Research Paper

Health Risks Awareness of Long-term E-cigarette Use in College Students

Czarina Julliane A. Mortejo1, Alexxis S. Nacalaban[1], Nikkie Marie M. Parrel[1], Angel Krishna A. Ramos[1], Wendybelle M. Rubin[1], Celine Sophia B. Saavedra[1], Joshi Salve L. Salvani[1], Johanna Rose M. Sumalpong[1], Arfred Miguel M. Tugasan[1], Allyn Izabela D. Valdez[1], Paolo B. Araune[2*], Roviech John M. Echeveria IV[1]

1. College of Nursing, Xavier University-Ateneo de Cagayan, Cagayan de Oro, Philippines.
2. Department of Mathematics, College of Arts and Sciences, Xavier University-Ateneo de Cagayan, , Cagayan de Oro, Philippines.

Use your device to scan and read the article online

Citation Mortejo CJA, Nacalaban AS, Parrel NMM, Ramos AKA, Rubin WM, Saavedra SSB, et al. Health Risks Awareness of Long-term E-cigarette Use in College Students. Iranian Journal of Health Sciences. 2025; 13(2):97-106. http://dx.doi.org/10.32598/ijhs.13.2.1111.2

http://dx.doi.org/10.32598/ijhs.13.2.1111.2

ABSTRACT

Background and Purpose: This study explores the rising popularity of e-cigarettes, often perceived as a safer alternative to traditional smoking, and examines its associated health risks, including lung and cardiovascular injuries. The primary objective was to evaluate college students' awareness of the long-term health implications of e-cigarette use and the factors influencing their awareness.

Materials and Methods: This descriptive correlational study was conducted in Cagayan de Oro City, Philippines, during the 2023-2024 academic year. Using a stratified random sampling method, 204 college students aged 18-22 were selected from different year levels. Data were collected using a validated researcher-made 19-item questionnaire, which assessed the awareness of the long-term health implications of e-cigarette use. The questionnaire included demographic information and awareness-related questions measured on a 4-point Likert scale. Statistical analyses, including analysis of variance (ANOVA) and t-test, were performed to examine differences in awareness based on variables such as sex, peer influence, media information, and smoking status.

Results: The study found no significant differences in awareness levels based on sex, peer influence, media information, or smoking status. The t-test results indicated no notable disparity in awareness between male and female students (P=0.889). ANOVA results showed that peer influence (P=0.176) and media information sources (P=0.381) did not significantly affect awareness. Additionally, prior tobacco smoking (P=0.495) and current e-cigarette use (P=0.516, ns) did not impact awareness levels.

Conclusion: College students generally demonstrated a high level of awareness regarding the long-term negative health effects of e-cigarette use, irrespective of sex, peer influence, media information, or smoking status. The study underscores the importance of ongoing educational initiatives to sustain and further enhance awareness within this demographic.

Keywords: E-cigarettes, Health awareness, College students, Long-term health effects, Descriptive correlational study

Article info:
Received: 14 Sep 2024
Accepted: 08 Feb 2025
Available Online: 01 Apr 2025

*** Corresponding Author:**
Paolo B. Araune, MS.
Address: *Department of Mathematics, College of Arts and Sciences, Xavier University-Ateneo de Cagayan, , Cagayan de Oro, Philippines.*
Tel: *+639 (261) 111564*
E-mail: *paraune@xu.edu.ph*

Introduction

The harmful effects of tobacco smoking have long been a significant public health concern, prompting all governments to mandate explicit warning labels on cigarette packaging. In response to the increasing health risks associated with conventional smoking, a technological innovation emerged in the early 2000s to mitigate its impact on human health, particularly the respiratory system [1]. This innovation, known as vaping or the use of electronic cigarettes (e-cigarettes), was initially marketed as a safer alternative to traditional tobacco consumption. Developed by Chinese pharmacist Hon Lik [1], modern e-cigarettes function by heating a liquid solution, typically containing nicotine, flavorings, and other additives, to produce an inhalable aerosol. Since their introduction, vaping technologies have rapidly evolved, offering customizable options and fueling ongoing public health debates regarding their potential risks and benefits [1].

