

## E-Cigarette Use, Its Impact on Tobacco Smoking and the Intention to Quit

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### ABSTRAK

*E-rokok telah mendapat populariti di serata dunia. Oleh kerana penggunaannya mendedahkan risiko kesihatan kepada pengguna, adalah penting untuk menilai niat mereka untuk berhenti dari tabiat ini. Kajian ini bertujuan untuk menentukan ciri-ciri penggunaan e-rokok, kesannya terhadap rokok dan niat pengguna untuk berhenti e-rokok dan rokok. Sejumlah 377 pengguna e-rokok telah direkrut dari 3 kedai vape di Bandar Baru Bangi, Selangor. Corak penggunaan e-rokok, penggunaan rokok tembakau dan niat mereka untuk berhenti di nilai dengan menggunakan borang soal selidik yang diisi oleh peserta. Kebanyakan (70%) peserta adalah pengguna e-rokok sahaja manakala 30% adalah pengguna dual (rokok tembakau dan e-rokok). Tempoh median penggunaan e-rokok adalah 2 (IQR 2) tahun. Hampir semua peserta (98.4%) menggunakan e-rokok generasi ketiga dan nikotin 6 mg merupakan kepekatan yang paling digemari (63.7%). Sekitar 92% peserta, terutamanya perokok berat dapat mengurangkan bilangan rokok tembakau selepas memulakan e-rokok. Majoriti (79.6%) pengguna dual juga mempunyai pengurangan penggunaan rokok tembakau dengan penggunaan semasa median sebanyak 5 (IQR 5.0) rokok sehari. Kebanyakan (87%) pengguna e-rokok berhasrat untuk berhenti tabiat itu suatu hari nanti, namun kebanyakan (63.1%) mereka berada di peringkat pra-kontemplasi. Pengguna e-rokok yang kurang dari 2 tahun lebih cenderung untuk berhenti tabiat ini berbanding dengan pengguna yang lebih 2 tahun ( $p = 0.005$ ). Kesimpulannya, terdapat lebih banyak pengguna e-rokok sahaja daripada pengguna dual. Penggunaan e-rokok boleh mengurangkan bilangan rokok terutamanya di kalangan perokok berat. Kebanyakan pengguna e-rokok mempunyai niat untuk berhenti tabiat ini tetapi tidak dalam masa terdekat dan penggunaan e-rokok yang lebih lama mungkin menghalang niat mereka untuk berhenti.*

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*Kata kunci:* berhenti merokok, e-rokok, elektronik, niat, rokok, vape

## ABSTRACT

E-cigarettes have rapidly gained worldwide popularity. Since its use still poses a health risk to the users, it is important to assess their intention to quit this habit. This study aimed to determine the characteristics of e-cigarette use, its effect on cigarette smoking and users' intention to quit vaping and smoking. A total of 377 e-cigarette users were recruited from three vape retail stores in Bandar Baru Bangi, Selangor. E-cigarette usage pattern, tobacco cigarette consumption and their intention to quit were assessed using a self-administered questionnaire. Most (70%) participants were e-cigarettes only users while 30% were dual users. The median duration of e-cigarette use was 2 (IQR 2) years. Almost all (98.4%) participants used third-generation devices and majority (63.7%) preferred liquid containing 6mg nicotine. About 92% participants, especially heavy smokers, smoked fewer tobacco cigarettes after initiating e-cigarette. Majority (79.6%) of dual users also had reduction in tobacco cigarette consumption with a median current consumption of 5 (IQR 5.0) cigarettes per day. Most (87%) e-cigarette users intend to quit the habit someday. However, many (63.1%) were in the pre-contemplation stage. E-cigarette users of less than 2 years duration tend to have the intention to quit compared to users of more than 2 years ( $p=0.005$ ). In conclusion, there was more e-cigarette only users than the dual users. E-cigarette use could significantly reduce tobacco smoking, especially among heavy smokers. Most e-cigarette users had the intention to quit vaping but not in the near future and longer e-cigarette use may deter their intention to quit.

