Original Article

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Comparing Harm Perception and Nicotine Dependence between Adult Roll-Your-Own and Factory-Made Cigarette Smokers in Southern Thailand

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Abstract:

Objective: This study aimed to compare harm perception and nicotine dependence between roll-your-own (RYO) and factory-made (FM) cigarette smokers among adults in Southern Thailand.

Material and Methods: A cross-sectional survey was conducted using structured questionnaires administered both online and in person to assess smoking behavior and nicotine dependence, and harm perceptions. A total of 385 adult cigarette smokers were recruited, including 191 RYO smokers and 194 FM smokers.

Results: RYO smokers were generally older, married, and had lower levels of education and monthly income compared to FM smokers. The most frequently cited reasons for choosing RYO cigarettes included lower cost, taste, smell or pleasantness, and perceived lower harm. Notably, 36.1% of RYO smokers believed these cigarettes contained fewer addictive and harmful substances than FM cigarettes. Additionally, 45.5% of RYO smokers acknowledged their harmful effects, while 30.4% perceived RYO cigarettes as less harmful than FM cigarettes. The Fagerström Test revealed higher nicotine dependence among RYO smokers.

Conclusion: This study highlights differences in harm perception and nicotine dependence between RYO and FM cigarette smokers. RYO smokers exhibited higher nicotine dependence and were more likely to perceive RYO cigarettes

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as less harmful than FM cigarettes. Men were more likely to smoke than women. Factors influencing smoking initiation included curiosity, peer pressure, social acceptance, socioeconomic conditions, and education levels.

Keywords: factory-made cigarettes, harm perception, nicotine dependence, roll-your-own cigarettes, smokers, tobacco consumption

Introduction

In Thailand, an estimated 58% of all smokers use roll-your-own (RYO) cigarettes[1], while 55% smoke factory-made (FM) cigarettes[2]. Tobacco control policies, including mandatory health warnings on tobacco packaging and increased tobacco tax rates—particularly for FM cigarettes—have been implemented to reduce tobacco consumption and exposure to second-hand smoke[2-4]. However, some FM cigarette smokers may seek lower-priced alternatives, such as RYO cigarettes, or reduce their FM cigarette consumption[2-4]. RYO cigarettes are the most popular type of tobacco product in Thailand and are deeply ingrained in Thai smoking culture. They are less expensive than FM cigarettes[5-7], with a significant proportion of RYO smokers being older males living in rural areas with lower education levels who tend to perceive smoking as less harmful[1,8].

RYO cigarettes, also known as hand-rolled cigarettes, typically contain approximately 60% tobacco[9] and most RYO smokers use unfiltered cigarettes[10]. RYO tobacco may contain high levels of nicotine and tar[11,12]. RYO smokers tend to be heavier smokers[6] and are at a higher risk of developing cancer compared to FM cigarette smokers[13-15]. Despite this, RYO smokers often perceive these cigarettes as less harmful[1,8,16], more "natural," and safer[9] than FM cigarettes. They are also more likely to consume their first cigarette earlier in the day and to have higher daily consumption levels. International surveys suggest that RYO cigarettes are linked to higher nicotine dependence and lower quitting rates[8,16].

The growing prevalence of RYO cigarette consumption is a significant public health concern, particularly as limited information exists about smokers' harm perceptions and nicotine dependence associated with these products. Therefore, this study aimed to compare the perception of harm and the level of nicotine dependence between RYO and FM cigarette smokers among adults. Our hypothesis is that RYO cigarettes are perceived as less harmful and are associated with higher levels of dependence compared to FM cigarettes.