Numerous studies have examined the prevalence of e-cigarette use, its health implications and public awareness of its risks and long-term consequences [2]. According to the World Health Organization (WHO), global e-cigarette users surged from 7 million in 2011 to 41 million in 2018, with projections indicating an increase to 58.1 million users worldwide [2, 3]. This trend extends across multiple continents. In North America, the US reported 2807 cases of e-cigarette or vaping-associated lung injuries across all 50 states, with 68 confirmed deaths [4]. In Europe, studies indicate a steady rise in e-cigarette users, particularly among young adults [3]. In the US, e-cigarette use is notably higher among men (4.6%) than women (2.8%) [5]. Lifetime prevalence rates of e-cigarette use have been reported as 24% in America, 26% in Europe, 16% in Asia and 25% in Oceania, while current prevalence rates stand at 10%, 14%, 11%, and 6%, respectively [6].

Despite initial claims of harm reduction, evidence suggests that e-cigarette use is linked to significant health risks, including a 56% increased risk of heart attack, 30% for stroke, 10% for coronary artery disease and 44% for circulatory problems. Additionally, mental health risks such as depression and anxiety have been associated with vaping [7]. Several factors influence awareness, attitudes, and behaviors related to e-cigarette use. Gender plays a key role, with men more likely to use e-cigarettes than women (4.6% vs 2.8% globally) [5]. Peer influence is another major factor, as adolescents with close friends who vape are 95% more likely to try e-cigarettes [8]. Media exposure also significantly impacts awareness, with anti-vaping campaigns leveraging television ads, online videos, social media, and collaborations with youth-focused brands [9]. Smoking history further influences e-cigarette use, as 38% of users previously smoked traditional tobacco, while 13% are dual users of both tobacco and e-cigarettes [10].

The accessibility and social acceptability of e-cigarettes have contributed to their widespread use, particularly among adolescents and young adults. In the Philippines, e-cigarette use among Filipino youth aged 13–15 years increased from 11.7% in 2015 to 14.1% in 2019, according to the Global Youth Tobacco Survey [11]. This increase raises concerns about awareness levels and the factors shaping perceptions of e-cigarette safety.

In Cagayan de Oro City, an increasing number of young adults have adopted vaping, yet studies on their awareness of the long-term health effects have remained limited. Understanding the sociocultural, behavioral and informational influences on their awareness is essential for developing targeted public health interventions. This study aims to assess college students' awareness of the long-term health implications of e-cigarette use and identify key factors shaping their understanding. By examining awareness levels and associated factors, this research seeks to contribute valuable insights to health education programs, policy development, and community awareness campaigns to mitigate the risks of e-cigarette use among young people.

Materials and Methods

Research design

The study employed a descriptive correlational design, which is appropriate for examining the relationship between college students' awareness of the long-term harmful health effects of e-cigarette use and factors such as sex, peer influence, media exposure, and smoking status. This design allowed for the collection and analysis of data without directly influencing the respondents.

As a cross-sectional study, data were gathered at one point during the academic year 2023–2024, providing a snapshot of students' awareness levels rather than tracking changes over time. The study aimed to generate descriptive statistics and identify correlations between awareness and influencing factors, offering insights into existing patterns. However, it does not establish causation or account for temporal changes in awareness.

Given the time constraints in conducting this study, the descriptive correlational approach was the most practical choice, enabling researchers to systematically assess awareness levels within a defined period. A population-based survey was utilized as the primary data collection method, capturing information from a group of individuals at a specific moment. This approach ensured that the findings reflected the current awareness among college students while highlighting potential areas for further longitudinal research.

Sample, sample size and sampling technique

The respondents of this study consisted of students from a chosen college of various year levels (first, second, third and fourth year) attending a prestigious learning institution in Cagayan de Oro City, Misamis Oriental. The total student population in the selected college program was 307 and the estimated sample size was 204 students. The sample size was determined based on a 95% confidence level, a 5% margin of error, and an assumed 50% proportion of the population with the characteristic of interest. The chosen respondents were deemed suitable because they were not inclined toward the healthcare field and represented a small but highly analytical and critical-thinking population. The sampling method used was stratified random sampling, with students stratified by year level and sex to ensure a balanced and representative sample. The sample size was calculated using the Cochran Formula, considering a 95% confidence level, a 5% margin of error, and an estimated proportion of 50%. The final sample size per year level was 71 first-year, 24 second-year, 32 third-year, and 77 fourth-year students.