Keywords: cigarette, e-cigarette, electronic, intention, smoking cessation, vape

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## INTRODUCTION

Electronic cigarette or e-cigarette is a battery-powered device which delivers nicotine in a vapour form (Brown & Cheng 2014). It is fast gaining popularity and has caused an increase in e-cigarette users worldwide (Dawkins et al. 2013; Pepper & Brewer 2014). A meta-analysis by Xu et al. (2016) which reviewed 28 studies published between 2003 and 2015 and mostly done in the US and European countries

showed a pooled prevalence of current e-cigarette users of 11.1% (Xu et al. 2016). However, a lower prevalence of current e-cigarette users was observed in Asia-Pacific countries ranging from 0.8 to 1.3% (Lee et al. 2016; Tabuchi et al. 2016; Li et al. 2015). In Malaysia, e-cigarette made its debut about 10 years ago. However, there was a steep reduction in users in 2015 due to restricted supply of e-cigarette juices containing nicotine after the Ministry of Health announced that its sale is

subjected under Poison Act (1952) and Dangerous Drugs Act (1952) (Ministry of Health Malaysia 2015). The latest prevalence of current e-cigarette users as shown by the Malaysia National E-Cigarette Survey (NECS) in 2016 was 3.2%, whereby 75% of them were dual users (Institute for Public Health 2016). Majority of the e-cigarette users were still able to purchase the nicotine e-liquid illegally from vape shops and online stores (Wong et al. 2017).

Use of e-cigarette to help smokers to quit smoking tobacco cigarettes or reduce its consumption were the commonest reasons for e-cigarette initiation (Dawkins et al. 2013; Etter & Bullen 2011; Pepper & Brewer 2014; Wong et al. 2016). The users can also manage their cravings and withdrawal symptoms due to nicotine addiction (Etter & Bullen 2011). This is particularly helpful for dual users who can still inhale nicotine at prohibited places (Etter & Bullen 2011). Due to this, there is an increase in the prevalence of e-cigarette use among those who stopped smoking (single users) (McNeill et al. 2018). In the UK, the prevalence of single users in 2017 was 9.5%, whereas the prevalence of e-cigarette use among current smokers (dual users) was between 18 and 20% (McNeill et al. 2018). However, the meta-analysis by Xu et al. (2016) showed that both prevalences were almost similar; the pooled prevalence of e-cigarette use among current smokers (dual users) and ex-smokers (single users) were 16.8% and 18.2%, respectively (Xu et al. 2016). Many users plan to use e-cigarette for more than one year and a majority of them

did not have the intention to quit vaping (Etter & Bullen 2011; Simmons et al. 2016). They wanted to avoid relapse to smoking as they were still dependant on nicotine (Etter & Bullen 2011). These findings were similar to a study in the US, whereby 43.7% of dual users continued vaping after 2 years of its initiation (Zhuang et al. 2016).

This long term use of e-cigarette may also be due to the common perception that e-cigarette is less toxic compared to tobacco cigarette because it delivers lesser harmful chemicals and carcinogens (Etter & Bullen 2011; Pepper & Brewer 2014). Thus, it is regarded as a safer alternative to cigarette smoking. Unlike tobacco cigarette smoking, which its adverse effects on health have been significantly established (USDHHS 2014; Wong et al. 2008), the negative effects of e-cigarette use are still understudied (Glantz & Bareham 2018). However, based on the latest evidence, e-cigarette use can cause cardiovascular and non-cancer lung diseases which could still lead to death (Glantz & Bareham 2018). Carcinogens were still found in the body of e-cigarette users and repeated exposures to these carcinogens, even at low levels, could cause cancer (Glantz & Bareham 2018).

