Editorial

Smoking and Electronic Cigarettes – Old Problem, New Challenges

Hiang Ping Chan, [1,2]*MBBS, MRCP*, Adrian CL Kee, [1,2]*MBBS, MMed, FRCP (Edin)*

Smoking is the leading cause of preventable morbidity and mortality worldwide. More than 1 billion deaths have been projected to be attributed to tobacco smoking in the 21st century should the current smoking trend persists.[1] Its detrimental effects on health are wide-ranging: from the highly feared carcinogenic effects to damage to the respiratory (such as chronic obstructive pulmonary disease and smoking-related interstitial lung disease), cardiovascular (for example, myocardial infarction) and cerebrovascular (such as cerebrovascular accidents and cognitive impairment) systems.[2-4]

Globally, up to 1 billion people are daily smokers with age-standardised prevalence of daily smoking of 25.0% in men and 5.4% in women.[5] In Singapore, 17.9% of men and 6.3% of women are daily smokers.[5] Between 1990 and 2005, there was a decline in smoking rates in men when the annualised rate of change was -1.6 and 95% uncertainty index (UI) was -2.3 to -0.9. In women, no decline was seen and the rate was -0.4 (95% UI, -1.4 to 0.9).[5] However, between 2005 and 2015, smoking rates were relatively flat in men (0.2; 95% UI, -0.8 to 1.1) but there was an alarming upward trend in women (1.3; 95% UI, -0.5 to 3.0).[5] Singapore has been combating the tobacco scourge through implementation of various legislations that pertain to enforcement of smoking prohibitions in public spaces (such as exercise areas, hawker centres, food shops, education compounds, shopping centres, buses and private-hire vehicles) and restrictions on sales and advertisement of tobacco products.[6] Recently, the minimum legal age for the purchase, use, possession, sale and supply of tobacco products was raised from 18 to 19 years old since 1 January 2019. It will be raised to 21 years old from 1 January 2021.[6]

The latest phenomenon sweeping the world is vaping. Vaping is the act of inhaling and exhaling aerosols that are delivered by devices, the most common being electronic cigarettes (e-cigarettes). E-cigarettes are battery-operated devices that heat a solution containing humectants, nicotine and flavours to deliver an aerosol which is inhaled by the user.[7] They are called by different names such as e-cigs, e-hookahs, mods, vape pens, vapes, tank systems and electronic nicotine delivery systems.[8] E-cigarettes can come in various designs. Some of them resemble regular cigarettes, cigars or pipes while others resemble pens, memory sticks and other everyday items.[8]

Since 1 February 2018, the purchase, use and possession of devices that imitate e-cigarettes were banned in Singapore.[9] Concerns were aired in the general media over whether the ban was misguided after some proponents of e-cigarettes had espoused their benefits that include: 1) the potential to be used as a smoking cessation tool, and 2) harm minimisation since there is a lower level of toxicant exposure in smokers who opt to use e-cigarettes over combustible cigarettes. A cross-sectional population survey in the United Kingdom (UK) had shown that e-cigarette users were more likely to report abstinence than those who either used nicotine replacement therapy bought over the counter (odds ratio [OR], 2.23; 95% confidence interval [CI], 1.70-2.93) or without aid (OR, 1.38; 95% CI, 1.08-1.76).[10] A time series analysis of smokers in the UK also demonstrated that the success rate of quit attempts increased by 0.098% (95% CI, 0.064-0.132; P <0.001) and 0.058% (95% CI, 0.038-0.078; P <0.001) for every 1% increase in prevalence of e-cigarette use in smokers and during a recent quit attempt, respectively.[11] Another report on e-cigarettes revealed that their use expose smokers to lower levels of toxicants compared to traditional combustible cigarettes.[12]

The existing evidence would, however, appear to support the decision to ban e-cigarettes. Studies on their use as a smoking cessation tool have yielded mixed results. A meta-analysis of studies that investigated e-cigarettes and smoking cessation had demonstrated that e-cigarettes impede—rather than promote—smoking cessation.[13] Smokers who used e-cigarettes had 28% lower odds of quitting compared to their counterparts who did not use e-cigarettes (OR 0.72; 95% CI, 0.57-0.91).[13] Although e-cigarettes offer users lower levels of exposure to toxicants, they are still exposed to a myriad of toxicants. Moreover, studies on acute effects of e-cigarettes on the

