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PERSONAL FACTORS, MEDIA EXPOSURE, ATTITUDES, AND E-CIGARETTE USE AMONG SCHOOL STUDENTS IN SOUTHERN THAILAND

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ABSTRACT

This study investigates the factors associated with e-cigarette use among school students in Nakhon Si Thammarat Province, Southern Thailand. A cross-sectional survey was conducted from August 2022 to February 2023, involving 270 students aged 13–19 from three secondary schools, with a random sampling technique ensuring a representative sample of actively enrolled students. Data were collected via online questionnaires and analyzed using quantitative descriptive statistics (percentages) and Chi-square tests (χ^2) to examine associations. The descriptive results indicated a nearly balanced gender distribution (51.1% male and 54.9% female), with the majority of participants falling within the 13–15 years' age range. Socioeconomically, 56.5% of parents were employed in hired labor, and 57.8% of students reported receiving a monthly allowance exceeding 3,000 Baht. E-cigarette awareness was notably high (92.2%), with 17.8% reporting lifetime trial. Inferential analysis revealed significant associations between e-cigarette use and several personal factors (age, parental occupation, grade level, and smoking initiation). Additionally, exposure to news media, particularly television, correlated with a higher likelihood of e-cigarette use, and students' attitudes were significantly linked to e-cigarette behavior ($p < 0.05$), suggesting that attitudes play a crucial role in influencing usage patterns. Based on these findings, the study recommends school-based interventions aimed at enhancing health literacy regarding e-cigarettes and their associated risks.

KEYWORDS: E-Cigarette Use, Adolescent Behavior, Thailand, Health Literacy, Media Exposure, Attitude.

1. INTRODUCTION

Electronic cigarettes (e-cigarettes) have gained widespread popularity globally (Jane Ling et al., 2023). The e-cigarette industry is increasingly targeting Southeast Asia due to its large smoking population and the growing market for e-cigarettes, especially among adolescents and young adults (Jane Ling et al., 2023; O'Brien et al., 2021). One key factor contributing to this rise in adolescent use is marketing that appeals to this demographic, portraying e-cigarettes as modern, appealing, and available in various flavors such as mint, fruit, chocolate, vanilla, and cola (Nicksic et al., 2017; Titthita & Titipong, 2023). Peer influence and advertising further drive e-cigarette use among adolescents, who perceive them as less harmful than traditional cigarettes (Trumbo & Harper, 2013).

E-cigarette use in this age group is linked to a higher risk of initiating conventional smoking and ongoing tobacco use among individuals aged 14–30 years. Respiratory problems—chronic cough, bronchial inflammation, dyspnea, and asthma—are among the most studied health effects (Carwile et al., 2019; Ghosh et al., 2018; McConnell et al., 2017). Daily vaping is also associated with increased heart rate, blood pressure, and a higher risk of myocardial infarction due to nicotine exposure (Alzahrani et al., 2018; Yan & D'Ruiz, 2015). Additionally, it may impair attention, worsen mood disorders, and raise the risk of lung and oral cancers (Camenga et al., 2014; Gargano et al., 2019). When inhaled, glycerol and glycerin in e-liquids can irritate the skin, eyes, and lungs (Jaturapat, 2023). Additionally, there is an increased risk of depression associated with electronic cigarette use (Thrasher et al., 2016).

Several Southeast Asian countries have reported a rise in e-cigarette use since 2015 (Jane Ling et al., 2023). In 2019, six Southeast Asian countries recorded e-cigarette sales totaling $595 million, with projections estimating an increase to $766 million by 2023 (Kim, Lee, & Chun, 2022). In Malaysia, the prevalence among adolescents increased sharply from 1.2% to 9.8%, representing a more than 700% rise (Jane Ling et al., 2022). According to the Global Youth Tobacco Survey, 3.3% of Thai adolescents and 14.1% of Filipino adolescents currently use e-cigarettes (Sreeramareddy, Acharya, & Manoharan, 2022). According to the World Health Organization (Bessho, 2019; Patanavanich et al., 2020), the 2020 Global Youth Tobacco Survey found that 7.7% of Thai students aged 13–15 reported using e-cigarettes, up from 3.5% in 2015. This sharp increase over five years signals a growing public health concern among Thai adolescents (Raweewan, 2019; Yossin, Oronapa, & Wuthichan, 2023). High school students in Thailand are particularly vulnerable to e-cigarette use, which poses risks to both their health and the environment. Limited intervention and awareness efforts at the school and government levels have contributed to this issue (Jankasem & Kanokthet, 2023).