In Malaysia, the main reason to use e-cigarette was to experiment with the e-cigarette. Only 16.2% admitted using the e-cigarette in an attempt to quit smoking tobacco cigarette (Institute for Public Health 2016). Perceived lower toxicity compared to tobacco and the enjoyment of the product was the most common reasons for using e-cigarette

(Zainol Abidin et al. 2018). However, many e-cigarette users intend to quit vaping (Wong et al. 2016). Those from the low socioeconomic group and perceived e-cigarette as more expensive compared to tobacco, were more likely to have the intention to quit (Wong et al. 2016). However, studies examining the use of e-cigarette and the intention to quit vaping in Malaysia are still lacking.

Hence, the aim of this study was to examine the characteristics of e-cigarette use, an effect of e-cigarette uses on smoking tobacco cigarettes and intention to completely quit vaping and smoking among current e-cigarette users. Association of intention to quit with sociodemographic factors and e-cigarette usage was also determined. It is hoped that this information will be useful for future planning interventional strategies in assisting all smokers to quit smoking tobacco and e-cigarette.

## **MATERIALS AND METHODS**

This was a cross-sectional study conducted at 3 vape retail stores in Bandar Baru Bangi, Selangor between January and March 2018. The inclusion criteria for the study were current e-cigarette users who had been using e-cigarette at least one day for the past 30 days and aged 18 years or above. E-cigarette users who were unable to understand Bahasa Malaysia and/or English language were excluded. Using the Epi Info™ STATCALC, the sample size calculated was 377 based on an estimated frequency of 50% from the finite population of 20,000, 0.05 accuracy, 95% confidence interval (CI).

Customers of the vape shops were screened for their eligibility to participate in the study through two questions: "Are you using e-cigarette?" and "How long have you been using e-cigarette?". If they use for one day or more in the past 30 days, verbal consent was taken. Overall, 430 customers were approached but only 400 of them met the inclusion criteria. Data was collected using a self-administered questionnaire which was developed based on literature review and expert panel discussion (Biener & Hargraves 2015; Dawkins et al. 2013; DiClemente et al. 1991; Etter & Bullen 2011; Farsalinos et al. 2014; Levy et al. 2017; Mcneill et al. 2015; Okuyemi et al. 2001; Pepper & Brewer 2014; Simmons et al. 2016; Stockings et al. 2013; West 2004). The expert panel consists of 2 family medicine specialists, one of whom had training and experience in managing the community quit smoking programme. The questionnaire consisted of three sections. Section A (6 items) contains participants' socio-demographic data, section B (14 items), assessing participants' e-cigarette usage and past smoking behaviour of tobacco cigarette including a history of quit attempts. The last section C (4 items) assessed participant's intention to quit vaping (for single users) or both vaping and smoking tobacco cigarette (for dual users). The items in section C were based on Transtheoretical Model (TTM) of change which identified different stages of change (pre-contemplation, contemplation and preparation stage) (DiClemente et al. 1991). This questionnaire was prepared

in Bahasa Malaysia and English language and subjected to content and face validation.

Participants were defined as e-cigarette only users (single users) or as e-cigarette and tobacco cigarette users (dual users). The intention to quit was categorised into two: ‘with intention to quit’ and ‘without intention to quit’. Those admitted having intention to completely quit smoking whether within the next 30 days (preparation stage), within the next 6 months (contemplation stage) or in the future but not within the next 6 months (precontemplation stage) (DiClemente et al. 1991) were considered as ‘with intention to quit’. However, e-cigarette users who admitted of not having any

intention to completely quit smoking in the future (regardless of the time frame) were regarded as ‘without intention to quit’.

This study obtained ethical approval from the Universiti Kebangsaan Malaysia (UKM) research ethics committee (FF-2017-002). Permission from owners of the vape retail stores were obtained prior to the study. Data analysis was done using the IBM SPSS® version 23.0 using descriptive analysis, percentage, median and interquartile range (IQR). Bivariate analysis was performed using chi-square test and non-parametric Mann-Whitney U test was used to examine the association between categorical dependent variable and numerical independent

Table 1: Sociodemographic of Respondents (N=377)

