ORIGINAL ARTICLE

Prevalence, Awareness and Perception of Electronic Cigarettes Usage Among Undergraduate Students Enrolled in Medical and Non-medical Related Programs in a Public University

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ABSTRACT

Introduction: Vaping electronic cigarettes has been a worrying issue due to its adverse effects and rising usage in universities in Malaysia. Many people misunderstand that smoking e-cigarettes is safer and less harmful than conventional cigarette smoking. This study assessed the prevalence, awareness, and perception of e-cigarette smoking among students from medical and non-medical-related courses in a public university. **Materials and methods:** A cross-sectional study using a self-administered questionnaire was conducted among 406 students in a public university in Selangor, Malaysia. **Results:** Respondents were mostly between 22 and 24-year-old undergraduates, with the majority being female. 18.5% of the respondents have tried e-cigarettes, with the highest percentage (41.3%) of them citing dealing with stress as the prime reason for vaping e-cigarettes. Bivariate analysis shows that there was a significant association between the prevalence of e-cigarette usage and demographic variables, i.e., age ($p = 0.046$), gender ($p = 0.001$) and faculty ($p = 0.007$). Simple logistic regression confirmed that male students are 5.81 times more likely to use e-cigarettes than females. Students from the faculty of medical-related programs are 0.49 times less likely to use e-cigarettes than those from non-medical-related programs. The majority of students were aware of the harmful effects of e-cigarettes. There was a significant difference in the mean prevalence, awareness, and perception score favouring students from medical-related programs. **Conclusion:** With good awareness, age, gender, and faculty are significant factors that can influence e-cigarette smoking. Public health initiatives and policies involving spreading the correct understanding and perception to students, is pertinent.
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INTRODUCTION

Over the past decade, the Electronic Nicotine Delivery System (ENDS), also called electronic cigarettes (e-cigarettes) or vape pens, has penetrated the market and become a soaring trend among youth and young adults worldwide. An e-cigarette is a small, portable, battery-operated device invented to be heated into a flavoured aerosol mist mixed with e-liquid, which usually contains doses of nicotine, tetrahydrocannabinol (THC) or cannabinoid (CBD), as well as flavouring agents, cancer-causing chemicals, volatile organic compounds, and heavy metals such as nickel, tin, and lead (1). These contents are formulated to be ultrafine particles that can be delivered deep into the lungs by vaporising vehicle solvents like propylene glycol (P.G.) and vegetable glycerin (2). E-cigarettes have become a fast-growing trend among youth in many countries, including Malaysia and other upper-middle-income countries like Indonesia and Thailand and lower-middle-income countries like Vietnam, Cambodia, and the Philippines (3). These have become a desirable target for transnational activities due to the weak e-cigarette regulations (4). As of March 2020, the menthol-flavoured e-cigarette market share increased by 57.7% at a constant high. Juul, an American electronic cigarette company, owns up approximately 60% of the menthol-flavoured market and 53% of the tobacco-flavoured market share (5).

Among 1253 adults aged more than 18 years included in the International Tobacco Control Malaysia Wave 1 Survey, the analysed data have shown that 5.4% of

the participants reported using e-cigarettes every day regularly and at least once a month and 11.4% used e-cigarettes in 2020 (6). A study has revealed that 74.9% of the respondents from six universities in Malaysia are current users of e-cigarettes. 40.3% are dual users of conventional cigarettes and e-cigarettes, while 34.5% are exclusive e-cigarette users (7). Some factors that may influence the use of e-cigarettes include previous history of cigarette smoking, parents' smoking tobacco behaviour, and growing sensation-seeking action (8).

A northern Malaysian public university conducted a study on the awareness of e-cigarettes among students in 2021. A total of 304 respondents were involved, and most of the respondents are aware of the impact of e-cigarettes, but 40.79% are current users of e-cigarettes. Most of the respondents in a study on awareness of e-cigarettes at a Malaysian public university believe the danger of e-cigarettes is no different to conventional cigarettes. Another 30.92% of the respondents still need to gain knowledge about the risks of e-cigarettes. Many students need to realise the dangers of e-cigarettes and have a low awareness of e-cigarettes. There still needs to be more enforcement and effort at every stage of education to spread awareness of the risks of e-cigarettes (9). The outbreak of lung injury associated with e-cigarettes or vaping (EVALI) has been highly correlated with the content of vitamin E acetate as a thickener or cutting agent in illicit tetrahydrocannabinol (THC) in e-cigarettes. The Centres for Disease Control and Prevention (CDC) classified EVALI as an outbreak due to the sudden and substantial increase in cases across multiple states in the United States in 2019 (10). EVALI is a relatively new terminology introduced by the CDC in 2019 in response to this specific lung injury pattern associated with vaping. The term helped to distinguish this condition from other respiratory diseases and lung injuries, aiding public health monitoring (11). According to the CDC, visits to emergency rooms for EVALI-related symptoms like shortness of breath, fever, chills, rapid heart rate, and chest pain were substantially rising in August 2019 and peaking in September. The outbreak of EVALI in the United States has caused over 2,800 hospitalisations and 68 deaths of young people during the period. However, EVALI cases have been steadily declining as of February 2020 for various reasons, including improved public knowledge of the dangers of THC-containing e-cigarettes, the elimination of vitamin E acetate from the product, and legal action related to illicit products (12). Nonetheless, it does not discard the possibility that e-cigarettes may eventually have several harmful effects on lung cellular, organ physiology, and immune function in the long run. Even on short-term use, e-cigarettes have increased the likelihood of affecting some chronic pulmonary toxicity (13).

