

# Reasons for Using Electronic Cigarettes and Intentions to Quit Among Electronic Cigarette Users in Malaysia

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**Abstract** The rapidly increasing uptake of e-cigarettes in Malaysia as of late demands a study to identify factors leading to its increased popularity and user intentions to quit smoking e-cigarettes. A convenience sample of e-cigarette smokers visiting e-cigarette retail shops in Selangor and Kuala Lumpur was recruited. The majority of e-cigarette smokers were youth in colleges or universities (39 %), and young professionals and managers (36 %). The main reasons for using e-cigarettes were to help the user quit tobacco cigarettes (88 %), the perception that e-cigarettes are not as intrusive as tobacco cigarettes (85 %) and can be used in public areas (70 %), the perception that e-cigarettes are healthier than tobacco cigarettes (85 %), and its relatively lower cost compared to tobacco cigarettes (65 %). A total of 65.3 % of respondents expressed intentions to quit e-cigarettes. In a multivariate analysis, the respondents who earned monthly income of RM1000 or less were significantly more likely to intend to quit smoking e-cigarettes [OR 1.551; 95 % CI 1.022–2.355;  $p = 0.015$ ] compared to the respondents who earned a monthly income of more than RM2000. The respondents who disagreed with the statement ‘Smoking e-cigs is relatively cheaper compared to tobacco cigarettes’ were significantly more likely to intend to quit smoking e-cigarettes [OR 1.548; 95 % CI 1.045–2.293;  $p = 0.027$ ] compared to

respondents who did not agree. e-cigarette preventive interventions should target areas related to the identified main reasons for using e-cigarettes, namely as an aid for quitting tobacco cigarettes, the perception that e-cigarettes are not as intrusive as tobacco cigarettes and can be used in public areas, the idea that e-cigarettes are healthier than tobacco cigarettes, and its relatively lower cost compared to tobacco cigarettes.

**Keywords** Electronic cigarette · Intention to quit · e-cig

## Introduction

The popularity of electronic cigarettes (e-cigarettes) in Malaysia has increased dramatically in recent years. Smoking e-cigarettes has become a common sight in public places in Malaysia, in addition to the thriving growth of shops selling e-cigarettes products. In the year 2012, a study reported that 61 % of Malaysian adults ( $\geq 18$  years old) were aware of e-cigarettes, 19 % ever tried using e-cigarettes and 14 % currently vape [1]. The Channel News Asia reported that the number of e-cigarette users, also known as ‘vapers’, in Malaysia may vary from 500,000 to 1 million as of 2015 [2].

The increased popularity of e-cigarettes, along with several deadly cases of e-cigarette explosions in mid-2014, has sparked a debate in Malaysia recently. Banning of e-cigarettes received strong reaction from smokers and traders. On 09 November 2015, Malaysia legislated that vaping will not be banned, but the sale of nicotine can only be done by pharmacists and medical practitioners [2]. The Ministry of Health Malaysia clarified in the press statement that ‘electronic vaping devices that contain nicotine will be referred to as electronic cigarettes (e-cigarette), while those

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**Table 1** Distribution of socio-demographic characteristics and e-cigarette practices (N = 429)

Details	N (%)
<b>(A) Socio-demographic data</b>	
Age group	
<25	256 (59.7)
≥25	173 (40.3)
Gender	
Male	401 (93.5)
Female	28 (6.5)
Marital status	
Single	352 (82.1)
Ever married	77 (17.9)
Ethnic	
Malay	360 (83.9)
Chinese	43 (10.0)
Indian	18 (4.2)
Other	8 (1.9)
Religion	
Islam	363 (84.6)
Buddhism	25 (5.8)
Hinduism	14 (3.3)
Christianity	22 (5.1)
Other	5 (1.2)
Education	
Secondary and below	100 (23.3)
Higher than secondary	329 (76.7)
Occupation	
Professional and managerial	156 (36.4)
Skilled/Non-skilled worker	101 (23.5)
Student	169 (39.4)
Unemployed	3 (0.7)
Monthly income	
≤RM1000	169 (39.4)
RM1000–2000	92 (21.4)
>RM2000	168 (39.2)
<b>(B) e-cigarette practices</b>	
Smoking status	
Non-regular smoker	97 (22.6)
Regular smoker	332 (77.4)
Daily/non-daily smoker	
Daily	343 (80.0)
Non-daily	86 (20.0)
Duration of smoking e-cigarettes	
<6 months	225 (52.4)
≥6 months	204 (47.6)
Expenses on e-cigarettes per month	
≤RM100	203 (47.3)
>RM100	226 (52.7)

