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Trend and Awareness of E-Cigarettes Among Students in a Private College in Sabah Malaysia

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ABSTRACT

Objective: This study aims to investigate the trend and awareness of e-cigarette use among students in a private college located in Sabah, Malaysia. Research Methods: The cross-sectional study was conducted in a private college in Sabah. A self-administered questionnaire was adapted and distributed to 300 randomly selected students regardless of their e-cigarettes vaping status. IBM SPSS Statistic 27 was utilized to analysed accumulated data. Results: A-245 students participated in the study with a response rate of 81.6%. Majority of the respondent were female (69.8%), Bumiputera Sabah (72.2%), Diploma students (90%) aged 22–25 years' old. The study revealed that almost all respondent was aware of e-cigarettes (89%) however low prevalence of e-cigarette use was observed (26.5%). The main source of information regarding e-cigarettes among students were found to be the internet (40.4%) and friends (38.8%). Conclusion: Further study needs to be done in a larger scale to provide comprehensive understanding on the factor influencing the use of e-cigarettes among students in higher institutions. In addition, the role of e- cigarettes that buzzed to be a smoking cessation tool need to be revised to evaluate its effectiveness. Hence, it is vital for the Malaysian authorities to establish a dynamic framework to tackle the surge of e-cigarettes use both in Peninsular and Borneo region.

Keywords: E-cigarettes, Vaping, Students, Private college, Sabah

1. Introduction

E-cigarette also known as electronic cigarette had increased tremendously over the years especially in the United States of America (USA) whereby 8 million adults reportedly use e-cigarettes in 2018 as a tool for smoking cessation according to Creamer, Wang & Babb, 2018 [1]. E-cigarette is a device powered by battery that heats the electronic liquid solution that turn the e-liquid to vapor to be inhaled by the user [2]. The first e-cigarettes introduced to the market in 2004 by Ruyan, a company operated in China that gained popularity tremendously. E-cigarettes products were trending and attracted attention from various international markets all over the world. Hence, e-cigarettes began appearing in Europe and North America leading to a rapid expansion of the industry [3]. E-cigarette devices can be varied in sizes and shapes which designed to cater dynamic preferences and needs of the users. This device can resemble traditional cigarettes, lighter, pen, marker or flash drive that similar in shapes and sizes that typically equip with disposable or replaceable cartridges. Normally, the device is operated using built-in battery that heat and vaporizes an as e-liquid containing various types of chemical compounds including nicotine, cannabis and flavouring agents [4]. In Malaysia, the trend of using e-cigarette or vaping has gain popularity in recent years among young adult aged 22-44 that started using e-cigarettes as early as 19 years old [5]. Although vaping had been classified as forbidden or haram by the National Fatwa Council of Malaysia,

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https://doi.org/10.70176/3007-973X.1018 3007-973X/© 2024 Al-Ayen Iraqi University. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/). e-cigarette is still prevalent among Malaysians [6]. A scientific study done in 2014, suggested that longterm e-cigarette use causes significant effect to human systemic inflammatory process that exposed to the ultrafine particles from vapours [7]. Moreover, various types of carcinogenic chemicals with different concentration including chromium, N-nitrosamines, lead, nickel and diethylene glycol have been detected in the e-liquid cartridge [8]. Meanwhile, in United States of America (USA), a total number of 47 reports regarding adverse event by e-cigarettes user had been received by Centre for Tobacco Products, Food and Drug Administration (FDA) the period of 2008 to 2012 [9]. Only few concentrations and flavours of e-liquid stated however the origin of the active composition including the standard manufacturing processes is not stated clearly [10]. Furthermore, wrong perception had been spread to the community regarding e-cigarettes such as e-cigarette is an effective tool for quit smoking, vaping is cheaper, no health risk and does not cause pollution to the environment [11]. Research reported that 23% of e-cigarette user were not aware of the health risk caused by vaping when compared to conventional or tobacco smoking [12]. Additionally, another study conducted showed that 57.3% of participants were unaware of the content for some of e-cigarette that the e-liquid can contain nicotine [13]. Besides, almost all undergraduate students in the Philippines, 96.1% lack of knowledge regarding the regulation, chemical content, design and possible health risk of e-cigarettes [14]. Many developed countries reported to have high awareness on e-cigarette use however some percentages of the participants were revealed to have insufficient knowledge on the risk of vaping and thought that it is much safer than conventional smoking [15]. Nevertheless, e-cigarettes initiation and dual use among younger males also linked to the desire to guit smoking but failed [16]. In other study, it is revealed that 40.8% of e-cigarette user were found to smoke tobacco which can be highly risky to health as the toxic levels inhaled were higher compared to conventional smoking alone [17]. The health risk to the dual user includes long-term smoking, high nicotine dependence and failed to quit smoking as vapers were commonly seen to be back with exclusive smoking [18]. Nonetheless, dual users often seen as people who wanted to quit smoking compared to the conventional smokers although their attempt deemed to be unsuccessful [19]. E-cigarette use were also prevalent among students in higher institutions and it is estimated that 36% of young professionals residing in Kuala Lumpur and Selangor were using e-cigarettes [20]. Several reasons given by the young people on