One of the factors associated with this increase in adolescent smoking is marketing that targets this age group, presenting electronic cigarettes as modern, attractive, colorful, and available in a variety of flavors such as mint, fruit, chocolate, vanilla, and cola (Nicksic et al., 2017; Titthita & Titipong, 2023). Thailand is one of over 30 countries that have enacted a complete ban on the sale of e-cigarettes, while permitting the sale of traditional cigarettes to individuals aged 20 and above (Phetphum, Prajongjeep, & Phuengnam, 2024). Despite this, domestic policies remain relatively permissive toward conventional cigarette use (Moeis et al., 2022), posing long-term risks to public health and environmental sustainability (Jaroenjitkul & Prasertsong, 2014). Public relations campaigns have been launched to raise awareness about the dangers of e-cigarettes, particularly targeting schoolchildren, teachers, and parents. Individuals who sell or distribute e-cigarettes may face up to three years of imprisonment, a fine of up to 600,000 baht, or both. Importers may be subject to a prison sentence of up to ten years, a fine of five times the value of the imported goods, or both.

This study is in Southern Thailand, specifically in Nakhon Si Thammarat Province. While previous research on factors associated with e-cigarette use among adolescents and university students has been conducted in Bangkok, Northern Thailand, and other regions, studies in Southern Thailand remain limited. Earlier findings identified significant associations between e-cigarette use and factors such as socioecological influences (Phetphum, Orawan, & and Prajongjeep), personal and perceptual characteristics (Phetphum et al., 2021), current cigarette smoking, parental and peer e-cigarette use, peer approval of smoking, and lack of awareness about e-cigarette risks (Patanavanich et al., 2021). This study introduces additional variables, including students' awareness, attitudes, and e-cigarette use. This study investigates the factors associated with electronic cigarette use among school students in Nakhon Si Thammarat Province, Southern Thailand. To respond to the rising prevalence of e-cigarette use among middle school students in the province (Benjakul, Nakju, & Termsirikulchai, 2023; Phetphum, Keeratisiroj, & Prajongjeep, 2024). The

findings will contribute to promoting health, preventing risks, and enhancing the quality of life for students. Moreover, this study provides a current snapshot of e-cigarette use at the school level and offers valuable insights for policymakers, school health program developers, and parents.

