Mouhamad Bigwanto - Determinants of e-cigarette use among a sample of high school students in Jakarta, Indonesia

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Mouhamad Bigwanto¹ / Mochamad Iqbal Nurmansyah² / Elizabeth Orlan³ / Yoli Farradika¹ / Tri Bayu Purnama⁴

¹ University of Muhammadiyah Prof. Dr. Hamka, Faculty of Health Sciences, South Jakarta, Indonesia
² Universitas Islam Negeri Syarif Hidayatullah Jakarta, Faculty of Health Science, Kertamukti No. 5 South Tangerang, Banten, 412, Indonesia, E-mail: iqbalnurmansyah@uinjkt.ac.id. https://orcid.org/0000-0001-5609-6038.
³ Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
⁴ Faculty of Public Health, Universitas Islam Negeri Sumatera Utara, Medan, Indonesia

Determinants of e-cigarette use among a sample of high school students in Jakarta, Indonesia

Abstract:

Objectives: The aim of this study was to determine the predisposing, enabling and reinforcing factors associated with electronic cigarette (e-cigarette) use among high school students in Jakarta, Indonesia.

Methods: This cross-sectional study took place in eight high schools in Jakarta, Indonesia. A total of 767 students were recruited by multistage cluster random sampling. Bivariate and multivariate statistical analyses were employed to determine the associations between socio-demographic, predisposing, reinforcing and enabling factors and e-cigarette use.

Results: Respondents were 54.1% male and the mean age was 16 years old [standard deviation (SD): 1.02]. In this sample, 32.2% of students (n = 247) had ever used e-cigarettes and 11.8% of students were e-cigarette users (n = 90). Several measured factors were positively associated with e-cigarette use, including: current smoking of conventional cigarettes [odds ratio (OR): 2.06]; perception that e-cigarettes are less addictive than conventional cigarettes (OR: 1.98); perception that e-cigarettes do not cause cancer (OR: 2.38); parental acceptance of e-cigarette use (OR: 30); and having enough money to buy e-cigarettes (OR: 3.24). The only variable found that was negatively associated with e-cigarette use was teacher's use of e-cigarettes (OR: 0.34).

Conclusions: This study found that student social influences, perceptions about and accessibility to e-cigarettes were significantly positively associated with e-cigarette use among high school students in Jakarta, Indonesia. This study highlights the importance of educating students, their parents and teachers regarding safety and potential health hazards of using e-cigarettes. Efforts to implement and enforce youth access restrictions on e-cigarettes in Indonesia are crucial to preventing further uptake of these products.

Introduction

Electronic cigarette (e-cigarette) use among youth and young adults has become a global public health issue [1]. Product flavour availability, design and promotion increases youth acceptability of the product [2]. Many studies revealed that e-cigarette products have a detrimental effect on health, including harm to the pulmonary, immune, central nervous and cardiovascular systems [3]. A systematic review revealed that almost of e-cigarettes contain nicotine [4]. Use of nicotine products, especially at a young age, can lead to addiction [4]. Moreover, another study revealed that nicotine exposure during adolescence may result in a greater risk of developing psychiatric disorders and cognitive impairment in later life [5]. E-cigarette use remains a controversial topic, given that the products may be used for cessation among smokers who cannot otherwise quit. However, many stakeholders including the World Health Organization (WHO) and the Forum of International Respiratory Societies recommend restricting marketing of products to prevent youth uptake [6], [7].

In 2010, e-cigarettes were declared a dangerous and illegal product by the Indonesian National Agency of Drug and Food Control (BPOM) [8]. Nevertheless, e-cigarettes remained widely available on the Indonesian market (both in stores and online) and are increasingly promoted [9]. Currently, the only e-cigarette policy that exists is an excise tax on e-liquids (the nicotine solution for both open and closed systems used to fill e-cigarettes). The Ministry of Finance imposed the maximum excise tariff (57%) on e-liquids in 2018 through the

Minister of Finance Regulation [10]. Because of this tax policy, e-cigarettes are now acknowledged as a legal product by the Indonesian government, although the products remain unregulated by BPOM [11].

According to the most recent Global Adult Tobacco Survey (2011), 10.9% of Indonesian adults had heard about e-cigarettes and among those who were aware, 2.5% used these products [12]. In 2017, a preliminary study on the prevalence of e-cigarette use among adolescents in Bekasi, West Java, Indonesia found that 22.3% of 581 high school students were current users of e-cigarettes [13]. Overall, e-cigarette use behaviours are understudied in Indonesia. Moreover, to the best of our knowledge, determinants of e-cigarette use among high school students in Indonesia has not yet been studied. Therefore, this study aims to determine factors that contribute to e-cigarette use via hypothesised predisposing, reinforcing and enabling factors of behaviour among a sample of high school students in Jakarta, Indonesia.