[1]Division of Respiratory and Critical Care Medicine, University Medicine Cluster, National University Health System, Singapore
[2]Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore
Address for Correspondence: Dr Adrian Kee, Division of Respiratory and Critical Care Medicine, University Medicine Cluster, National University Health System, 5 Lower Kent Ridge Road, Singapore 119074.
Email: Adrian_CL_KEE@nuhs.edu.sg

respiratory, cardiovascular and immune systems have already demonstrated detrimental effects even though long-term studies of their effects on health are not available.[7]

In Singapore, there is little knowledge of the perils of e-cigarettes in youths. The finding from a survey of 600 youths by the Health Promotion Board (HPB) in 2018 showed that up to 70% of respondents were not aware that e-cigarettes, like combustible cigarettes, contain nicotine and carcinogenic chemicals.[14] What is perhaps even more alarming is the fact that e-cigarettes could potentially entice more youths to take up cigarette smoking. The use of e-cigarettes has been shown to result in nicotine dependence in adolescents. Likewise, early initiation and higher frequency of e-cigarette use and the use of nicotine e-liquids have been associated with higher nicotine dependency.[15] In the United States, a prospective cohort study involving high school students over a 6-month period had demonstrated that the use of e-cigarettes increased the frequency and intensity of smoking and vaping.[16] In a UK study, the use of e-cigarettes was associated with initiation and escalation of smoking in adolescents.[17] Opponents of e-cigarettes have argued that instead of focussing on the debate between the potential benefits and harmful effects of e-cigarettes, more attention should be paid to how the tobacco industry targets youths especially when it uses social media to aggressively advertise and market tobacco products to them compared to traditional media.[18]

To address queries and differing views from the public on its ban on e-cigarettes, the Ministry of Health in Singapore issued a media release in 2018 which clarified the: 1) inherent harm posed by e-cigarettes, 2) role of e-cigarettes as a gateway to smoking, 3) lack of evidence to support its use as a smoking cessation tool, and 4) importance to prevent e-cigarettes from becoming entrenched in Singapore.[19]

Notably, a recent randomised UK trial involving 886 participants that compared the use of e-cigarettes to nicotine replacement therapy to achieve abstinence from cigarette smoking found that subjects in the e-cigarette group (18.0%) were more likely to succeed at abstaining from smoking than those in the nicotine replacement group (9.9%) at 1 year (relative risk, 1.83; 95% CI, 1.30-2.58; P <0.001).[20] Although this study provides additional information on the utility of e-cigarettes, the context and limitations of the study should be carefully considered. The study was performed under expert guidance with access to a full range of nicotine replacement therapies and face-to-face behavioural support. The limitations of the study included the fact that subjects were not blinded and "placebo e-cigarettes" were not used. In their discussion, the authors acknowledged that "if nicotine replacement was seen as an inferior option, participants in the nicotine replacement group could have put less effort into their quit attempt than those in the e-cigarette group".[20] The authors were also concerned that the results were not generalised to less dependent smokers and those who had tried e-cigarettes for reasons other than to quit smoking. Additionally, their study reported a fairly high rate of continued use of e-cigarettes that may suggest long-term e-cigarette use. In spite of this useful new information, we should await further generalisable evidence before rules on the use of e-cigarettes can be relaxed. This sentiment was echoed by various members of the medical community following the publication of the randomised trial by Hajek and colleagues.[20-22]

Tobacco smoking is entrenched in modern society and it may have become too huge a juggernaut to be halted in its tracks. Nevertheless, it is important to educate and prevent spread of its use, encourage and assist in smoking cessation and prevent other mimickers from paving a path towards this vice. The decision to implement more stringent laws against smoking—as well as the decisive and well considered act to ban e-cigarettes before it morphs into a vice that becomes too big to control—should be applauded.