On the other hand, e-cigarettes have been used as a smoking cessation tool for traditional cigarette users. 42.7% of e-cigarette users in a study of 1007 health science students from three different universities in Jeddah have used e-cigarettes as a smoking cessation tool. More than half of them have succeeded in stopping conventional smoking. They believed that e-cigarettes have a higher probability and functionality as a smoking cessation tool and that traditional smoking can cause more addiction than e-cigarettes (14). However, a study has reported that third- and fourth-year medical students have correctly reported that e-cigarettes were not FDA-approved for smoking cessation (15). Most e-cigarette users and conventional smokers have perceptions that traditional cigarettes are more harmful than e-cigarettes. They also perceived e-cigarettes as a beneficial tool in aiding smoking cessation, reducing the urge to smoke, and as a more effective substitute for medication in quitting smoking (16). Nicotine-filled e-cigarettes were found to be more effective as smoking cessation tools than those without nicotine. E-cigarette users can develop nicotine addiction after successfully abstaining from cigarette smoking. They have a greater rate of continuation on e-cigarettes than the Nicotine Replacement Therapy (NRT) advised by the health professionals. Therefore, the proposed benefits of e-cigarettes as smoking cessation aids should be compared and weighed against their likelihood of bearing the effect of e-cigarettes. Despite the positive result of the above study, overall, the risks of e-cigarettes outweighed the benefits and should be discouraged as a whole and, notably, as a smoking cessation tool (17).

Malaysia, with a population of 32 million, has been reported to have the biggest e-cigarette market among Southeast Asian markets. From 2012 to 2015, Malaysia's e-cigarette sales have grown drastically from 106 million U.S. dollars to 514 million U.S. dollars. However, in 2016, the e-cigarette market experienced a sharp drop to less than half, i.e., 229 million U.S. dollars, due to the ban on nicotine-containing e-liquids by the Malaysia National Fatwa Council. They have declared e-cigarettes as 'haram' (forbidden) and banned vaping in some states like Johor, Kelantan, Penang, Terengganu, and Kedah. Despite the ban on nicotine-containing e-liquids, Malaysia's e-cigarette sales were estimated to remain stable into the 2020s at 260 million U.S. dollars per year (4). Shockingly, as of April 2023, the Malaysian government has exempted nicotine liquids and gels as controlled substances under the Poisons Act 1952, allowing e-cigarettes containing nicotine to be sold on the open market and subject to tax. It is more concerning that this action may have indirectly supported the use and selling of e-cigarettes.

Moreover, a standard for manufacturing e-cigarette solutions is not available in Malaysia. Therefore, the quality of the e-cigarette products offered in the Malaysian market is still being determined, and more is needed about the chemical contents, including nicotine, in e-cigarette solutions and aerosols (18). In conclusion, the Malaysian government is called to announce

strict regulations and enforcement on the selling and purchasing e-cigarettes. Furthermore, nationwide health promotion programs can also be organised to shift the perception of e-cigarettes and raise awareness of the use of e-cigarettes (19). About the above scenarios, this study aimed to determine the prevalence of e-cigarette usage and compare the understanding and perception of e-cigarette usage among undergraduate students from the medical and non-medical-related programs in UiTM Puncak Alam.

MATERIALS AND METHODS

Study design and population

A cross-sectional self-administered survey was carried out among undergraduate university students enrolled in medical-related and non-medical-related programs of Universiti Teknologi MARA (UiTM) at the Puncak Alam Campus in Selangor, Malaysia. The study protocol was approved by the Research Ethics Committee, UiTM (Ref. No.: REC (P.H.)/U.G./060/2023).

Sample size calculations

The online Raosoft software calculator was used to calculate the sample size. The number of active students in UiTM Puncak Alam Campus in 2023, which is the same as the year of study, is 19755 students. According to Raosoft Software Online Calculator, as the calculator generated with +/- 5% margin of error and 95% confidence interval, the minimum estimated sample size was 377. However, we have added another nine per cent to the sample size, which adds up to 406 questionnaires to be distributed to achieve the estimated sample size for our study (20). Raosoft Software Online Calculator uses the following formula for the sample size n:

$$n = \frac{Z^2 \times p \times (1-p)}{e^2}$$

Where n = required sample size, Z = Z-score, which corresponds to the confidence level (e.g., 1.96 for 95% confidence), p = estimated proportion of the population that has the attribute of interest (if unknown, 0.5 is commonly used for a conservative estimate), and e = margin or error (expressed as a decimal, e.g., 0.05 for 5%).