Variables	n (%)	Median (IQR)
Age (years)		24.0 (9.0)
< 25 (18-24)	189 (50.1)	
≥ 25 (25-58)	188 (49.9)	
Gender		
Male	369 (97.9)	
Female	8 (2.1)	
Ethnicity		
Malay	358 (95.0)	
Chinese	9 (2.4)	
India	8 (2.1)	
Others	2 (0.5)	
Education level		
Primary & non-formal	5 (1.3)	
Secondary	183 (48.5)	
Tertiary	189 (50.1)	
Employment		
Employed	265 (70.3)	
Unemployed	112 (29.7)	
Household Income (RM/month) (N=265)		3000 (4000.0)
Low level income (<RM4360.0)	169 (63.8)	
Middle level income (RM4360.0-9619.0)	71 (26.8)	
High level income (≥RM9620.0)	25 (9.4)	

Table 2: Characteristics of e-cigarette use (N=377)

Variables	Total (N=377)	E-cigarette only user n=264	Dual user (tobacco cigarette & e-cigarette) n=113
Type of user [n (%)]	377 (100.0)	264 (70.0)	113 (30.0)
Duration of e-cigarette use (years) [Median (IQR)]	2 (2.0)	2 (2.0)	2 (2.5)
Type of e-cigarette device <sup>a</sup> [n (%)]			
First generation (disposable)	0 (0.0)	0 (0.0)	0 (0.0)
Second generation (replaceable cartridge)	14 (3.7)	10 (3.8)	4 (3.5)
Third generation (refill tank)	371 (98.4)	260 (98.5)	111 (98.2)
Nicotine concentration (mg) [n (%)]			
0	13 (3.4)	9 (3.4)	4 (3.5)
3	24 (6.4)	20 (7.6)	4 (3.5)
6	240 (63.7)	169 (64.0)	71 (62.8)
9	17 (4.5)	12 (4.5)	5 (4.4)
12	80 (21.2)	51 (19.3)	29 (25.7)
18	3 (0.8)	3 (1.1)	0 (0.0)
Number of tank refill per day [Median(IQR)]	2 (1.0)	2 (1.7)	2 (1.0)

variable.

## RESULTS

Out of 400 customers who met the study criteria, 377 respondents gave consent to participate in the study and completed the questionnaire. The median age of the respondents was 24 (IQR 9.0) years in which about half (50.1%) of them were younger than 25 years old. Almost all participants were males (97.9%) and belong to the Malay ethnic group (95%). Half of them (50.1%) received tertiary education and majority (70.3%) were employed. E-cigarette users mostly (63.8%) belong to the low-level income group (<RM4360.0) (Table 1).

About two-thirds of the participants were e-cigarette only users and the remaining one-third was dual users (Table 2). Among 264 of e-cigarette

only users, 33.3% were tobacco naive. Further analysis of the 88 respondents who had never smoked tobacco cigarette showed that 75% of them were less than 25 years. The median duration of e-cigarette use was 2 (IQR 2.0) years. The third-generation e-cigarette devices and juices containing 6mg nicotine were the preferred choices. The median number of tank used in a day was 2 (IQR 1.0).

Among e-cigarette users who had been smoking tobacco cigarette prior initiating e-cigarette, their median age of tobacco cigarette initiation was 16 (IQR 4.0) years and median duration of tobacco cigarette use before e-cigarette initiation was 8 (IQR 8.0) years (Table 3). The median tobacco cigarette consumption before using e-cigarette was 15 (IQR 13.0) cigarettes in a day. All e-cigarette only

Table 3: Characteristics of tobacco cigarette use among e-cigarette users with history of smoking tobacco cigarette (N=289)

