% of all respondents. Approximately two-thirds of respondents had an educational level of bachelor degree while 88 (17.6%) and 84 (16.8%) respondents reported to have a postgraduate degree and secondary school level, respectively (Table 1).

When respondents were grouped into non-HCPs and HCPs based on the report occupations, the majority of respondents (n=369, 73.8%) were in the non-HCP group. When demographic characteristics of these two groups were compared, there was no statistically significant difference between any of the variable studied with the exception of age, where in the non-HCPs group the average age (mean±SD) was significantly higher than in the HCPs group (31.9±13.6 vs. 26.5±7.8 years).

Of the total participants tobacco smoking and e-cigarette use were reported in 78 (15.6%) and 68 (13.6%) respondents, respectively. Among tobacco smokers, smoking duration between 1 to 5 years and 10 years or more were reported in 33% and 32% of respondents, respectively.

Table 1. Demographic characteristic of the study sample

Demographic variable	Total, (n=500)	HCP, (n=131)	Non-HCP, (n=369)	p value
Female gender (n, %)	296 (59.2)	52 (39.7)	152 (41.2)	0.764
Age (Mean ± SD)	30.49±12.6	26.5±7.8	31.9±13.6	<0.001
Region of residence				
Bangkok (n, %)	291 (58.2)	74 (56.5)	217 (58.8)	0.412
Central (n, %)	81 (16.2)	30 (22.9)	53 (14.3)	0.431
East (n, %)	33 (6.6)	5 (3.8)	28 (7.6)	0.680
West (n, %)	3 (0.6)	1 (0.8)	1 (0.5)	n/a
North (n, %)	23 (4.6)	7 (5.3	16 (4.3)	0.898
Northeast (n, %)	42 (8.6)	12 (9.2)	30 (8.1)	0.469
South (n, %)	25 (5.0)	2 (1.5)	23 (6.2)	0.229
Educational level				
Primary (n, %)	3 (0.6)	0 (0.0)	3 (0.8)	n/a
Secondary (n, %)	84 (16.8)	15 (11.5)	69 (18.7)	0.752
Diploma (n, %)	19 (3.8)	3 (2.3)	16 (4.3)	0.466
Bachelor degree (n, %)	306 (61.2)	93 (30.4)	213 (57.7)	0.984
Postgraduate (n, %)	88 (17.6)	20 (15.3)	68 (18.4)	0.852

For e-cigarette users, 52.9% of respondents report to have used e-cigarette between 1 to 5 years and 29% reported to use only occasionally and collectively less than one year. Regarding source of information about e-cigarette, about half of all respondents reported to obtain the information from internet and social media platforms, one-third reported to receive information from audiovisual media such as television or radio and 11.4% reported to get information from their family or peers. Only 5% of respondents reported to read the information from printed media (Table 2).

With regrouping into the HCPs and non-HCPs, the prevalence of tobaccos smoking in the HCPs was lower than the non-HCP (10.7% vs. 27.7%). However, the difference was not statistically significant. Among tobacco smokers in the non-HCPs, up to 8.9% reported to have been smoking for at least 5 years. For e-cigarette, 10.7% of HCPs and 14.6% of non-HCPs reported to have used e-cigarettes. No statistically significant difference between the groups regarding duration of usage was observed. Non-HCPs reported to have learned about e-cigarettes from people in close contact were significantly higher in proportion than the HCPs (12.2% vs. 9.2%, p=0.004).

Perceptions about e-cigarettes

Perceptions pertaining to perceived harm, risks and role as a tobacco smoking cessation option among all participants as well as when participants were grouped into HCPs and non-HCPs were summarized in Table 3. Regarding harm and risks, the majority of participants perceived that e-cigarette was harmful to health similar to tobacco smoke (n=306, 61.2%) and not a safer alternative to tobacco (n=346, 69.2%), could release heavy metal particle into vapor (n=234, 46.8%), increased risk of cancer (n=282, 56.4%), heart disease and stroke (n=266, 53.2%), and could result in addiction (n=360, 72%). When perception about a possible role in smoking cessation was asked, 49.2% of respondents recognized that e-cigarette contained nicotine and 61.2% did not consider e-cigarette to be a smoking cessation tool. Most respondents were also cognizant that e-cigarettes were banned in Thailand (n=371, 74.2). However, in some aspects such as whether PM2.5 was present in e-cigarette vapor, irritating to the airway more than tobacco or safer for pregnant women or children, the majority of participants responded as not sure or do not know (68.4%, 52.4% and 46.8%, respectively).