Data collection and sampling

This study employs a convenient sampling whereby the questionnaire, participant information sheet (PIS), and informed consent form containing information on the study's background, confidentiality, procedure, risks, and benefits associated with the survey were delivered online via Google Forms to all the students from all faculty in UiTM Puncak Alam Campus via email, WhatsApp, and Telegram as an invitation for any one of them to answer our questionnaire. Participants provided their consent by signing the consent form before being granted access to the questionnaire. All the participants were required to read and understand the preceding statement of the questionnaire regarding the research's nature and objectives. The participants were required to complete the survey and consent form online on their willingness to participate. The contact number of the authors to be contacted in case of difficulty answering the questions was encrypted with the questionnaire. After a week's lapse from the distribution date, student heads of each faculty sent a reminder to fill out the questionnaire as a follow-up measure. From March to May 2023, we distributed 406 questionnaires and the signed consent form proportionally based on the number of students in each faculty, with the help of respective faculty representatives. A total of 406 questionnaires were almost equally distributed to two groups of eligible students, i.e., undergraduates aged 18 years and above, Malaysian citizens who studied full-time, who were enrolled on either medical-related programs, i.e. pharmacy and health sciences courses, or non-medical related programs such as accountancy, hotel and tourism, business and management, and education. Only the UiTM campus of Puncak Alam city has the two categories of courses for data comparison. Within the study period, effort was made to obtain an almost equal number of responses for each group to avoid bias. Students who refused to respond or answer the questionnaire were not required to sign the consent form and, hence, were not eligible to be our respondents. Students were assured by a statement in the Google form that their participation in the study was entirely voluntary and their responses would be kept strictly confidential in a digital folder accessible by password only by researchers. It was also stated in the Google Form for students' understanding that the responses were used for research purposes without affecting their academic performance. No incentives were offered to the potential participants. An appendix containing medical jargon or healthcare-related terminologies with definitions and explanations was also distributed with the questionnaires to assist respondents, especially those of non-health-related backgrounds.

Survey instruments

The 17-item instrument in the English language used in this study was adapted from previous studies by Acosta (2022) (21) and Roma P and Stone E (2020) (22). The questionnaire consisted of four parts: The first part (Part A) of the questionnaire included eight questions on respondents' demographic data, i.e., age, race, gender, locality of stay, faculty, "Have you heard about e-cigarettes?" with Yes=1, No=2 choices of answers, source of information about e-cigarettes with a list of different sources of information to choose from, and "ever used e-cigarettes" with Yes=1, No=2 choices of answers. Next, the second part (Part B) of the questionnaire is a question with various answers about the reasons for using e-cigarettes. The third part (Part C) of the questionnaire includes four questions: Yes=1, Not sure=2, No=3, and choice of answers on awareness

of e-cigarettes. The last part (Part D) comprised three questions, each with a Likert-scale (1–5) selection of answers regarding the perception of e-cigarettes.

Face and Content Validation

Content validation was done regarding relevancy and clarity among four senior lecturers from the university as experts in the field. The results of content validity obtained showed an acceptable item content validity index (I-CVI) of 0.83. Their comments were used to amend the items' wording. Pilot testing was done on ten pharmacy students to get feedback regarding their understanding and comprehension of the questionnaire. The face validity index (FVI) calculated was an acceptable value of 0.85. The feedback obtained from the pilot study was used to refine the questionnaire in terms of structure and wording before coming up with the final version for our field study. This refining includes modifying the sentences to tailor to our Malaysian students' local and cultural context.

Statistical analysis

Both descriptive and inferential statistics were used for data analysis. Descriptive statistics regarding demographic variables were reported regarding mean (S.D.) and percentage. Inferential statistical analysis was done, i.e., using the Chi-Square Test of Independence, to analyse the association between the variables with the prevalence, awareness, and perception of e-cigarette use, and an independent t-test was used to determine whether there was a significant difference in the mean score between students from medical and non-medical related courses. Another inferential statistical test used is Simple Logistic Regression to confirm the Chi-Square test results and to assess the degree of association between the age, gender, and faculty of medical-related and non-medical-related programs with the prevalence of e-cigarette use. Statistical Package for Social Science (SPSS) version 28 was used for the statistical analysis (23).

RESULTS

A total of 406 questionnaires were distributed, and all were entirely answered by the respondents and returned, giving a response rate of 100%. Table I shows the demographic profile of students. A majority (73.2%) of the respondents were female in the age range of 22 to 24 years (53.4%), and about half (53%) were from medical-related courses comprising pharmacy and health science, while the other half (47%) were from the non-medical related programs that consist of business management, accountancy, education, creative art, hotel and tourism management and the built environment.