Variables	Total (N=289)	E-cigarette only user (already quit smoking tobacco cigarette) n=176	Dual user (tobacco cigarette & e-cigarette) n=113
Age of tobacco cigarette initiation (years) [Median (IQR)]	16 (4.0)	16 (4.0)	16 (4.0)
Duration of tobacco cigarette use before starting e-cigarette (years) [Median (IQR)]	8 (8.0)	8 (9.0)	8 (8.0)
Tobacco cigarette consumption per day before starting e-cigarette [Median (IQR)]	15 (13.0)	20 (13.0)	12 (13.0)
Current tobacco cigarette consumption per day [Median (IQR)]	5 (5.0)	0 (0.0)	5 (5.0)
Tobacco cigarette consumption after initiating e-cigarette [n (%)]			
Reduction in consumption	266 (92.0)	176 (100.0)	90 (79.6)
Status quo	16 (5.5)	0 (0.0)	16 (14.2)
Increased consumption	7 (2.4)	0 (0.0)	7 (6.2)
Quit attempt [n (%)]			
Yes	269 (93.1)	176 (100.0)	93 (82.3)
No	20 (6.9)	0 (0.0)	20 (17.7)

users had previous quit attempt but only 82.3% of dual users attempted to quit tobacco cigarette. A majority of dual users (79.6%) had reduction in tobacco cigarette consumption with median number of 5 (IQR 5.0) tobacco cigarettes a day after using e-cigarettes. Significantly more heavy smokers who used to smoke 20 cigarettes a day were noted to have reduction in their tobacco cigarette consumption after initiating e-cigarette compared to moderate and light smokers ( $p=0.001$ ) (Table 4).

Majority (87%) e-cigarette users had the intention to completely quit both tobacco cigarette and e-cigarette in

the future. More than half (63.1%) of the e-cigarette users were in the pre-contemplation stage, while 15.2% were in the contemplation stage and 21.6% were in the preparation stage. Duration of e-cigarette use was significantly associated with their intention to quit  $p=0.005$ ; with intention: median 2 (IQR 2.5) years versus without intention: median 3 (IQR 2.5) years (Table 5).

## DISCUSSION

Almost all the e-cigarette users in this study were males and belonged to the Malay ethnic group. The predominance

Table 4: Pattern of tobacco cigarette consumption among dual users (N=113)

Variables	Reduction in consumption n (%)	Status quo or increase in consumption n (%)	p value
Light smoker (<10 cigarettes/day)	22 (61.1)	14 (38.9)	0.001*
Moderate smoker (10-19 cigarettes/day)	24 (80.0)	6 (20.0)	
Heavy smoker ( $\geq$ 20 cigarettes/day)	44 (93.6)	3 (6.4)	

Using Chi-square test, \*p value <0.05

of male gender among e-cigarette users has been demonstrated by many earlier studies (Dawkins et al. 2013; Etter & Bullen 2011; Farsalinos et al. 2014; Wong et al. 2016). The predominance of Malay ethnic group closely matched the population in Bandar Baru Bangi, Selangor. Most of them had tertiary education which is similar to two earlier studies in Malaysia (Wong et al. 2016; Zainol Abidin et al. 2018).

About half (50.1%) of the participants in this study were younger than 25

years old which was similar with other local studies (Wong et al. 2016; Zainol Abidin et al. 2018). However, in western countries e-cigarette use was common among the middle age group (Dawkins et al. 2013; Etter & Bullen 2011). In the current study, tobacco naïve e-cigarette users were also found to be more common among young adults (<25 years) compared to those aged more than 25 years. Experimenting with e-cigarette and enjoyment of the products maybe the

Table 5: Association of intention to quit with sociodemographic factors and e-cigarette usage

Variables	With Intention to Quit	Without Intention to Quit	p value
Age (years) [Median (IQR)]	24 (9.0)	27 (11.0)	0.088 <sup>a</sup>
Gender			
Male	322 (87.3)	47 (12.7)	0.279 <sup>b</sup>
Female	6 (75.0)	2 (25.0)	
Ethnicity			
Malay	310 (86.6)	48 (13.4)	0.488 <sup>b</sup>
Non- Malay	18 (94.7)	1 (5.3)	
Employment Status			
Employed	226 (85.3)	39 (14.7)	0.127 <sup>c</sup>
Unemployed	102 (91.1)	10 (8.9)	
Household Income (RM/month) [Median (IQR)]	3000 (4000)	2700 (5200)	0.956 <sup>a</sup>
Duration of using e-cigarette (years) [Median (IQR)]	2 (2.5)	3 (2.5)	<b>0.005*</b>
Nicotine concentration (mg) [Median (IQR)]	6 (3.0)	6 (6.0)	0.496 <sup>a</sup>
No of tank refill per day [Median (IQR)]	2 (1.0)	2 (2.3)	0.977 <sup>a</sup>