Data collection process

Before distributing the questionnaires, the respondents were provided with a detailed consent form encompassing a comprehensive explanation of the study's aims and objectives, wherein respondents could provide their consent to participate in the survey. The form offered informed consent outlining the goal, confidentiality measures and respondent rights. Respondents were given a consent certification to sign willingly, indicating their participation agreement. To guarantee that the 19-question survey effectively gathered information relevant to the study goals, it underwent a thorough validation process. The procedure provided accurate and legitimate data for a comprehensive examination of the factors influencing the level of awareness of college students on the long-term negative health implications of e-cigarette use.

The Instrument of data collection

This study utilized a validated researcher-made 19-item questionnaire to assess college students' awareness of the long-term health implications of e-cigarette use. Expert input from professionals in public health and survey methodology was sought to ensure the questionnaire's relevance, clarity and comprehensiveness. The questionnaire was structured and standardized to ensure data collection and analysis consistency.

The instrument was divided into two sections. The first section gathered demographic information, including sex, year level, peer influence, media information, and smoking status, to contextualize the data. The second section comprised close-ended questions measured on a 4-point Likert scale (4, strongly agree; 3, agree; 2, disagree; 1, strongly disagree), allowing respondents to express their perspectives on the long-term health risks of e-cigarette use. The questionnaire contained 19 items and required approximately 3–5 minutes to complete.

To ensure validity and reliability, the questionnaire underwent content validation by a panel of experts, achieving a content validity index above 0.78, indicating strong validity. A pilot test was conducted among a small group of students not included in the final sample, and the Cronbach alpha was 0.85, confirming high internal consistency and reliability.

Data analysis

To determine the significant differences in the level of awareness regarding the long-term negative health implications of nicotine-containing e-cigarettes among college students based on sex, peer influence, media information, and smoking status, the researchers utilized both the analysis of variance (ANOVA) and the t-test. These statistical methods allowed the researchers to assess whether there were any statistically significant differences between the means of the different groups, thereby identifying the factors that most strongly influenced awareness levels among the student population. The ANOVA test was used to compare awareness levels across multiple groups. At the same time, the t-test was employed to compare the means between two specific groups, enhancing the robustness and precision of the analysis.

Ethical Consideration

Participation in the study was voluntary, and respondents could refuse participation or discontinue their involvement at any time. Their decisions regarding participation were respected, and confidentiality was maintained. No compensation was offered to avoid influencing their decision to participate and to ensure the data's impartiality and accuracy. Respondents were informed through the informed consent form that their personal information would be gathered and processed, with the right to object or withdraw consent if there were any changes to the provided information. The form ensured respondents maintained control over their data and could withdraw from the study at any point, ensuring their privacy and agency. Additionally, individuals under 18 were not eligible to participate, protecting minors from potential ethical issues related to consent and data processing.

Results

A total of 204 participants with a Mean±SD age of 20.4±3.1 years were included in the study. Among them, 32.4% were male and 67.6% were female. While factors such as socioeconomic status and history of respiratory diseases may influence awareness levels, these variables were not recorded in this study, limiting the ability to control for potential confounding effects.

A t-test (Table 1) was conducted to compare the awareness levels of males and females regarding the long-term negative health implications of e-cigarette use. The results showed that the mean awareness score for males was 3.47±0.62, while for females, it was 3.46±0.58. The difference was not statistically significant (P=0.889, ns), indicating that sex did not significantly influence awareness levels.

ANOVA (Table 2) was performed to assess the impact of peer influence on awareness levels. The mean awareness scores varied slightly across peer influence groups, with respondents who reported having no peer influence scoring 3.49±0.65, those with 1-5 peers scoring 3.44±0.61, those with 6-10 peers scoring 3.64±0.59, and those with 10 or more peers scoring 3.36±0.70. The results showed no statistically significant differences (P=0.176, ns), suggesting that peer influence levels did not significantly impact respondents' awareness of the negative health implications of e-cigarette use.