This study used the PRECEDE (predisposing, reinforcing and enabling constructs) model as a conceptual framework to examine factors that may contribute to e-cigarette use. The predisposing factors we assessed include knowledge, attitudes, beliefs and perceptions; the reinforcing factors include social norms such as peer, school and parent influence; and the enabling factors include conditions that enable behaviour change, such as programmes and policies that influence the availability of resources and accessibility or affordability [14]. The model is used to identify not only all aspects of a person's environment but also the person's own cognitions, skills and behaviour so that its utility helps to provide a comprehensive framework of the factors that influence behaviour, and allows for tangible factors on which to intervene and build an effective health behaviour change program [15], [16].

Methods

We distributed a cross-sectional, self-report survey to students in eight high schools in Jakarta, Indonesia in September 2018. Jakarta was chosen as the study location given its cosmopolitan population, its status as the national capital and the largest city in Indonesia, where previous studies have found that adults are more likely to be exposed to e-cigarettes in urban versus rural areas [17]. There were 681 high schools in Jakarta that consisted of 501 and 180 schools were vocational and general high schools, respectively. Multi-stage cluster random samplings were used to select two vocational and two general high schools from public schools and select two vocational and two general high schools from private schools (Figure 1). Then, three classes representing each grade were randomly selected from each school. In the selected classes, all the students were recruited to participate. All the schools approached agreed to participate in the study, and all the students participated in each class approached. The survey was managed by five trained research assistants and carried out in the classroom without the presence of a teacher. Informed consent was obtained before the questionnaire was distributed, and respondents were given a brief orientation on how to fill out the questionnaire. This study was approved by the Committee on Health Research Ethics of Universitas Muhammadiyah Prof. DR. HAMKA with number 03/18.11/026 and institutional permissions were obtained from each school prior to study.
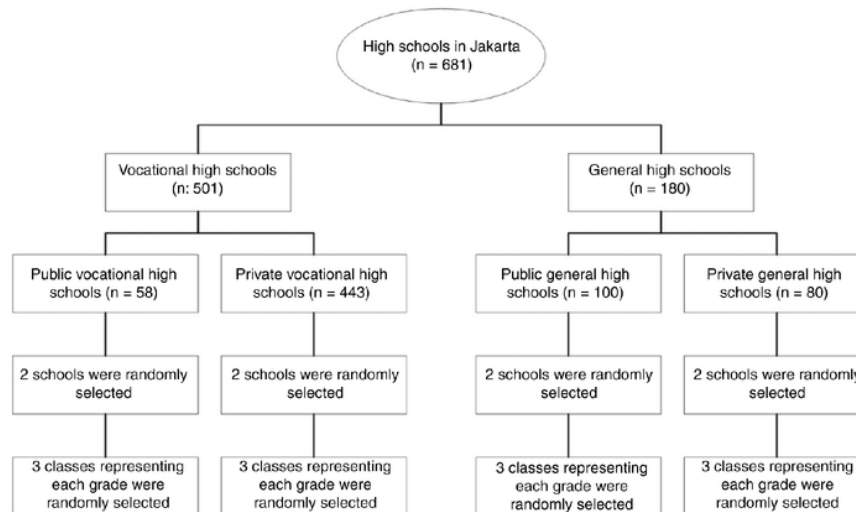

Figure 1: Flow diagram of multistage sampling.

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The minimum sample size (689 respondents) was determined by using the formula of hypothesis testing for two-population proportion [95% confidence interval (CI)]. A total of 767 students were recruited for this study. The survey instrument used consisted of five parts. The first part of the survey contained questions about socio-demographic characteristics including sex, age, class grade, amount of pocket money per week and parents' occupation. The second part of the survey included questions on conventional cigarette and e-cigarette use status. This section of the questionnaire used the Global Youth Tobacco Survey (GYTS) standard items and was adapted to include e-cigarette use questions [18]. The definition of e-cigarettes used in this study is in line with what WHO describes as "electronic nicotine delivery system (ENDS)" and does not include heated tobacco products (HTPs) [19], [20]. Respondents were said to be non-users of e-cigarettes if they reported never using e-cigarettes, even a puff [21]. If the respondent had not used e-cigarettes in the last 30 days but had ever used one of the products (at least one puff), then s/he were categorized as an "ever e-cigarette user". Current e-cigarette users are students who used the products any time during the past 30 days. For those who smoked cigarette any time during the past 30 days they are categorized as "current cigarette smoker". We categorized students as dual users if they reported current cigarette smoking and using e-cigarette within the past 30 days [22]. The third part of the questionnaire consisted of social influences (i.e. at home and school) to use e-cigarettes. The questions explored e-cigarette use behaviours by people close to respondents' such as family, peers and teachers, and also included questions that measured the tolerance of use and penalties when using electronic cigarettes at home and at school. We subsequently asked about the participants' perceptions of referent others' attitudes towards e-cigarette use.