One Malaysian Ringgit (RM) is equal to USD0.25

that do not contain nicotine will be known as ‘vape’ [3]. As of 01 January 2016, the states of Johor, Kelantan, Negeri Sembilan and Kedah in Malaysia prohibited sales of e-cigarettes, while other states still wait for more guidance over whether or not to regulate the habit [4].

Various studies have reported reasons for using e-cigarettes. Among the most common reasons for using e-cigarettes were the beliefs that e-cigarettes are healthier than is conventional tobacco [5, 6]. Studies have shown that many e-cigarette smokers assumed that because e-cigarettes do not rely on combustion or contain tobacco, they produce far fewer harmful constituents compared to regular cigarettes, and thus e-cigarettes are relatively less harmful [7, 8]. Several studies also reported that tobacco cigarette users that have experienced health deterioration due to tobacco smoking tended to switch to e-cigarettes, as they perceived smoking e-cigarettes to be healthier [5, 9, 10]. Many e-cigarette users appear to report that e-cigarettes can help conventional tobacco smokers reduce smoking, alleviate cravings for nicotine, and prevent relapse following smoking cessation [6]. Although the studies reveal that e-cigarettes help tobacco smokers quit smoking traditional cigarettes, the extent to which e-cigarettes help smokers quit is still unclear [11–13].

Cost appears to be another important reason that e-cigarettes are gaining more popularity compared to conventional tobacco. Many studies reported that one of the important reasons for the popularity of e-cigarettes is that electronic smoking is much cheaper compared to traditional cigarettes [7, 9]. Although the e-cigarette start-up cost relatively expensive, the liquid nicotine cartridges are far cheaper than tobacco cigarettes. In the long run, smoking e-cigarettes is cheaper [14]. Other reported reasons for using e-cigarettes are perceptions that smoking e-cigarettes is less intrusive to public [7, 15–17], curiosity about the new gadget [6, 17], enjoyment of the intricate flavours of e-cigarettes [18] and peer influence [6, 17].

Despite the rising popularity of e-cigarette use among Malaysian, there is little empirical research investigating reasons for e-cigarette use among Malaysian smokers. An empirical research finding on the reasons for e-cigarette use is important in order to correct any misperceptions and provide insight into approaches to e-cigarette smoking cessation interventions in Malaysia. Therefore, this study aimed to investigate reasons for smoking electronic cigarettes among e-cigarette users in Malaysia. Additionally, this study also aimed to investigate intentions to quit smoking electronic cigarettes among the current active users in Malaysia. Understanding who has the intention to stop using e-cigarettes would allow for distinguishing user types [6] and ultimately allowing any future public health campaigns to focus on this subtype of e-cigarette users.

## Methods

### Study Participants and Settings

This cross-sectional study was conducted between June and October 2015 at electronic cigarettes retail businesses in Selangor and Kuala Lumpur. First, permission from electronic cigarette retail shop owners was obtained to administer a survey to their customers who were e-cigarette users. A total of 12 retail outlets took part in the study and 429 e-cigarette users answered the survey. The University of Malaya Medical Ethics Committee approved this study and written informed consent was obtained from all respondents (MECID.NO:20148-456).

### Data Collection

Researchers approached e-cigarette users who presented themselves at the participatory e-cigarette retail shops. The researchers explained the purpose of the study and participation was voluntary. After participants had read and understood the study information sheet provided to them, written informed consent was obtained and they were given the self-administered questionnaire. A small token of appreciation was given to participants who completed the questionnaire.