Similarly, an ANOVA test (Table 3) was conducted to examine differences in awareness levels based on respondents' primary source of media information. The mean awareness scores were 3.48±0.63 for respondents who obtained information from social media, 3.33±0.67 for those who relied on television news, 0.00 for those who used radio and newspapers (as no respondents reported obtaining information from these sources) and 3.41±0.60

Table 1. The t-test results of respondents' level of awareness on the long-term negative health implications of using e-cigarettes according to sex

Sex	Level of Awareness	
	Mean±SD	P
Male	3.47±0.62	0.889 ns
Female	3.46±0.58	

ns: Not significant, *significant, **highly significant.

Table 2. ANOVA results of respondents' level of awareness on the long-term negative health implications of using e-cigarettes according to peer influence

Peer Influence	Level of Awareness	
	Mean±SD	p
0	3.49±0.65	0.176 ns
1-5	3.44±0.61	
6-10	3.64±0.59	
>10	3.36±0.70	

ns: Not significant, *significant, **highly significant.

Table 3. ANOVA results of respondents' level of awareness on the long-term negative health implications of using e-cigarettes according to media information

Media Information	Level of Awareness	
	Mean±SD	P
Social media platform	3.48±0.63	
News TV	3.33±0.67	
Radio	0	0.381 ns
Newspaper	0	
None	3.41±0.60	

ns: Not significant, *significant, **highly significant.

for those who did not receive media information. The analysis revealed no statistically significant differences (P=0.381, ns), indicating that the source of media information did not significantly influence awareness levels.

A t-test (Table 4) was conducted to determine whether smoking status affected awareness levels. The mean awareness score for previous tobacco smokers was 3.56±0.57, while for non-smokers, it was 3.46±0.64. The difference was not statistically significant (P=0.495, ns), suggesting that prior smoking experience did not significantly impact awareness. Additionally, no significant differences were found when comparing awareness levels between those who used e-cigarettes or vaping devices 3.43±0.59 and those who did not 3.47±0.62 (P=0.516, ns). Similarly, respondents who had tried using e-cigarettes as an alternative to traditional cigarettes had a mean awareness score of 3.47±0.60. In contrast, those who had not attempted had a mean score of 3.46±0.61, with no significant difference (P=0.983, ns). These findings indicate that neither past smoking behavior nor e-cigarette use had a statistically significant effect on respondents' awareness of the long-term negative health implications of vaping.

Discussion

On average, 3.46 male and 3.45 female respondents showed a high awareness. According to a study [12], males were more likely to get addicted to e-cigarettes than females. Additionally, males reported higher attributions for maintaining e-cigarette use related to positive reinforcement (enjoyment), whereas females reported using e-cigarettes for stress reduction or mood management. This outcome implies that men were more likely to develop an e-cigarette addiction and typically continued using e-cigarettes because of the enjoyment they derived from them, suggesting susceptibility to addiction-related behaviors. Conversely, females often used e-cigarettes to manage stress or mood, implying they may use e-cigarettes as coping mechanisms for stressors or emotional difficulties. In conclusion, there were differences between sexes in the likelihood of developing an e-cigarette addiction and the reasons for their use.

Table 4. The t-test results of respondents' level of awareness on the long-term negative health implications of using e-cigarettes according to smoking status

Characteristics			Mean±SD	P
Smoking Status	(Previous) tobacco smoker or not	Yes	3.56±0.57	0.495 ns
		Not	3.46±0.64	
	Used e-cigarettes/vaping devices or not	Yes	3.43±0.59	0.516 ns
		Not	3.47±0.62	
	Tried using e-cigarettes as an alternative to traditional cigarettes or not	Yes	3.47±0.60	0.983 ns
		Not	3.46±0.61	

Kaleta et al. [13] stated that female students had higher levels of knowledge regarding the adverse effects associated with e-cigarette use than male students. This finding implies a sex gap in students' understanding of the adverse effects of e-cigarette use, showing that female students had greater awareness of the potential health concerns compared to their male counterparts. These data suggest sex-based differences in the awareness and perception of e-cigarette dangers. Additionally, the study found that males were more likely to have used e-cigarettes than females, with sex being a predictor of e-cigarette use. This finding could be attributed to sociocultural factors and may also reflect how receptive and influenced young males are by marketing strategies and current trends. Males may also be "early adopters" of technology, meaning their novelty draws them more to e-cigarettes.