Table I: The demographic characteristics in terms of mean and percentage

	Demographic Characteristics	Frequencies (N)	Percentage (%)	Mean (S.D.)
Age	19-21 years old	134	33.0	1.83 (0.72)
	22-24 years old	217	53.4	
	25-27 years old	45	11.1	
	>27 years old	10	2.5	
Gender	Male	109	26.8	1.73 (0.44)
	Female	297	73.2	
Faculty	**Medical**	**215**	**53**	**1.47 (0.5)**
	Pharmacy	91	22.4	
	Health Science	124	30.5	
	Non-Medical	**191**	**47**	
	Business Management	82	20.2	
	Accountancy	36	8.9	
	Education	31	7.6	
	Creative Art	10	2.5	
	Hotel and Tourism Management	19	4.7	
	Built Environment	13	3.2	

Table II shows the prevalence of e-cigarette users among the respondents was 18.5%, and the prime reasons for the use of e-cigarettes were to deal with stress (41.3%), to socialise with friends (34.7%), to quit smoking (32%), and because of their curiosity (30.7%).

Table II: The prevalence of e-cigarette usage in terms of mean and percentage

	Prevalence	Frequencies (N)	Percentage (%)	Mean (S.D.)
Have you ever used e-cigarettes	Yes	75	18.5	1.82 (0.39)
	No	331	81.5	
What is the reason that you have used e-cigarettes	I was curious	23	30.7	
	I was addicted	16	21.3	
	To quit smoking	24	32	
	To deal with stress	31	41.3	
	To socialize with friends	26	34.7	
	Because it is cheaper than smoking tobacco	9	12	
	They are less harmful than the other forms of tobacco	6	8	

Table III shows the association between the prevalence of e-cigarette users between age, gender, and faculty from the chi-square test. It was found that age (p = 0.046), gender (p = 0.001), and faculty (p = 0.007) were significantly (p < 0.05) associated with the usage of e-cigarettes. Results of simple logistic regression showed a significant degree of association between the prevalence of the use of e-cigarettes with gender, age, and faculty; males were shown to be 5.81 times more likely to use e-cigarettes than females (OR: 5.81, 95% CI: 3.41-9.9, p = 0.001). It was also found that adding the "gender" variable significantly (p < 0.05) improved the prediction of usage of e-cigarettes. From the Cox and Snell R2 values, 10.0% of the usage of e-cigarettes was explained by gender, and the Nagelkerke R2 value indicates a 16.2 % relationship between gender and the usage of e-cigarettes. Overall, 81.5 % were correctly classified. Furthermore, students aged 25-27 years are less likely to use e-cigarettes than subjects aged 18-22 years (OR = 0.46, 95% CI= 0.22 - 0.98, p = 0.04).. Faculty of medical-related programs were 0.49 times protectively less likely to use e-cigarettes than student-faculty of non-medical-related programs (OR = 0.49, 95% CI: 0.29-0.82). "Faculty" and "age" variables were also added significantly (p < 0.05) to improve the prediction of usage of e-cigarettes. From the Cox and Snell R2 values, 1.8% of the usage of e-cigarettes was explained by both variables of "faculty" and "age," and the Nagelkerke R2 value indicates the existence of 3% for "faculty" and 2.9% for the "age" of the relationship between those variables and usage of e-cigarettes. Overall, 81.5 % of both variables were correctly classified.

Table III: The prevalence of e-cigarette usage using Chi-Square Test and Simple Logistic Regression

		Responses		**Chi-Square test exact *p* values**		
		n (%)		($p < 0.05$)		
		Yes	No	Age	Gender	Faculty
Have you ever used e-cigarettes		75 (18.5)	331 (81.5)	0.046	0.001	0.007
				Simple Logistic Regression		
				($p < 0.05$)		
		B (S.E.)	**Wald[a] (pdf)**	**OR (95% CI)**		***p*-value**
Gender (Male)		**1.76 (0.27)**	**41.75 (1)**	**5.81 (3.41-9.9)**		**<0.001**
Age	18-21 years old		7.76 (3)	1		Ref. (0.51)
	22-24 years old	0.25 (0.29)	0.71 (1)	1.28 (0.72-2.27)		0.4
	25-27 years old	-0.78 (0.39)	4.07 (1)	0.46 (0.22-0.98)		**0.04**
	>27 years old	-0.09 (0.82)	0.01 (1)	0.92 (0.18-4.59)		0.92
Faculty (Non-medical)		-0.71 (0.26)	7.37 (1)	0.49 (0.29-0.82)		**0.007**