the use of e-cigarettes were their interest to find out about the new device with various choice of flavours, experimenting, recreational and its popularity among younger generation [21]. The study of e-cigarettes on its effectiveness as a tool for smoking cessation among young adults also lacking as only limited randomized controlled trials are at one's disposal [22]. The longterm health effects of e-cigarettes were also unknown as existing study unable verify the information on nicotine effect obtained in e-cigarettes products and the effectiveness of e-cigarette as smoking cessation tools [23]. E-cigarettes become a popular choice as an alternative method to stop smoking in United States of America (USA) in the year between 2014 to 2016 [24]. Romberg et al (2019) stated that the sales of e-cigarettes had increased by two-fold within 4 years associated with the increase uptake of e-cigarettes product among adolescent [25]. Meanwhile, Miech, Johnston & O'Malley (2019) mentioned that the rapid surge of e-cigarette use is due to the choice of quit smoking alternative or the use for an alternative nicotine among population to reduce tobacco smoking [26]. Currently, the optimal research design to examine the efficacy of e-cigarettes as tool for guit smoking is known to be the randomised clinical trials (RCTs) which successfully addressed the role of e-cigarettes and nicotine replacement therapy (NRT) in reducing tobacco smoking among quitters [27]. Other study [28] suggests that RCTs may not be able to decipher overall effectiveness of e-cigarette used for smoking cessation.

Table 1 stated the prevalence of e-cigarette use among Malaysian adolescent from the year of 2019 until 2022 reported that male aged 14 years old up to 19 years were identified to be the highest e-cigarettes user [34]. This is concerning that the impact of e-cigarettes products among adolescent had risen therefore, the number of vapers may increase when this group of youngsters further their study in higher learning. In addition, Hyland, Ambrose & Conway (2017) found that the use of vaping product fails to produce significant impact to the user [35]. The negative impact of e-cigarettes illustrates by the Population Assessment Tobacco and Health (PATH) study reported that the chances of the tobacco smoker return to tobacco smoking after using e-cigarettes as an alternative to quit smoking is high between 2014-2016 [36]. The evolution of e-cigarettes had changed the way of e-cigarettes designed and developed especially on its chemical constituents including the increase of nicotine content and introduction of nicotine salt technology to e-cigarettes pods [37]. The most popular e-cigarettes producer in the USA known as JUUL recorded the high number of e-cigarettes

Journal	Year	Total participants	Highest user
Current e-cigarette use among in-school adolescents in West Malaysia: Examining the interactions between sociodemographic characteristics and lifestyle risk behaviours [29]	2022	22,228	Male, 16–18 years old
Nicotine dependence among adolescents single and dual cigarette users [30]	2021	227	Male, 17 years old
Factors associated with different smoking statuses among Malaysian adolescent smokers: A cross-sectional study [31]	2019	422	Male, 14 years old
Factors associated with e-cigarette usage and the reasons for initiation among Malaysian adolescents [32]	2019	13,162	Male, 16 to 19 years old
Alternative tobacco products use among late adolescents in Kelantan, Malaysia [33]	2019	388	Male, 18 to 19 years old

Table 1. The prevalence of e-cigarette use among adolescent in Malaysia.

sales with more than half of its products reported to contain high concentration of nicotine found in its e-liquid [38, 39]. Furthermore, Goldenson et al (2021) argued the effectiveness of using e-cigarettes as smoking cessation tool to quit smoking as the nicotine content for both tobacco and e-cigarettes found to be similar [40]. This demonstrates negative implication on the use of e-cigarettes as an alternative to quit smoking as it can cause relapse for individual that successfully quit smoking after the introduction if e-cigarette products [41]. Since e-cigarettes are widely popular choice as an effective method to stop smoking, this analytical choice implies that the control group will greatly contrast with the group of e-cigarette users. Nevertheless, the control group that encompass numerous individuals who are not actively attempting to quit smoking, thereby introducing a substantial bias that favours the perception of using e-cigarettes as alternative to tobacco smoking is perceived as effective [42]. Moreover, the e-cigarette study in Malaysia mainly in Sabah is still lacking especially among students in higher education. Therefore, this study was aimed to evaluate the trend of e-cigarette use among students in one of the private colleges in Sabah.