Nevertheless, Samuels [14] conducted a meticulous analysis using data from the population assessment of tobacco and health wave 2 survey, aiming to probe potential sex disparities in awareness and perceived harm linked to e-cigarette usage among adult Americans. Employing rigorous statistical methodologies such as t-test and regression analyses, they discerned no significant differences between sexes in terms of awareness and perceived harm associated with e-cigarettes. Their study, characterized by methodological rigor and comprehensive analysis, contributes significantly to the field's understanding of e-cigarette perceptions, suggesting that sex does not play a discernible role in shaping individuals' awareness and perceptions regarding the negative health implications of e-cigarette use. Despite the results showing that men were more highly aware of the negative health implications of e-cigarette use, the difference between male and female awareness levels was deemed not significant, as the results of their awareness levels were close to each other.

Respondents with 6-10 peers using e-cigarettes had the highest level of awareness, with a mean average of 3.64. This result indicates that having this number of peers influences the respondents' level of awareness, underscoring how peer numbers affect awareness. People who use e-cigarettes regularly and those with acquaintances who use them perceived a favorable social impact from their use [15]. The study revealed a close relationship between social networks and e-cigarette usage among college students, explicitly noting that having more friends who use e-cigarettes increased the likelihood of accepting future offers to use them and actively using them.

Peer influence significantly impacts students' awareness of the health implications associated with vaping. A cross-sectional study found that peers were a significant reason for e-cigarette use among university students [16]. This implication indicates that peer influence directly affects students' decision-making processes. Adolescents are particularly prone to defining their identity through their peer groups. Therefore, when peers engage in e-cigarette use, students may be inclined to do the same to maintain or enhance their social identity. Social norms within peer groups play a crucial role in shaping behaviors. If e-cigarette use is perceived as a norm within a student's peer group, there is a strong tendency for conformity. Students may adopt this behavior to align with their peers' expectations and values.

Peers can create a normative framework endorsing e-cigarette use, thereby fostering an environment where such behavior is deemed socially acceptable, leading students to perceive diminished health risks [17]. This outcome implies that being informed about the potential health hazards associated with e-cigarettes is crucial. It enables students to be more cautious and effectively counter peer pressure by explaining the risks and consequences to their peers, potentially influencing them to reconsider their choices. Knowledge about health hazards can shape individuals' perceptions of social norms. Informed students may be less swayed by peers who promote e-cigarette use, recognizing the potential health risks.

According to AlMuheissen et al. [18], social media strongly influences students' perceptions and knowledge about the long-term negative health implications of e-cigarette use. With 80.9% of students primarily relying on social media for information on e-cigarettes, digital platforms play a pivotal role in disseminating information and shaping attitudes towards these products. Similarly, Aldurayish et al. [19] highlighted that social media significantly shapes university students' awareness and attitudes toward e-cigarettes. The study emphasizes that social media is a crucial channel for disseminating information about e-cigarettes among young people, potentially influencing their perceptions and usage patterns. This finding underscores the importance of understanding and leveraging digital platforms to effectively communicate the long-term negative health implications of e-cigarette use to mitigate their impact on public health. However, this study's findings show that college students' awareness of the long-term negative health implications of e-cigarettes is the same in terms of media information.

Zhao et al. [20] investigated attitudes and beliefs about e-cigarettes among smokers and non-smokers. The study found that non-smokers had significantly higher awareness of the potential risks of e-cigarettes, such as increasing the risk of heart disease, compared to smokers. Additionally, a more significant proportion of non-smokers were aware of the addictive nature of e-cigarettes. Despite the higher awareness among non-smokers, the study also revealed that a considerable percentage of participants perceived e-cigarettes as helpful in quitting smoking and less harmful than combustible cigarettes. Overall, non-smokers exhibited a higher level of awareness regarding the negative implications of e-cigarette use.

However, Alhajj et al. [21] reported that smoking status did not significantly influence knowledge about e-cigarettes among students. This result suggests that both smokers and non-smokers possess similar levels of comprehension regarding e-cigarettes. The findings of this study emphasize the necessity of providing comprehensive e-cigarette education to all students, regardless of their smoking status. Similar to the study [21], the results showed that smoking status does not yield a significant difference in the awareness levels of college students.