The fourth part of the questionnaire included the participants' own perceptions about e-cigarettes, which were assessed by nine statements comparing e-cigarette use to cigarette smoking. Eight positively framed statements; (1) e-cigarettes are safer, (2) trendier, (3) cheaper, (4) easier to obtain, (5) more non-addictive, (6) can help stop smoking, (7) the vapour does not disturb the surrounding people and (8) not restricted in the public area; and one negatively framed statement that electronic cigarette products can cause lung cancer. Four Likert scale items were used to identify attitude variables namely strongly agree, agree, disagree and strongly disagree. The Cronbach's alpha for the perception questions scale is 0.75. The fifth part of the questionnaire consisted of three questions measuring students' perception of e-cigarettes affordability and accessibility. This part explores accessibility to vape shops, affordability of e-cigarettes and students' price sensitivity to e-cigarettes.

All statistical tests were analyzed using SPSS statistics version 22.0 (IBM Corp, Armonk, NY, USA). E-cigarette use patterns were described using descriptive statistics. Chi-square tests were employed to determine associations between independent and dependent variables. Independent variables with p-value <0.25 in bivariate tests were included in multivariate analysis. Adjusted odds ratios (OR) and predictors of e-cigarette use were determined in multivariate analysis.

Results

The questionnaire response rate was 100%, of which 99.6% (n = 767) of respondents completed all questions in the survey. Table 1 shows the characteristics of the students surveyed. The respondents were 54.1% male and the mean age was 16 years old [standard deviation (SD): 1.02]. In our sample, 247 (32.2%) students had ever tried e-cigarettes, but were not currently using the products. About 46 (6%) of the sample were dual users (smoking cigarettes and using e-cigarettes). Among e-cigarette users (n = 90), 51.1% of them (n = 46) were smokers and 20% had never smoked conventional cigarettes before (n = 18). Regarding source of information about e-cigarettes, almost half of students learned about e-cigarettes through observation of other people using the product (47.5%, n = 364), whereas a quarter of them learned through seeing products online (i.e. social media) (25.2%, n = 139).

Table 1: High school students' use of electronic cigarettes by sociodemographic variables and smoking status.

	Total 767 (%)	Current user 90 (%)	Ever user 247 (%)	Never user 430 (%)
Sex				
Male	415 (54.1)	64 (71.1)	183 (74.1)	168 (39.1)
Female	352 (45.9)	26 (28.9)	64 (25.9)	262 (60.9)
Age				
<=16 years	446 (58.1)	54 (60.0)	128 (51.8)	264 (61.4)
>=17 years	321 (41.9)	36 (90.0)	119 (48.2)	166 (38.6)
Pocket money				
High (>$7.07 USD/week)	384 (50.1)	48 (53.3)	123 (49.8)	213 (49.5)

Low (<$7.08 USD/week)	383 (49.9)	42 (46.7)	124 (50.2)	217 (50.5)
Smoking status				
Active	187 (24.4)	46 (51.1)	110 (44.5)	31 (7.2)
Former	132 (17.2)	26 (28.9)	60 (24.3)	46 (10.7)
Never	448 (58.4)	18 (20.0)	77 (31.2)	353 (82.1)
E-cigarette information source				
Seeing other people use (except friend and family)	364 (47.5)	42 (46.7)	110 (44.5)	212 (49.3)
Social media	135 (17.6)	16 (17.8)	52 (21.1)	67 (15.6)
Friend	125 (16.3)	9 (10.0)	48 (19.4)	68 (15.8)
Internet (other than social media)	58 (7.6)	9 (10.0)	10 (4.0)	39 (9.1)
E-cigarette store	33 (4.3)	4 (4.4)	13 (5.3)	16 (3.7)
Family	27 (3.5)	7 (7.8)	11 (4.5)	6 (1.4)
Television	22 (2.9)	0 (0.0)	2 (0.8)	20 (4.7)
Magazines	3 (0.4)	0 (0.0)	1 (0.4)	2 (0.5)

Among those who ever use and current users, the average of their first try of an e-cigarette was at 14.5 years old. Among electronic cigarette users, 34 students (10.1%) claimed that the e-liquid they used contained nicotine. The most frequently used type of e-cigarette (45.5%) has a refill tank, and most users (28.9%) buy their devices from vape shops. Curiosity (65%) is one of the main reasons why the student had tried e-cigarettes followed by the reason to stop smoking (6.5%), and had considered e-cigarettes as a lifestyle choice (fashionable) (6.5%) (Table 2).