(<sup>a</sup>) Mann-Whitney U, (<sup>b</sup>) Fisher Exact Test, (<sup>c</sup>) Chi-square test, \*p value <0.05



reasons for this pattern (Institute for Public Health 2016; Zainol Abidin et al. 2018).

In an average, the participants started smoking at the age of 16 years. However, a national study among 2795 Malaysian adolescents showed that the age of smoking debut was younger than 16 years (Lim et al. 2017). There are multiple risk factors for smoking among adolescents, particularly male gender, poor academic performance, parental smoking, loneliness, low religiosity, friends who smoke, perceived acceptance of smoking by parents as well as perceived benefits and less risks of smoking (Lim et al. 2017; Lim et al. 2011; Tohid et al. 2011; Tohid et al. 2016). However, a study by Lim et al. (2011) showed that adolescents' susceptibility to smoking, which is their cognitive strength and capability to resist smoking, was the main predictor for smoking after adjusting for other important factors (Lim et al. 2011).

About two-thirds of the e-cigarette users in the current study were from the lower income bracket. This finding is similar to earlier local studies (Wong et al. 2016; Zainol Abidin et al. 2018). This is probably because e-cigarette is more affordable in the long term compared to smoking tobacco cigarette (Zainol Abidin et al. 2018). Since our respondents used about two tanks of juices a day, the cost of using e-cigarette for a month would be about RM105 (~USD 25) while smoking 15 tobacco cigarettes a day would cost RM405 (~USD 100) a month.

Most (70%) of participants in the current study were e-cigarette only

users. This finding is contrary to the Malaysia National E-Cigarettes Survey (NECS) in 2016 and a study in England (Institute for Public Health 2016; McNeill et al. 2015) whereby majority of e-cigarette users were dual users (prevalence range between 60% and 75%). The difference in the findings may be because of the convenience sampling used by our study which recruited the participants from vape retail stores. However, the proportion of e-cigarette only users in our study was higher than Wong et al. (2016) which also used convenient sampling. Since our study was done after the tax increase by 40 percent at the end of November 2015 (Mohd Pilus & Kamal 2015), the substantial increase in tobacco price might cause an increase in e-cigarette use due to shifting from smoking tobacco cigarette.

The average duration of e-cigarette use among the respondents in this study was two years. This finding indicates that the long term use of e-cigarette is more common among Malaysians (Institute for Public Health 2016). The Malaysia National E-cigarette Survey in 2016 found that 42.6% used e-cigarette for two years or more. Similarly in the USA, 43.7% of users were using e-cigarette at two years of follow up (Zhuang et al. 2016). Other studies generally demonstrated a shorter duration of e-cigarette use ranging from three to ten months (Dawkins et al. 2013; Etter & Bullen 2011; Zainol Abidin et al. 2018). The long-term use of e-cigarettes especially among e-cigarette only users, may suggest that they were still dependent on nicotine. They may also have

the fear that they may resort back to smoking tobacco cigarette if they stop vaping (Etter & Bullen 2011). E-liquid containing 6 mg nicotine were the most preferred by them which was similar with other local studies (Institute for Public Health 2016; Zainol Abidin et al. 2018). In general e-cigarette use might help them to quit smoking tobacco cigarettes (Etter & Bullen 2011) but the vaping habit may persist.

