Original Article

Perceived Safety and Effectiveness of Electronic Cigarettes among Malaysian Adults and Public Support for Regulations

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Context: Electronic cigarettes have been used as a harm reduction method toward tobacco cessation. Malaysian government has enforced a strict policy to regulate the sale of electronic cigarette products because its liquid contains nicotine. Aims: This study aimed to explore the general public's perception toward electronic cigarette use. Public support toward electronic cigarette regulation was also examined. Settings and Design: This was a Malaysian population-based survey. Materials and Methods: Data were obtained from the National E-Cigarette Survey (NECS) 2016, which used a multistage stratified cluster sampling household survey representing all Malaysian adults aged 18 years old. A cross-sectional survey was conducted among a total of 4288 adults. Statistical Analysis Used: Descriptive and logistic regression analysis. Results: Majority were aged 25–44 years old (44%), completed at least secondary education (69%), of Malay ethnicity (73%), and married (68%). Majority (88.1%) have never used electronic cigarette. A quarter (25.5%) perceived electronic cigarette helps people quit cigarette smoking, whereas 20.3% perceived electronic cigarette helps people to maintain cigarette abstinence. Approximately 85% believed that electronic cigarette use does not help in improving breathing and coughing. Majority (91.8%) disagreed that electronic cigarettes should be allowed in places where tobacco smoking is banned. Thus, 63.4% agreed that electronic cigarette should be banned completely rather than regulated. Conclusion: Majority of general public had negative perception about electronic cigarette use.

Keywords: Effectiveness, electronic cigarette, Malaysia, perception, regulation, safety

INTRODUCTION

Each year, tobacco smoking is responsible for 20,000 deaths among Malaysians. By the year 2030, annual deaths caused by tobacco smoking among Malaysians could be increased to up to 30,000. Globally, the leading causes of death due to tobacco smoking are cardiovascular diseases (1.69 million deaths), chronic obstructive pulmonary disease (0.97 million deaths), and lung cancer (0.85 million deaths). Although vast majority of Malaysian adults were aware of the harmful effects of tobacco smoking toward health, approximately one-quarter of them remained as active smokers.

Tobacco smoking is a manifestation of nicotine addiction. Although currently-marketed smoking

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cessation products do increase the chance for active smokers to stop smoking, these products have been reported to lack high levels of efficacy in the real life setting.\[4\]

The electronic cigarette (EC) is an electronic nicotine delivery device (ENDD) powered by battery. Its functions are similar to tobacco cigarettes, delivering nicotine to its user without tobacco combustion.\[5\]

Studies reported that using EC could help to reduce tobacco cigarette use, to relieve tobacco withdrawal symptoms, and to quit smoking.\[6-8\] In Malaysia, the prevalence of current EC users was 3.2%, which represents more than 600,000 adults (based on 19 million adults in Malaysia).\[9\] Since the introduction of the EC into the global market, its use has increased rapidly around the world. A study found high awareness of EC but low levels of trial and usage (46.6% overall, with 73% USA) among adults.\[10\] A population survey of a British sample showed that current use of EC doubled between 2010 and 2012 from approximately 3% to 7%.\[11\]

The Global Adult Tobacco Survey (GATS), conducted in 2011 among 4250 Malaysians aged 15 years and above, revealed that 21% of Malaysian adults were aware of EC and 3.9% of them were current users.\[12\] Studies on awareness and factors associated with the use of ECs have found several similar associated factors. These factors include reduction in conventional cigarette (tobacco smoking), reduction in the number of cigarettes smoked, claims that EC helped smokers to quit, less costly, less hazardous to health, and curiosity about EC use.\[11,13\]

Nicotine is classified as a Class C poison under the Poisons Act of 1952 and the Control of Drugs and Cosmetic Regulations of 1984 (Malaysia), which forbids the sale or supply of poisons to people under 18 years old.\[14\] Therefore, after considerable debate, in early 2016, Malaysian government enforced a policy on the sale of nicotine, tobacco products, and ECs by allowing only licensed pharmacies or registered medical practitioners to sell nicotine-containing EC liquids, and prohibiting unregulated premises from selling such products.\[15\]

