

Original Article

KNOWLEDGE, ATTITUDE, AND PRACTICE OF ELECTRONIC CIGARETTE USE AMONG MEDICAL STUDENTS IN MALAYSIA

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ABSTRACT

Electronic cigarettes (e-cigarettes) have become a significant global public health concern, especially among youth. In Malaysia, a country with high tobacco use rates, the popularity of e-cigarette has surged. As future healthcare providers, medical students play a vital role in tobacco control and public health education. This study aims to assess the knowledge, attitudes, and practices (KAP) regarding e-cigarette use among medical students in Malaysia, identifying gaps and trends to inform targeted interventions. This cross-sectional study was conducted among medical students at various universities in Malaysia from June to August 2024. A total of 377 participants were recruited using stratified sampling to ensure representation across pre-clinical and clinical years. Data were collected through an online questionnaire covering demographics, knowledge, attitudes, and practices related to e-cigarette use. Statistical analysis was performed using SPSS version 26. Among the 377 participants, 94.4% demonstrated adequate knowledge about e-cigarettes. Attitudes toward e-cigarettes were balanced, with 157 students holding favourable views and 220 holding unfavourable ones. A small percentage (6.9%) reported current e-cigarette use, with male students more likely to use e-cigarettes than female students. The main reasons for usage were stress relief and peer pressure. In conclusion, this study underscores the importance of enhancing education on the health risks of e-cigarettes among medical students in Malaysia. The results highlight the need for targeted interventions focusing on stress management and public health advocacy to reduce e-cigarette use. Medical students, as future healthcare providers, must be equipped with accurate knowledge and strategies to combat the rising trend of e-cigarette use.

INTRODUCTION

Electronic cigarettes (e-cigarettes), also known as vapes, are devices used to inhale aerosols typically containing nicotine, flavourings, and other chemicals [1,2]. E-cigarettes come in various designs and appearances, resembling items such as regular cigarettes, pipes, pens, USB sticks, or even everyday objects [3,4]. Despite their diverse forms, e-cigarettes share common components and mechanisms [1,5,6]. There are four components contained in an e-cigarette which are a pod

(containing the nicotine, flavorings and other chemicals), a heating element, a power source and a mouthpiece (part whereby vape users will inhale). The mechanism of vaping is puffing, which causes the activation of the battery to give power to the heating device and lead to the vaporization of the liquid in the pod or cartridge. Hence, the resulting aerosol will be inhaled by e-cigarettes users known as vaping.

E-cigarette use, particularly among youth, has become a significant global public health concern

[1,4,5]. Malaysia, a country with high rates of tobacco use, has also seen a surge in e-cigarette popularity [3]. As future healthcare providers, medical students play a critical role in tobacco control advocacy and public health education [5,7]. Studies have shown that the prevalence of e-cigarette use among medical students varies across different countries. In Hungary, 2.7% of never-smokers had ever used e-cigarettes [1], while in the United States and the UK, the prevalence was around 20-25% [8]. In Malaysia, a study found that 10% of medical students were considered e-cigarette users [9].

Factors such as peer influence, gender, and prior conventional cigarette use have been associated with e-cigarette experimentation [10]. This study aims to assess the knowledge, attitudes, and practices (KAP) of e-cigarette use among medical students in Malaysia. By identifying gaps and trends, this research seeks to inform targeted educational interventions and policy recommendations.

METHODS

Study Design

This cross-sectional study was conducted among medical students at various medical schools in Malaysia between 1st June 2024 and 12th August 2024. A total of 377 participants were recruited through stratified sampling to ensure representation across pre-clinical and clinical years. Ethical approval was obtained from Universiti Islam Antarabangsa Sultan Abdul Halim Mu'adzam Shah (UniSHAMS) ethical committee.

Participants

Eligible participants included students enrolled in medicine program. Inclusion criteria required students to provide informed consent and complete a structured questionnaire. Students who declined consent or provided incomplete responses were excluded.

Data Collection

A self-constructed questionnaire was used as a measurement tool to collect the data. This validated questionnaire covered four key areas:

1. **Demographics (9 items):** Age, gender, year of study, and smoking history.
2. **Knowledge (10 items):** Awareness of e-cigarette components, health risks, and regulatory policies.
3. **Attitude (10 items):** Perceptions of e-cigarette safety, efficacy for smoking cessation, and social acceptability.
4. **Practice (14 items):** Patterns of e-cigarette use, reasons for initiation, and frequency of use.

