Vol. [2] / Issue. [2] [2024]

Knowledge, Attitude, and Educational Resources on E-cigarettes among Adults in Malaysia

Article accepted: 18-10-2024

Corresponding Author: Mila Nu Nu Htay

Email: drmlnnh@gmail.com

Fahad Ameer[1], Wong Ming Wai[1], Nanthini Subramanian[1], Gowri Adaikammai Sithambaram[1], Preshetta Ramu[1], Emily Joseph[1], Minoo Pothen[2], Soe Moe[3], Mila Nu Nu Htay[3*]

[1]Faculty of Medicine, Manipal University College Malaysia, Malaysia

[2]Department of Psychiatry, Faculty of Medicine, Manipal University College Malaysia, Malaysia

[3]Department of Community Medicine, Faculty of Medicine, Manipal University College Malaysia, Malaysia

ABSTRACT

The emergence and increasing popularity of e-cigarettes have sparked ongoing debates regarding their adverse effects, rising usage, and claims of being a 'safer' alternative to traditional tobacco cigarettes. This cross-sectional study examines the current state of knowledge, attitudes towards e-cigarettes and educational resources for e-cigarettes among the adults in Malaysia. This study was conducted between May and June 2024 and data was collected by using an online questionnaire. A total of 156 adults from general population responded to this study. Data was analyzed by using SPSS (Version 27). The findings indicated that approximately half of the respondents (48.1%) were unsure about their approval for utilization in smoking cessation. The majority of respondents (69.9%) had not received formal education about e-cigarettes, relying on social media and online advertising for information. The study also highlights gender differences in attitudes toward e-cigarettes, with males showing more favorable attitudes compared to females (OR 2.45, 95%CI: 1.28,4.67). The results underscore the need for improved educational programs and awareness campaigns about e-cigarettes, particularly targeting school-age populations and leveraging various media to address misinformation. Such efforts could help mitigate misinformation and promote informed decision-making regarding their use.

Keywords:

E-cigarette, Smoking, Young Adults, Malaysia

INTRODUCTION

Tobacco consumption dates back to the first millennium, it was initiated to use in religious ceremonies to medicinal purposes (Sansone et al., 2023). In modern times, tobacco is primarily consumed for leisure or relaxation. Notably, research by Dai, et al highlights a significant reduction in the prevalence of smoking among adults since 1990, with a 27.2% decrease in men and a 37.9% decrease in women (Dai, Gakidou and Lopez, 2022). Despite this decline, the harmful health effects of smoking remain severe and widespread. Smoking negatively affects nearly every organ in the body and remains a leading cause of mortality among users. It contributes to 80% of deaths from chronic obstructive pulmonary disease (COPD) and increases the risk of heart disease, stroke, and lung cancer (Health Effects of Cigarette Smoking, 2022). The primary addictive component in tobacco, nicotine, is craved by millions worldwide. The shift from traditional tobacco consumption methods, such as pipes, cigars, and

cigarettes, has led to the emergence of a new nicotine delivery system: electronic cigarettes, or e-cigarettes (Adib et al., 2018).

E-cigarettes, also known as vapes, are marketed as an alternative to conventional tobacco cigarettes. These devices use rechargeable batteries to vaporize a nicotine-containing glycerin solution for inhalation, serving as another form of nicotine delivery (Adib et al., 2018). Manufacturers often promote e-cigarettes as a simpler and more cost-effective method for smoking cessation. Between 2010 and 2014, e-cigarettes became the second most marketed nicotine products in the United States, following traditional tobacco cigarettes. Their popularity and accessibility continue to grow, with many countries lacking adequate regulations on their sale and use. Studies indicate that increased marketing expenditures and social media engagement have led to greater exposure and experimentation among adolescents and young adults, presenting e-cigarettes as an alternative to combustible cigarettes (Collins et al., 2019). In Malaysia, usage increased from 0.8% in 2011 to 4.9% in 2019 (Driezen et al., 2022). Additionally, a significant rise in e-cigarette use among adolescents has been observed over the past decade (Jones and Salzman, 2020). In 2020, 5.4% of Malaysian adults reported using e-cigarettes daily. The most commonly cited reasons for using e-cigarettes among both youth and young adults are curiosity, flavor preferences, and the perception that e-cigarettes are less harmful than other tobacco products (National Center for Chronic Disease Prevention and Health Promotion [US] Office on Smoking and Health, 2016).