Conceptual framework

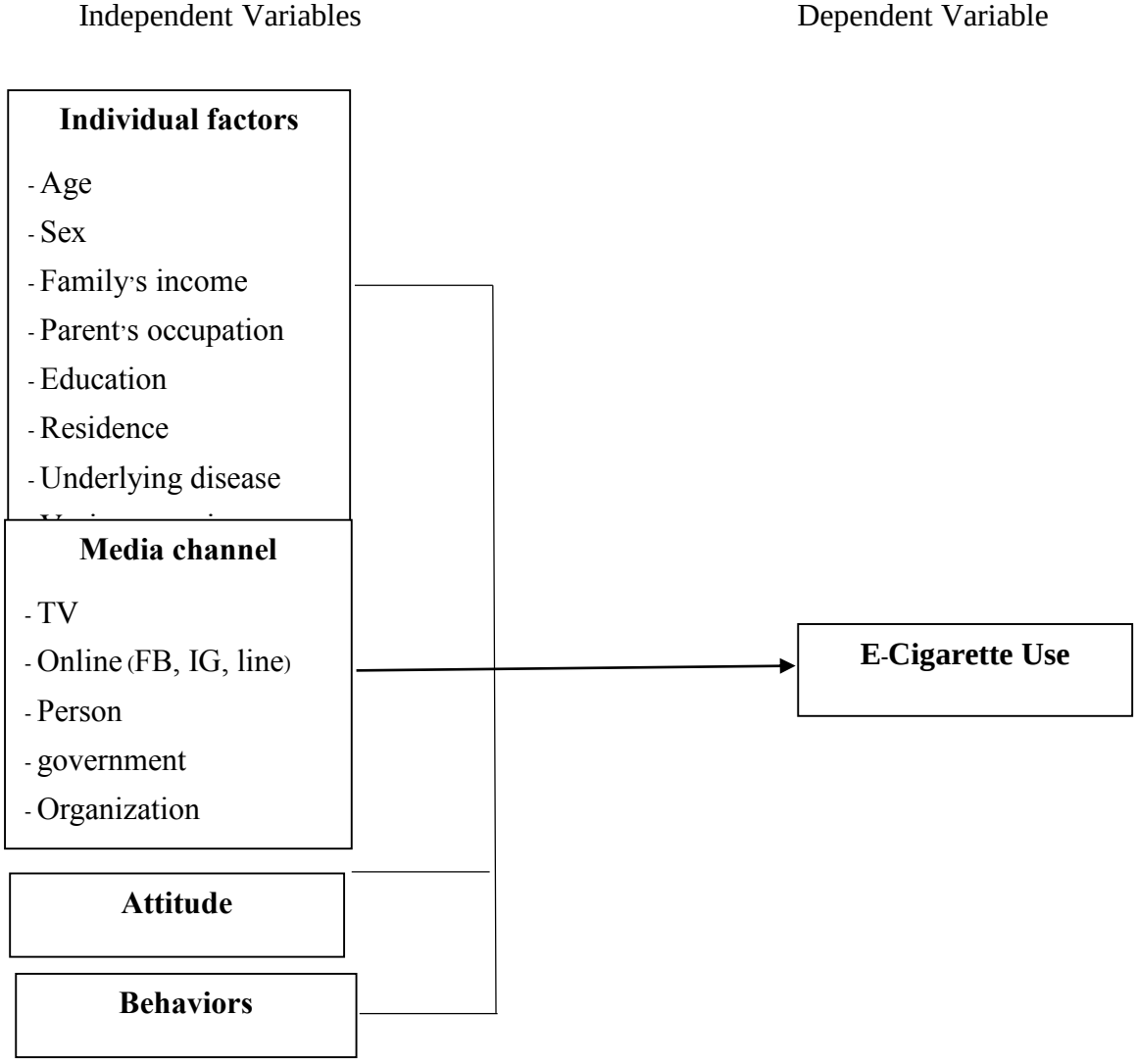

Figure 1: Conceptual framework.

2. LITERATURE REVIEW

2.1. E-Cigarettes And The Situation In Thailand

E-cigarettes, or electronic nicotine delivery systems (ENDS), have become increasingly popular among adolescents worldwide and are recognized as an emerging public health issue in Thailand. National surveys reveal that awareness and use of e-cigarettes among Thai youth have significantly increased in recent years (Bureau of Tobacco Control, 2022; World Health Organization [WHO], 2021). Despite Thailand's ban on importation and sale of e-cigarettes, products remain accessible through online platforms and social media (Sookjaroen et al., 2022). The marketing of flavored products, modern designs, and misleading claims of harm reduction contribute to experimentation and regular use among secondary school students (Chotbenjamaporn et al., 2021).

2.2. Health Risks And Toxicology Of E-Cigarettes

E-cigarette aerosols contain nicotine, propylene glycol, glycerin, and various flavoring agents that may decompose into harmful substances such as formaldehyde, acetaldehyde, and acrolein when heated (National Academies of Sciences, Engineering, and Medicine [NASEM], 2018).

Nicotine exposure during adolescence can impair brain development and increase susceptibility to addiction (Yuan et al., 2015). In addition, exposure to ultrafine particles and metals in aerosols (including lead, nickel, and chromium) may contribute to cardiovascular and pulmonary effects (Gaur & Agnihotri, 2019). Although marketed as safer alternatives, e-cigarettes still pose significant health risks and may act as a gateway to traditional smoking among adolescents (Gentzke et al., 2022).

2.3. Legal And Regulatory Context In Thailand

Thailand enforces strict legal measures on e-cigarettes under the Consumer Protection Act (2014) and Customs Act (2017), which prohibit the importation, sale, and distribution of vaping devices and liquids. Violations are subject to fines and imprisonment (Department of Disease Control, 2020). Despite these measures, online markets and informal networks continue to distribute e-cigarette products, particularly to adolescents (Sookjaroen et al., 2022). These challenges highlight the need for comprehensive enforcement and public education to reduce youth access.