### Study Questionnaire

The researchers developed a semi-structured questionnaire based on a literature review and discussion among the research team members. It was then pilot tested. The questionnaire consisted of 27 items divided into four sections.

The first section assessed the participants' socio-demographic background. The second section included six items that assessed participants' practices of using electronic cigarettes: e-cigarette smoking status, duration of smoking e-cigarettes, monthly expenditure on e-cigarettes, monthly expenditure on tobacco cigarettes, and amount of money saved since beginning the use of e-cigarettes. The third section included 15 items to determine the reasons for using e-cigarettes. The fourth section included two items to investigate the intention to quit e-cigarette smoking.

### Data Analyses

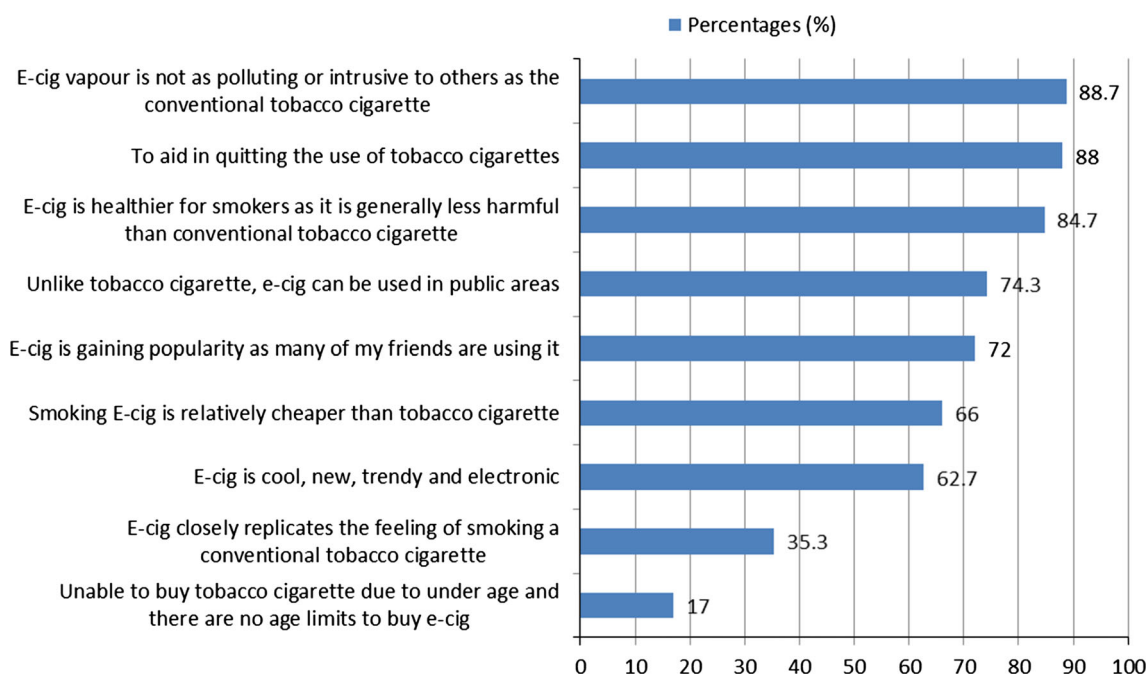
Chi squared and Fisher's exact test were used to examine univariate association between categorical characteristics and intention to quit e-cigarette. Significant associations ( $p < 0.05$ ) were entered into the binary logistic regression using the enter method to determine which characteristics

were associated to intention to quit e-cigarette. The Logistic regression model was used to examine the association between intention to quit and several outcome variables, adjusted odd ratio (OR) and 95 % confidence interval (95 % CI) were calculated.