Table IV shows the independent t-test of the prevalence, awareness, and perceptions of e-cigarette usage between students from medical and non-medical-related courses. It was reported that only three factors, which are the prevalence of e-cigarette use, the awareness of e-cigarettes, and the side effects of e-cigarette usage, have significant (p < 0.05) differences between the medical and non-medical related students. The mean prevalence of e-cigarette usage for medical-related courses was 1.87 (SD: 0.342), and the mean prevalence for non-medical-related courses was 1.76 (SD: 1.76). Levene's test for equality of variance indicates that the variances are similar and shows a significant difference in the mean prevalence of e-cigarette usage between medical and non-medical related programs (t (404) = 2.765, p = 0.000). Next, the mean awareness of e-cigarette usage for medical courses was 1.00 (SD: 0.000), and the mean for non-medical related courses was 1.01 (SD: 0.072). The mean awareness regarding the effects of e-cigarette usage for medical-related courses was 2.05 (SD: 0.838), and for non-medical-related courses, it was 2.26 (SD: 0.925). The t-test indicates there is a significant difference in mean awareness and familiarity with side effects of e-cigarette usage between medical and non-medical related programs t (404) = -1.061, p = 0.033 for the awareness and t (404) = -2.347, p = 0.002 for the side effects. These results show that the medical and non-medical related courses have a significant mean difference in awareness and familiarity with the side effects of e-cigarette usage.

Table IV: The prevalence, awareness and perceptions of e-cigarette usage using Independent T-Test

	Independent T-Test				
	Mean (S.D.)		Mean difference (95% CI)	t-statistics (pdf)	*P* value ($p<0.05$)
	Medical	Non-Medical			
Have you ever used electronic cigarettes (e-cigarettes)	1.87 (0.342)	1.76 (0.429)	0.106 (0.031, 0.181)	2.765 (404)	**0.000**
Have you heard about electronic cigarettes	1.00 (0.000)	1.01 (0.072)	-0.005 (-0.015, 0.004)	-1.061 (404)	**0.033**
I know that e-cigarettes contain harmful substances and cancer-causing chemicals such as nicotine, nickel, tin and lead	1.79 (0.802)	2.04 (0.870)	-0.251 (-0.414, -0.088)	-3.028 (404)	0.820
I am familiar with the side effects of e-cigarette use	2.05 (0.838)	2.26 (0.925)	-0.205 (-0.377, -0.033)	-2.347 (404)	**0.002**
I know that long-term e-cigarette use can cause respiratory problems and lung damage	1.91 (0.881)	2.06 (0.904)	-0.156 (-0.330, 0.018)	-1.757 (404)	0.226
I know that e-cigarette use can lead to long-term nicotine addiction	1.95 (0.903)	2.14 (0.942)	-0.187 (-0.367, -0.007)	-2.045 (404)	0.226
When thinking about e-cigarettes, do you think they are harmful to one's health	1.63 (0.619)	1.88 (0.731)	-0.252 (-0.384, -0.121)	-3.765 (404)	0.486
Do you believe that e-cigarettes is less addictive than tobacco cigarettes	3.18 (1.008)	3.12 (1.001)	0.056 (-0.140, 0.253)	0.564 (404)	0.642
E-cigarettes can help smokers to quit	3.27 (1.041)	3.14 (1.017)	0.129 (-0.072, 0.330)	1.260 (404)	0.112
E-cigarette is an incoming public health crisis	1.80 (0.723)	1.90 (0.729)	-0.096 (-0.238, 0.046)	-1.328 (404)	0.349

Table V shows the awareness level of UiTM Puncak Alam students on e-cigarettes. The majority (99.8%) of the respondents have heard about e-cigarettes mostly from social media (80.5%) and through family and friends (62.8%).

Table V: The awareness of e-cigarette usage in terms of mean and percentage

	Awareness	Frequencies (N)	Percentage (%)	Mean (S.D.)
Have you heard about e-cigarettes	Yes	405	99.8	1.00 (0.05)
	No	1	0.2	
Where have you got most of your information about e-cigarettes	School/community program	81	20	
	Traditional media (Newspaper, magazines)	38	9.4	
	Television, radio	101	24.9	
	Social media	327	80.5	
	Health care provider	135	33.3	
	Family, friends	255	62.8	
	Medical journals/research findings	42	10.6	
	Personal investigation	57	14	

Table VI shows most of the students strongly agreed (36.2%) and agreed (40.6%) that they know e-cigarettes contain harmful substances and cancer-containing chemicals such as nicotine, nickel, tin and lead. More than half of the students agreed (39.2%) and strongly agreed (26.1%) that they were familiar with the side effects of e-cigarettes, and the other 29.1% were neutral about it. Three-quarters (71.5%) strongly agreed and agreed that they know the long-term use of e-cigarettes can cause respiratory problems and lung damage. 68.8% also strongly agreed and agreed that e-cigarette use can lead to long-term nicotine addiction. The chi-square test analysis results show a significant ($p < 0.05$) association between the awareness level of the harmful substances in the e-cigarette content ($p = 0.012$) and side effects of e-cigarette use ($p = 0.025$) with faculty. At the same time, gender is also significantly ($p < 0.05$) associated with the awareness of the long-term effect of e-cigarette use ($p = 0.007$) and long-term nicotine addiction ($p = 0.005$).