2.4. Theoretical Frameworks Applied To E-Cigarette Behavior

Several behavioral theories underpin the understanding of adolescent e-cigarette use, including the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). According to these models, an individual's behavior is influenced by perceived susceptibility, perceived benefits, attitudes, and subjective norms. In this study's conceptual framework, personal factors, media exposure, and attitudes toward e-cigarettes are key determinants of use. Attitudes mediate the relationship between media exposure and e-cigarette use, consistent with findings from other adolescent tobacco studies (Trumbo & Harper, 2013).

2.5. Empirical Evidence On Correlates Of Adolescent E-Cigarette Use

Previous studies indicate that gender, age, and previous smoking experience are strong predictors of e-cigarette use among adolescents (Lee et al., 2020; Wang et al., 2021). In Thailand, exposure to online advertisements and peer influence significantly increase the likelihood of e-cigarette initiation (Chotbenjamaporn et al., 2021). Conversely, accurate perceptions of harm and strong parental monitoring are protective factors (Zhong et al., 2021). Research has shown that attitudes mediate the effect of exposure and social influences on usage behavior (Trumbo & Harper, 2013). Thus, multi-dimensional models integrating individual and environmental factors are needed to explain vaping behaviors in Thai youth.

2.6. School Environment And Surveillance Findings

The school environment shapes norms and accessibility surrounding e-cigarette use. Studies indicate that students in schools with clear anti-smoking policies and supportive health education report lower prevalence of vaping (Centers for Disease Control and Prevention [CDC], 2022). Conversely, weak enforcement or lack of supervision in schools increases the opportunity for experimentation (Wang et al., 2021). Observations in southern Thailand suggest variation in school preventive policies and awareness campaigns, which may partly explain differing usage rates among students (Bureau of Tobacco Control, 2022).

2.7. Gaps In The Literature And Rationale For The Present Study

Although prior research has explored youth e-cigarette use, there remain gaps in understanding how personal factors, media exposure, and attitudes interact to influence behavior in the Thai context. Few studies have integrated these dimensions into a single analytical framework in southern Thailand. Moreover, there is limited empirical evidence linking school-level environments with individual-level attitudes and behavior. Therefore, this study aims to fill these gaps by examining associations among personal factors, media exposure, attitudes, and e-cigarette use among secondary school students in Nakhon Si Thammarat Province.

3. METHODOLOGY

3.1 Population And Sampling Frame

A self-administered cross-sectional survey was conducted between August 2022 and February 2023 among school-going adolescents aged 13–19 years who were actively enrolled during the academic semester at three secondary schools in Nakhon Si Thammarat Province, Southern Thailand. Secondary schools in the province were selected through a random sampling procedure, resulting in three schools being included in the study. Within each selected school, classrooms were randomly chosen, and all students from those classrooms were invited to participate. The sample size was determined using the formula for estimating a finite population proportion [31, 32], yielding a required sample of 238

participants. To compensate for an anticipated response rate of 90%, the target sample size was increased to 265 participants. Ultimately, data were successfully collected from 270 students.

3.2. Study Sampling Procedure And Selection

This study employed a cross-sectional descriptive design conducted from August 2022 to February 2023 among secondary school students in Nakhon Si Thammarat Province, Southern Thailand. The study area was selected because of its mixed urban–rural characteristics, diverse school types, and increasing reports of adolescent e-cigarette use. The target population consisted of students aged 13–19 years who were enrolled in lower- and upper-secondary levels (Mathayom 1–6) in public and private schools within the province during the study period.