Table 2: Descriptive characteristics of current e-cigarette users and those who ever tried.

	n = 337 (%)
Age of first use, years	
<=12	14 (4.6)
13	30 (9.9)
14	60 (19.8)
15	107 (35.3)
16	60 (19.8)
17+	32 (10.6)
Main reason to use EC	
Curious to try	219 (65.0)
To quit smoking	22 (6.5)
E-cigarettes are fashionable	22 (6.5)
To reduce smoking	18 (5.3)
E-cigarettes have variant flavours	14 (4.2)
E-cigarettes are less harmful than cigarettes	8 (2.4)
Encouragement of friend/ads	7 (2.1)
Vapor does not disturb others	4 (1.2)
Encouragement of ads	1 (0.3)
Other reasons	22 (6.5)
E-cigarette device type	
Portable vapouriser	41 (45.6)
Vaporizer pen	8 (8.9)
Cig-a-like	4 (4.4)
Other	37 (41.1)
E-cigarette (device and liquid) source	
Vape shop	26 (28.9)
Online shop	13 (14.4)
Purchased from friends	5 (5.6)
Given by friends	15 (16.7)
Other sources	31 (34.4)
Contains nicotine	
Yes	34 (10.1)
No	118 (35.0)
Does not know	185 (54.9)
Nicotine concentration info	
Yes	61 (18.1)
No	78 (23.1)
Does not know	198 (58.8)

In this study, we compared the socio-demographic characteristics and conventional cigarette use behaviour among e-cigarette users compared to non-users (Table 3). The conventional cigarette smokers were more likely to be current e-cigarette users than non-smokers (OR: 3.97; 95% CI: 2.53–6.25). However, there were no significant associations between age, amount of pocket money and e-cigarette use.

Table 3: Association between sociodemographic status and e-cigarette use.

	E-cig use status		OR (95% CI)	p-Value
	E-cigarette user n = 90 (%)	Non-e-cigarette user n = 677 (%)		
<=16 years old	54 (12.1)	392 (87.9)	1.09 (0.70–1.70)	0.705
Male sex	64 (15.4)	351 (84.6)	2.29 (1.42–3.70)	0.001
High level of pocket money	48 (12.5)	336 (87.5)	1.16 (0.75–1.80)	0.509
Current cigarette smoker	46 (24.6)	141 (75.4)	3.97 (2.53–6.25)	0.000

Table 4 shows the association between predisposing/reinforcing/enabling factors and e-cigarette use. Numerous predisposing factors were significantly associated with e-cigarette use. For those who have some perceptions, such as e-cigarette use is safer, trendier, easier to obtain, less addictive than cigarettes, can help to quit smoking, not restricted in the public areas, not causing cancer and the resulting vapour is not as disturbing to surrounding people compared to cigarettes, had significantly higher ORs for using e-cigarettes. Students who had a family member or members who used e-cigarettes were significantly more likely to use e-cigarettes than those whose family members did not use e-cigarettes (OR: 2.37; 95% CI: 1.48, 3.40). Parents who allowed students to use e-cigarettes had higher odds of using e-cigarettes compared to students whose parents did not allow this behaviour (OR: 7.84; 95% CI: 4.33, 14.20). Meanwhile, school restriction of e-cigarettes and friend use of e-cigarettes were not significantly associated with e-cigarette use. Availability of money to buy e-cigarettes, perception of e-cigarette price as being affordable and easy to access were enabling factors positively associated with higher odds of e-cigarette use.

Table 4: Association between PRECEDE factors and e-cigarette use.