Consequently, majority of the EC users (95.8%) in Malaysia were reported to be against the policy, and obtaining nicotine from pharmacies was the least preferred source of purchase (21.4%).\[16\]

Despite the controversial discussion on EC in the country, it is not known how the general public in the nation perceive the safety of ECs, as well as their perception on the efficacy of EC in smoking cessation. The perception on policies related to regulation on EC is also unknown.

The aim of this study was to investigate the perception of the general public toward the safety, perceived effectiveness for smoking cessation, and related policy regarding EC use.

**SUBJECTS AND METHODS**

A cross-sectional study, known as the Malaysian National E-Cigarette Survey (NECS) 2016, was conducted between May and June in 2016 among Malaysian adults in the entire Malaysia. Approval for the research ethics of this study was obtained from the Medical Research and Ethics Committee of the Ministry of Health Malaysia (NMRR-16-171-28819 (IIR)). This study represents one part of the NECS 2016: Prevalence, Pattern and Perception Regarding E-Cigarette and Vape Use Among Malaysian Adults.

**Participant**

The inclusion criteria were all Malaysians above the age of 18 years who had lived in the selected residences for at least 6 months in the past 1 year, understood Bahasa Malaysia or English, and agreed to participate. Exclusion criteria were institutional populations such as those staying in hotels, hostels, and hospitals. The survey form was distributed to 5722 participants who fulfilled the inclusion criteria. Both verbal and written consent were obtained from subjects who fulfilled the criteria.

In this paper, a current EC user refers to one who has smoked at least a puff of EC and has been using it in the last 30 days; a current tobacco smoker is one who has smoked at least 100 cigarettes in their lifetime and who has smoked at least one cigarette in the past 30 days; a dual user is one who is currently smoking both tobacco cigarettes and EC during the period of the study.

**Procedure**

A NECS Questionnaire Survey Form was designed and developed from the inputs of experts in tobacco control and smoking cessation from the Ministry of Health and academics. The questionnaire underwent face and content validation processes before it was then piloted. Nevertheless this questionnaire had been used by two major published studies in Malaysia: the GATS Malaysia 2011 and Tobacco and E-cigarette Use among Adolescents (TECMA) survey.

Sample size was calculated to be 5722, based on the prevalence (p) of 5% with the precision (d) of 1.5%,
2 strata (s), and design effect (DEFF) of 2.0 at 95% confidence interval.

The primary sampling unit was the administrative district. The secondary sampling unit was the enumeration blocks within the selected districts. The final sampling unit was the living quarters within the selected enumeration blocks. The study population was divided into six zones according to the map of Malaysia for data collection—north, central, south, east coast, Sabah, and Sarawak. All data were collected at the respective zone level, before being posted to the coordination center in International Islamic University Malaysia (IIUM), Kuantan campus. In IIUM, the data were entered into the NECS Database twice (double data entry) to ensure the data were keyed in correctly.

Data were analyzed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA) and Stata Statistical Software: Release 13 (StataCorp LP, College Station, TX, USA). All information obtained in this survey was kept and handled in a confidential manner. Identity of the subjects will not be revealed during publishing or presenting of the survey results.

Data from 4288 subjects, corresponding to 19 million Malaysian adults nationally, were assessed. Table 1 shows the sociodemographic characteristics of the study’s subjects. Majority (88.1%, n = 3874) have never used EC. Less than one-third (28.0%, n = 1140) were current cigarette users. Only a small number of them were using EC (3.2%, n = 110) and using both ECs and tobacco cigarettes (2.3%, n = 77). There were 4.6% (n = 183) former cigarette smokers.