## Results

Table 1 shows the socio demographic characteristics and e-cigarette practices among the respondents ( $N = 429$ ). The response rate was 71.5 %. Most of the respondents were less than 25 years of age ( $n = 256, 59.7 %$ ). The majority of the respondents were males ( $n = 401, 93.5 %$ ) and were single ( $n = 352, 82.1 %$ ). Most of the respondents were Malay ( $n = 360, 83.9 %$ ) and Muslims ( $n = 363, 84.6 %$ ). With regard to the distribution of educational levels, the majority had a tertiary education ( $n = 329, 76.7 %$ ). For the distribution of respondents by type of occupation, most of the respondents were students ( $n = 169, 39.4 %$ ) and from professional and managerial groups ( $n = 156, 36.4 %$ ). The majority of respondents reported having an average monthly income of RM1000 (One Malaysian Ringgit is equal to USD0.25) and below ( $n = 169, 39.4 %$ ). Of the total study sample, 77.4 % ( $n = 332$ ) were regular e-cigarette smokers. Out of 332 regular e-cigarette smokers, 49.7 % reported only smokes e-cigarettes, 37.3 % usually smokes e-cigarettes and occasionally smokes tobacco cigarettes, 11.1 % mostly smokes tobacco cigarettes and occasionally smokes e-cigarettes, and 1.8 % equally smokes both types of cigarettes. The majority of the respondents were daily smokers ( $n = 343, 80.0 %$ ). Nearly half of our study respondents had been smoking e-cigarettes for more than 6 months ( $n = 204, 47.6 %$ ). In terms of monthly expenses on e-cigarettes, most of the respondents spent more than RM100 ( $n = 226, 52.7 %$ ), but most also reported saving up to RM200 per month since beginning the use of e-cigarettes (53.2 %).

Most e-cigarette smokers in this study were young males under the age of 25 years, and were single with a tertiary education. The majority were students (39.4 %) and working in professional and managerial positions (36.4 %). Half of the respondents smoked both tobacco cigarettes and e-cigarettes. The majority of regular e-cigarette users who smoked on a daily basis were 25 years of age or older. Respondents working in professional and managerial positions were more likely to be daily ( $p < 0.05$ ) and regular smokers ( $p < 0.05$ ). A significantly higher proportion of respondents earning a monthly income of more than RM2000 were regular smoker (vs. non regular smokers,  $p < 0.01$ ) and smoked e-cigarettes daily (vs. non-daily,  $p < 0.05$ ).



**Fig. 1** Reasons for e-cigarette use (N = 429)

Figure 1 shows the distribution of respondents according to their reasons for using e-cigarettes. The majority of respondents reported using e-cigarettes as a way to quit smoking tobacco (87.9 %). In addition, some had the perception that its vapour is non-polluting or not as intrusive to others compared to conventional tobacco cigarettes (85.3 %). A total of 85.3 % respondents chose to use e-cigarettes due to the perception that e-cigarettes are healthier to smokers, as e-cigarettes are generally less harmful than are conventional tobacco cigarettes. Other reasons that the respondents use e-cigarettes were that, unlike tobacco cigarettes, e-cigarettes can be used in public areas (70.4 %), e-cigarettes are gaining popularity as many of an individual's friends are using them (68.5 %), smoking them is relatively cheaper compared to tobacco cigarettes (64.8 %) and e-cigarettes are cool, new, trendy and electronic (57.1 %). Less than half of the respondents used e-cigarettes due to the product's ability to closely replicate the feeling of smoking a conventional tobacco cigarette (35.3 %).

In all, 65.3 % of respondents expressed intentions to quit e-cigarette smoking in the future and 34.7 % of the respondents did not intend to quit. Table 2 provides the socio-demographic characteristics and e-cigarette practices, as well as the proportion of respondents that intended to quit smoking e-cigarettes. There was no significant statistical association between the respondents' intention to quit smoking e-cigarettes and the socio-demographic characteristics, e-cigarette practices and reasons for using e-cigarettes. In a multivariate analysis, the respondents

who earned a monthly income of RM1000 or less were significantly more likely to intend to quit smoking e-cigarettes [OR 1.551; 95 % CI 1.022–2.355;  $p = 0.015$ ] compared to the respondents who earned a monthly income of more than RM2000. The respondents who disagreed with the statement 'Smoking e-cigs is relatively cheaper compared to tobacco cigarettes' were significantly more likely to intend to quit smoking e-cigarettes [OR 1.548; 95 % CI 1.045–2.293;  $p = 0.027$ ] compared to respondents who did not agree.