	E-cigarette use status		OR (95% CI)	p-Value
	User n = 90 (%)	Non-user n = 677 (%)		
Predisposing factors (e-cigarettes are … than conventional cigarettes)				
Less harmful	41 (21.8)	147 (78.2)	3.02 (1.92–4.75)	0.000
Trendier	61 (14.5)	361 (85.5)	1.84 (1.15–2.94)	0.010
Cheaper	9 (20.5)	35 (79.5)	2.04 (0.95–4.39)	0.064
Easier to obtain	24 (22.0)	85 (78.0)	2.53 (1.51–4.26)	0.000
More non-addictive	56 (21.3)	207 (78.7)	3.74 (2.37–5.90)	0.000
Can help stop smoking	54 (24.2)	169 (75.8)	4.51 (2.86–7.12)	0.000
Not disturbing	50 (21.5)	183 (78.5)	3.37 (2.15–5.29)	0.000
Not causing cancer	49 (20.9)	185 (79.1)	3.18 (2.03–4.98)	0.000
Not restricted in public areas	22 (35.5)	40 (64.5)	5.15 (2.89–9.18)	0.000
Reinforcing factors				
Family uses	32 (20.0)	128 (80.0)	2.37 (1.48–3.80)	0.000
Friend uses	66 (13.1)	436 (86.9)	1.52 (0.93–2.49)	0.094
Teacher uses	12 (6.3)	177 (93.7)	0.44 (0.23–0.82)	0.008
Parents allow	24 (44.4)	30 (55.6)	7.84 (4.33–14.20)	0.000
Not restricted in school	79 (11.4)	615 (88.6)	0.72 (0.37–1.43)	0.352
Enabling factors				
Having enough money to buy e-cigarettes	23 (41.8)	32 (58.2)	6.92 (3.83–12.51)	0.000
Affordability	24 (20.9)	91 (79.1)	2.34 (1.40–3.93)	0.001
Accessibility to vape shop	37 (17.5)	175 (82.5)	2.00 (1.27–3.15)	0.002

The results of multivariate logistic regression analysis are shown Table 5. Current smoking of conventional cigarettes, perception that e-cigarettes are less addictive, do not cause cancer, family use of e-cigarettes, al-

lowance by parents to use e-cigarettes and availability of money to buy e-cigarettes were independently, significantly associated with higher odds of e-cigarette use.

Table 5: Multivariate analysis to determine predictors of e-cigarette use.

	AOR	95% CI	p-Value
Currently use conventional cigarette	2.06	1.11–3.81	0.022
E-cigarettes are less harmful	0.92	0.47–1.79	0.798
E-cigarettes are trendier	0.75	0.41–1.41	0.374
E-cigarettes are cheaper	1.18	0.44–3.17	0.749
E-cigarettes are easier to obtain	1.93	0.99–3.77	0.055
E-cigarettes are more non-addictive	1.98	1.04–3.78	0.039
E-cigarettes can help stop smoking	1.65	0.86–3.18	0.131
E-cigarettes are not disturbing	1.22	0.67–2.23	0.518
E-cigarettes are not causing cancer	2.38	1.36–4.14	0.002
E-cigarettes are not restricted in public areas	0.58	0.33–1.03	0.063
Family uses e-cigarette	1.76	0.99–3.14	0.056
Friend uses e-cigarette	1.55	0.85–2.81	0.155
Teacher uses e-cigarette	0.34	0.16–0.71	0.004
Allowed by parents to use e-cigarette	3.80	1.74–8.33	0.001
Having enough money to buy e-cigarettes	3.24	1.43–7.35	0.005
E-cigarettes affordability	0.80	0.40–1.59	0.523
Accessibility to vape shop	0.92	0.50–1.69	0.786

AOR, adjusted odds ratio was adjusted for sex, age, class grade and pocket money; CI, confidence interval.

Discussion

Cigarette smoking status, perceptions of e-cigarette products, social influences and availability/accessibility of e-cigarettes are significantly associated with e-cigarette use among students. In this study, 11.8% of students were using e-cigarettes. This is lower than the rates reported among high school students in Denpasar, Indonesia (20.5%) [8], California, USA (12.9%) [23] and Connecticut, USA (12%) [24]. Yet, the use rate in this study is higher than the study among university students in France (3.6%), and among middle school students in China (1.2%) [25], [26].

The most reported reason for using the products in this study was curiosity. This is unsurprising because students around the world list curiosity about e-cigarettes as a main driver for use [27], [28], [29]. Besides psychological and socio-demographic factors, personality traits such as novelty seeking and sensation seeking also play an important role in the early stages of smoking uptake [30]. This study also found that 11.9% of e-cigarette users reported using e-cigarettes to reduce and ultimately quit conventional cigarette smoking. Although, the main reason among e-cigarette users was to quit smoking, research shows that many smokers fail to transition from smoking cigarettes to e-cigarettes to successfully quitting; and may instead continue using both products [31]. In this study, 51.1% of e-cigarette users were also cigarette smokers (dual users). The high number of dual users might show that e-cigarette use is not yet effective as aid for quitting smoking. Another study has revealed that not only e-cigarettes are not an effective tool for smoking cessation among adolescents but also, they actually are associated with higher incidence of combustible cigarette smoking [32].