Perspectives on e-cigarette use

When participants were inquired to provide their viewpoints about using e-cigarettes and factors that might be associated with usage, the responses provided in some aspects were divergent. Most respondents (n=329, 65.8%) felt that the circulating information about e-cigarettes in society was on the positive side, which could encourage more people to use and did not agree that peers or people on social media influence e-cigarette usage behavior (n=304, 60.8%), with regard to e-cigarette use, 46.4% of respondents did not agree that e-cigarettes should be used as an alternative in persons who were not able or willing to quit. Further, 44.4% did not agree about the usage of e-cigarettes as a tool to aid smoking cessation process, and 41% reported that they were not sure if e-cigarette could help in reducing nicotine addiction, while the remaining felt either equivocal or agree. A small proportion (n=72, 14.4%) of respondents viewed that the looks and appeals of e-cigarettes influenced e-cigarette usage behavior, while others disagreed or viewed as ambivalent. Details about perspectives of the study

Table 2. Tobacco and e-cigarette-related exposure among HCPs and non-HCPs

Tobacco and e-cigarette-related variable	Total (n=500)	HCP (n=131)	Non-HCP (n=369)	p-value
Tobacco smoking				
Never (n, %)	422 (84.4)	117 (89.3)	305 (72.3)	0.569
At least once to 1 year (n, %)	12 (2.4)	2 (1.5)	10 (2.7)	0.067
1 to 5 years	26 (5.2)	5 (3.8)	21 (5.7)	0.698
5 to 10 years	15 (3.0)	5 (3.8)	10 (2.7)	0.464
10 years or more	25 (5.0)	2 (1.5)	23 (6.2)	n/a
E-cigarette use				
Never (n, %)	432	117 (89.3)	315 (85.4)	0.899
At least once to 1 year (n, %)	29 (5.8)	8 (6.1)	21 (5.7)	0.408
1 to 5 years	36 (7.2)	6 (4.6)	30 (8.1)	0.230
5 to 10 years	2 (0.4)	0 (0.0)	2 (0.5)	n/a
10 years or more	1 (0.2)	0 (0.0)	1 (0.3)	n/a
Information source about e-cigarette				
Social platform/internet (n, %)	251 (50.2)	57 (43.5)	194 (52.6)	0.810
Audiovisual media (n, %)	166 (33.2)	53 (40.5)	113 (30.6)	0.599
Printed media (n, %)	26 (5.2	9 (6.9)	17 (4.6)	0.484
Family/co-worker/peers (n, %)	57 (11.4	12 (9.2)	45 (12.2)	0.004
No. of e-cigarette users in close contact				
None	133 (26.6)	41 (30.8)	92 (24.9)	0.524
1 to 2 persons	196 (39.2)	51 (38.9)	145 (39.3)	0.883
3 to 4 persons	61 (12.2)	16 (12.2)	45 (12.2)	0.163
≥5 persons	110 (22.0)	23 (17.6)	87 (23.6)	0.649

participants were summarized in Table 4.

Comparisons between HCPs and non-HCPs

Data concerning perceptions and perspectives in participants was classified based on their occupations (HCP and non-HCP), in order to determine if any differences between the two groups existed. For perceptions, no statistically significant difference between the two groups for responses to all statements, except for one about the harm of e-cigarette vapor to children and pregnant women, where a significantly higher proportion of respondents in HCP group perceived that the vapor was harmful compared with the non-HCP (50.4% vs. 35.5%, p=0.002). When it comes to perspectives, a significantly higher proportion of respondents in non-HCP group agreed that e-cigarettes were easy to purchase and available both in shops and online (27.1% vs. 21.4%, p=0.032) but did not agree that the current information about e-cigarette favored usage (4.6% vs. 1.5%, p=0.028). The majority of HCPs respondents agreed that e-cigarette produced less secondhand vapor than traditional cigarette and were significantly higher than the non-HCP group. Further they disagreed that social media influencers and peers could influence e-cigarette use behavior (66.4% vs 58.8%, p=0.045).

Discussion

In recent years, the growing prevalence of e-cigarette users has underscored the increasing significance of these devices in public health worldwide, including Thailand. Despite being banned since 2014, e-cigarettes are never too far away from reach and as reported in a recent study, 66% of those who reported to regularly use e-cigarette reported to have purchased them from local or groceries stores[15]. While easy availability could be an aspect that encourages this health behavior, there could also other important factors such as attitudes towards e-cigarettes and what was learned or how people perceived about it might be useful to unravel this complex issue. The present study was set out to gain insight into perceptions and perspectives on e-cigarette among HCPs and to find out whether they were different from the non-HCP population.