## Discussion

The findings revealed that a surprisingly large number of e-cigarette smokers in this study were young college and university students. Of concern, teenagers and youths are more vulnerable to the deadly effects of smoking compared to adults. Adolescents who smoke were found to exhibit the onset of declining lung function, impaired lung growth, chronic coughing and wheezing during early adulthood [19]. Many may have the erroneous perception that young people have better tolerance to the adverse health impacts of smoking compared to adults. It is therefore important to deliver educational messages that inform youth that smoking at a young age is far more hazardous than smoking during adulthood.

Likewise, supporting the findings of many previous studies [6, 7, 11–13], our study revealed that the most

**Table 2** Intention to quit e-cigarette smoking and its associated factors (n = 429)<sup>a</sup>

	Overall (N = 429), N (%)	Intend to quit e-cigarette, n (%)		Logistics regression Adjusted odds ratio (95 % CI) for intending versus not intending to quit smoking e-cigarettes
		Yes N = 280 (65.3 %)	No N = 149 (34.7 %)	
<b>(A) Socio-demographics</b>				
Age group (years old)				
<25	256 (59.7)	174 (68.0)	82 (32.0)	1.341 (0.931–1.932)
≥25	173 (40.3)	106 (61.3)	67 (38.7)	Reference
Gender				
Male	401 (93.5)	262 (65.3)	139 (34.7)	1.047 (0.507–2.162)
Female	28 (6.5)	18 (64.3)	10 (35.7)	Reference
Marital status				
Single	352 (82.1)	229 (65.1)	123 (34.9)	1.054 (0.656–1.693)
Ever married	77 (17.9)	51 (66.2)	26 (33.8)	Reference
Religion <sup>a</sup> (n = 424)				
Islam	363 (85.6)	243 (66.9)	120 (33.1)	1.402 (6.40–3.070)
Buddhism	25 (5.9)	14 (56.0)	11 (44.0)	0.881 (0.315–2.468)
Hinduism	14 (3.3)	9 (64.3)	5 (35.7)	1.246 (0.358–4.339)
Christianity	22 (5.2)	13 (59.1)	9 (40.9)	Reference
Education level				
Secondary and lower	100 (23.3)	61 (61.0)	39 (39.0)	0.786 (0.518–1.192)
Above than secondary	329 (76.7)	219 (66.6)	110 (33.4)	Reference
Occupation <sup>a</sup> (426)				
Professional and managerial	156 (36.6)	102 (65.4)	54 (34.6)	0.911 (0.599–1.387)
Skilled/Non-skilled worker	101 (23.7)	63 (62.4)	38 (37.6)	0.800 (0.501–1.276)
Student	169 (39.7)	114 (67.5)	55 (32.5)	Reference
Income				
≤RM1000	169 (39.4)	121 (71.6)	48 (28.4)	1.551 (1.022–2.355) <sup>a</sup>
RM1001–RM2000	92 (21.4)	55 (59.8)	37 (40.2)	0.915 (0.574–1.458)
>RM2000	168 (39.2)	104 (61.9)	64 (38.1)	Reference
<b>(B) e-cigarette practices</b>				
Smoking status				
Non-regular smoker	97 (22.6)	68 (70.1)	29 (29.9)	1.327 (0.847–2.080)
Regular smoker	332 (77.4)	212 (63.9)	120 (36.1)	Reference
Daily/non-daily				
Daily	343 (80.0)	221 (64.4)	122 (35.6)	0.829 (0.521–1.318)
Non-daily	86 (20.0)	59 (68.6)	27 (31.4)	Reference
Smoking status				
≤6 months	225 (52.4)	153 (68.0)	72 (32.0)	1.288 (0.897–1.850)
>6 months	204 (47.6)	127 (62.3)	77 (37.7)	Reference
Monthly expenditure				
≤RM100	203 (47.3)	137 (67.5)	66 (32.5)	1.205 (0.838–1.732)
>RM100	226 (52.7)	143 (63.3)	83 (36.7)	Reference
<b>(C) Reasons for e-cigarette (e-cig) use</b>				
e-cigs are healthier for smokers as it is generally less harmful compared to conventional tobacco cigarettes				
Yes	366 (85.3)	236 (64.5)	130 (35.5)	0.784 (0.460–1.335)
No	63 (14.7)	44 (69.8)	19 (30.2)	Reference
e-cig vapour is not as polluting or intrusive to others compared to conventional tobacco cigarettes				
Yes	366 (85.3)	234 (63.9)	132 (36.1)	0.655 (0.377–1.138)