Responses from the subjects on perception toward EC are shown in Table 2. Majority (74.5%, n = 2796) of the subjects did not believe that ECs are helpful in smoking cessation. In maintaining tobacco abstinence, ECs were not believed to be helpful (79.7%, n = 2969). More than half (63.0%, 2299) of the subjects also believed that ECs do not reduce tobacco use. Majority of subjects did not feel that EC users would improve in breathing and coughing, subjects did not differ much in opinions about whether ECs or tobacco cigarettes were more satisfying. At the very least, the use of EC is perceived by this survey’s respondents to worsen breathing (84.6%) and coughing (85.8%).

Most subjects (80.8%, n = 2415) believed that ECs could cause poisoning. But opinion on whether people would crave more toward ECs or toward tobacco cigarettes did not differ much.

Table 1: Sociodemographic profile of subjects

| Age group | n (%) | N     |
|-----------|-------|-------|
| 18–24     | 693 (19.4) | 3,676,358 |
| 25–44     | 1684 (43.6) | 8,268,976 |
| 45–64     | 1437 (25.9) | 5,280,969 |
| 65 and above | 464 (9.1) | 1,728,000 |

| Gender | n (%) | N     |
|--------|-------|-------|
| Male   | 1984 (50.2) | 9,533,557 |
| Female | 2298 (49.8) | 9,444,650 |

| Education | n (%) | N     |
|-----------|-------|-------|
| No formal education | 429 (7.1) | 1,351,823 |
| Completed primary | 1163 (23.6) | 4,472,862 |
| Completed secondary | 1820 (44.3) | 8,402,672 |
| Completed college/university | 871 (25.0) | 4,753,257 |

| Occupation | n (%) | N     |
|------------|-------|-------|
| Government | 384 (10.2) | 1,945,052 |
| Nongovernment | 958 (26.3) | 5,002,612 |
| Self-employed | 928 (20.2) | 3,830,211 |
| Student | 267 (7.5) | 1,427,397 |
| Homemaker | 1106 (21.7) | 4,114,501 |
| Retiree | 208 (4.9) | 931,590 |
| Not working | 436 (9.2) | 1,751,746 |

| Race | n (%) | N     |
|------|-------|-------|
| Malay | 3215 (72.6) | 13,783,021 |
| Chinese | 419 (12.2) | 2,323,697 |
| Indian | 188 (5.9) | 1,126,055 |
| Iban | 49 (0.9) | 169,998 |
| Kadazan | 51 (0.9) | 175,889 |
| Other Bumiputra | 348 (7.1) | 1,351,770 |
| Others | 13 (0.2) | 44,064 |

| Religion | n (%) | N     |
|---------|-------|-------|
| Islam | 3483 (78.9) | 14,951,196 |
| Buddhism | 330 (9.5) | 1,809,317 |
| Christianity | 254 (5.0) | 953,256 |
| Hinduism | 174 (5.5) | 1,051,885 |
| Others | 39 (1.0) | 191,886 |

| Marital status | n (%) | N     |
|----------------|-------|-------|
| Married | 3057 (68.1) | 12,916,105 |
| Living with partner | 15 (0.4) | 72,737 |
| Separated | 13 (0.3) | 65,132 |
| Divorced | 43 (0.9) | 162,991 |
| Widowed | 190 (3.7) | 701,685 |
| Single | 964 (21.0) | 5,049,944 |

| Residence | n (%) | N     |
|-----------|-------|-------|
| Urban | 2123 (49.5) | 14,478,772 |
| Rural | 2165 (50.5) | 4,526,484 |