The questionnaire was developed in English using Google Forms and distributed through social media platforms such as Facebook, Instagram, and WhatsApp. The initial draft of the questionnaire was pilot-tested on 20 medical students before undergoing a comprehensive review and editing process. Reliability testing yielded a Cronbach's alpha of 0.863, indicating a high level of internal consistency.

The sample size of 377 participants was calculated using an online sample size calculator provided by Raosoft, Inc. (Seattle, WA). The collected data were analyzed to assess participants' levels of knowledge, attitudes, and practices regarding e-cigarette use.

The scoring for each component (knowledge and practice) was based on the accumulated scores obtained:

- **Knowledge:** This section consisted of 10 questions, each with a single correct answer. Scores were assigned as follows: 1 for a correct answer and 0 for an incorrect answer or "don't know" response.
- **Attitude:** This section consisted of 10 questions evaluated using a 5-point Likert scale. For positive statements, the scoring ranged from 5 for "Strongly agree" to 1 for "Strongly disagree." Conversely, for negative statements, the scoring was reversed, with 5 indicating "Strongly disagree" and 1 representing "Strongly agree."

Knowledge scores were categorized as adequate (6 or more marks) or inadequate (less than 6). Attitude scores were classified as favourable (25 or more marks) or unfavourable (less than 25). The practice section assessed the frequency and reasons for using e-cigarettes.

Statistical Analysis

The data were analysed using SPSS version 26. Descriptive statistics were used to summarize demographic information. Categorical data were presented as frequencies and percentages. Bivariate analysis was conducted to evaluate associations between demographic variables and KAP (Knowledge, Attitude, and Practice) scores. Statistical significance was defined as $p < 0.05$.

RESULTS

Demographics

The study included 377 participants, comprising 37.4% male and 62.6% female students. Table 1 presents the distribution of the participants' sociodemographic characteristics. The majority

were aged between 20 and 22 years. Pre-clinical students represented 78.2% of the sample, while clinical students accounted for 21.8%. Additionally, most participants were enrolled in public universities (65.3%). Among the participants, 11.9% reported having smoked tobacco products, whereas 88.1% had never smoked. Of those who had smoked, 46.6% identified as current smokers.

Knowledge of e-cigarettes among medical students in Malaysia

The majority of medical students demonstrated adequate knowledge about e-cigarettes and their associated consequences. In the knowledge section, where the maximum possible score was 10, 94.4% of participants scored above 50%. One participant (0.3%) obtained a minimum score of zero, while 134 participants (35.5%) achieved the maximum score of 10.

A significant relationship was observed between knowledge of e-cigarettes and ethnicity ($p < 0.05$), whereas no significant associations were found with other factors.

Attitudes toward e-cigarettes among medical students in Malaysia

According to Figure 1, the attitudes of medical students toward e-cigarettes were relatively balanced, with 157 students holding favourable views and 220 holding unfavourable ones. Some students perceived e-cigarettes as less harmful to health and as a positive alternative for smokers. Interestingly, among the 45 students who had smoked tobacco products, 75.6% (34 students) held unfavourable attitudes toward e-cigarettes while only 37.0% (123 students) of the 332 students who had never smoked tobacco products expressed unfavourable attitudes.

Table 1: Sociodemographic characteristics of the participants (n =377)

Sociodemographic Variables		Frequency (n)	Percentage (%)
Age	17-19	48	12.7
	20-22	280	74.3
	23-25	35	9.3
	Above 25	14	3.7
Gender	Male	141	37.4
	Female	236	62.6
Ethnicity	Malay	350	92.8
	Chinese	8	2.1
	Indian	9	2.4
	Others	10	2.7
Religion	Islam	358	95
	Christian	9	2.4
	Buddha	3	0.8
	Hindu	7	1.9
Status	Single	370	98.1
	Married	7	1.9
Living area	Urban (City)	261	69.2
	Rural (Villages)	116	30.8
University	IPTA	246	65.3
	IPTS	131	34.7
Year of study	Year 1	233	61.8
	Year 2	62	16.4
	Year 3	43	11.4
	Year 4	24	6.4
	Year 5	15	4.0
Per capita household income	B40 (RM0 - RM4850)	165	43.8
	M40 (RM4851 – RM10970)	126	33.4
	T20 (RM10971 and above)	86	22.8