**Table 2** continued

	Overall (N = 429), N (%)	Intend to quit e-cigarette, n (%)		Logistics regression Adjusted odds ratio (95 % CI) for intending versus not intending to quit smoking e-cigarettes
		Yes N = 280 (65.3 %)	No N = 149 (34.7 %)	
No	63 (14.7)	46 (73.0)	17 (27.0)	Reference
e-cigs closely replicate the feeling of smoking a conventional tobacco cigarette				
Yes	168 (39.2)	111 (66.1)	57 (33.9)	1.060 (0.731–1.537)
No	261 (60.8)	169 (64.8)	92 (35.2)	Reference
e-cig as an aid to quitting smoking tobacco cigarettes				
Yes	377 (87.9)	247 (65.5)	130 (34.5)	1.094 (0.634–1.888)
No	52 (12.1)	33 (63.5)	19 (36.5)	Reference
Unlike tobacco cigarettes, e-cigs can be used in public areas				
Yes	302 (70.4)	198 (65.6)	104 (34.4)	1.045 (0.704–1.550)
No	127 (29.6)	82 (64.6)	45 (35.4)	Reference
e-cig is cool, new, trendy and electronic				
Yes	245 (57.1)	152 (62.0)	93 (38.0)	0.715 (0.493–1.036)
No	184 (42.9)	128 (69.6)	56 (30.4)	Reference
e-cig is gaining popularity as many of my friends are using it				
Yes	294 (68.5)	198 (67.3)	96 (32.7)	1.333 (0.910–1.952)
No	135 (31.5)	82 (60.7)	53 (39.3)	Reference
Smoking e-cigs is relatively cheaper compared to tobacco cigarettes				
No	151 (35.2)	108 (71.5)	43 (28.5)	1.548 (1.045–2.293) <sup>a</sup>
Yes	278 (64.8)	172 (61.9)	106 (38.1)	Reference

<sup>a</sup> The number of respondents was less because the ‘other’ group in the religion variable and the ‘unemployed’ group in the occupation variable were not included in the analysis due to the small number of respondents

One Malaysian Ringgit (RM) is equal to USD0.25

common reason for using e-cigarettes was as a smoking cessation aid. The public should be made aware that although e-cigarettes are widely marketed as a way to help smokers quit using tobacco cigarettes, their efficacy in helping users to quit tobacco cigarettes has been the subject of a heated debate. It has been shown that smokers who use e-cigarettes demonstrate a reduction in the use of tobacco cigarettes [11, 20]. e-cigarettes also help former smokers avoid relapse [21] and attenuate cravings [22, 23]. Empirical evidence showing that e-cigarettes help smokers completely quit smoking is lacking. Data from a longitudinal survey found that smokers do not completely quit and some have no intentions of quitting smoking [13]. Often, e-cigarettes users were found to continue smoking both e-cigarettes and tobacco cigarettes, thus exposing themselves to both the e-cigarette and tobacco cigarette related intoxicants [24].