In many countries e-cigarettes are allowed to be sold and used. However, regulations and restrictions regarding composition of nicotine-containing fluid mixture (called e-liquid), components and operation of the device, distribution, sale, and usage varies widely between countries. E-cigarettes are considered beneficial in certain aspects such as facilitating smoking cessation, reducing harm posed by tobacco products, controlling the amount of nicotine intake, and being a safer alternative to tobacco in persons who cannot quit smoking. Regarding the role in smoking cessation, a recent Cochrane systematic review and meta-analysis that looked into the effects of using e-cigarette as a smoking cessation found that nicotine containing

Table 3. Perceptions about e-cigarettes and health risk

Question/statement	All (n=500)	HCP (n=131)	Non-HCP (n=369)	p-value
1) Vapor from e-cigarette is harmful to health similar to tobacco smoke				
Yes	377 (75.4)	108 (82.4)	269 (72.9)	0.655
Not sure/Do not know	94 (18.8)	18 (13.7)	76 (20.6)	0.294
No	29 (5.8)	5 (3.8)	24 (6.5)	0.945
2) E-cigarette can be used as tobacco smoking cessation tool				
Yes	39 (7.8)	10 (7.6)	29 (7.9)	0.300
Not sure/Do not know	155 (31.0)	28 (21.4)	127 (34.4)	0.845
No	306 (61.2)	93 (71.0)	213 (57.7)	0.770
3) E-cigarette is a safer alternative option for tobacco cigarette				
Yes	59 (11.8)	15 (11.5)	44 (11.9)	0.200
Not sure/Do not know	95 (19.0)	20 (15.3)	75 (20.3)	0.811
No	346 (69.2)	96 (73.3)	250 (67.8)	0.661
4) E-cigarette can release heavy metal particle in vapor				
Yes	234 (46.8)	61 (46.6)	173 (46.9)	0.498
Not sure/Do not know	232 (46.4)	59 (45.0)	173 (46.9)	0.260
No	34 (6.8)	11 (8.4)	23 (6.2)	0.726
5) E-cigarette contains air pollutants such as PM2.5				
Yes	107 (21.4)	27 (20.6)	80 (21.7)	0.133
Not sure/Do not know	342 (68.4)	93 (71.0)	249 (72.8)	0.835
No	51 (10.2)	11 (8.4)	40 (10.8)	0.388
6) E-cigarette vapor is less irritating to the airway than tobacco smoke				
Yes	116 (23.2)	34 (26.0)	82 (22.2)	0.392
Not sure/Do not know	262 (52.4)	61(46.6)	201 (54.5)	0.877
No	122 (24.4)	36 (27.5)	86 (23.3)	0.759
7) E-cigarette are nicotine free device				
Yes	74 (14.8)	17 (13.0)	57 (15.4)	0.416
Not sure/Do not know	180 (36.0)	37 (28.2)	143 (38.8)	0.162
No	246 (49.2)	77 (58.8)	169 (45.8)	0.209
8) E-cigarette increases risk of cancer				
Yes	282 (56.4)	79 (60.3)	203 (55.0)	0.723
Not sure/Do not know	175 (35.0)	43 (32.8)	132 (35.8)	0.814
No	43 (8.6)	9 (6.9)	34 (9.2)	0.612
9) E-cigarette increases risk of heart disease and stroke				
Yes	266 (53.2)	90 (68.7)	176 (47.7)	0.9976
Not sure/Do not know	201 (40.2)	36 (27.5)	165 (44.7)	0.960
No	33 (6.6)	5 (3.8)	28 (7.6)	0.764
10) Addiction is unlikely with e-cigarette use				
Yes	53 (10.6)	10 (7.6)	43 (11.7)	0.947
Not sure/Do not know	87 (17.4)	19 (14.5)	68 (18.4)	0.448
No	360 (72.0)	102 (77.9)	258 (69.9)	0.962
11) E-cigarette is prohibited and illegal in Thailand				
Yes	371 (74.2)	98 (74.8)	273 (74.0)	0.701
Not sure/Do not know	87 (17.4)	24 (18.3)	63 (17.1)	0.464
No	42 (8.4)	9 (6.9)	33 (8.9)	0.146
12) Vapor from e-cigarette is harmless in children and pregnant women				
Yes	69 (13.8	16 (12.2)	53 (14.4)	0.329
Not sure/Do not know	234 (46.8)	49 (37.4)	185 (50.1)	0.947
No	197 (39.4)	66 (50.4)	131 (35.5)	0.002