The number of subjects who wanted to completely ban ECs (63.4%, n = 2616) was lower than the number of subjects who did not want to allow ECs in places where tobacco cigarettes are banned (91.8%, n = 3693).
| Item                                                                 | Total | 95%CI     |
|---------------------------------------------------------------------|-------|-----------|
| 1. Electronic cigarette helps people quit smoking tobacco cigarette.|       |           |
| Agree                                                              | 867   | 4,253,391 | 23.5, 27.5 |
| Disagree                                                           | 2796  | 12,440,420| 72.5, 76.5  |
| 2. Electronic cigarette helps people maintain cigarette abstinence.|       |           |
| Agree                                                              | 690   | 3,389,422 | 18.6, 22.1  |
| Disagree                                                           | 2969  | 13,315,254| 77.9, 81.4  |
| 3. The urge to smoke is reduced by using electronic cigarette.     |       |           |
| Agree                                                              | 1034  | 5,296,624 | 30.7, 35.1  |
| Disagree                                                           | 2432  | 10,820,508| 64.9, 69.3  |
| 4. Electronic cigarette is more effective than medication for quitting smoking. |      |           |
| Agree                                                              | 440   | 2,224,552 | 13.0, 16.6  |
| Disagree                                                           | 2826  | 12,905,212| 83.4, 87.0  |
| 5. Electronic cigarette is not a transition to quit nicotine.      |       |           |
| Agree                                                              | 1276  | 6,134,719 | 37.6, 44.6  |
| Disagree                                                           | 1954  | 8,806,743 | 55.4, 62.4  |
| 6. Electronic cigarette helps people cut down tobacco smoking.    |       |           |
| Agree                                                              | 1201  | 5,978,588 | 34.6, 39.5  |
| Disagree                                                           | 2299  | 10,191,310| 60.5, 65.4  |
| 7. Breathing is improved after using electronic cigarette.        |       |           |
| Agree                                                              | 428   | 2,162,318 | 13.9, 17.1  |
| Disagree                                                           | 2577  | 11,837,933| 82.9, 86.1  |
| 8. Coughing is improved by using electronic cigarette.            |       |           |
| Agree                                                              | 391   | 1,943,599 | 12.7, 15.9  |
| Disagree                                                           | 2585  | 11,756,095| 84.1, 87.3  |
| 9. Electronic cigarette is less satisfying than tobacco smoking. |       |           |
| Agree                                                              | 1211  | 5,934,372 | 48.5, 55.3  |
| Disagree                                                           | 1213  | 5,499,543 | 44.7, 51.5  |
| 10. People react more positively to electronic cigarette users than that to tobacco smokers. |   |           |
| Agree                                                              | 940   | 4,509,926 | 24.4, 29.1  |
| Disagree                                                           | 2770  | 12,391,435| 70.9, 75.6  |
| 11. The smell of an electronic cigarette is better than a tobacco cigarette. |   |           |
| Agree                                                              | 2129  | 10,009,710| 61.8, 67.3  |
| Disagree                                                           | 1208  | 5,486,098 | 32.7, 38.2  |
| 12. Electronic cigarette should be allowed in places where smoking is banned. | |   |
| Agree                                                              | 320   | 1,481,549 | 7.0, 9.7    |
| Disagree                                                           | 3693  | 16,512,719| 90.3, 93.0  |
Six items were selected for further discussion on the respondents’ perception toward safety, effectiveness, and policy. Logistic regression was carried out to compare the difference of answers among different types of users [Table 3].

Generally, there are significant differences in perception between current EC users and those who had never used EC. The current EC users believed that EC is less harmful than tobacco cigarettes and is more effective in smoking cessation. Current tobacco cigarette users believed that ECs can cause poisoning. A significant number of EC users wanted ECs to be allowed in places where tobacco smoking is banned. Current tobacco users also believed that EC use should be regulated rather than banned completely.