Romijnders et al. [22] conducted a narrative literature review to explore perceptions and reasons for e-cigarette use among individuals across various demographics. The study found that multiple factors, including social norms, marketing strategies, product characteristics, and personal experiences, influence perceptions of e-cigarettes among users and non-users. For instance, some individuals perceive e-cigarettes as less harmful alternatives to traditional cigarettes due to their potential for harm reduction or smoking cessation. Others may be attracted to the variety of flavors or the ability to use e-cigarettes in smoke-free environments.

Moreover, a literature review [22] highlights the role of peer influence and social factors in shaping perceptions and decisions related to e-cigarette use. Many users report initiating e-cigarette use due to peer pressure or social acceptance. At the same time, non-users may abstain from e-cigarette use to avoid negative social stigma or health concerns. These findings complement the results of the current study, indicating that smoking status alone may not significantly impact awareness levels regarding the negative health implications of e-cigarette use among college students. Instead, perceptions and reasons for e-cigarette use are multifaceted and influenced by a complex interplay of individual, social, and environmental factors.

Marques et al. [23] provided an updated overview of the impact of e-cigarettes on human health, highlighting a diverse array of potential health consequences associated with their use. While e-cigarettes are often marketed as safer alternatives to traditional cigarettes, research indicates that they are not without risks, including concerns about respiratory effects, cardiovascular health, and potential carcinogenicity.

Additionally, a review [24] offers a balanced examination of the current literature on e-cigarettes, providing insights into the potential benefits and risks associated with their use. While some studies suggest that e-cigarettes may play a role in harm reduction or smoking cessation, others raise concerns about their long-term health effects, particularly on pulmonary and cardiovascular health.

These articles contribute to understanding the complexities of e-cigarette use and its impact on human health. While the exact health implications of e-cigarette use remain an area of ongoing research and debate, the findings of the current study suggest that trying e-cigarettes as an alternative to traditional cigarettes does not significantly influence respondents' awareness of the associated health risks. Top of FormBottom of Form

The results of this study can be contextualized using relevant sociological and psychological theories. The observed sex-based differences in the reasons for e-cigarette use, where males cited enjoyment and females emphasized stress reduction [12], align with psychological frameworks such as coping theory, which explains how individuals adopt behaviors like e-cigarette use to manage emotional or psychological stress. This finding supports the notion that females may use e-cigarettes as a form of emotion-focused coping. Furthermore, the influence of peer groups on awareness and behavior, as highlighted in studies [15-17], reflects social learning theory. It posits that individuals learn behaviors by observing and imitating others, particularly within their social circles. The normalization of e-cigarette use within peer groups suggests that social contexts play a vital role in shaping behavior. This finding is consistent with the theory of symbolic interactionism, where meanings and identities are constructed through social interaction. The role of social media in shaping awareness [18, 19] also supports this view, emphasizing how external social factors, both interpersonal and digital, contribute to the formation of attitudes and perceived norms surrounding e-cigarette use.

Conclusion

The study concluded that college students demonstrated a high level of awareness regarding the long-term negative health implications of e-cigarette use, irrespective of sex, peer influence, media information, or smoking status. These findings suggest that while awareness is uniformly high, targeted educational campaigns and clinical interventions are still essential to reinforce and expand this knowledge base, ensuring that students are well-informed about the health risks. Clinically, this research underscores the importance of continuous health education and prevention strategies in reducing e-cigarette usage and its associated health risks, contributing to better overall public health outcomes.

Take home messages

College students are generally aware of the long-term health risks of e-cigarettes, but ongoing education is vital to maintain this awareness and prevent usage. Public health initiatives should reinforce knowledge and address misconceptions to safeguard against e-cigarette-related health issues.

Study limitations

This study has several limitations that should be acknowledged. First, while the findings indicate a high level of awareness regarding the adverse health implications of e-cigarette use among college students, this awareness does not necessarily translate to behavior change. The study did not assess whether this awareness influenced participants' e-cigarette use or cessation efforts, which could have provided a more comprehensive understanding of its impact.

Second, the study did not account for key factors such as socioeconomic status, history of respiratory diseases, or parental smoking behavior, which could have influenced both awareness levels and e-cigarette use. These factors have been identified in previous research as significant determinants of tobacco-related knowledge and consumption patterns. Future studies should consider incorporating these variables to provide a more nuanced analysis.