The e-cigarette users in this study thought that e-cigarette use was less harmful, trendier and less addictive compared to cigarettes. This result was unsurprising given that previous studies show similarly aged youth view e-cigarettes as less harmful [33], [34] and less addictive than cigarettes [35], [36]. This study also revealed that perception of e-cigarette vapour is not disturbing surrounding people and that e-cigarette use is not restricted in public areas were significant factors associated with use of e-cigarette. Kim and Lee described in their study that e-cigarette users chose the product because e-cigarettes do not leave a tobacco smell, and therefore do not disturb surrounding people [37]. Pokhrel et al. stated that e-cigarette users perceived that there was no necessity to go to a smoking zone to use an e-cigarette and use of e-cigarette in public places would not attract the attention of others [38].

This study's findings showed that young people who have family and teachers who use e-cigarettes have higher odds of being an e-cigarette user. This study also found that students who were e-cigarette users were more likely to be allowed to use e-cigarettes by their parents. A study among adults in the US found that many parents who use e-cigarettes were unaware of the potential health and safety hazards, including nicotine

poisoning for children [39]. A study by Barrington-Trimis et al. also stated that family use of e-cigarette was strongly associated with intention to use cigarette among 11th/12th grade students in Southern California, USA [40]. Most of this study's e-cigarette users obtained e-cigarette from vape shops, friends and online shops. A study performed among youth in Connecticut, USA also found the same pattern where most of youth obtain their e-cigarettes from friends (45.4%), vape shops (12.6%) and online shops (10.5%) [41].

An effective public health programme for tobacco control in Indonesia should consider a multilevel and multi-prong approach that focuses on the individual, community and policy levels [14]. This study examines factors which predispose, enable and reinforce e-cigarette use behaviour which, in turn, could help identify appropriate and effective tobacco control interventions for this population [42]. At the individual level, the perception among youth that e-cigarettes are less addictive and do not cause cancer compared to cigarettes are associated with use, and therefore, more education and awareness about the harms of e-cigarettes is needed for Jakarta high school students. This research also implies that educational efforts for family and teachers, in addition to students, can impact use of these products, given that the students perceived that acceptance of use was relatively high among this population. Because most high school-aged e-cigarette users in our sample were obtaining e-cigarettes from vape shops, their peers and online stores, policymakers should implement regulations that restrict youth access to obtain e-cigarettes. One study performed in Connecticut, USA concluded that implementing and enforcing the prohibition of the sale of e-cigarettes in person and online are important steps toward controlling e-cigarette use among youth [41]. The government also needs to consider bans on Internet advertisements of e-cigarette products, including social media, which is heavily used by youth [43].

These data were collected cross-sectionally, so we are unable to determine whether perceptions influenced behaviour prior to use of e-cigarettes, whether the students have since quit using e-cigarettes, or otherwise changed their behaviour and perceptions. There may be some unmeasured clustering in this study that is not controlled for. The questionnaires did not include school-related data, and therefore, we are uncertain whether there was an additional level of clustering at the school level, in addition to the class level. This research used an anonymous self-reported questionnaire tool to collect data. Our data collectors gave an orientation prior to the students completing the questionnaire; however, there were some cases of missing data (removed from the sample) which may signify a lack of understanding of some of the questions. This research is school-based, and is therefore not representative of high school-aged students in Jakarta, or of the high school or adolescent Indonesian population.

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Conflict of interest: The authors declare that they have no competing interests.

References

[1] United States Department of Health and Human Services. E-Cigarette Use Among Youth and Young Adults: A Report of the Surgeon General. Bethesda, MD: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2016.

[2] Hilton S, Weishaar H, Sweeting H, Trevisan F, Katikireddi SV. E-cigarettes, a safer alternative for teenagers? A UK focus group study of teenagers' views. BMJ Open. 2016;6(11):e013271.

[3] Qasim H, Karim ZA, Rivera JO, Khasawneh FT, Alshbool FZ. Impact of electronic cigarettes on the cardiovascular system. J Am Heart Assoc. 2017;6(9):e006353.

[4] Pisinger C, Døssing M. A systematic review of health effects of electronic cigarettes. Prev Med (Baltim). 2014;69:248–60.

[5] Goriounova NA, Mansvelder HD. Short- and long-term consequences of nicotine exposure during adolescence for prefrontal cortex neuronal network function. Cold Spring Harb Perspect Med. 2012;2(12):a012120.

[6] World Health Organization. Electronic Nicotine Delivery Systems and Electronic Non-Nicotine Delivery Systems (ENDS/ENNDS). Report by WHO. Conference of the Parties to the WHO Framework Convention on Tobacco Control; 2016.

[7] Ferkol TW, Farber HJ, Grutta S La, Leone FT, Marshall HM, Neptune E, Electronic cigarette use in youths: a position statement of the Forum of International Respiratory Societies. Eur Respir J. 2018;51(5):1800278.