2. Research methodology

Study design

A cross-sectional study was conducted in one of the private College in Sabah located at Kota Kinabalu from May 2023 to October 2023. The study focused on investigating the patterns and trends of e-cigarette usage among students enrolled in higher education within this institution, with the aim of engaging them in the research process. The study was approved by the institutional ethics committee (2022/11NOV2022/03) and complied with the Declaration of Helsinki and good clinical practice guidelines.

2.1. Sample selection

A-300 student was selected as participants via simple random sampling from certificate level to bachelor's degree level including foundation in science, allied health science and pharmacy students. Sample size calculation was done using OpenEpi software version 3.03a, therefore the minimum sample size needed for the study was 218 participants. Several inclusion criteria incorporated in this study such as the participants must be 18 years old and above, categorized as local students that volunteer to take part in the study and having no mental or physical disability.

2.2. Study instrument

A self-administered questionnaire was adapted from previous study [43] and distributed to 300 randomly selected students regardless of their ecigarettes use status. The pilot study was done to 10 students to measure collection instrument and protocols to aid in planning and modifications to any anomaly occur however, the results was not included in the study. The questionnaire was constructed in dual languages, English and Bahasa Malaysia and structured into two parts. The first part composed of participant's socio-demographic background including gender, age, education level, race and family income. Meanwhile, the second part of the questionnaire consist of the assessment regarding awareness on e-cigarette use, whether participants vape, where they obtained information about e-cigarette, participants knowledge on the health risk of on e-cigarette use, vaping of e-cigarette as an alternative to quit smoking, and the higher institution initiative on prevention of e-cigarette use among students. The data obtained were analysed using IBM SPSS Statistic 27 and arranged in tables and figure to summarize the findings of the study.

Variables	Characteristic	Frequency	Percentage
Gender	Male	74	30.2
	Female	171	69.8
Age	18–21	107	43.7
	22–25	121	49.4
	26–28	15	6.1
	>29	2	0.8
Education	Foundation in science	1	0.4
	Certificate	7	2.9
	Diploma	222	90.6
	Bachelor's degree	15	6.1
Race	Bumiputera sabah	177	72.2
	Malay	18	7.3
	Chinese	14	5.8
	Indian	1	0.4
	Others	35	14.3
Income	RM 1,500.00 and below	103	42
	RM 1,501.00 - RM 2,000.00	58	23.6
	RM 2,001.00 – RM 3,000.00	32	13.1
	RM 3,001.00 - RM 4,000.00	21	8.6
	RM 4,001.00 and above	31	12.7

Table 2. Distribution of respondents by socio-demographic.

3. Result & discussion

The survey questionnaire was distributed to 300 students from one of the private colleges in Sabah, Malaysia with a response rate 81.6%. A total of 245 students voluntarily participated in the study and completed all parts of the questionnaire.

Table 2 shows most respondents were female, 171 (69.8%), Bumiputera Sabah, 177 (72.2%), aged 22–25, 121 (49.4%), with Diploma education, 222 (90.6%) and having family income below RM1,500.00,103 (42%). Meanwhile, the lowest respondent among students in private college were male with only 74 (30.2%) had voluntarily participated in this study.

Table 3 assess the awareness of e-cigarettes among respondent that participated in the study. The result was used to analyse the data given regarding e-cigarettes if there were significant differences in the distribution of variables. Chi-square goodness-of-fit test was used to determine the frequencies difference for each variable from expected frequencies under a null hypothesis.