Table 2: Knowledge level in different sociodemographic variables (n=377)

Sociodemographic Variables		Inadequate knowledge (n)	Adequate knowledge (n)	Total (n)
Age	17-19	2	46	48
	20-22	12	268	280
	23-25	3	32	35
	Above 25	4	10	14
Gender	Male	12	129	141
	Female	9	227	236
Ethnicity	Malay	6	344	350
	Chinese	0	8	8
	Indian	2	7	9
	Others	1	9	10
Religion	Islam	19	339	358
	Christian	2	7	9
	Buddha	0	3	3
	Hindu	0	7	7
Status	Single	20	350	370
	Married	1	6	7
Living area	Urban (City)	17	244	261
	Rural (Villages)	4	112	116
University	IPTA	8	238	246
	IPTS	13	118	131
Year of study	Year 1	12	221	233
	Year 2	3	59	62
	Year 3	1	42	43
	Year 4	3	21	24
	Year 5	2	13	15
Per capita household income	B40	8	157	165
	M40	9	77	126
	T20	4	122	86

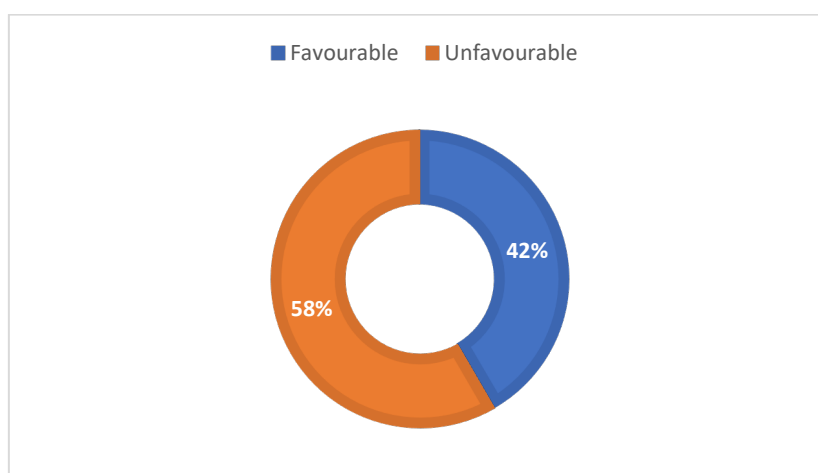


Figure 1: Attitude of medical students towards electronic cigarettes

Table 3: Association between students that currently using electronic cigarette and age.

	17-19		20-22		23-25		Above 25		Pearson Chi-Square
	Count	%	Count	%	Count	%	Count	%	
Yes	1	0.27	15	3.98	7	1.86	3	0.80	<.001
No	47	12.47	265	70.29	28	7.43	11	2.92	

Usage of e-cigarettes among medical students in Malaysia

In terms of practice, 26 participants (6.9%) reported current e-cigarette use, with higher prevalence among male students (13.5%) compared to females (3.0%). The primary reasons cited for e-cigarette use were stress relief and peer pressure (4.5%). As shown in Table 3, a significant relationship was identified between e-cigarette use and age ($p < 0.05$), while no significant associations were observed with other factors.

DISCUSSIONS

This study highlights the knowledge, attitudes, and practices regarding e-cigarettes among medical students in Malaysia, shedding light on significant trends. The findings reveal that knowledge about vaping varied across ethnic groups. Among the Malay group, which constituted the majority of the sample (350 students), 344 (98.3%) demonstrated adequate knowledge, while 6 (1.7%) were classified as having inadequate knowledge. In comparison, all Chinese respondents had adequate knowledge (100%), indicating the highest proportion among the groups. Among Indian students, 7 out of 9 (77.8%) had adequate knowledge, with 2 (22.2%) classified as having inadequate knowledge. For the "Others" category, 9 out of 10 (90%) respondents displayed adequate knowledge, with 1 (10%) classified as having inadequate knowledge. These trends align with the findings of Puteh SEW et al. [11,12], suggesting that greater social exposure, accessibility to information, and targeted awareness programs within the Malay community may contribute to these results.