Table VI: The awareness of e-cigarettes usage using the Chi-Square Test

Questions	Responses					Chi-Square test exact p values	
	n (%)					(p<0.05)	
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Gender	Faculty
I know that e-cigarettes contain harmful substances and cancer-causing chemicals such as nicotine, nickel, tin and lead	147 (36.2)	165 (40.6)	76 (19.5)	14 (3.4)	1 (0.2)	0.31	**0.012**
I am familiar with the side effects of e-cigarette use	106 (26.1)	159 (39.2)	118 (29.1)	21 (5.2)	2 (0.5)	0.07	**0.025**
I know that long-term e-cigarette use can cause respiratory problems and lung damage	144 (35.5)	146 (36)	98 (24.1)	16 (3.9)	2 (0.5)	**0.007**	0.360
I know that e-cigarette use can lead to long-term nicotine addiction	139 (34.2)	138 (34)	106 (26.1)	21 (5.2)	2 (0.5)	**0.005**	0.298

Table VII shows the perceptions of e-cigarette usage among students. The study found that most (89.9%) respondents strongly agreed and agreed that e-cigarettes harm health. However, only a small percentage (24.2%) strongly agreed and agreed that e-cigarettes are less addictive than tobacco cigarettes. However, about one-third (39.4%) were neutral about e-cigarettes being less addictive than tobacco cigarettes. Other than that, more than one-third (36.5%) were neutral, and about one-third (30.5%) disagreed that e-cigarettes can help smokers quit. Nevertheless, most (87.2%) of the students strongly agreed and agreed that e-cigarettes were an incoming public health crisis. The Chi-Square test was also used to analyse the association between the students' perceptions and their faculty. The perceptions that e-cigarettes are harmful to one's health (p = 0.001) and that e-cigarettes can help smokers to quit (p = 0.002) have a p-value lower than 0.05 that shows an association with the perception of e-cigarette use and the faculty. Gender is associated with the perceptions that e-cigarettes can help smokers quit (p = 0.002) and e-cigarettes as an incoming public health crisis (p = 0.001).

Table VII: The perceptions of e-cigarettes usage using Chi-Square Test

Questions	Responses					Chi-Square test exact p values	
	n (%)					(p<0.05)	
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Gender	Faculty
When thinking about e-cigarettes, do you think they are harmful to one's health	149 (36.7)	216 (53.2)	36 (8.9)	3 (0.7)	2(0.5)	**0.001**	**0.001**
Do you believe that e-cigarettes is less addictive than tobacco cigarettes	23 (5.7)	75 (18.5)	160 (39.4)	114 (28.1)	34 (8.4)	0.094	0.671
E-cigarettes can help smokers to quit	24 (5.9)	71 (17.5)	148 (36.5)	124 (30.5)	39 (9.6)	**0.002**	**0.002**
E-cigarette is an incoming public health crisis	126 (31)	228 (56.2)	42 (10.3)	7(1.7)	3 (0.7)	**0.001**	0.334

DISCUSSION

The prevalence of e-cigarette usage

The global prevalence of past-30 days of e-cigarette use of 1.9% to 33.2% among youths of age 12-16 years globally has been reported (24). According to statistics from various government organisations and scientific research, this number is expected to continue rising (25, 26). In our study, we found that 18.5% of respondents reported using e-cigarettes within the past 30 days, indicating a relatively high level of recent e-cigarette use among students in a university setting. The current prevalence of e-cigarette users, according to a systematic review among adolescents in Southeast Asia, ranges from 3.3% to 11.8% (3). In contrast, the Tobacco and E-cigarette Survey Among Malaysian Adolescents (TECMA) 2016 data showed lower prevalence rates among younger age groups: 11.3% of adolescents aged 13 to 15 and 9.1% of adolescents aged 10 to 19 reported using e-cigarettes (27). Given that TECMA focuses on adolescents (ages 10–19), the higher incidence in our study might be due to the older age group (university students). Higher consumption rates may result from older students' increased autonomy and access to e-cigarettes, especially those attending universities. A snapshot from a few years ago, the TECMA data from 2016 might not accurately represent more current e-cigarette use trends driven by shifting societal norms, marketing tactics aimed at young adults, and changing perceptions. Our results might point to a growing trend in youth e-cigarette usage, which could be brought on by more readily available products, a sense of social acceptance, or false beliefs about the safety of e-cigarettes. The higher prevalence among university students in our study may underscore the necessity for continued education after high school, even though TECMA's adolescent statistics showed notable use rates even in the early teenage years. These findings highlight the significance of ongoing health promotion initiatives that reach into higher education, as young adults may be

more likely to experiment with or embrace e-cigarettes, especially in social and less controlled university settings. Concerns over the health hazards connected to young individuals' early and ongoing e-cigarette usage are raised by the increased prevalence in our study. It highlights the necessity of focused initiatives in academic institutions to dispel myths and educate people about the possible risks associated with e-cigarettes. Public health initiatives could be modified to target young adults and adolescents to make anti-vaping programs relevant and reach university populations.