Out of 245 participants, 218 (89%) aware of the existence of e-cigarettes and only few numbers of participants, 27 (11%) were not aware of e-cigarettes products. The p-value estimated to be approximately 0.17, which is greater than the common significance level of 0.05. This suggests that no statistically significant difference in the awareness of the existence of EC between male and female participants in this study. Meanwhile, the frequency of e-cigarette use among male and female students were found to be

considerably low as only 65 (26.5%) of them uses e-cigarettes. The usage of e-cigarettes differs as the p-value was less than 0.001 implying a highly significant difference in the proportion of e-cigarettes users between male and female students. The frequency use of e-cigarettes was analysed according to category such as "today", "last day", "last month" and "never use". The p-value was found to be significantly smaller than 0.05 demonstrating a significant difference in the distribution of the timing of the last use of e-cigarettes among the categories. This proposes that the timing of the last use of e-cigarettes varies significantly between the groups and was not due to random chance alone. Meanwhile there were numerous sources of information regarding e-cigarettes acquired by participants in this study. Result suggest that most participants obtained the information on e-cigarettes with two major sources which were the Internet, 99 (40.4%) and friends, 95 (38.8%). This showed that two most influential sources of information pertaining to e-cigarettes were somehow attached to their participant's personal life as they may have spent most of their time on social media and with their peers. Meanwhile, the lowest information on e-cigarettes that participants can find was from the television, 7 (2.9%). This was probably due to the government restriction on the advertisement of e-cigarettes on television and college students nowadays prefer to get information using their smartphones. The p-value generated was less than 0.001 signifying a highly significant difference in the sources of information about e-cigarettes between male and female students. Hence, result shows that the source of information varies significantly between the two groups. Furthermore, a total number of 143 (58.4%) of the participants were not agree on the statement that e-cigarettes are less harmful than tobacco smoking. The p-value is approximately 0.037 which was less than the common significance level of 0.05. Thus, this indicates a statistically significant difference in opinions about whether e-cigarettes were less harmful than tobacco smoking. Similarly, the participants were also disagreeing that e-cigarettes were used as an alternative to conventional smoking or as a tool for smoking cessation 160 (65.3%). The p-value reported to be approximately 0.008 which was less than the common significance level of 0.05. Consequently, this number provide a statistically significant difference in opinions about whether e-cigarettes help people to quit smoking or not. Furthermore, about 133 (54.3%) of the participants perceived that ecigarette give a serious health effect as 180 (73.5%) of them agree that e-cigarettes will carry same health risk compared to conventional smoking. The p-value given was approximately 0.058, which is slightly

Table 3. Distribution of data based on variables.

	Male	Female	Total	
	N = 74	N = 171	N = 245	
Characteristic	n (%)	n (%)	n (%)	p-value
Aware existence of EC				
Yes	68 (91.9)	150 (87.7)	218 (89)	0.17
No	6 (8.1)	21 (12.2)	27 (11)	
EC user				
Yes	39 (52.7)	26 (15.2)	65 (26.5)	< 0.001
No	35 (47.2)	145 (84.7)	180 (73.5)	
Last time using an EC				
Today	17 (22.9)	11 (6.4)	28 (11.4)	< 0.001
Last Day	5 (6.7)	2 (1.1)	7 (2.9)	
Last Month	15 (20.2)	14 (8.1)	29 (11.8)	
Have never used an EC	37 (50)	144 (84.2)	181 (73.9)	
Source of information on EC				
Advertisement	11 (14.8)	12 (7)	23 (9.4)	< 0.001
Family	4 (5.4)	17 (9.9)	21 (8.6)	
Friends	40 (54)	55 (32.1)	95 (38.8)	
Internet	18 (24.3)	81 (47.3)	99 (40.4)	
Television	1 (1.3)	6 (3.5)	7 (2.9)	
EC is less harmful than tobacco smoking				
Yes	39 (52.7)	63 (36.8)	102 (41.6)	0.037
No	35 (47.2)	108 (63.2)	143 (58.4)	
EC help people to quit smoking			. ,	
Yes	35 (47.2)	50 (29.2)	85 (34.7)	0.008
No	39 (52.7)	121 (70.8)	160 (65.3)	
Health perception on EC			. ,	
Give a minor health effect	12 (16.2)	18 (10.5)	30 (12.2)	0.058
Give a moderate health effect	17 (22.9)	41 (23.9)	58 (23.7)	
Give a serious health effect	32 (43.2)	101 (59.1)	133 (54.3)	
No effect	11 (14.8)	13 (7.6)	24 (9.8)	
EC has similar health threat with tobacco smoking				
Yes	50 (67.5)	130 (76)	180 (73.5)	0.154
No	24 (32.4)	41 (24)	65 (26.5)	
College initiative on the prevention of EC use				
Handouts	9 (12.1)	16 (9.3)	25 (10.2)	0.18
Discussion in class	31 (41.8)	76 (44.4)	107 (43.7)	
Offer nurse/counsellor to assist	6 (8.1)	7 (4.1)	13 (5.3)	
Programs cater for EC users	7 (9.4)	19 (11.1)	26 (10.6)	
Never discuss	21 (28.3)	53 (30.1)	74 (30.2)	
	=1 (=0.0)	00 (0012)	, . (00.2)	