REFERENCES

1. Vineis P. Smoking and impact on health. Eur Respir Rev 2008;17:182-6.
2. Lee HP. Smoking and blood pressure among adults in Singapore. Ann Acad Med Singapore 1980;9:416-20.
3. Pride NB. Smoking and the development of progressive airflow obstruction. Ann Acad Med Singapore 1985;14:496-502.
4. Cher BP, Chen C, Yoong J. Prevalence-based, disease-specific estimate of the social cost of smoking in Singapore. BMJ Open 2017;7:e014377.
5. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. Lancet 2017;389:1885-906.
6. Singapore Statutes Online. Smoking legislations. Available at: https://sso.agc.gov.sg/Search/Content?Phrase=smoking&PhraseType=AllTheseWords&In=InForce_Act_SL&Within=title. Accessed on 19 February 2019.
7. Eltorai AE, Choi AR, Eltorai AS. Impact of electronic cigarettes on various organ systems. Respir Care 2019;64:328-36.
8. Centers for Disease Control and Prevention. Smoking and tobacco use: about electronic cigarettes (e-cigarettes). Available at: https://www.cdc.gov/tobacco/basic_information/e-cigarettes/about-e-cigarettes.html. Accessed on 19 February 2019.
9. Health Sciences Authority, Singapore. Prohibition on certain products. Available at: https://www.hsa.gov.sg/content/hsa/en/Health_Products_Regulation/Tobacco_Control/Overview/Tobacco_Legislation/Prohibition_on_Certain_Products.html. Accessed on 19 February 2019.
10. Brown J, Beard E, Kotz D, Michie S, West R. Real-world effectiveness of e-cigarettes when used to aid smoking cessation: a cross-sectional population study. Addiction 2014;109:1531-40.

11. Beard E, West R, Michie S, Brown J. Association between electronic cigarette use and changes in quit attempts, success of quit attempts, use of smoking cessation pharmacotherapy, and use of stop smoking services in England: time series analysis of population trends. BMJ 2016;354:i4645.
12. Goniewicz ML, Smith DM, Edwards KC, Blount BC, Caldwell KL, Feng J, et al. Comparison of nicotine and toxicant exposure in users of electronic cigarettes and combustible cigarettes. JAMA Netw Open 2018;1:e185937.
13. 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.
14. Heng M. Nearly 7 in 10 youth unaware of e-cigarette dangers: HPB survey. The Straits Times, 27 January 2019. Available at: https://www.straitstimes.com/singapore/health/nearly-7-in-10-youth-unaware-of-e-cigarette-dangers-hpb-survey. Accessed on 19 February 2019.
15. Morean ME, Krishnan-Sarin S, S O'Malley S. Assessing nicotine dependence in adolescent e-cigarette users: the 4-item Patient-Reported Outcomes Measurement Information System (PROMIS) Nicotine Dependence Item Bank for electronic cigarettes. Drug Alcohol Depend 2018;188:60-3.
16. Goldenson NI, Leventhal AM, Stone MD, McConnell RS, Barrington-Trimis JL. Associations of electronic cigarette nicotine concentration with subsequent cigarette smoking and vaping levels in adolescents. JAMA Pediatr 2017;171:1192-9.
17. Conner M, Grogan S, Simms-Ellis R, Flett K, Sykes-Muskett B, Cowap L, et al. Do electronic cigarettes increase cigarette smoking in UK adolescents? Evidence from a 12-month prospective study. Tob Control 2018:27:365-72.
18. van der Eijk Y, Lee JK. Youth smoking is a problem, so is youth vaping. CNA, 4 March 2019. Available at: https://www.channelnewsasia.com/news/commentary/youth-smoking-is-a-problem-so-is-youth-vaping-11289582. Accessed on 4 March 2019.
19. Ministry of Health, Singapore. FAQs on e-cigarettes, vaporisers and heat-not-burn tobacco products. https://www.moh.gov.sg/news-highlights/details/faqs-on-e-cigarettes-vaporisers-and-heat-not-burn-tobacco-products. Accessed on 19 February 2019.
20. Hajek P, Phillips-Waller A, Przulj D, Pesola F, Myers Smith K, Bisal N, et al. A randomized trial of e-cigarettes versus nicotine-replacement therapy. N Engl J Med 2019;380:629-37.
21. Borrelli B, O'Connor GT. E-cigarettes to assist with smoking cessation. N Engl J Med 2019;380:678-9.
22. Drazen JM, Morrissey S, Campion EW. The dangerous flavors of e-cigarettes. N Engl J Med 2019;380:679-80.