Nevertheless, a recent systematic review and meta-analysis study [25] has proven that e-cigarettes are not effective in helping smokers quit smoking. In contrast, the study found that adult smokers who use e-cigarettes are in fact 28 % less likely to stop smoking. It has been shown

that instead of smoking cessation, e-cigarette use resulted in prolonged nicotine addiction. Barbeau et al. [5] reported that former cigarette smokers who currently use e-cigarettes do not necessarily see e-cigarettes as a means to transition to quitting nicotine altogether. Although e-cigarettes may result in quitting tobacco cigarettes, some users may be unable to or refuse to overcome their nicotine addiction. Thus, nicotine cessation remains a challenge for e-cigarette users. As a result, to some users, e-cigarettes may aid in tobacco cessation without complete nicotine cessation, and users may continuously need to use e-cigarette devices [26]. It has also been reported that many users are comfortable with continuously using e-cigarettes, having the common perception that using e-cigarettes allows them to get their nicotine fix in otherwise smoke-free environments [25].

The second most common reason that our respondents used e-cigarettes was the perception that the e-cigarette vapour is non-polluting or non-intrusive to others compared to tobacco cigarettes. The study participants could have the erroneous belief as e-cigarettes do not have the burning smell found with tobacco smoke. Furthermore, the



vapour can smell pleasant due to a wide range of fruity e-liquid flavours. Local data regarding how the public or non-smokers view e-cigarette vapour are not available and warrant further study. Nevertheless, studies in the United States showed that the public considers second-hand e-cigarette vapour exposure to also be harmful to their health, and many supported banning vaping in public spaces [27]. Despite the fact that compared to traditional tobacco cigarettes, e-cigarettes do not produce burning smoke, vapours from e-cigarettes contain toxic and carcinogenic carbonyl compounds [28], thus e-cigarette smokers should be informed of that fact.

The third most common reason for using e-cigarettes in this study was the perception that e-cigarettes are generally less harmful compared to smoking conventional tobacco. e-cigarette smokers should be enlightened to the fact that although e-cigarettes are a form of harm reduction for cigarette smoking and are relatively less hazardous than are tobacco cigarettes, the chemicals and toxicants contained in e-cigarettes have not been fully disclosed and their safety is not assured. It has been reported that carcinogenic compounds, such as diethylene glycol, lead, chromium, nickel and tobacco specific N-nitrosamines, have been found in e-cigarette cartridges, solutions and mist in varying amounts [29, 30]. From 2008 to 2012, the Center for Tobacco Products, Food and Drug Administration in the USA received 47 adverse event reports on e-cigarettes [31]. Furthermore, in Malaysia, many e-liquids on the market are manufactured by unlicensed companies, thus the exact composition of e-liquids is unknown. Therefore, e-cigarette smokers should be alerted to the fact that the compounds in e-cigarettes are not entirely harmless. e-cigarette products should come with a health warning detailing the potential adverse effects, similar to tobacco cigarettes. The retailers and manufacturers of e-cigarette products should be carefully regulated.

The fact that, to date, there are no signs on prohibition of using e-cigarettes in public places, have lead many to view that unlike tobacco cigarettes, e-cigarettes can be used in public areas. It is a common scene to see e-cigarette smokers in shopping malls in Malaysia. Many are seen using e-cigarettes in areas marked smoke-free zones, which refer to tobacco smoke and not to e-cigarettes smoke. Currently, electronic cigarettes are not covered by laws restricting smoking in public areas in Malaysia. As the vapour of e-cigarettes has been shown to also be hazardous, the authorities should also regulate policies regarding the prohibition of the use of e-cigarettes in indoor environments.

Peer influence appears to be important in e-cigarette use. Nearly 70 % of our study participants noted that the use e-cigarettes as gadget is gaining popularity. Furthermore, slightly more than half noted that e-cigarettes are a cool and trendy gadget. Respondents also used e-cigarettes

because they are gaining popularity as many of their friends are using it. In this fast-moving technological world, consumers are always trying to keep up with the latest gadget. People like new, attractive innovations and like to be seen with new gadgets. Furthermore, many may be curious to test a new product and begin with experimentation [32].