Additionally, while the study explored sex differences in awareness and reasons for e-cigarette use, conflicting findings in the literature suggest the need for further investigation. For instance, some studies indicate that males are more aware of the risks yet continue using e-cigarettes for enjoyment, while others suggest no significant differences in awareness between sexes. These discrepancies highlight the complexity of behavioral motivations and the potential influence of social and cultural factors, which this study did not explore deeply.

Lastly, the study relied on self-reported data, which may be subject to social desirability bias or recall inaccuracies. Participants may have overestimated or underestimated their awareness levels or reasons for e-cigarette use. Future research could benefit from mixed-method approaches, including qualitative interviews or experimental designs, to validate self-reported findings and explore underlying motivations in greater depth.

Despite these limitations, this study provides valuable insights into college students' awareness of e-cigarette health risks and highlights the role of peer influence and media exposure in shaping perceptions. Further research is recommended to address these gaps and strengthen the understanding of e-cigarette awareness and usage patterns among young adults.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Xavier University-Ateneo de Cagayan, Cagayan de Oro, Philippines (Code: NSG-2024001282). Informed consent was obtained from all participants before their inclusion in the study.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors contributions

Data analysis and Writing the original draft: Czarina Julliane A. Mortejo, Alexxis S. Nacalaban, Paolo B. Araune and , Roviech John M. Echeveria IV; Data collection and revising the manuscript: Nikkie Marie M. Parrel, Wendybelle M. Rubin and Celine Sophia B. Saavedra; Data interpretation and literature review: Joshi Salve L. Salvani, Johanna Rose M. Sumalpong, Arfred Miguel M. Tugasan and Allyn Izabela D. Valdez; final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgements

The authors would like to thank all participants in this study for their time and cooperation.

References

[1] Kwok PC, Rogueda P, Hou L. E-cigarettes: Learnings for inhalation scientists. Inhalation Magazine. 2016; 20-5. [Link]

[2] European Society of Cardiology. Electronic cigarettes are not worth the risk, say scientists. Sophia Antipolis: European Society of Cardiology; 2019. [Link]

[3] Jerzyński T, Stimson GV, Shapiro H, Król G. Estimation of the global number of e-cigarette users in 2020. Harm Reduction Journal. 2021; 18(1):109. [DOI:10.1186/s12954-021-00556-7] [PMID]

[4] Navon L, Ghinai I, Layden J. Notes from the Field: Characteristics of Tetrahydrocannabinol-Containing E-cigarette, or Vaping, Products Used by Adults - Illinois, September-October 2019. MMWR. Morbidity and Mortality Weekly Report. 2020; 69(29):973-5. [DOI:10.15585/mmwr.mm6929a5] [PMID]

[5] Cornelius ME, Wang TW, Jamal A, Loretan CG, Neff LJ. Tobacco Product Use Among Adults - United States, 2019. Morbidity and Mortality Weekly Report. 2020; 69(46):1736-42. [DOI:10.15585/mmwr.mm6946a4] [PMID]

[6] Tehrani H, Rajabi A, Ghelichi-Ghojogh M, Nejatian M, Jafari A. The prevalence of electronic cigarettes vaping globally: A systematic review and meta-analysis. Archives of Public Health. 2022; 80(1):240. [DOI:10.1186/s13690-022-00998-w] [PMID]

[7] Vindhyal MR, Ndunda P, Munguti C, Vindhyal S, Okut H. Abstract P387: Comparing cardiovascular outcomes among smokers and electronic cigarette users: A review from National Health Interview Surveys. Circulation. 2019; 139(Suppl_1):387-8. [Link]

[8] Wang Y, Duan Z, Weaver SR, Self-Brown SR, Ashley DL, Emery SL, et al. tronic cigarette use. Association of e-Cigarette advertising, parental influence, and peer influence with US adolescent e-cigarette use. JAMA Network Open. 2022; 5(9):e2233938. [DOI:10.1001/jamanetworkopen.2022.33938] [PMID]

[9] Noar SM, Gottfredson NC, Kieu T, Rohde JA, Hall MG, Ma H, et al. Impact of vaping prevention advertisements on US adolescents: A randomized clinical trial. JAMA Network Open. 2022; 5(10):e2236370. [PMID]