Raising awareness about e-cigarettes can highlight their adverse health effects, including respiratory issues, cardiovascular problems, and nicotine addiction (Wang, Lu, Cai and Feng, 2020). Educating the public and filling gaps in existing knowledge empowers individuals to make informed decisions about their health and well-being (Collins et al., 2019). For example, a study by Mpousiou et al. (2021) found out that school-based educational intervention programme improved smoking-related knowledge and anti-smoking attitudes among middle-school students in Greece (Mpousiou et al., 2021). As a result, awareness programmes should prioritize the implementation of comprehensive health education programs and myth-busting campaigns about e-cigarettes, helping the population make well-informed choices regarding their use. Understanding public knowledge, awareness, and attitudes towards e-cigarette usage is essential to addressing the emerging public health challenges associated with these products. Therefore, this study aimed to investigate knowledge, attitude towards e-cigarettes, educational resources regaled to e-cigarettes and their associated factors among general adults in Malaysia.

METHODS

Study Design and Setting

This study is a cross-sectional analytic study conducted from May to June 2024. Respondents were recruited from the general population in Malaysia.

Sample Size and Sampling

The sample size was calculated using the OpenEpi statistical calculator. An anticipated frequency of 88.4% was derived from Wang et al (Wang, Zhang, Xu and Gao, 2019), with a 95% confidence level and a 5% margin of error. Accounting for a 10% non-response rate, the final sample size required for this study was 176 respondents.

Respondents were recruited using a convenience sampling method. The inclusion criteria for the study included adults aged 18 years and above, of both male and female genders, including both Malaysian and non-Malaysian nationalities, from all ethnic groups and varying education levels, provided they

gave informed consent. Exclusion criteria were individuals employed in the tobacco industry were excluded from the study, and this was clearly stated in the invitation and consent forms.

Data Collection

The questions in our study were adapted and modified from a previously published article (Hinderaker et al., 2018). The questionnaire was divided into four sections and was available in both English and Bahasa Malay.

Section 1: Demographic Information

This section collected demographic details such as gender, age, nationality, ethnicity, and education level.

Section 2: Knowledge of E-Cigarettes

Four true-or-false questions were included to assess the respondents' knowledge of e-cigarettes.

Section 3: Attitudes Toward E-Cigarettes

This section contained five questions aimed at understanding respondents' attitudes towards e-cigarette use. Responses were measured on a five-point Likert scale: strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.

Section 4: Educational Resources on E-Cigarettes

This section comprised five questions to evaluate the respondents' sources of information about e-cigarettes.

Data Processing and Data Analysis

The data was analyzed using Epi Info version 7.2 software. Results were presented through frequency counts and other descriptive statistics. The association between education on e-cigarettes and the attitudes of adults towards e-cigarettes was assessed using the Chi-square test. A significance level (p-value) of 0.05 was set, with a 95% confidence interval.

Ethical Considerations

Before respondents completed the questionnaire, they were provided with clear and comprehensible information about the purpose of the study, the potential benefits, and their right to withdraw at any time without any consequences. We ensured that all respondents' details and responses remained confidential. The data collected were anonymized and securely stored. Our commitment to transparent communication about the study's purpose and methods was upheld throughout the research process. By adhering to these ethical principles, we aimed to conduct a study that was ethically sound, respectful, and contributed positively to the advancement of knowledge. The study proposal was submitted to and approved by the Research Ethics Committee of Manipal University College Malaysia (MUCM/Research Ethics Committee – 003A/06/2024).

RESULTS

The sociodemographic characteristics of the 156 adult respondents indicate a predominantly youthful sample, with a mean age of 21.63 years (SD = 1.87). The gender distribution is nearly balanced, with 50.6% male and 49.4% female respondents. In terms of nationality, 85.3% are Malaysian. Regarding educational attainment, the sample is highly educated, with 94.9% having completed tertiary education (Table 1).