Table 4. Perspectives about e-cigarette use

Question/statement	All (n=500)	HCP (n=131)	Non-HCP (n=369)	p value
1) E-cigarette is less harmful to health then tobacco smoke				
Agree	35 (7.0)	6 (4.6)	29 (7.9)	0.777
Not sure/Equivocal	136 (27.2)	25 (19.1)	111 (30.1)	0.476
Disagree	329 (65.8)	100 (76.3)	229 (62.1)	0.445
2) E-cigarette are available and easy to purchase (shop and online)				
Agree	128 (25.6)	28 (21.4)	100 (27.1)	0.032
Not sure/Equivocal	212 (42.4)	58 (44.3)	154 (41.7)	0.424
Disagree	128 (25.6)	45 (34.4)	115 (31.2)	0.344
3) Most current information about e-cigarette favors its use				
Agree	346 (69.2)	97 (74.0)	249 (67.5)	0.689
Not sure/Equivocal	135 (27.0)	32 (24.4)	103 (27.9)	0.517
Disagree	19 (3.8)	2 (1.5)	17 (4.6)	0.028
4) E-cigarette should be used as a smoking cessation aid				
Agree	85 (17.0)	19 (14.5)	66 (17.9)	0.364
Not sure/Equivocal	193 (38.6)	40 (30.5)	153 (41.5)	0.524
Disagree	222 (44.4)	72 (55.0)	150 (40.7)	0.362
5) For those who continues to smoke, e-cigarette should be offered instead				
Agree	141 (28.2)	44 (33.6)	97 (26.3)	0.558
Not sure/Equivocal	127 (25.4)	26 (19.8)	101 (27.4)	0.099
Disagree	232 (46.4)	61 (46.6)	171 (46.3)	0.467
6) E-cigarette can be used to reduce nicotine addiction				
Agree	113 (22.6)	29 (22.1)	84 (22.8)	0.536
Not sure/Equivocal	205 (41.0)	50 (38.2)	155 (75.6)	0.120
Disagree	182 (36.4)	52 (39.7	130 (35.2)	0.121
7) E-cigarette users are more likely to try tobacco cigarette later				
Agree	219 (43.8)	58 (44.3)	161 (43.6)	0.980
Not sure/Equivocal	182 (36.4)	46 (35.1)	136 (36.9)	0.086
Disagree	99 (19.8)	27 (20.6)	72 (19.5)	0.129
8) Looks and favors makes e-cigarette attractive for use				
Agree	72 (14.4)	16 (12.2)	56 (15.2)	0.558
Not sure/Equivocal	214 (42.8)	55 (42.0)	159 (43.1)	0.190
Disagree	214 (42.8)	60 (45.8)	154 (41.7)	0.162
9) E-cigarettes produce less secondhand smoke than traditional cigarettes				
Agree	266 (53.2)	90 (68.7)	176 (47.7)	0.031
Not sure/Equivocal	201 (40.2)	36 (27.5)	165 (44.7)	0.646
Disagree	33 (6.6)	5 (3.8)	28 (7.6)	0.326
10) Peers and social media influencers influence e-cigarette use behavior				
Agree	85 (17.0)	23 (17.6)	62 (16.8)	0.095
Not sure/Equivocal	111 (22.2)	21 (16.0)	90 (24.4)	0.110
Disagree	304 (60.8)	87 (66.4)	217 (58.8)	0.045

e-cigarettes increased quit rates when compared to other nicotine replacement therapies and e-cigarettes without nicotine[16,17]. Another umbrella review also reported that e-cigarettes may be beneficial for smokers who use them to completely and promptly quit smoking however it was not yet approved for use as a smoking cessation tool[18].

Despite claims as a safer alternative to the traditional cigarette and, in some countries, allowed to be used as a smoking cessation tool, the device and the e-liquid are not without risk. Several adverse effects caused or associated with e-cigarette have been reported including burning injuries[19], injuries due to device explosion[20,21], intentional and unintentional exposure to e-liquid[22], and inflammatory condition in the lungs termed e-cigarette or vaping-associated lung injury (EVALI) which had been reported about 3,000 cases in United States in 2020[23-25]. Recent studies have also shown that e-cigarettes users are 3 to 4 time as likely to begin using tobacco cigarette later,

known as "the gateway effect"[26,27]. Furthermore, because many liquid mixtures contain flavoring agents and other chemicals to make a more desirable experience, they are largely unregulated, with a toxic effect or the consequences of long-term exposure of these chemicals are unknown[28,29]. Therefore raising awareness and developing a clear understanding about e-cigarettes is critical to effectively reduce these risks and prevent the possible related adverse effects.