Contrary to the favourable views reported by Johnson et al. [13,14], this study indicates a growing skepticism regarding e-cigarettes. Many respondents express concerns about the safety and long-term health effects of e-cigarettes, viewing them as potentially harmful alternatives to traditional

tobacco products. This shift in perception is critical as it may influence public health policies and individual choices regarding smoking and e-cigarettes.

Male participants (57.4%) were more likely to perceive e-cigarettes as less harmful than other smoking products. A study by Tackett et al. found that male caregivers in their sample often perceived e-cigarettes and other non-cigarette products as less harmful than traditional cigarettes [15]. This aligns with previous literatures indicating that males generally hold more favourable views towards e-cigarettes, often underestimating their potential risks [16,17].

In discussing the practice of e-cigarette use among medical students, the majority of participants in this study were not active e-cigarette users. This trend can be attributed to their heightened awareness of the associated risks of e-cigarette, which is consistent with findings from various studies that explore the attitudes and behaviours of medical students regarding tobacco products [18,19]. Medical students due to their training and exposure to health education, may have a more critical view of these products.

However, among those who vape, the primary reasons cited were stress and emotional distress, such as depression [20–22]. Many students reported initiating e-cigarettes during their foundation or diploma years, likely due to increased accessibility, as electronic cigarettes are often purchased from vape retail stores. These findings highlight the need to address the misconceptions and implement targeted interventions to reduce its prevalence among medical students. Such practices could potentially undermine their credibility as future health advocates.

Incorporating e-cigarette education into medical curricula is imperative. Modules should emphasize evidence-based information on health risks, cessation strategies, and public health advocacy.

Additionally, addressing stress management and providing alternative coping mechanisms may reduce e-cigarette use among medical students.

LIMITATIONS

This study has several limitations. First, the sample included fewer Chinese and Indian respondents, likely due to the reliance on acquaintances during participant recruitment, which may have introduced sampling bias. Second, the study was constrained by a short data collection period of two months, which may have impacted the diversity and comprehensiveness of the sample. Additionally, the reliance on self-reported data introduces the possibility of response bias, particularly as medical students may underreport e-cigarette usage due to perceptions that they must behave appropriately as future health professionals. Future research should consider exploring longitudinal trends and implementing targeted interventions to address vaping behaviours more comprehensively.

CONCLUSION

The majority of medical students in Malaysia exhibit varied levels of knowledge, attitudes, and practices regarding e-cigarettes. Many students are not adequately informed about the health risks associated with e-cigarettes, highlighting the need for targeted educational initiatives. These initiatives should aim to improve students' understanding of e-cigarettes and its potential health impacts, with a particular focus on stress management as a key motivator for e-cigarette use. Our study successfully achieved its objectives, providing sufficient evidence to conclude that there is a critical need for educational programs to address these issues among medical students.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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REFERENCES

1. Péntzes M, Foley KL, Balázs P, Urbán R. Intention to Experiment With E-Cigarettes in a Cross-Sectional Survey of Undergraduate University Students in Hungary. *Subst Use Misuse*. 2016 Jul 28;51(9):1083–92.
2. Keenan M, Keenan K, Wrotniak B, Qiao H, Emborsky M. Do Your Kids Vape? *Pediatr Emerg Care*. 2022 Jun;38(6):e1309–13.
3. Goh YH, Dujaili JA, Blebil AQ, Ahmed SI. Awareness and use of electronic cigarettes: Perceptions of health science programme students in Malaysia. *Health Educ J*. 2017 Dec 28;76(8):1000–8.
4. Sutfin EL, McCoy TP, Morrell HER, Hoepfner BB, Wolfson M. Electronic cigarette use by college students. *Drug Alcohol Depend*. 2013 Aug;131(3):214–21.
5. Hadland SE, Chadi N. Through the Haze: What Clinicians Can Do to Address Youth Vaping. *Journal of Adolescent Health*. 2020 Jan;66(1):10–4.
6. Brożek G, Jankowski M, Zejda J, Jarosińska A, Idzik A, Bańka P. E-Smoking Among Students of Medicine—Frequency, Pattern and Motivations. *Adv Respir Med*. 2017;85(1):8–14.
7. Brożek G, Jankowski M, Zejda J, Jarosińska A, Idzik A, Bańka P. E-Smoking among Students of Medicine—Frequency, Pattern and Motivations. *Adv Respir Med*. 2017 Feb 13;85(1):8–14.
8. Musawnaq FY, Zoghby AK, Al saqqaf AA, Alblwiy NA, Alhejaili FF, AlQurayyan AA, et al. The prevalence of the use of electronic smoking devices among medical students in Madinah. *Med Sci*. 2023 Jul 21;27(137):1–14.
9. Ahmed K, Alkabli S, Alawaji R, Almutairi A, Albarrak Y, Alammari A. Prevalence of Tobacco Consumption Through Passive Smoking and E-cigarette at Fakeeh College for Medical Sciences. *Journal of Healthcare Sciences*. 2021;02(02):31–6.
10. Jeon C, Jung KJ, Kimm H, Lee S, Barrington-Trimis JL, McConnell R, et al. E-cigarettes, conventional cigarettes, and dual use in Korean adolescents and university students: Prevalence and risk factors. *Drug Alcohol Depend*. 2016 Nov;168:99–103.
11. Wan Puteh SE, Abdul Manap R, Maharani H, Ahmad IS, Idris IB, Md Sham F, et al. The use of e-cigarettes among university students in Malaysia. *Tob Induc Dis*. 2018 Dec 10;16(December).