Generally, tobacco cigarette smokers worldwide initiate e-cigarette to reduce harm from smoking tobacco cigarette (Etter & Bullen 2011; Pepper & Brewer 2014; Wong et al. 2016). The awareness of risks associated with tobacco smoking compared to e-cigarette may be responsible for the shift to e-cigarette use to reduce tobacco cigarette consumption (Dawkins et al. 2013) which was demonstrated by our study. The dual users in the current study had significant reduction in tobacco cigarette consumption with an average of five cigarettes per day after initiating e-cigarette. This reduction was significantly observed among the heavy smokers. Even though complete abstinence from smoking tobacco and e-cigarette is the ultimate goal, this harm reduction approach may be temporarily beneficial for the heavy smokers as e-cigarette is 9 to 450 times less toxic compared to tobacco cigarette (Goniewicz et al. 2014). However, e-cigarette can still cause cardiovascular and non-cancer lung diseases (Glantz & Bareham 2018) and might contribute to occurrence of lung cancer (Lee et al. 2018).

This study showed that the majority (87%) of the e-cigarette users intend to

quit completely from smoking tobacco cigarette and vaping which was similar to the findings by Wong et al. (2016). However, more than half of them (63.1%) were in the pre-contemplation stage. Evidence shows that smokers in this stage are less likely to quit although they have the intention, compared to those in the preparation and contemplation stages (DiClemente et al. 1991). Thus, majority of our participants can be considered as not ready to give up smoking and vaping completely. Nevertheless, 21.6% of e-cigarette users were in preparation stage which means that they were ready to quit soon. Evidence shows that, this group of smokers are most receptive to quit smoking intervention and hence will benefit from the quit smoking program (DiClemente et al. 1991). It may be worthwhile to recruit e-cigarette smokers who are in the preparation stage to the quit smoking clinics to help them with their nicotine addiction so that they can quit completely.

The participant's intention to quit smoking was significantly associated with duration of e-cigarette use. Users without intention to quit significantly used e-cigarette longer than those with the intention to quit ( $p=0.005$ ). However, an earlier study by Wong et al. (2016) did not demonstrate any association between duration of e-cigarette use and intention to quit. It is possible that the respondents in our study were already complacent with their current behaviour thus sustaining their use of e-cigarette which might be perceived as less harmful. E-cigarette has been shown to be effective to

increase chances to stop tobacco smoking and is in fact recommended as a smoking cessation tool by the Commissioner of Public Health England (Mcneill et al. 2015). However, this may not be a suitable tool for the participants in the current study as majority of them were not prepared to quit and had used e-cigarette for a longer duration. Therefore, intensive counselling using pharmacotherapy and behavioural therapy to promote cessation of tobacco cigarette and e-cigarette smoking should ideally start early before e-cigarette users get contended with the idea of reduced harm with e-cigarettes. Nevertheless, further research is needed to determine the effectiveness of e-cigarette as smoking cessation tool especially in the local context (Caponnetto et al. 2013; Franck et al. 2014; Hartmann-Boyce et al. 2016; Siegel et al. 2011):

One of the limitations of the current study is the selection of participant using convenience sampling hence the results may not be generalised to the whole of local e-cigarette user population. This study also did not explore further into the reasons of using e-cigarette, but this was postulated from other studies.

## CONCLUSION

E-cigarette use was common among young adults and those with low income suggesting that it is more attractive and affordable. The proportion of e-cigarette only users was higher than dual users and long-term use of e-cigarette was common. E-cigarette use appears to help smokers to reduce

tobacco cigarette consumption and may have helped tobacco smokers to quit smoking. Most e-cigarette users had the intention to quit the habit completely but not in the near future. Their intention to completely quit was significantly associated with duration of e-cigarette use where longer duration of e-cigarette consumption could deter consumer's intention to quit the habit. Intensive counselling to promote cessation of cigarette smoking and e-cigarette use should ideally start early before consumers get comfortable with the idea of reduced harm from using e-cigarettes. Further studies are needed to evaluate the effectiveness of e-cigarette as a smoking cessation tool among Malaysian smokers. This information may help the stakeholders to strategise the best approach for Malaysian smokers to quit smoking.

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