Table 1. Sociodemographic characteristics of respondents (n=156)

Variable	Frequency (%)
Age (years)	
19-21	84 (53.2)
22-29	73 (46.8)
Mean (SD)	21.63 (1.87)
Minimum - Maximum	19 – 29
Gender	
Male	79 (50.6)
Female	77 (49.4)
Nationality	
Malaysian	133 (85.3)
Non-Malaysian	23 (14.7)
Ethnicity	
Malay	6 (3.8)
Chinese	58 (37.2)
Indian	88 (56.4)
Others	4 (2.6)
Education level	
Secondary education	8 (5.1)
Tertiary education	148 (94.9)

Overall, from 156 adults, 23.7% believed that e-cigarettes were approved by the Ministry of Health for smoking cessation, others remain uncertain (48.1%). Approximately, 20.5% reported that they would recommend the use of e-cigarettes as a smoking cessation method (Table 2).

Table 2. Knowledge on E-cigarettes among Adults in Malaysia (n=156)

Item	n (%)
E-cigarettes approved by the Ministry of Health for smoking cessation	
Yes	37 (23.7)
No	44 (28.2)
Not sure	75 (48.1)
E-cigarettes lower the risk of cancer for patients who use them instead of smoking traditional cigarettes	
Yes	40 (25.6)
No	106 (67.9)
Not sure	10 (6.4)
E-cigarettes are a helpful aid for smoking cessation	
Yes	36 (23.1)
No	101 (64.7)
Not sure	19 (12.2)
I would recommend the use of e-cigarettes as a smoking cessation method	
Yes	32 (20.5)
No	110 (70.5)
Not sure	14 (9.0)

Among the respondents, 56.4% had shown good attitudes towards e-cigarettes (Figure 1).

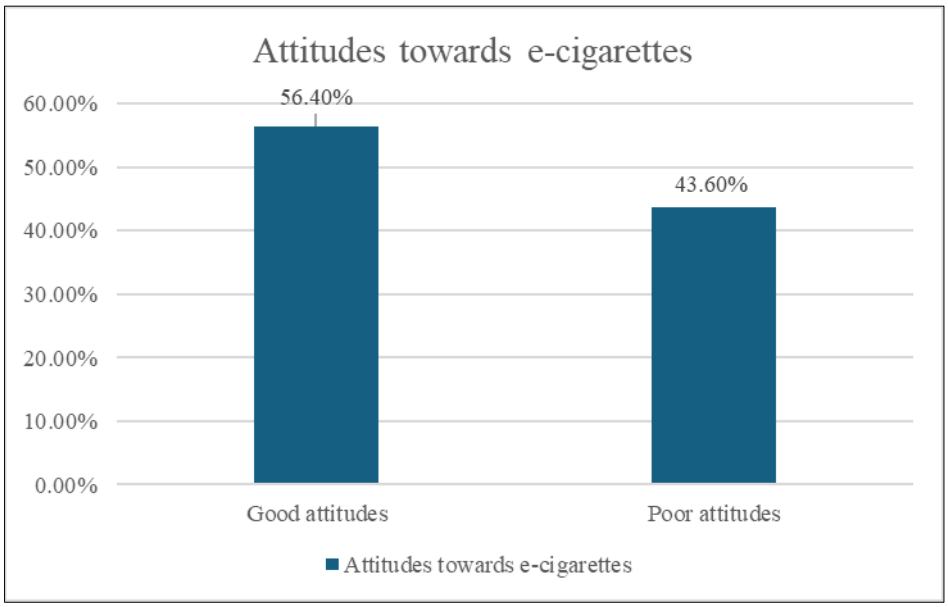

Figure 1. Attitude on E-cigarettes among Adults in Malaysia (n=156)

Table 3 reported the educational sources regarding e-cigarettes among adults in Malaysia. A majority (69.9%) of respondents did not receive any education about e-cigarettes in school, while only 30.1% did.