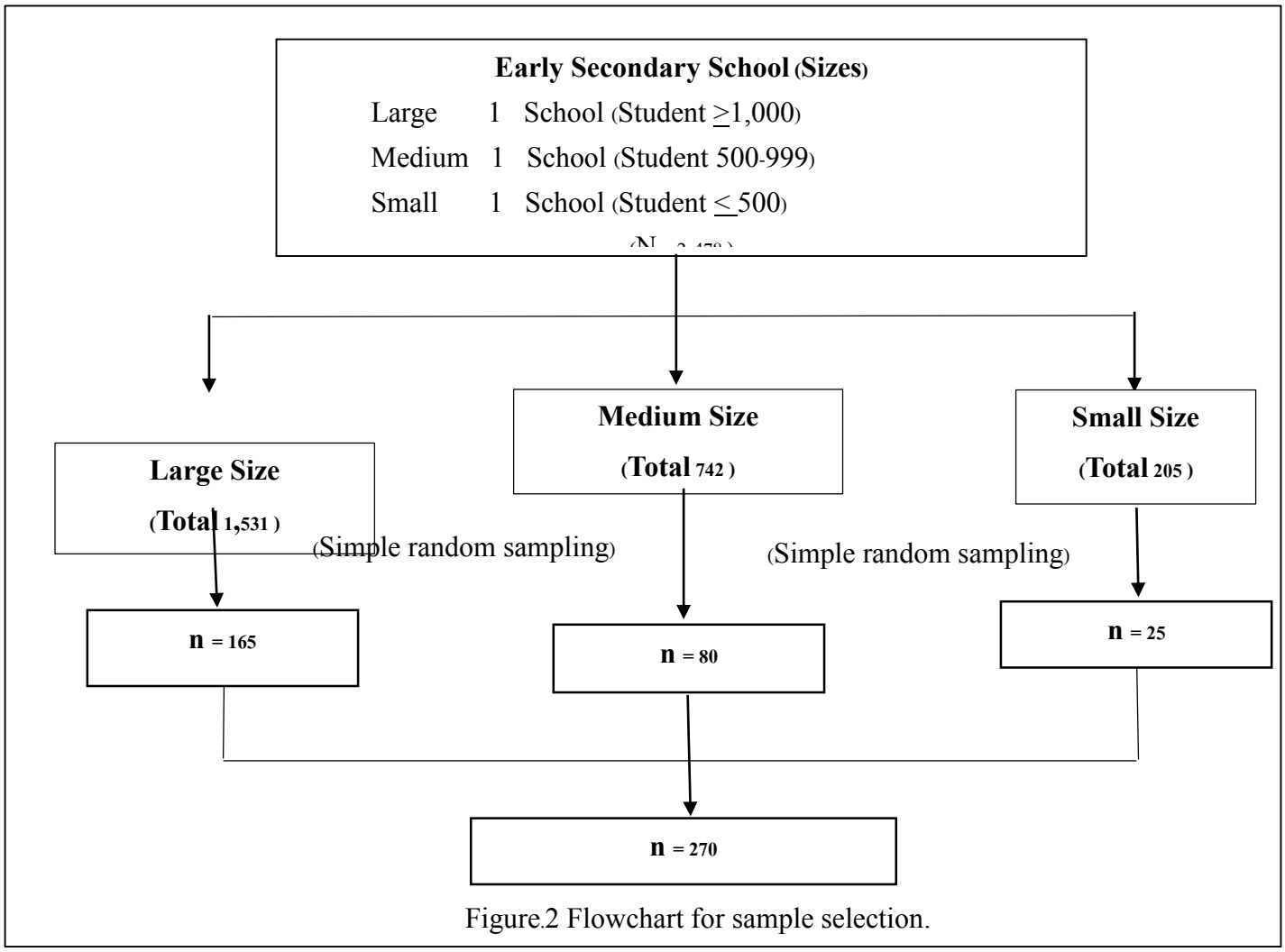

Figure.2 Flowchart for sample selection.

3.3. Measurement And Instrumentation

Online questionnaires were used for data collection and developed using Google Forms (Borualogo & Casas, 2024). The questionnaire was designed based on the Theory of Planned Behavior (TPB) and a review of validated instruments related to adolescent smoking and e-cigarette use (Family inventories : inventories used in a national survey of families across the family life cycle, 1985; Simpson et al., 2022; Sutha, Prabandari, & Padmawati, 2023). Content validity and cultural relevance for early secondary school students in Thailand were ensured through a review by three experts in public health and psychology. A pilot study was conducted among 30 students to assess clarity and reliability, resulting in a Cronbach's alpha of 0.82, indicating good internal consistency. Revisions were made to enhance readability and relevance. The final questionnaire comprised 43 items organized into five sections, using Likert scales to assess perceptions, attitudes, and behaviors.