[8] Putra IG, Putra IM, Prayoga DG, Astuti PA. Gambaran Pemahaman, Persepsi, dan Penggunaan Rokok Elektronik pada Siswa Sekolah Menengah Atas di Kota Denpasar. In: Proceeding Book 4th ICTOH; 2018.

[9] Bam TS, Bellew W, Berezhnova I, Jackson-Morris A, Jones A, Latif E, et al. Position statement on electronic cigarettes or electronic nicotine delivery systems. Int J Tuberc Lung Dis. 2014;18(1):5–7.

[10] Kementerian Keuangan Republik Indonesia. Kemenkeu Terbitkan Kebijakan Tarif Cukai 2019 [Ministry of Finance Issues Excise Tariff Policy 2019] [Internet]. Indonesia: KEMENTERIAN KEUANGAN REPUBLIK INDONESIA SEKRETARIAT JENDERAL BIRO KOMUNIKASI DAN LAYANAN INFORMASI; 2018. Available from: https://www.kemenkeu.go.id/media/11250/siaran-pers-kemenkeu-terbitkan-kebijakan-tarif-cukai-2019.pdf.

[11] Cahya KD. Vape Tanpa Kandungan Nikotin Tetap Berbahaya, Benarkah? Kompas.com [Vape without Nicotine Content Still Dangerous, Really? Kompas.com] [Internet]. 2019 Apr 17; Available from: https://lifestyle.kompas.com/read/2019/03/14/220000520/vape-tanpa-kandungan-nikotin-tetap-berbahaya-benarkah-.

[12] Palipudi KM, Mbulo L, Morton J, Mbulo L, Bunnell R, Blutcher-Nelson G, et al. Awareness and current use of electronic cigarettes in Indonesia, Malaysia, Qatar, and Greece: findings from 2011–2013 global adult tobacco surveys. Nicotine Tob Res. 2016;18(4):501–7.

[13] El Hasna FN, Cahyo K, Widagdo L. Faktor-faktor yang berhubungan dengan penggunaan rokok elektrik pada perokok pemula di SMA kota Bekasi [Factors related to the use of e-cigarettes in novice smokers in Bekasi City High School]. J Kesehat Masy. 2017;5(3):548–57.

[14] Gielen AC, Green LW. The impact of policy, environmental, and educational interventions: a synthesis of the evidence from two public health success stories. Heal Educ Behav. 2015;24(1 Suppl):20S–34S.

[15] Crosby R, Noar SM. What is a planning model? An introduction to PRECEDE-PROCEED. J Public Health Dent. 2011;71(S1):S7–15.

[16] Valente TW. Evaluating health promotion programs. 1th ed. Oxford: Oxford University Press; 2002.

[17] World Health Organization. Indonesian Ministry of Health; CDC Foundation. Gats. Indonesia; 2011. 1–182 p.

[18] World Health Organization. Global Youth Tobacco Survey (GYTS): Indonesia report 2014 [Internet]. WHO-SEARO; 2015. 24 p. Available from: http://www.searo.who.int/tobacco/data/ino_rtc_reports/en/%5Cnhttp://www.searo.who.int/tobacco/documents/ino_gyts_report_2014.pdf.

[19] World Health Organization. Electronic nicotine delivery systems: Report by WHO. WHO Framework Convention on Tobacco Control; 2014.

[20] World Health Organization. Heated tobacco products (HTPs) information sheet. World Heal Organ [Internet]; 2018 (may). p. 2–3. Available from: https://www.who.int/tobacco/publications/prod_regulation/heated-tobacco-products/en/%0Ahttp://www.who.int/tobacco/publications/prod_regulation/heated-tobacco-products/en/.

[21] World Health Organization. Global Youth Tobacco Survey (GYTS): Indonesia report 2014 [Internet]. WHO Regional Office for South-East Asia; 2015. 24 p. Available from: http://www.searo.who.int/tobacco/data/ino_rtc_reports/en/%5Cnhttp://www.searo.who.int/tobacco/documents/ino_gyts_report_2014.pdf.

[22] Rath JM, Villanti AC, Abrams DB, Vallone DM. Patterns of tobacco use and dual use in US young adults: The missing link between youth prevention and adult cessation. J Environ Public Health. 2012;2012:1–9.

[23] Bostean G, Trinidad DR, McCarthy WJ. E-cigarette use among never-smoking California students. Am J Public Health. 2015;105(12):2423–5.

[24] Krishnan-Sarin S, Morean ME, Camenga DR, Cavallo DA, Kong G. E-cigarette use among high school and middle school adolescents in Connecticut. Nicotine Tob Res. 2015;17(7):810–8.

[25] Kinouani S, Pereira E, Tzourio C. Electronic cigarette use in students and its relation with tobacco-smoking: a cross-sectional analysis of the I-Share study. Int J Environ Res Public Health. 2017;14(11):E1345.