Among those with prior education, most (70.2%) felt they had received adequate information, with secondary school (55.3%) seen as the best time/location for such education. Social media was the most common source of information outside of schools (80.9%), followed by online advertising (61.7%).

Among respondents without prior education, most (78.9%) suggested secondary school as the best time/location for education. Social media was also the most common source of information outside schools (89.0%), followed by online advertising (54.1%) (Table 3).

Table 3. Education on E-cigarettes among adults in Malaysia (n=156)

Item	n (%)
Have you received any education about e-cigarettes in school?	
Yes	47 (30.1)
No	109 (69.9)
Where did you learn about e-cigarettes? Check all that apply.	
Primary school	12 (7.7)
Secondary school	33 (21.2)
Tertiary education	29 (18.6)
Educational Resources on E-cigarettes among Adults (With prior education on e-cigarettes (n=47)	
In your opinion, have you received adequate education about e-cigarettes in schools?	
Yes	33 (70.2)
No	14 (29.8)
Where do you think the best time/location is to receive education about e-cigarettes?	
Primary school	18 (38.3)
Secondary school	26 (55.3)
Tertiary Education	3 (6.4)
Have you received any information about e-cigarettes outside of schools? (multiple answers allowed)	
Social media (Facebook, Twitter)	38 (80.9)
Online advertising	29 (61.7)
Television advertisement	18 (38.3)
Radio advertisement	17 (36.2)
Billboards and/or public signs	16 (34.0)
Newspapers or Magazines	20 (42.6)
None	1 (2.1)
Educational Resources on E-cigarettes among Adults (Without prior education on e-cigarettes) (n=109)	
Where do you think the best time/location is to receive education about e-cigarettes?	
Primary school	21 (19.3)
Secondary school	86 (78.9)
Tertiary Education	2 (1.8)
Have you received any information about e-cigarettes outside of schools? Check all that apply.	
Social media (Facebook, Twitter)	97 (89.0)
Online advertising	59 (54.1)

Television advertisement	19 (17.4)
Radio advertisement	12 (11.0)
Billboards and/or public signs	27 (24.8)
Newspapers or Magazines	26 (23.9)

Among the various factors, gender is the only sociodemographic factor significantly associated with attitudes toward e-cigarettes, with males more likely to have good attitudes than females. Males had significantly better attitudes (67.1%) compared to females (45.5%). Males were 2.45 times more likely to have good attitudes than females, and this difference is statistically significant (p = 0.006) (Table 4).

Table 4. Factors associated with attitude towards e-cigarettes among adults in Malaysia (n=156)

Sociodemographic factors	Good attitudes n(%)	Poor attitudes n(%)	OR (95%CI)	P
Age (years)				
19 -21	50 (60.2)	33 (39.8)	1.40 (0.74, 2.64)	0.304
22-29	38 (52.1)	35 (47.9)	Reference	
Gender				
Male	53 (67.1)	26 (32.9)	2.45 (1.28,4.67)	0.006
Female	35(45.5)	42 (54.5)	Reference	
Nationality				
Malaysian	75 (56.4)	58 (43.6)	0.99 (0.41,2.43)	0.990
Non-Malaysian	13 (56.5)	10 (43.5)	Reference	
Ethnicity				
Malay	1 (16.7)	5 (83.3)	0.20 (0.01, 3.66)	0.260
Chinese	33 (56.9)	25 (43.1)	1.32 (0.17, 10.03)	0.788
Indian	52 (59.1)	36 (40.9)	1.44 (0.19, 10.73)	0.718
Others	2(50)	2 (50)	Reference	
Education level				
Secondary education	6 (75)	2 (25)	2.41 (0.47,12.36)	0.276
Tertiary education	82 (55.4)	66 (44.6)	Reference	
Having Prior Education on E-cigarettes				
Yes	26 (55.3)	21 (44.7)	0.94 (0.47,1.87)	0.857
No	62 (56.9)	47 (43.1)	Reference	

DISCUSSION

Our study was conducted among adults in Malaysia to assess their knowledge and attitudes toward e-cigarettes, explore the available educational resources on the topic, and examine the associations between demographic characteristics, education on e-cigarettes, and their attitudes toward e-cigarette use.