above the common significance level of 0.05 suggesting that there was marginal evidence for a difference in health perceptions of e-cigarettes however was not statistically significant at the 0.05 level. E-cigarettes also deemed to produce similar health effect to the user 180 (73.5) and the p-value was approximately 0.154 which was greater than the common significance level of 0.05. This report signifies that there was no statistically significant difference in the opinions regarding e-cigarettes in this context. Lastly, it was found that the college program conducted in the college to tackle e-cigarette use were insufficient as only 26 participants (10.6%) were exposed however, majority of participants had discussed the e-cigarettes topic during lectures 107 (43.7%). According to the result, p-value is approximately 0.18, which is greater than the common significance level of 0.05 that implying no statistically significant difference in the

responses about college initiatives on the prevention of e-cigarettes use prevention between male and female students in this study. Therefore, it is concluded that the awareness of e-cigarettes was high however the usage is relatively low among male and female students that participating in this study. The findings revealed that the participants create a general perception that the use of e-cigarettes was harmful, having a similar health disadvantage and ineffective to be used as an alternative to quit smoking. Meanwhile, the most important place of information gathering pertaining to e-cigarettes would be in the learning institution itself as students spend more time in college. Other than that, college initiative to provide targeted health program to specifically tackle the incidence of e-cigarette use among students was lacking in consistency, innovation and comprehensive review. The outcome of this study demonstrated the low prevalence of e-cigarettes use among students in private college located in Sabah, Malaysia. This was probably due to many of male students that suspected to be e-cigarette user refuse to participate in the study even though participants had been informed regarding their privacy and confidentiality protection. Nevertheless, study shown that female students were more aware on the risk of health caused by ecigarettes hence the prevalence of vaping is relatively low compared to male students [44]. Another study stated that although the prevalence of e-cigarette use is low compared to the current trend worldwide, the awareness of e-cigarettes displayed by the students is high. These students were also aware on the health implication caused by e-cigarettes whereby the awareness among them is high especially those who never vape (59.2%) [45]. This study is consistent with other research in the same area that reported a greater awareness about e-cigarettes products and use ensures greater prevention of vaping e-cigarettes at the early age [46]. Even though the Ministry of Health Malaysia banned the use of e-cigarettes in higher education settings, the use of e-cigarettes was still prevalent in college and Universities with approximately more than half of the respondent that participated in the study [43]. Through the findings, it was found that the e-cigarette user did not aware of the restriction and about 89.7% of the respondent did not receive the information from the institution's board [47]. In addition, the prevalence of e-cigarette user in this study were consistent with the study [48] whereby the percentage of vapers were low due to many females participated in the study compared to male student. However, it is concerning that a local study found that there were significant increased on female adolescent smokers which rise from 2.1% to 5.3% within 5 years [49]. This is probably due to the smoking habits of Malaysian adolescent that begin before they even pursuing their study in higher education and it is most likely during their secondary school session [50]. Furthermore, other study reported that the incidence of e-cigarette use is continuously rising among university students in Malaysia whereby within 4 years of duration, the percentage had grown from 0.8% to 11.5% [51]. Study also mentioned that the rise of e-cigarette uses among students mainly to reduce their tobacco smoking dependency, however small portion of participants that known to be non-smokers that did not agree that e-cigarette used for smoking cessation tool as it is ineffective [52]. Meanwhile, other study also supports this finding that e-cigarettes is not suitable to be as alternative to conventional smoking [53]. Moreover, the main reason of significant surge in e-cigarettes use among youth globally is due to the