Section 1: General Personal Information, consisting of 9 items such as gender, age, average monthly income per household, Monthly allowance

for school, parent's occupation, parent's level of education, type of residence, awareness of electronic cigarettes, ever tried electronic cigarettes, presence of chronic illness or diagnosed medical condition.

Section 2: News Source Channels and Perception Regarding Electronic Cigarettes, consisting of 13 items. There is a rating scale (estimation with five options): Very high = 5, High = 4, Moderate =3, Low =2, and very low = 1, with a score >= 80% indicating a perception adequate level and a score < 80% indicating a perception inadequate level.

Section 3: Attitudes towards Electronic Cigarettes, consisting of 10 items: There is a rating scale (estimation with five options): Very high=5, High=4, Moderate=3, Low=2, and very low=1. A score >=60% indicates a positive attitude towards electronic cigarettes, and a score <60% indicates a negative attitude towards electronic cigarettes.

Section 4: Electronic Cigarette Smoking Behavior, consisting of 10 items. There is a rating scale (estimation with three options): Not practiced=3, Occasionally practiced =2, and practiced with a score = 100%, indicating no risk for using electronic cigarettes. And score <100%, indicating risk for using electronic cigarettes.

4. DATA ANALYSIS

Data were collected using a Google Form, allowing students to complete the online questionnaire conveniently. The survey was anonymous, and the data were encrypted to ensure security. Before accessing the online survey, all participants were required to review and provide electronic consent. The study was conducted following the approval of the Human Research Ethics Committee.

Statistical analysis was performed using SPSS version 29 (SPSS 113 Inc., Chicago, IL). Descriptive analysis was conducted to summarize the study's independent variables, followed by bivariate analysis of categorical variables using chi-square or its alternatives to identify factors associated with e-cigarette use.

The analysis presented the significant variables' adjusted odds ratios and 95% confidence intervals. Variables with a p-value of less than 0.05 were considered significantly associated with e-cigarette use.

4.1. Results

This research finds the important factors affecting e-cigarette usage among high schools in Thailand. The results depict attitudes, perceptions, and behavioral approaches towards usage. These results are mentioned below:

4.2. General Characteristics of Participants

Table 1 presents the general characteristics of Nakhon Si Thammarat Province school students. The majority of participants were male (51.1%). Most students were in the third year of lower secondary school (37.8%). Most parents had an average monthly income of less than 130,000 baht (50.4%), while most students received a monthly school allowance of more than 3,000 baht (57.8%). The largest proportion of parents were engaged in trading (19.6%). Most students resided in their own homes (84.8%). A high proportion of students were aware of e-cigarettes (92.2%), although the majority had never tried them (82.2%). Most students reported having no chronic diseases or illnesses (86.7%).

Most students demonstrated good awareness of e-cigarettes, with approximately 92.2% indicating they were aware of them. Most students (86.7%) also reported never having tried e-cigarettes. Regarding news consumption from television, 31 students (11.5%) reported high levels, 111 students (41.1%) reported moderate levels, and 128 students (47.4%) reported low levels. Regarding information exposure, the study found that the sample group generally held a negative attitude towards e-cigarettes, with 196 students (72.6%) expressing such views.

4.3. Associations Between Personal Factors, Media Exposure, Attitudes, And E-Cigarette Use Among School Students

Table 1 shows associations between personal factors, media exposure, attitudes, and e-cigarette use among Nakhon Si Thammarat Province, Southern Thailand school students. The Chi-square test results revealed statistically significant associations between personal factors and e-cigarette use among early secondary school students (Han & Son, 2022).

The Chi-square test indicated that students' age, parents' occupations, education levels, and smoking initiation behavior were significantly associated with e-cigarette smoking behavior among students ($p < 0.05$). These findings suggest that differences in these personal factors relate to variations in students' likelihood of using e-cigarettes. Furthermore, there is a significant association between news source channels, particularly television, and e-cigarette use among students ($p = 0.036$). Specifically, 31 students (11.5%) reported high levels of television news consumption, 111 students (41.1%) reported moderate levels, and 128 students (47.4%) reported

low levels. These findings suggest that the level of exposure to television news may be related to students' engagement in e-cigarette use. There is a statistically significant association between students' attitudes and e-cigarette smoking behavior ($p < 0.05$). Most of the sample demonstrated a negative attitude toward e-cigarettes, with 196 students (72.6%) expressing unfavorable views. This association was highly significant, as indicated by a p-value of 0.001, suggesting that students' attitudes may play a meaningful role in influencing their likelihood of e-cigarette use.