The data reveals a limited accurate awareness about e-cigarettes among adults in Malaysia. Only 28.2% correctly identified that e-cigarettes are not approved by the Ministry of Health for smoking cessation. According to an article from the Galen Centre in 2022, Malaysia continues to prescribe nicotine replacement therapy (NRT) products, such as patches or gum, for smoking cessation (Boo Su-Lyn, 2022). However, a considerable number of respondents were unaware of this fact. Unlike traditional cigarettes, e-cigarettes do not contain tobacco, which is the primary carcinogen in conventional cigarettes. However, they are not risk-free and contain harmful chemicals that may pose health risks. It is crucial for the public to understand these health risks. A substantial majority (67.9%) do not believe that e-cigarettes reduce the risk of cancer compared to traditional cigarettes. Furthermore, our study found that 70.5% of respondents would not recommend e-cigarettes as a smoking cessation method.

In a study on e-cigarette use among university students in Jordan, 26.5% of users reported using e-cigarettes for smoking cessation, while 22% used them out of curiosity, and 20.5% believed they were less harmful than other tobacco products. Another study among medical students revealed significantly better knowledge compared to non-medical students (Al-Sawalha, Almomani, Mokhemer, Al-Shatnawi and Bdeir, 2021).

Our results indicate that while a minority had good knowledge of e-cigarettes, most respondents did not view them as helpful, would not recommend their use for smoking cessation, and did not believe they reduced cancer risk. Thus, we can conclude that knowledge about e-cigarettes among adults is influenced not only by formal education but also by social media, peers, family, public health campaigns, media coverage, personal experiences, community programs, and school-based initiatives.

The attitudes of adults toward e-cigarettes were mixed. While the mean attitude score indicated a generally moderate to positive perception, responses to specific attitude items revealed significant concerns about the safety and addictiveness of e-cigarettes. Most respondents agreed that e-cigarettes are addictive (mean score 4.27) and stressed the importance of educating adults about e-cigarettes (mean score 4.62). Notably, respondents expressed lower confidence in discussing e-cigarettes compared to traditional cigarettes, highlighting the need to improve communication skills and knowledge among adults to foster informed discussions on the topic.

A study titled Knowledge and Attitude Toward E-Cigarettes Among First-Year University Students in Riyadh, Saudi Arabia revealed that most respondents were aware of the addictive effects of e-cigarettes, and a strong attitude toward banning e-cigarettes was evident in that study (Alduraywish et al., 2023). These findings suggest widespread support for educational programs and anti-smoking campaigns.

Although our results show a generally positive attitude toward e-cigarettes, more initiatives are needed to reinforce this. Activities such as educational campaigns (informative sessions and health workshops), stronger regulations and policies (age restrictions and health warnings), and open dialogues (discussion forums and parental involvement) are necessary to instill positive attitudes and informed decision-making among adults.

The study highlights a gap in formal education about e-cigarettes, with only 30.1% of respondents having received any school-based education on the topic, most of which occurred during secondary school (21.2%). A significant majority (69.9%) of respondents reported not having received any formal

education about e-cigarettes. This lack of formal education is largely compensated by information from other sources, with social media being the most prevalent (89.0% among those without prior education).

A study conducted in Western New York found that major information sources included advertisements, family, peers, social media, and the internet (Park, Kwon, Gaughan, Livingston and Chang, 2019). Another study from Alabama, revealed that educational interventions significantly increased knowledge about e-cigarettes, improved perceptions of their harmfulness and addictiveness, and significantly reduced the intent to try e-cigarettes. Before the intervention, middle school students had less knowledge, believed e-cigarettes were less addictive, and showed a higher intent to try both e-cigarettes and traditional cigarettes compared to high school students. Groups associated with lower perceptions of harm and addiction included ever-users of e-cigarettes, dual users of e-cigarettes and cigarettes, and prior users of mint/menthol-flavored e-cigarettes (Gaiha et al., 2021). These findings suggest that school-based educational sessions can significantly enhance adolescent knowledge about e-cigarettes, increase the perception of their harmfulness and addictiveness, and reduce the intent to try them. Prioritizing e-cigarette education for middle school students is crucial, as they tend to have lower levels of knowledge and a higher intent to experiment with tobacco products compared to high school students. By focusing on formal education, adults will gain comprehensive, accurate information about e-cigarettes, rather than relying on fragmented and unverified sources.