In the present study the majority of participants perceived that e-cigarettes were harmful to health in ways similar to tobacco cigarettes, namely increasing risk of cancer and heart disease, releasing metal particles into vapor and causing addiction. Most participants also realized that e-cigarettes were banned in Thailand despite being used in public. However, more than half of participants in the study reported that they did not know or were not sure about some aspects of e-cigarette such as whether e-cigarettes were nicotine-free, less irritating to the airway than tobacco smoke, or could release PM2.5 particulate matter into the air. Notably, the pattern of perception observed among participants somewhat resembled the perceived harm and risk associated with tobacco smoking. These perceptions might have been generalized from what the participants had learned about tobacco as it was known to contain nicotine, cause addiction, irritate the airway, and is associated with cardiovascular diseases. In Thailand this information was intensively campaigned, while very little information about risks related to e-cigarette was officially provided. The knowledge gap about the differences between these two was therefore inferred but at a lower level of confidence. Currently, data regarding cancer and cardiovascular risks related to e-cigarette remains uncertain[30]. Some studies reported that e-cigarettes could be a potential source of exposure to toxic metals (Cr, Ni, and Pb), and to metals that are toxic when inhaled (Mn and Zn)[31]. With regard to particular matters, including PM2.5, a few studies reported that particulate matters could be released from e-cigarette but generally in less amount when compared to tobacco[32].

Regarding overall perspectives on e-cigarette use among participants, the majority of respondents felt that the information available was rather encouraging for more people to use but did not agree that peers or people on social media influenced e-cigarette use behavior. While information about e-cigarettes can be searched and retrieved with ease, information provided in Thai language by authorities using various types of media, particularly as audiovisual media provided on social media platforms is still very limited. Since the internet and audiovisual media were the most common sources of information reported among participants, the information or marketing messages promoting e-cigarette use are more likely to be viewed and perceived. The limited information about e-cigarette use was also reflected by the finding that nearly half of all participants were unsure about the presence of nicotine in e-cigarettes and did not think that e-cigarettes could be used in smoking cessation despite the increasing evidence to support to the contrary. This finding emphasizes the importance of providing clear information to society so health behavioral change can be implemented and influenced successfully.

When participants were divided into HCPs and non-HCPs groups to look into their perceptions and viewpoints, HCPs perceived and viewed e-cigarettes relatively similar to those non-HCPs, excepts for some aspects such as health harm and factors that influence e-cigarette use behavior. This could be the result of various factors such as lack of knowledge, attitude towards the expected role of health advocates and the lack of clear and consistent public policies about e-cigarette to be implemented in society.

Lack of knowledge is likely the reason for the lower harm perception and uncertainty in some aspects regarding e-cigarettes. While knowledge about e-cigarette is increasingly important for both HCPs and non-HCPs a formal, systematic education about this topic remains lacking. In schools, education about e-cigarettes is usually provided in health classes and in school-wide assemblies where messages about punitive measures to discourage students from using are emphasized while information about health-related issues was inadequate or not mentioned at all[33]. In Thailand, education programs that focus on cigarette smoking and information about the risk of e-cigarettes is also limited.14 Likewise, in most health science schools very limited time is dedicated to educate and prepare their prospective healthcare professionals to be well-informed enough to provide the necessary information and confidently give their patients advice. The lack of difference in perception about e-cigarettes between HCPs and non-HCP in this study may imply that knowledge and information that might have been provided during the formal education period contributed very little to the perceptions and perspectives among HCPs. Furthermore, a recent study about factors associated with knowledge and attitude towards e-cigarettes among undergraduate pharmacy students found that 74.4% of participants had never heard of e-cigarettes[34]. These findings emphasize the importance of providing knowledge and information to prospective HCPs during their formal training years.

Attitudes among people in society is an important factor that results in different actions or reactions where e-cigarettes are concerned. As shown in the present study, family members, colleagues and peers contributed a significant proportion as a source of information about e-cigarette, particularly among the non-HCPs. This

finding might be explained by the social learning theory where perception and learning can occur by observing the behaviors of another person and imitation of observed behavior. Therefore perception, viewpoints and behaviors of the surrounding persons can be critical in shaping what an individual will think and behave[35]. A study about use of e-cigarettes among public health students in Thailand found that nearly half of those who reported to be current users had an attitude toward e-cigarette use as neutral and did not believing that the role of health advocate is expected or required for public health professionals[36]. Other studies in UK and Norway also found similar association where general practitioners who used cigarette or e-cigarette were less likely to give advice about smoking cessation to their patients[37,38].