Table 1: The Relationship Between Personal Factors And Electronic Cigarette Smoking Behavior Among Early Secondary School Students (N = 270).

Variable	Number (%)	Behavior level		χ^2	*p*-value
		No Risk(%)	Risk (%)		
Gender				0.559	0.455
Male	138 (51.1)	109 (79.9)	29 (21.0)		
Female	132 (48.9	109 (82.6)	23 (17.4)		
Age (year)				5.298	0.021*
≤ 14	191 (70.7)	161 (84.3)	30 (15.7)		
> 14	79 (29.3)	57 (72.2)	22 (27.8)		
Parent's monthly income (US)				0.751	0.386
≤ 1,000	136 (50.4)	107 (78.7)	29 (21.3)		
> 1,000	134 (49.6)	111 (82.8)	23 (17.2)		
Students monthly school allowance (US)				2.398	0.122
≤ 100	114 (42.2)	97 (85.1)	17 (14.9)		
> 100	156 (57.8)	121 (77.6)	35 (22.4)		
Parent's occupation				13.52	0.019
Merchant	53 (19.6)	43 (81.1)	10 (18.9)		
Employee	53 (19.6)	36 (67.9)	17 (32.1)		
Agriculture	49 (18.1)	42 (85.7)	7 (14.3)		
Company Employment	33 (12.2)	30 (90.9)	3 (9.1)		
Private business	50 (18.5)	37 (74.0)	13 (26.0)		
Government	32 (11.9)	30 (93.8)	2 (6.3)		
Education level				7.758	0.021
Grade 7	96 (35.6)	75 (78.1)	21 (21.9)		
Grade 8	72 (26.7)	66 (91.7)	6 (8.3)		
Grade 9	102 (37.8)	77 (75.5)	25 (24.5)		
Residential characteristics (Student live in their own home)				1.781	0.182
Yes	209 (84.8)	188 (82.1)	41 (17.9)		
NO	41 (15.2)	30 (73.2)	11 (26.8)		
Awareness of electronic cigarette				0.362	0.774
Yes	249 (92.2)	200 (80.3)	49 (19.7)		
No	21 (7.8)	18 (85.7)	3 (14.3)		
E-cigarette smoking behavior (used)				116.6	<0.025*
Yes	48 (17.8)	12 (25.0)	36 (75.0)		
No	222 (82.2)	206 (92.8)	16 (7.2)		
Illness				0.235	0.628
Yes	36 (13.3)	28 (77.8)	8 (22.2)		
No	234 (86.7)	190 (81.2)	44 (18.8)		
* $p<0.05$ is significant					

5. DISCUSSION

This study examined factors associated with e-cigarette use among school students in Nakhon Si Thammarat Province, Southern Thailand. Personal characteristics—including age, parental occupation, educational grade level, and initiation of smoking behavior—were found to be significantly associated with e-cigarette use. Additionally, exposure to news media, particularly television, was positively associated with e-cigarette use. Students' attitudes toward e-cigarettes also demonstrated a statistically significant relationship with their smoking behavior ($p < 0.05$), indicating that attitudinal factors may play

a crucial role in shaping adolescent e-cigarette. A significant association between students' age and educational grade level with e-cigarette use was identified. The positive relationship between older age, higher grade level, and increased likelihood of e-cigarette use has been consistently reported in prior research. Studies conducted in the United States [36,37] similarly indicate that older adolescents and senior high school students are more likely to engage in e-cigarette use. These findings highlight the need for early and continuous health promotion interventions aimed at school-aged populations to mitigate the risks of e-cigarette initiation and to address external influences such as social pressures, targeted marketing, and peer norms.