The study found that males are significantly more likely to have positive attitudes toward e-cigarettes compared to females. This suggests that gender plays a key role in shaping attitudes and willingness to try new smoking methods, with males showing a greater propensity for favorable views of e-cigarettes. This difference may be influenced by social norms, where traditional gender roles shape how smoking-related behaviors are perceived. Males may view e-cigarettes as less harmful or more socially acceptable than females do. Additionally, peer groups and social circles often play a major role in shaping attitudes toward smoking and vaping, with males potentially being more influenced by peers who favor e-cigarette use.

The study indicates that receiving education about e-cigarettes did not significantly influence adults' attitudes toward these products. Both those who received education and those who did not exhibited similar proportions of positive and negative attitudes. Which might be contributed by the low number of respondents who had received prior educational experience on e-cigarettes and limited effectiveness of the educational content. Additionally, other influential factors such as peer pressure, media portrayals, personal experiences, and cultural norms might play a stronger role in shaping the perceptions, reducing the impact of formal education.

Strengths and limitations

Our study investigated a wide range of aspects related to e-cigarette use, including knowledge, attitudes, influences of demographic factors, and educational sources of e-cigarettes in both genders. This provides a holistic view of the issue among adults in Malaysia. The study also identified an important gap in the formal education to include about e-cigarettes knowledge and impacts on health, demonstrating a need for enhanced public health and school-based initiatives.

Our study has some limitations. The data is reliance on self-reported answers regarding the knowledge attitudes towards e-cigarettes, and educational sources. Therefore, it might introduce social desirability bias and recall bias. The sample population was mainly included young adults, and the findings might limit the generalizability to older age groups in Malayia. Convenience sampling might also limit the generalizability of the findings to a wider range across Malaysia. This study was conducted as a cross-sectional study and data was collected at a single point of time. Therefore, changes of knowledge and attitudes towards e-cigarettes overtime might not be able to be captured in this study.

CONCLUSION

In conclusion, our study revealed a concerning lack of knowledge about e-cigarettes among respondents. Approximately 24% mistakenly believed that e-cigarettes are endorsed by the Ministry of Health for smoking cessation, while nearly half (48.1%) were unsure of their regulatory status. Although respondents tended to view e-cigarettes as potentially less harmful than traditional tobacco products, they also expressed concerns about their addictive nature. Many stressed the urgent need for comprehensive education to inform adults about the risks associated with e-cigarette use.

Notably, only 30.1% of respondents reported receiving formal education about e-cigarettes in school, with the majority indicating a complete lack of such education during their school years. Instead, respondents gathered information through various media channels, including social media, online advertisements, television and radio ads, billboards, and newspapers.

These findings highlight the pressing need for more structured and comprehensive educational initiatives to enhance adults' understanding of e-cigarettes. Such efforts could help mitigate misinformation and promote informed decision-making regarding their use.

RECOMMENDATIONS AND FUTURE DIRECTIONS

Our study revealed that there was a limited educational exposure to e-cigarette among the study respondents and lack of a significant association between e-cigarette education and attitudes. The findings suggest that a comprehensive approach might be needed to alter attitudes among adults. Future educational efforts should adopt more comprehensive approaches, incorporating diverse viewpoints, emphasizing evidence-based information, and addressing broader social and cultural factors that influence attitudes toward e-cigarettes. Since the popularity of e-cigarettes among adults is increasing in nature, future educational strategies could be in school-based and university-based settings. Furthermore, general public education and campaigns could be implemented in various media such as mass media and online resources.