Variations and differences in public health policy implemented in each country could be another reason that explain the perceptions and perspectives observed among participants in this study, particularly the HCPs. In many countries such as Germany[39], France[40], and the United Kingdom[41], e-cigarette usage was legalized and recommended in clinical practice to be an aid in smoking cessation, while in the United States and Australia e-cigarettes are allowed for use but not approved to be a smoking cessation tool. Additionally, public policy and regulations for e-cigarettes in different countries vary widely and because electronic nicotine delivery systems are banned in Thailand, no recommendation or information relating its used are available. HCPs in Thailand are faced with inconsistent or no information and unable to provide useful advice to their patients. The lack of difference in perceptions and perspectives between healthcare professionals and those in other fields implies that a formal educational program developed specifically for healthcare professionals is urgently needed.

To our knowledge the present study is the first to gain insight about the perceptions and perspectives on e-cigarettes among HCPs in addition to those obtained from other fields. Additionally, as a comparison pertaining perceptions and perspectives between HCPs and non-HCPs to determine whether differences between the two-group existed. Demographic characteristics of the study sample after being classified into the HCPs and non-HCP were similar except for age where all participants who reported to be in retirement were classified into the non-HCP group, therefore the results were less likely to be confounded. Limitations of the present study are including data collection process was carried out via internet only so individuals who have limited access to the internet or limited ability to use electronic equipment are not able to participate which results in some degree of underrepresentation. Even though demographic data such as area of residency and occupation were collected, further details about these particular variables could be useful for looking into an association between socioeconomic or geographic variables and e-cigarette smoking behavior. Finally, the questionnaire used in the present study was composed solely of statements with selected response therefore it could be rather compulsive for the respondents to choose only one response. Details about perception and perspectives might not be completely captured by the options provided. Qualitative studies that explore about why and how people in society choose to (or not to) use e-cigarettes may help identifying additional modifiable factors to increase control over usage and studies that look into what and how information about e-cigarettes should be provided to children and adolescents in order to prevent them from starting to use it. Needs assessment research may also help identifying the area of knowledge required for HCPs, which may be helpful in planning of healthcare professional training program or developing a curriculum in health science education.

Conclusion

In Thailand both healthcare professionals and people working in other fields perceived harm risks and how e-cigarette was used in a pattern relatively similar to what they perceived about tobacco smoke. For perspectives on e-cigarette use, most people in the society had ambivalent or uncertain attitude towards many aspects, which may be attributable to limited information or adequate educational programs provided in Thailand. Healthcare professionals did not have different perceptions or perspectives on e-cigarettes from those who work in other fields. Development of formal educational programs for healthcare professionals and populations at risk of using e-cigarette is urgently needed.

What is already known on this topic?

While the prevalence of tobacco smoking declined progressively in Thailand, an increasing prevalence of e-cigarette use during the past decade, particularly among adolescents and young adults which could undermine the success of tobacco control by way of gateway effect where e-cigarette use may escalate their use to tobacco later. In previous studies factors such as flavors and device appearance, as well as the presence of e-cigarette users in the family or close contact in association with initiation of use has been reported and perceptions about certain harms and risks have been explored. However, perceptions and viewpoints on e-cigarette use among healthcare professionals and whether they are different from people working other fields have not been previously determined.

What this study adds?

The present study provides an insight about what

healthcare professionals perceived and their attitude towards e-cigarette use with a comparison of those who are not in healthcare fields. Perception and viewpoints about most aspects of e-cigarettes among both HCPs and non-HCP were quite similar to what is known and perceived about tobacco smoke. While HCPs were expected to know more and have more informed attitudes towards e-cigarette as the role of health advocates, no significant difference in perception or perspectives between HCPs and non-HCPs was observed, which implies that the information provided by HCPs is less likely to have an impact on health behavior in patients.

Acknowledgements

The authors would like to thank Thongpitak Huabbangyang, Chunlanee Sangketchon, and Amornthep Polasuek for their suggestions regarding development and dissemination of the questionnaire, Thomas E. Grogan for his invaluable assistance as a proofreader of this manuscript.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declare no conflicts of interest.

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