Additionally, the result of prevalence from our study can be related to the fact that in April 2023, the Malaysian government exempted nicotine liquids and gels from the Poison Act 1952, allowing e-cigarettes containing nicotine to be sold on the open market, which concurrently supports the sale and use of e-cigarettes (18). Plus, the postponement of e-cigarette taxes and regulations also contributes to the lower price of e-cigarettes, making them affordable to consumers. Our study found males and students from the faculty of non-medical to be more likely to use e-cigarettes. According to another study, males with higher levels of education in proxy of higher income who are younger adults were more likely to use e-cigarettes than females (28).

Among 18.5% that have used e-cigarettes in the past 30 days, most of the users used e-cigarettes as a coping mechanism to deal with stress (41.3%), to socialise with friends (34.7%), to quit smoking (32%), and because of their curiosity (30.7%). A study finding proves that 74% of e-cigarette users use it with joy, happiness, and peace as their coping mechanisms to deal with stress. Plus, 56% of the respondents who were using antidepressant medication agreed that stress was their prime factor in the use of e-cigarettes (29). Understanding the role of e-cigarettes in the lives of college students could help one gain insight into much more than just nicotine use. Instead of focusing solely on physical dependence, it may show the emotional and mental reasons for a person's demand for nicotine (30). Thus, by using a different approach and effort to raise awareness of using e-cigarettes, we could also provide other solutions to solve the root factors.

The awareness of e-cigarette usage

In recent years, e-cigarettes have dramatically become popular, surpassing traditional cigarette use among adolescents worldwide (31). As much as e-cigarette users have been increasingly trending, the comprehensive awareness and knowledge on the use of e-cigarettes are still vaguely known to the public, which could also cause misinformation and inaccurate facts as social media and the internet become the leading search engine for obtaining information by the public (32). In this study, most of the respondents have heard about e-cigarettes. This phenomenon can be supported by a survey conducted among first-year university students, which found that most (99%) of the study population were aware of e-cigarettes (33). A study on awareness among Zhejiang Chinese adolescents found that 70.61% of the population had heard of e-cigarettes (34).

Social media is the primary source of information and plays a predominant role among youth. Hence, most respondents obtain information on e-cigarettes mainly from social media, family and friends as their closest persons. Among first-year university students, 76.4% of respondents use social media as their primary source of knowledge (32), followed by family and friends (51.6%), which shows a consistent trend in the source of knowledge about e-cigarettes among university students (35). As much as they rely on seeking information through social media, they must be aware of the less reliable sources, which cause inaccurate information on e-cigarettes (30). Therefore, social media campaigns on e-cigarette education with standardised and accurate information have been proven to be a viable way to educate the youth directly and potentially share information among peers (36).

Most of the study population has knowledge of the harmful content of e-cigarettes and the side effects of e-cigarettes, which shows a distinct response between medical and non-medical related programs. The non-medical-related programs have a basic knowledge of the harmful content of e-cigarettes and their side effects, while medical-related students were more exposed to the matter. A study reported a poor level of knowledge on vaping from medical and dental undergraduates, even though they did get their facts correct about vaping. They are perceived to need better-equated expertise, as there is still a need for a more extensive understanding of the use of e-cigarettes (37).

Furthermore, the respondents also show a high awareness of the long-term effects of e-cigarette use and long-term nicotine addiction. However, there is no distinct difference between the two fields, in which the fields of study do not affect the level of knowledge on e-cigarettes. We could analyse that the population has a basic understanding of e-cigarette use as there is still a big loophole in knowledge on the long-term effect of e-cigarette use and long-term nicotine addiction, regardless of their field of study. Since 2015, most university authorities, following the Health Ministry of Malaysia's decision to ban the use of e-cigarettes in the university, have neglected the responsibility to educate on this matter, causing a significant gap in the knowledge and information about e-cigarettes (38). Therefore, as the related courses, students are the future health professionals who play a prominent role in educating the community; this is an urgent call to double the effort

and educate on the awareness of e-cigarette use through social media as the leading platform among the youth of the university (36).

The Perceptions of E-cigarette UsageMost of the population (89.9%) believes that e-cigarette use is harmful to health. From the Chi-Square test, a significant association exists between the faculty and the perceptions of the harmful of e-cigarettes on health. Based on the result of the Independent T-Test, the perception of the harmful effects of e-cigarettes on health favours the medical-related students since the mean score for this variable of the detrimental impact of e-cigarettes is lower in the medical-related group than the non-medical-related counterpart. This favourable result for the medical-related program students may be explained by the fact that medical-related students have more frequent exposure to anti-smoking and anti-vaping campaigns and the latest research on vaping-related health risks, especially as these topics are common in their lectures. This exposure likely reinforces a cautious view of e-cigarettes among this medical-related group. A study reported that one-third (37.1%) of e-cigarette users for the past 30 days claimed that e-cigarettes were harmful to their health. Most of the sample (64%-80%) believed e-cigarettes were either less harmful than or just as harmful as cigarettes. However, over a third of the sample needed to be made aware of how harmful e-cigarettes were in comparison with traditional cigarettes (24). A survey by TECMA 2016 also found that 41.4% felt that e-cigarettes were equally harmful as cigarette smoking (27).