The association between students' attitudes and e-cigarette use observed in this study aligns with findings from previous research conducted in Hong Kong [38] and Central Thailand [39]. Negative attitudes toward e-cigarettes were shown to serve as a protective factor, as adolescents holding unfavorable views exhibited a lower likelihood of use. This emphasizes the importance of fostering negative attitudes toward e-cigarettes through targeted educational interventions. Since attitudes are shaped by educational exposure, peer influence, and family communication, collaborative efforts between schools, parents, and communities are recommended. Interventions could include interactive sessions and peer-based storytelling that highlight real-life consequences of e-cigarette use, thereby promoting risk awareness and resilience among adolescents.

In this study, a high level of awareness regarding e-cigarettes (92.2%) was reported, consistent with findings from China [40] and India [41]. However, despite widespread awareness, 17.8% of respondents reported having tried e-cigarettes. These results suggest that awareness alone may not deter use and that further research is required to examine whether a direct causal relationship exists between awareness and initiation. Previous studies have shown that school-based health education programs, particularly those incorporating behavioral counseling, can effectively reduce vaping behaviors among adolescents. Media exposure, particularly through television, was also significantly associated with e-cigarette use in this study. This finding corroborates evidence from longitudinal research in the United States, which demonstrated that media exposure can shape adolescents' attitudes, beliefs, and subsequent behaviors toward vaping. Given that today's adolescent population predominantly comprises individuals from Generation Z (born between 1997 and 2010) and Generation Alpha (born from 2010 onward), both characterized as digital natives, their high engagement with digital media warrants special concern. These generations are continuously exposed to targeted marketing and persuasive content through social media and online platforms [42–44]. Therefore, regulatory measures to restrict the advertising and promotion of e-cigarettes—particularly via digital channels—should be prioritized within national public health policy frameworks. Such measures are vital to counter media influences that normalize vaping and to prevent early initiation among adolescents [43].

Although Thailand is among the five Southeast Asian countries that have banned e-cigarettes and vaping products, knowledge gaps persist regarding perceived risks and attitudes toward e-cigarette use. Current school-based anti-smoking programs mainly emphasize traditional cigarette smoking, with limited information available in the Thai language concerning the risks associated with e-cigarettes [39]. This gap underscores the urgent need for school-based interventions to enhance students' health literacy and awareness of the harmful effects of e-cigarettes.

In alignment with the Sustainable Development Goals—specifically Goal 3 (Good Health and Well-being) and Goal 4 (Quality Education)—creating a healthy and supportive school environment should be a national priority. To address adolescent e-cigarette, use effectively, multi-sectoral strategies are required at both policy and operational levels to restrict accessibility and cultivate negative perceptions toward e-cigarette use. Schools should develop and disseminate educational materials highlighting the health risks of e-cigarettes through diverse communication channels, including television, social media, and school-based campaigns. Future research should further investigate adolescent smoking behaviors through comparative analyses of conventional and electronic cigarette use. Overall, the findings of this study, which identify both direct and indirect factors influencing e-cigarette use, can inform the development of evidence-based, contextually appropriate interventions. These strategies can be adapted to similar settings facing emerging public health challenges related to adolescent vaping.

5.1. Conclusion

Personal factors, including age, parental occupation, grade level, and smoking initiation, were found to be significantly associated with e-cigarette

use among adolescents. Exposure to news media—particularly television—was also correlated with an increased likelihood of e-cigarette use. Moreover, students' attitudes demonstrated a statistically significant association with e-cigarette behavior ($p < 0.05$), underscoring their potential influence on usage patterns. These findings highlight the need for comprehensive school-based interventions aimed at enhancing students' health literacy regarding e-cigarettes and their associated health risks. Given that the current adolescent population, largely comprising Generation Z and Generation Alpha—digital natives with extensive media exposure—is particularly vulnerable to marketing influences, regulatory measures restricting e-cigarette advertising should be prioritized in public health policy, especially across digital platforms. Furthermore, future research is warranted to explore the potential causal pathways between e-cigarette awareness and adolescent usage behavior.

Conflicts of Interest: The authors declare no conflict of interest.

Ethical Approval: Ethical approval for this study was obtained from the Human Research Ethics Committee of Walailak University, Thailand (Protocol No. WUEC-23-308-01). The research protocol was reviewed to ensure compliance with the Declaration of Helsinki (2013) and the National Research Council of Thailand's Ethical Guidelines for Human Research.

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