It has been established that e-cigarettes' biggest advantage over tobacco cigarettes is their price. Likewise, in our study, over two-thirds of respondents supported the notion that e-cigarettes are less expensive than are tobacco cigarettes. In Malaysia, the retail price of tobacco cigarettes has increased tremendously in an effort reduce smoking, some to as high as RM18 a packet. e-cigarettes are a cheaper alternative to smoking with the rising prices of tobacco cigarettes [7]. Studies from high-income countries have confirmed the inverse relationship between cigarette prices and smoking rates [33–35]. It has been reported that a 10 % increase in the price of cigarettes in developed countries will result in a 3–5 % reduction in overall cigarette consumption [36]. Among New Zealand smokers, demand for e-cigarettes increased as the price of regular cigarettes increased [37].

To have a positive impact on public health, it has been suggested that cigarette prices need to be increased to ensure that cigarettes become less affordable over time [36]. Although e-cigarettes are relatively cheaper than tobacco cigarettes, smoking e-cigarettes can be an expensive affair to some users. In this study, a total of 35 % of the respondents do not agree that e-cigarettes are cheaper compared to tobacco cigarettes. Furthermore, in this study, e-cigarette smoking is also gaining strong foothold with the higher income group and the those in the professional and managerial sectors, implying that cost is not the entire reason that smokers turn to e-cigarettes. After the initial upfront investment for e-cigarettes, often users will get carried away purchasing and collecting different types of devices, trying out different flavours and nicotine strengths. To some extent, e-cigarette smoking could be an expensive affair for enthusiasts. e-cigarettes now come in many special designs. There are various types of artistically designed carrying cases and accessories for modes that are available on the market to attract e-cigarette users. Diverse modifications, accessories and e-liquids have become a collector's hobby for users [5]. Enthusiasts could spend far more than do conventional tobacco cigarettes smokers. This new emerging subculture may illustrate that many smokers fancy showing their unique or latest gadget as a symbol of social status. Therefore, such perception of social status by using a unique or the latest e-cigarette gadget should be changed.

Even for conventional e-cigarette users, e-cigarettes are considered consumables and are subject to wear and tear.

The e-liquid and the atomiser, which heats up and vaporises the e-liquid, need to be replaced regularly. The price range for 30 ml of e-liquid is RM30 to RM55 for local made liquids and RM80 to RM130 for imported ones. On average, if a person vapes 3 ml of e-liquid a day, three bottles of e-liquid would be consumed monthly, with an estimated monthly cost of RM90 for a supply of e-liquid. Although e-cigarettes are relatively cheaper compared to tobacco cigarettes, for the lower income groups, cost remains a challenge.

Regarding the intention to stop smoking e-cigarettes, nearly two-thirds of our study participants indicated an intention to stop using e-cigarettes. Our multivariate findings revealed that respondents belonging to lower income groups and those that view e-cigarettes as expensive were significantly more likely to express intention to quit smoking e-cigarettes. Likewise, a study in the USA found that respondents of lower incomes were more likely to stop using e-cigarettes and a total of 13 % stopped using e-cigarettes because of cost [6]. This possibly suggests that raising the cost of e-cigarettes may decrease their use. Further research should look into e-cigarette prices and the effect on their demand.

### Study Limitations

Due to difficulty in getting a complete sampling frame of e-cigarette smokers in Malaysia, we surveyed a convenience sample of users who are customers of e-cigarettes shops in the Selangor and Kuala Lumpur areas. Therefore the results cannot be generalised to the entire population of e-cigarette users in Malaysia.

### Conclusion

e-cigarette smoking was prevalent among youth in Malaysia. Preventive measures should target areas related to the identified main reasons for using e-cigarettes, namely as an aid to quit tobacco cigarettes, the perception that e-cigarettes are not as intrusive as tobacco cigarettes and can be used in public areas, the idea that e-cigarettes are healthier than are tobacco cigarettes, and the relatively lower cost compared to tobacco cigarettes. A considerable number of participants expressed intentions to quit e-cigarettes, implying that efforts to provide resources for encouraging those with an intent to quit should be publicised. Given that cost remains an important factor associated with the frequency of e-cigarette use and the intent to quit, increasing e-cigarette excise taxes may be an apparent effort to reduce smoking and should be carefully balanced with the price of tobacco cigarettes to avoid the consequence of switching back to tobacco cigarettes. This

research would provide insight into the area of health promotion in smoking cessation.

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### Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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