28.1% disagree that e-cigarettes are less addictive compared to cigarettes, and 39.4% were neutral or perceived both devices to have an equivalent risk. In a study among university students in Shanghai, China, e-cigarettes were a healthier (78%) and less addictive (63.1%) option compared to regular cigarettes (39). Another study among first-year university students also found that the study population did not have the knowledge and believed that e-cigarettes and regular cigarettes carry the same risk (22.5%) and have the same chemicals as regular cigarettes (48.4%) (33).

Additionally, more than a third (36.5%) of the respondents were neutral, and almost a third (30.5%) disagreed that e-cigarettes can help smokers quit. There is also a significant association between course differences in perceiving this matter, which again favours the medical-related students based on the result of the Independent T-Test. This favourable result for medical-related students is because students in medical-related programs are typically more exposed to understanding the physiological cause of quitting smoking. Thus, they might be more inclined to critically evaluate e-cigarette marketing claims (e.g., that e-cigarettes are a "safer" alternative that can help to quit smoking) due to their academic training. On the other hand, non-medical students might lack similar depth in understanding the physiological impacts, potentially resulting in a more favourable or neutral view of e-cigarettes. According to data from a study at the University of Minnesota Medical School, 28.1% of men who have tried tobacco smoking generally support the use of e-cigarettes for smoking cessation and believe e-cigarettes have a lower risk of causing cancer compared to traditional cigarettes. At the same time, non-smokers did not share this opinion (15). Another different study stated that younger respondents between the ages of 18 and 24 were more inclined to perceive e-cigarettes as a smoking cessation tool and agreed that e-cigarettes are less harmful than traditional cigarettes. However, further study is needed to establish the guidelines and educate the public that there are still risks involved with e-cigarette use.

Moreover, there are traditional methods such as Nicotine Replacement Therapy (NRT) for smoking cessation aid with lesser risk and harm. Furthermore, most (87.2%) respondents strongly agreed and agreed that e-cigarettes are an incoming public health. A study stated that high knowledge is not a prerequisite for behavioural change. One's perceptions and beliefs can significantly influence behavioural change compared to knowledge. Indeed, most theories of health behaviours need to be more conspicuously present in expertise (40). Therefore, shifting perceptions on the use of e-cigarettes may significantly reduce and affect the number on the prevalence of e-cigarette users.

The results of this study highlight the necessity of focused university health education initiatives

They aimed at non-medical students who might need to become more familiar with this knowledge. Young adults can benefit from this strategy by making better decisions and receiving early intervention support. Students in medical and non-medical-related studies have different perspectives. Thus, non-medical students need more knowledge regarding the possible risks of e-cigarettes. Reducing misconceptions regarding vaping and closing this gap can be accomplished by raising awareness. The findings of this study can help university health services, and legislators create regulations that limit campus e-cigarette usage while emphasising the dangers to one's health. To develop healthier, more knowledgeable students, public health officials should work with educational institutions to provide standardised, evidence-based curricula on the adverse effects of vaping. It should be emphasised that lowering e-cigarette use and changing young individuals' opinions about how safe they are can help lessen the health risks that vaping will cause in the future.

Limitations

Our study had several limitations. Due to time constraints to complete this study, there are limits in data accuracy and misleading data, as well as methods used to obtain the data, which may lead to bias and skewed results.

Furthermore, the sample consisted primarily of females, which could not contribute to more equivalent samples and data.

CONCLUSION

This research has found that there was almost a one-fifth prevalence rate even though there was a high level of awareness of the basic knowledge of e-cigarette usage among respondents. Additionally, the perspectives of the harmful and benefits of e-cigarette usage are likewise well understood. Age, gender and faculty are significant factors that can influence e-cigarette vaping. The faculty administrator should heed the important influencing factors of e-cigarette vaping to curb the spread of e-cigarette use activity, especially among students from non-medical-related courses. Spreading the correct awareness and perceptions to students, especially in non-medical-related programs, is therefore pertinent. Our study findings contribute to better understanding and shaping public health initiatives related to e-cigarette use among young adults. Early education and awareness are vital public health tools that can contribute to reducing the rates of e-cigarette-associated health issues, finally ultimately benefiting society at large. Public health promotion, guidance for public health policies and long-term public health goals are also part of the real-world relevance and practical applications of our research findings from a public health perspective.

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