**DISCUSSION**

To fill up the gap mentioned by Wong et al.,[16] this study answered the question on how the public viewed ECs. Majority of the subjects in this study had never used ECs, which could be the reason why their perception differed from the study by Wong et al.,[16] where the subjects consisted of EC users. Overall, the general public in this study carried negative perception toward EC, some even portrayed misconceptions. Although the current EC users carried similar perceptions with
Table 3: Perception of respondents on items representative of safety (items 17 and 19), effectiveness (items 1 and 4), and policy (items 12 and 20)

| Item 17 | Overall | Perception on “Electronic cigarette vapor is more harmful to others compared to tobacco smoke,” | Logistic regression |
|---------|---------|---------------------------------------------------------------------------------|---------------------|
|         | (N = 3175), n (%) | | Adjusted odds ratio (95% CI) for agree versus disagree for “Electronic cigarette vapor is more harmful to others compared to tobacco smoke.” |
|         | Agree N = 1820 (57.3%) | *Disagree N = 1355 (42.7%) | |
| Electronic cigarette use status | | | |
| Current | 102 (3.2) | 18 | 84 | 0.270 (0.90–0.808) |
| Never | 2829 (89.1) | 1719 | 1100 | 2.785 (2.080–3.729) |
| Former | 244 (7.7) | 83 | 161 | Reference |
| Tobacco cigarette use status | | | |
| Current | 734 (23.1) | 355 | 379 | 0.866 (0.657–1.141) |
| Never | 2105 (66.3) | 1275 | 830 | 1.005 (0.789–1.279) |
| Former | 336 (10.6) | 190 | 146 | Reference |
| Dual use status | | | |
| No | 3103 (97.7) | 1806 | 1297 | 0.551 (0.162–1.869) |
| Yes | 72 (2.3) | 14 | 58 | Reference |

| Item 19 | Overall | Perception on “Electronic cigarette solutions cause poisoning,” | Logistic regression |
|---------|---------|---------------------------------------------------------------------------------|---------------------|
|         | (N = 2944), n (%) | | Adjusted odds ratio (95% CI) for agree versus disagree for “Electronic cigarette solutions cause poisoning.” |
|         | Agree N = 2408 (81.8%) | *Disagree N = 536 (18.2%) | |
| Electronic cigarette use status | | | |
| Current | 96 (3.3) | 37 | 59 | 0.469 (0.208–1.058) |
| Never | 2636 (89.5) | 2245 | 391 | 3.424 (2.481–4.724) |
| Former | 212 (7.2) | 126 | 86 | Reference |
| Tobacco cigarette use status | | | |
| Current | 659 (22.4) | 472 | 187 | 0.674 (0.456–0.978) |
| Never | 1971 (66.9) | 1675 | 296 | 0.895 (0.638–1.255) |
| Former | 314 (10.7) | 261 | 53 | Reference |
| Dual use status | | | |
| No | 2876 (97.7) | 2384 | 492 | 1.133 (0.445–2.881) |
| Yes | 68 (2.3) | 24 | 44 | Reference |

| Item 1 | Overall | Perception on “Electronic cigarette helps people quit smoking tobacco cigarette,” | Logistic regression |
|---------|---------|---------------------------------------------------------------------------------|---------------------|
|         | (N = 3652), n (%) | | Adjusted odds ratio (95% CI) for agree versus disagree for “Electronic cigarette helps people quit smoking tobacco cigarette.” |
|         | Agree N = 865 (23.7%) | *Disagree N = 2787 (76.3%) | |
| Electronic cigarette use status | | | |
| Current | 110 (3.0) | 71 | 39 | 3.778 (1.667–8.561) |
| Never | 3260 (89.3) | 678 | 2582 | 0.388 (0.295–0.511) |
| Former | 282 (7.7) | 116 | 166 | Reference |
| Tobacco cigarette use status | | | |
| Current | 855 (23.4) | 252 | 603 | 0.944 (0.706–1.263) |
| Never | 2406 (65.9) | 508 | 1898 | 0.893 (0.691–1.154) |
| Former | 391 (10.7) | 105 | 286 | Reference |
the subjects of Wong et al., concerns of the general public toward EC use are not irrelevant.