The potential influencing factors on attitudes toward e-cigarette, such as social, cultural, peers, media, could be further explored in future research. Further qualitative research could explore in depth to have a better understanding of the public attitudes and perceptions of using e-cigarettes.

ACKNOWLEDGEMENTS

We extend our sincere gratitude to Pro Vice Chancellor Professor Dr. Adinegara Lutfi Abas and the Dean of Manipal University College Malaysia (MUCM), Professor Dr. Jayakumar Gurusamy, as well as the higher management, for their invaluable support in conducting this study. We also wish to express our gratitude to the Research Ethics Committee (MUCM) for their approval. We are immensely thankful to all the study respondents, whose cooperation and insights have greatly contributed to our project and enhanced the broader understanding of knowledge and attitudes towards e-cigarettes.

REFERENCES

Adib, A., Riza, N., Lukman, Z., Azlini, C., Kamal, M.Y., Chik, A. and Lukman, Z.M., (2018) 'Student awareness about the use of electronic cigarettes in Malaysia', *International Journal of Research and Innovation in Social Science*, 2(12), pp. 212-215.

Alduraywish, S.A., Aldakheel, F.M., Alsuhaibani, O.S., Jabaan, A.D.B., Alballa, R.S., Alrashed, A.W., ... & Aldwaighri, M.K. (2023) 'Knowledge and attitude toward e-cigarettes among first-year university students in Riyadh, Saudi Arabia', *Healthcare*, 11(4), p. 502. https://doi.org/10.3390/healthcare11040502

Al-Sawalha, N.A., Almomani, B.A., Mokhemer, E., Al-Shatnawi, S.F. and Bdeir, R. (2021) 'E-cigarette use among university students in Jordan: Perception and related knowledge', *PLOS ONE*, 16(12), p. e0262090. https://doi.org/10.1371/journal.pone.0262090

American Cancer Society (no date) 'American Cancer Society position statement on electronic cigarettes', *American Cancer Society*. Available at: https://www.cancer.org/cancer/risk-prevention/tobacco/e-cigarettes-vaping/e-cigarette-position-statement.html

Boo Su-Lyn, M.D. (2022) 'How Malaysia's smoking cessation efforts can improve', *CodeBlue*. Available at: https://codeblue.galencentre.org/2022/02/25/how-malaysias-smoking-cessation-efforts-can-improve/

Collins, L., Glasser, A.M., Abudayyeh, H., Pearson, J.L. and Villanti, A.C. (2019) 'E-cigarette marketing and communication: How e-cigarette companies market e-cigarettes and the public engages with e-cigarette information', *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, 21(1), pp. 14-24. https://doi.org/10.1093/ntr/ntx284

Dai, X., Gakidou, E. and Lopez, A.D. (2022) 'Evolution of the global smoking epidemic over the past half-century: Strengthening the evidence base for policy action', *Tobacco Control*, 31, pp. 129-137.

Driezen, P., Nordin, A.S.A., Hairi, F.M., Yee, A., Tajuddin, N.A.A., Hasan, S.I., ... & Fong, G.T. (2022) 'E-cigarette prevalence among Malaysian adults and types and flavors of e-cigarette products used by cigarette smokers who vape: Findings from the 2020 ITC Malaysia Survey', *Tobacco Induced Diseases*, 20, p. 32. https://doi.org/10.18332/tid/146363

Gaiha, S.M., Duemler, A., Silverwood, L., Razo, A., Halpern-Felsher, B. and Walley, S.C. (2021) 'School-based e-cigarette education in Alabama: Impact on knowledge of e-cigarettes, perceptions, and intent to try', *Addictive Behaviors*, 112, p. 106519. https://doi.org/10.1016/j.addbeh.2020.106519

Hinderaker, K., Yuan, M., Perks, S.N., Clark, D.B., Pampati, S., Armenta, R.F., ... & Schley, K. (2018) 'What do young adults know about e-cigarettes? A cross-sectional survey from one U.S. medical school', *BMC Medical Education*, 18, p. 1134. https://doi.org/10.1186/s12909-018-1134-1

Jones, K. and Salzman, G.A. (2020) 'The vaping epidemic in adolescents', *Missouri Medicine*, 117(1), pp. 56-58.