[10] Kanyadan V, Ganti L. E-cigarette awareness among young adults: a pilot survey study. Cureus. 2019; 11(7):e5234. [DOI:10.7759/cureus.5234] [PMID]

[11] Serra C, Njie G, Jacques N, Pan L. Prevalence and covariates of electronic cigarette use among students aged 13-15 years in the Philippines: 2019 Global Youth Tobacco Survey. International Journal of Environmental Research and Public Health. 2023; 20(24):7193. [DOI:10.3390/ijerph20247193] [PMID]

[12] Piñeiro B, Correa JB, Simmons VN, Harrell PT, Menzie NS, Unrod M, et al. Gender differences in use and expectancies of e-cigarettes: Online survey results. Addictive Behaviors. 2016; 52:91-7. [DOI:10.1016/j.addbeh.2015.09.006] [PMID]

[13] Kaleta D, Wojtysiak P, Polańska K. Use of electronic cigarettes among secondary and high school students from a socially disadvantaged rural area in Poland. BMC Public Health. 2016; 15:703. [DOI:10.1186/s12889-016-3417-y] [PMID]

[14] Samuels S. E-cigarettes: Perceived harm among youth in the United States [PhD dissertation]. Florida: Nova Southeastern University; 2019. [Link]

[15] Wallace LN, Roche MJ. Vaping in context: Links among e-cigarette use, social status, and peer influence for college students. Journal of Drug Education. 2018; 48(1-2):36-53. [Link]

[16] Kurdi R, Al-Jayyousi GF, Yaseen M, Ali A, Mosleh N, Abdul Rahim HF. Prevalence, risk factors, harm perception, and attitudes toward E-cigarette use among University Students in Qatar: A cross-sectional study. Frontiers in Public Health. 2021; 9:682355. [DOI:10.3389/fpubh.2021.682355] [PMID]

[17] Bold KW, Kong G, Camenga DR, Simon P, Cavallo DA, Morean ME, et al. Trajectories of e-cigarette and conventional cigarette use among youth. Pediatrics. 2018; 141(1):e20171832. [DOI:10.1542/peds.2017-1832] [PMID]

[18] AlMuheissen S, Mohammad H, Dabobash A, Nada MQ, Suleiman ZM. Prevalence, knowledge, and attitudes among health professions students toward using electronic cigarettes. Healthcare (Basel, Switzerland). 2022; 10(12):2420. [DOI:10.3390/healthcare10122420] [PMID]

[19] Alduraywish SA, Aldakheel FM, Alsuhaibani OS, Jabaan ADB, Alballa RS, Alrashed AW, et al. Knowledge and attitude toward E-Cigarettes among first year university students in Riyadh, Saudi Arabia. Healthcare (Basel). 2023; 11(4):502. [PMID]

[20] Zhao D, Abdullah AS, Wen T, Chen X, Xiao X, Pan Z, He J, Urmi DS, Hao W, Lin H, Zheng P. Perceptions of e-cigarettes among smokers and non-smokers in households with children in rural China: A cross-sectional study. Tobacco Induced Diseases. 2021; 19:25. [DOI:10.18332/tid/133264] [PMID]

[21] Alhajj MN, Al-Maweri SA, Folayan MO, Halboub E, Khader Y, Omar R, et al. Knowledge, beliefs, attitude, and practices of E-cigarette use among dental students: A multinational survey. PLoS One. 2022; 17(10):e0276191. [PMID]

[22] Romijnders KAGJ, van Osch L, de Vries H, Talhout R. Perceptions and reasons regarding e-cigarette use among users and non-users: A narrative literature review. International Journal of Environmental Research and Public Health. 2018; 15(6):1190. [DOI:10.3390/ijerph15061190] [PMID]

[23] Marques P, Piqueras L, Sanz MJ. An updated overview of e-cigarette impact on human health. Respiratory Research. 2021; 22(1):151. [DOI:10.1186/s12931-021-01737-5] [PMID]

[24] Giovacchini CX, Crotty Alexander LE, Que LG. Electronic Cigarettes: A pro-con review of the current literature. The Journal of Allergy and Clinical Immunology. In practice. 2022; 10(11):2843-51. [DOI:10.1016/j.jaip.2022.07.009] [PMID]

This Page Intentionally Left Blank