A majority of the subjects in this study believed that EC do not aid in tobacco smoking cessation or reducing number of cigarette smoking. However, many studies revealed that the most common reason for people to use EC is to quit tobacco smoking. Current EC users from this study also supported the statement that EC could be helpful in smoking cessation, and it seemed to be more helpful than using medications. Although it remains controversial whether ECs really do help people to quit tobacco smoking, evidence suggest that...
EC use could help to reduce tobacco cigarette use\cite{10,21} to prevent relapse (or, to maintain abstinence),\cite{22} and to reduce the urge for craving.\cite{23,24} Nevertheless, it was proven that ECs are not actually effective in smoking cessation.\cite{25} Therefore, concern from the general public about this issue remains valid.

It was suggested that former tobacco users who use ECs may not have the intention to quit nicotine use altogether.\cite{26} Some EC users may not be able to or are unwilling to quit nicotine addiction, although they could stop smoking.\cite{27} Also, because ECs could provide nicotine while acting as a smoke-free alternative, many users remained comfortable with ECs.\cite{25} Therefore, it is not impossible for ECs to allow more nicotine use, in comparison to tobacco cigarettes.

Although more than half of the subjects in this study did endorse the appealing smells of EC vapors, but they were not denying on the harmful effect caused by the vapors. Majority agreed that EC should be treated same as tobacco cigarette whereby both should be banned its use in prohibited places and did not want ECs to be used in places where tobacco cigarettes are banned. This is similar to the majority of the opinions of the general public in the United States, where second-hand EC vapor exposure is considered to be harmful to their health, and many people wanted ECs to be banned in public areas.\cite{28} Currently, in public areas of Malaysia, the rules and regulations of the law have not been enforced on EC use. As the EC vapors have been proven to be harmful, banning of EC use in public areas should be implemented in public areas in Malaysia.

The subjects’ impression about the harmful effects of EC products is relevant. In Malaysia, many of the EC liquids on the market have been manufactured by unlicensed companies, and the exact components of these liquids are not known. Therefore, EC users should be warned that these liquids are not entirely harmless.\cite{16} Although ECs are relatively less harmful than tobacco cigarettes, its use has been only intended for harm reduction and tobacco cessation, and it has been reported that EC vapors contain toxic and carcinogenic compounds.\cite{29} Other findings from the NECS 2016 study revealed that out of 81 samples analyzed for nicotine content, a total of 13 samples had no label for nicotine but was found to contain nicotine.

On the basis of the current regulations of nicotine, to ensure safety of users, strict enforcement is needed for EC liquid.

The general public should be educated about this fact, so that people who have not used ECs would not risk their health by picking up the habit. Those who perceived ECs as less harmful than conventional cigarettes were more likely to use ECs and, conversely, that those who use ECs perceive them as less dangerous.

Industry’s unsupported health-related claims and their apparent success in convincing individuals that ECs are a safer alternative presents a concerning picture unaddressed by current regulatory policies. Therefore,
manufacturers and retailers of EC products must be strictly regulated.

One of the main reasons EC has gained more popularity in comparison to tobacco cigarette is that ECs are considered to be cheaper. However, the study by Wong et al.\textsuperscript{[16]} revealed that, subjects from lower income groups and those who view ECs as expensive were more willing to quit EC use. Similarly, a study done in the United States also showed that subjects from a low-income background were more likely to quit EC use, and some actually quit due to the perceived high cost of ECs.\textsuperscript{[17]} Thus, it was suggested that one of the possible ways to discourage EC and tobacco cigarette use is by increasing the prices of these products.

The authors in this study would also like to suggest future researchers to investigate how well-perceived health risks of using ECs correspond to objective risks, and whether beliefs about the perceived risks change as more safety data become available. Educating the general public regarding the purposes and harm of ECs may also be helpful in encouraging current tobacco smokers to seek a more harmless alternative, discouraging nonsmokers to start trying ECs, and keeping a scientific, unbiased view for the general public on EC use.

**Conclusion**

Concerns and negative perceptions regarding EC use among the general public in Malaysia were common. However, these concerns and impressions are not baseless. The general public should be educated about EC use and products, especially the purpose of using it as well as the harm it brings. Opinion about banning ECs in public areas should be taken into consideration, as EC use in public areas is harmful and unwelcomed. Authorities could also increase the price of cigarettes, whether ECs or tobacco cigarettes, to encourage people in quitting nicotine use.