impact of strategic marketing of e-cigarettes products that tremendously influence the e-cigarettes initiation at the early age [54]. Study indicates that various factors, including social, psychological, and environmental influences, play a significant role in students' decisions to start or continue using e-cigarettes. One of the most significant factors influencing students' decision to use e-cigarettes is peer influence. Studies have consistently shown that adolescents are more likely to experiment with e-cigarettes if they perceive that their friends or peers use them [55, 56]. Peer acceptance, social norms, and the desire to fit in with a particular group can encourage students to initiate or continue e-cigarette use. This is particularly relevant in high school settings, where peer pressure and group dynamics are powerful motivators [57]. The perception of e-cigarettes as a safer alternative to traditional cigarettes can also influence students' decision-making. Students believe that e-cigarettes are less harmful than smoking traditional cigarettes, which can make them more likely to start or continue using it [55]. Nevertheless, misconceptions about the health risks of e-cigarettes, particularly among young users, may lead to an underestimation of their potential dangers, contributing to increased use [58]. In contrast, awareness of the health risks associated with e-cigarette use can act as a deterrent for some students. Family dynamics and parental behaviour also play a critical role in shaping students' attitudes toward e-cigarette use. Studies suggest that students who have parents who smoke or use e-cigarettes themselves are more likely to initiate or continue using e-cigarettes [59]. Parental attitudes, behaviours, and supervision can either discourage or encourage e-cigarette use, especially in younger students. Additionally, lack of parental involvement or monitoring can increase the likelihood of experimentation [60]. Exposure to advertising and social media content promoting e-cigarettes can influence students' perceptions and use of these products. Research indicates that marketing strategies, especially those targeting younger populations, have been successful in normalizing e-cigarette use among adolescents [61]. Social media platforms and influencers who promote ecigarette use often contribute to the glamorization of vaping, making it appear as a trendy and acceptable activity among students [62]. This exposure can significantly impact students' decisions, particularly when they perceive vaping as fashionable or a form of rebellion. Psychological factors, including stress, anxiety, and emotional distress, can also influence students' decision to start or continue using e-cigarettes. Studies show that some students may turn to e-cigarettes as a coping mechanism for stress or to manage negative emotions [63]. The use of e-cigarettes as a means of relaxation or stress relief is a common theme in adolescent users [64]. E-cigarettes are often easily obtainable, both through online sales and in retail stores, sometimes with little age verification. This ease of access increases the likelihood that students will experiment with e-cigarettes [62]. Studies have found that the availability of flavoured e-cigarettes, which appeal to younger users, further contributes to the decision to try or continue vaping [65]. Curiosity and the desire to try new experiences are additional factors that influence students' decisions to begin using e-cigarettes. Adolescence is a time of experimentation, and students may be motivated by a sense of adventure or peer influence to try e-cigarettes [59]. The novelty and appeal of ecigarette flavours, such as fruit and candy, make them particularly attractive to younger users [66]. Hence, there is a need for regulatory bodies with all supports from non-government organizations targeting the higher institutions like colleges and universities to come up with promising strategies and innovative approaches that strong enough to tackle this rising phenomenon that has impacted worldwide.

4. Conclusion

The study provides an overview of e-cigarette use among Malaysian students studying in college located in Sabah. The prevalence of e-cigarette use among participants is low and consistent with other studies that having high number of female participants. Despite this, the participants have adequate awareness on the health risk towards e-cigarette use. Majority of students feels that e-cigarettes have no significant effect to be used as smoking cessation tool. Meanwhile, the knowledge on e-cigarettes especially on its various forms of products, chemical composition and health risk should be instilled in their programs to increase the awareness among students. The content obtained in internet must be monitored to enable the students get correct information on e-cigarettes. Lack of knowledge and awareness on e-cigarettes will impact the choice of vaping and will be easily influenced by peers. Besides, the institutions also play an important role in educating the students on the danger of vaping e-cigarettes. Additionally, the government must support the institution through its support system, impose timely rules and regulation and provide financial support to conduct research. This study acknowledges sampling bias and generalizability whereby the study was conducted at a single private college in Sabah, Malaysia, which may not be representative of students in other colleges or universities in Malaysia. Therefore, the findings may not be generalizable to the broader population of students across Malaysia or to other age groups outside the age range. Self-reported data the study relied on self-administered questionnaires that can have social desirability bias, recall bias or misreporting. In this case, students may have underreported or overreported their e-cigarette usage or knowledge due to fear of judgment or lack of accuracy in recall. Meanwhile, the geographical limitation that may not fully capture nationwide trends or behaviours regarding e-cigarette use. Overall, this study recommend that further research should be conducted on all institutions in Sabah to reveal the actual numbers of e-cigarette user.

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Conflict of interest

The authors declare that they have no competing interests.

Ethical approval

This study was conducted in accordance with the ethical standards of Lincoln University College, Malaysia. Ethical approval was obtained from the ethics committee (2022/11NOV2022/03). All participants were informed of the study's purpose, their involvement, and their rights, and provided written informed consent prior to participation. The research adhered to the principles of confidentiality and participant autonomy, ensuring the protection of personal data and privacy throughout the study.

Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

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Author contributions

All authors contributed to the conceptualization, design, analysis, and writing of the manuscript.

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