12. Katz SJ, Cohen EL, Kinzer HT. "Can I hit that?" Vaping knowledge, attitudes and practices of college students. *Journal of American College Health*. 2022 Aug 18;70(6):1778–87.
13. Johnson AC, Mays D, Hawkins KB, Denzel M, Tercyak KP. A qualitative study of adolescent perceptions of electronic cigarettes and their marketing: Implications for prevention and policy. *Children's Health Care*. 2017 Oct 2;46(4):379–92.
14. Rohde J, Noar S, Horvitz C, Lazard A, Cornacchione Ross J, Sutfin E. The Role of Knowledge and Risk Beliefs in Adolescent E-Cigarette Use: A Pilot Study. *Int J Environ Res Public Health*. 2018 Apr 23;15(4):830.
15. Tackett AP, Wallace SW, Smith CE, Turner E, Fedele DA, Stepanov I, et al. Harm Perceptions of Tobacco/Nicotine Products and Child Exposure: Differences between Non-Users, Cigarette-Exclusive, and Electronic Cigarette-Exclusive Users. *Tob Use Insights*. 2021 Jan 30;14.
16. Jankowski M, Wrześniewska-Wal I, Ostrowska A, Lusawa A, Wierzba W, Pinkas J. Perception of Harmfulness of Various Tobacco Products and E-Cigarettes in Poland: A Nationwide Cross-Sectional Survey. *Int J Environ Res Public Health*. 2021 Aug 20;18(16):8793.
17. Shaikh A, Ansari HT, Ahmad Z, Shaikh MY, Khalid I, Jahangir M, et al. Knowledge and Attitude of Teenagers Towards Electronic Cigarettes in Karachi, Pakistan. *Cureus*. 2017 Jul 13;
18. Alzalabani AA, Eltaher SM. Perceptions and reasons of E-cigarette use among medical students: an internet-based survey. *Journal of the Egyptian Public Health Association*. 2020 Dec 17;95(1):21.
19. Afzal M, Ellis-Parkinson M, Holdsworth L, Sykes D, Crooks M. Electronic cigarette use and perceptions amongst UK medical students: A cross-sectional study. *Tob Prev Cessat*. 2021 Feb 22;7(February):1–3.
20. Sheikh E, Kumar A. Knowledge, attitude and practice of smoking vape among medical students in Karachi, Pakistan. In: *Tobacco, smoking control and health education*. European Respiratory Society; 2023. p. PA5330.
21. Hartono R, Yan C, Chen Y, Ma B, Deng Y, Sun Y, et al. Knowledge, attitude, and practice of e-cigarette use among undergraduate students: A comparative study between China and Indonesia. *Tob Induc Dis*. 2024 Jul 16;22(July):1–12.
22. Donaldson CD, Fecho CL, Ta T, Vuong TD, Zhang X, Williams RJ, et al. Vaping identity in adolescent e-cigarette users: A comparison of norms, attitudes, and behaviors. *Drug Alcohol Depend*. 2021 Jun;223:108712.