It is important for the authorities to increase efforts to highlight the dangers of EC use so people will be more alert and concerned on its negative consequences.

**Ethical policy and institutional review board statement**

Ethical approval for this study was obtained from Medical Research Ethics Committee (MREC), MOH Malaysia (NMRR-16-171-28819 (IIR)).
Using the Poison Act 1952 [press release]. Putrajaya, Malaysia: Malaysian Ministry of Health; 2015.

15. Glum J. Malaysian states ban E-cigarette sales, regulate popular vape industry. International Business Times 22 January, 2016;2016.

16. Wong LP, Alias H, Mohammadi NA, Ghadimi A, Hoe VCW. E-cigarette users’ attitudes on the banning of sales of nicotine E-liquid, its implication on E-cigarette use behaviours and alternative sources of nicotine E-liquid. J Community Health 2017;42:1225-32.

17. Pepper JK, Ribisl KM, Emery SL, Brewer NT. Reasons for starting and stopping electronic cigarette use. Int J Environ Res Public Health 2014;11:10345-61.

18. Etter JF, Bullen C. Electronic cigarette: users profile, utilization, satisfaction and perceived efficacy. Addiction 2011;106:2017-28.

19. Bhatnagar A, Whitset LP, Ribisl KM, Bullen C, Chaloupka F, Piano MR, et al.; American Heart Association Advocacy Coordinating Committee, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research. Electronic cigarettes: a policy statement from the American Heart Association. Circulation 2014;130:1418-36.

20. Grana RA, Popova L, Ling PM. A longitudinal analysis of electronic cigarette use and smoking cessation. JAMA Intern Med 2014;174:812-3.

21. Caponnetto P, Campagna D, Cibella F, Morjaria JB, Caruso M, Russo C, et al. Efficiency and safety of an electronic cigarette (ECLAT) as tobacco cigarettes substitute: a prospective 12-month randomized control design study. PLoS One 2013;8:e66317.

22. Etter JF, Bullen C. A longitudinal study of electronic cigarette users. Addict Behav 2014;39:491-4.

23. Bullen C, McRobbie H, Thornley S, Glover M, Lin R, Laugesen M. Effect of an electronic nicotine delivery device (e cigarette) on desire to smoke and withdrawal, user preferences and nicotine delivery: randomised cross-over trial. Tob Control 2010;19:98-103.

24. Vansickel AR, Cobb CO, Weaver MF, Eissenberg TE. A clinical laboratory model for evaluating the acute effects of electronic “cigarettes”: nicotine delivery profile and cardiovascular and subjective effects. Cancer Epidemiol Biomarkers Prev 2010;19:1945-53.

25. Kalkhoran S, Glantz SA. E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis. Lancet Respir Med 2016;4:116-28.

26. Barbeau AM, Burda J, Siegel M. Perceived efficacy of e-cigarettes versus nicotine replacement therapy among successful e-cigarette users: a qualitative approach. Addict Sci Clin Pract 2013;8:5.

27. Nelson VA, Goniewicz ML, Beard E, Brown J, Sheals K, West R, et al. Comparison of the characteristics of long-term users of electronic cigarettes versus nicotine replacement therapy: a cross-sectional survey of English ex-smokers and current smokers. Drug Alcohol Depend 2015;153:300-5.

28. Mello S, Bigman CA, Sanders-Jackson A, Tan AS. Perceived harm of secondhand electronic cigarette vapors and policy support to restrict public vaping: results from a national survey of US adults. Nicotine Tob Res 2016;18:686-93.

29. Kosmider L, Sobczak A, Fik M, Knysak J, Zaciera M, Kurek J, et al. Carbonyl compounds in electronic cigarette vapors: effects of nicotine solvent and battery output voltage. Nicotine Tob Res 2014;16:1319-26.