[26] Xiao L, Parascandola M, Wang C, Jiang Y. Perception and current use of e-cigarettes among youth in China. Nicotine Tob Res. 2019;21:1401–7.

[27] Wackowski OA, Bover Manderski MT, Delnevo CD, Giovenco DP, Lewis MJ. Smokers' early e-cigarette experiences, reasons for use, and use intentions. Tob Regul Sci. 2016;2(2):133–45.

[28] Margolis KA, Nguyen AB, Slavit WI, King BA. E-cigarette curiosity among U.S. middle and high school students: findings from the 2014 national youth tobacco survey. Prev Med (Baltimore). 2016;89:1–6.

[29] Patel D, Davis KC, Cox S, Bradfield B, King BA, Shafer P, et al. Reasons for current e-cigarette use among U.S. adults. Prev Med (Baltimore). 2016;93:14–20.

[30] The Annenberg Foundation Trust at Sunnylands' Adolescent Mental Health Initiative. Treating and preventing adolescent mental health disorders: what we know and what we don't know: a research agenda for improving the mental health of our youth. In: Evans DL, Foa EB, Gur RE, Hendin H, O'Brien CP, Seligman ME, et al., editors. Oxford: Oxford University Press; 2006.

[31] Manzoli L, Flacco ME, Ferrante M, La Vecchia C, Siliquini R, Ricciardi W, et al. Cohort study of electronic cigarette use: effectiveness and safety at 24 months. Tob Control. 2017;26(3):284–92.

[32] Chatterjee K, Alzghoul B, Innabi A, Meena N. Is vaping a gateway to smoking: a review of the longitudinal studies. Int J Adolesc Med Health. 2018;30(3). DOI: 10.1515/ijamh-2016-0033.

[33] Xu Y, Guo Y, Liu K, Liu Z, Wang X. E-Cigarette awareness, use, and harm perception among adults: A meta-analysis of observational studies. PLoS One. 2016;11(11):e0165938.

[34] Shpakou A, Kovalevskiy V, Klimatskaia L, Naumau I, Sivakova S, Zaitseva O, et al. Traditional smoking and e-smoking among medical students and students-athletes – popularity and motivation. Fam Med Prim Care Rev. 2018;20:61–6.

[35] Randolph CC. Perceptions of e-cigarettes and noncigarette tobacco products among US YOuth. Pediatrics. 2017;138(5):e20154306.

[36] Jiang N, Cleland C, Wang MP, Kwong A, Lai V. E-cigarette perceptions, use frequency and susceptibility among young adults in Hong Kong. In: Scott JE, Agaku I, editors. Tobacco induced diseases [Internet]. Cape Town: EU European Publishing; 2018. Available from: http://www.tobaccoinduceddiseases.org/dl/61aad426c96519bea4040a374c6a6110/%0A.

[37] Kim J, Lee S. Using focus group interviews to analyze the behavior of users of new types of tobacco products. J Prev Med Public Heal. 2017;50(5):336–46.

[38] Pokhrel P, Herzog TA, Muranaka N, Fagan P. Young adult e-cigarette users' reasons for liking and not liking e-cigarettes: a qualitative study. Psychol Heal. 2015;30(12):1450–69.

[39] Garbutt JM, Miller W, Dodd S, Bobenhouse N, Sterkel R, Strunk RC. Parental use of electronic cigarettes. Acad Pediatr. 2015;15(6):599–604.

[40] Barrington-Trimis JL, Berhane K, Unger JB, Cruz TB, Urman R, Chou CP, et al. The e-cigarette social environment, e-cigarette use, and susceptibility to cigarette smoking. J Adolesc Heal. 2016;59(1):75–80.

[41] Kong G, Morean ME, Cavallo DA, Camenga DR, Krishnan-Sarin S. Sources of electronic cigarette acquisition among adolescents in Connecticut. Tob Regul Sci. 2016;3(1):10–6.

[42] Martini S, Sulistyowati M. The determinants of smoking behavior among teenagers in East Java Province, Indonesia. (HNP Economics of Tobacco Control Discussion Paper no. 32). Determ Smok Behav among teenagers East Java Prov Indones; 2007.

[43] Asosiasi Penyelenggara Jasa Internet Indonesia. Infografis Penetrasi dan Perilaku Pengguna Internet Indonesia Survey 2017 [Indonesian Internet User Penetration and Behavior Survey 2017] [Internet]. Apjii. APJII; 2018. Available from: https://apjii.or.id/content/read/39/410/Hasil-Survei-Penetrasi-dan-Perilaku-Pengguna-Internet-Indonesia-2018.

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