Kelsh, S., Ottney, A., Young, M., Kelly, M., Larson, R. and Sohn, M. (2023) 'Young adults' electronic cigarette use and perceptions of risk', *Tobacco Use Insights*, 16, p. 1179173X2311613. https://doi.org/10.1177/1179173x231161313

Sansone, L., Milani, F., Fabrizi, R., Belli, M., Cristina, M., Zagà, V., de Iure, A., Cicconi, L., Bonassi, S., & Russo, P. (2023). Nicotine: From Discovery to Biological Effects. *International journal of molecular sciences*, *24*(19), 14570. https://doi.org/10.3390/ijms241914570

Mpousiou, D. P., Sakkas, N., Soteriades, E. S., Toumbis, M., Patrinos, S., Karakatsani, A., Karathanassi, A., Raftopoulos, V., Gratziou, C. G., & Katsaounou, P. A. (2021). Evaluation of a school-based, experiential-learning smoking prevention program in promoting attitude change in adolescents. *Tobacco induced diseases*, *19*. https://doi.org/10.18332/tid/134605

National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health (2016) *E-cigarette use among youth and young adults: A report of the Surgeon General*, *Centers for Disease Control and Prevention*. https://www.ncbi.nlm.nih.gov/books/NBK538684/

Park, E., Kwon, M., Gaughan, M.R., Livingston, J.A. and Chang, Y. (2019) 'Listening to adolescents: Their perceptions and information sources about e-cigarettes', *Journal of Pediatric Nursing*, 48, pp. 82-91. https://doi.org/10.1016/j.pedn.2019.07.010

Pinho-Gomes, A., Santos, J.A., Jones, A., Thout, S.R. and Pettigrew, S. (2023) 'E-cigarette attitudes and behaviours amongst 15–30-year-olds in the UK', *Journal of Public Health*, 45(4), pp. e763-e775. https://doi.org/10.1093/pubmed/fdad138

Puteh, S.E.W., Manap, R.A., Hassan, T.M., Ahmad, I.S., Idris, I.B., Sham, F.M., ... & Yusoff, M.Z.M. (2018) 'The use of e-cigarettes among university students in Malaysia', *Tobacco Induced Diseases*, 16, p. 57. https://doi.org/10.18332/tid/99539

Rasha, D., Khaytan, S., Alobaidan, A.S., Alqahtany, B.M., Aldosari, N.M., Almutairi, A., ... & Fayed, A. (2023) 'Knowledge, attitude, and practice of e-cigarettes of adolescents and adults in Saudi Arabia: A cross-sectional study', *Healthcare*, 11(22), p. 2998. https://doi.org/10.3390/healthcare11222998

Sánchez-Sánchez, E., García-Ferrer, L., Ramirez-Vargas, G., Díaz-Jimenez, J., Rosety-Rodriguez, M., Díaz, A.J., ... & Poza-Méndez, M. (2023) 'Knowledge, attitudes and behaviours of adolescents and young adult population on the use of e-cigarettes or personal vaporizer', *Healthcare*, 11(3), p. 382. https://doi.org/10.3390/healthcare11030382

Wang, W., Lu, M., Cai, Y. and Feng, N. (2020) 'Awareness and use of e-cigarettes among university students in Shanghai, China', *Tobacco Induced Diseases*, 18, pp. 1-9. https://doi.org/10.18332/tid/125748

Wang, X., Zhang, X., Xu, X. and Gao, Y. (2019) 'Perceptions and use of electronic cigarettes among young adults in China', *Tobacco Induced Diseases*, 17, p. 17.

American Cancer Society (2024) *What do we know about e-cigarettes?*, *American Cancer Society*. Available at: https://www.cancer.org/cancer/risk-prevention/tobacco/e-cigarettes-vaping/what-do-we-know-about-e-cigarettes.html

World Health Organization (2023) *Tobacco*, *World Health Organization*. Available at: https://www.who.int/news-room/factsheets/detail/tobacco