Material and Methods

Design and participants

This cross-sectional study, approved by the Institutional Review Board, was conducted between January 2022 and December 2023. Adult cigarette smokers from Southern Thailand were recruited using non-probability sampling methods, including social media, word-of-mouth, and posters. Participants were selected from provinces with a high prevalence of RYO or FM cigarette smokers, including Nakhon Si Thammarat, Surat Thani, Krabi, Trang, Phatthalung, Satun, Songkhla, Pattani, Yala, and Narathiwat. Eligible participants were 18 years or older, active smokers of either RYO or FM cigarettes, capable of effective communication, and willing to participate. Individuals were excluded if they had communication difficulties, were unable to read and understand Thai, or smoked both FM and RYO cigarettes. The sample size was calculated using Cochran's correction formula[17], and 385 eligible participants provided consent, either in person

or online. Data were collected through self-reported questionnaires or face-to-face interviews. The study was approved by the Human Research Ethics Committee (HREC) of the Faculty of Medicine at the Prince of Songkla University (No. 64-489-30-2).

Measures

Subject demographics

Gender was recorded as male or female. Age was categorized into three groups: young adults (18–35 years), middle-aged adults (36–60 years), and older adults (over 60 years)[18]. Marital status was classified as single, married, separated, or divorced. Education levels ranged from high school graduate or less, some college or associate degree, bachelor's degree or higher, nonformal education, or uneducated[7]. Past-month income was categorized as less than 10,000 THB, 10,000–30,000 THB, 30,001–50,000 THB, or more than 50,000 THB[19]. Based on the current minimum wage rate of 330 THB per day, the minimum income threshold was set at below 10,000 THB for this study[20].

Smoking behavior and nicotine dependence

Participants were asked about their reasons for using FM or RYO cigarettes, with possible responses including low cost, smell or pleasantness, perceived lower harm, quantity, and taste. The age at which participants first smoked a cigarette was categorized as: <12, 12–18, or >18 years. The duration of active smoking was grouped into 1–10 years, 11–20 years, or >20 years[21]. The number of cigarettes smoked per day was classified as 1, 2–5, 6–10, 11–20, or >20[22]. Nicotine dependence was assessed for all participants using the Thai-language version of the Fagerström Test for Nicotine Dependence (FTND). This tool provides a single score that reflects the level of nicotine dependence and aids in determining appropriate cessation therapy options[23].

Harm perceptions

The questionnaire was developed based on data from focus groups with eight adult RYO and FM cigarette smokers and in-depth interviews with four medical professionals experienced in smoking cessation care. Content validity was evaluated by three experts, achieving an item content validity index above 0.79 and scale content validity index of 0.9. Reliability testing yielded a Cronbach's alpha coefficient of 0.719 and an intraclass correlation coefficient of 0.975 (p-value<0.001) prior to data collection.

All participants were asked the following questions:

1. "Do you think the following tobacco products are less addictive and harmful?" (Response options: completely agree, agree, neither agree nor disagree, slightly agree, or disagree);

2. "How harmful do you think the following tobacco products are to your health?" (Response options: completely harmful, harmful, not harmful, or uncertain);

3. "How much more harmful do you think RYO cigarettes are to your health than FM cigarettes?" (Response options: more harmful, equally harmful, less harmful, do not know, and no answer);

4. "Do you think the following tobacco products contain less nicotine?" (Response options: completely agree, agree, neither agree nor disagree, slightly agree, or disagree);

5. "Do you think that smoking tobacco products is more relaxing than non-smoking?" (Response options: more relaxing, less relaxing, equally relaxing, and uncertain);

6. "Are you likely to distance yourself from friends who smoke?" (Response options: distance yourself from all friends who smoke, distance yourself from almost all friends who smoke, distance yourself from some friends who smoke, would not distance yourself, and uncertain);

7. "How difficult would it be for you to reduce or quit smoking?" (Response options: completely easy,

might be easy, might be difficult, completely difficult, and uncertain).

Statistical analysis

Data were processed and analyzed using SPSS version 17.0 (SPSS, Ltd., Chicago, IL, USA). Results were presented as frequencies and percentages. For participant-level responses, data were expressed as the percentage of all participants, the percentage of the subgroup providing a specific answer, and the mean value for responses involving a quantitative scale. Statistical analyses were performed using Pearson's chi-squared test, with all tests being two-sided and a significance level set at p-value<0.05.

Results

Demographic comparisons

In a sample of 385 cigarette smokers, 194 participants (50.4%) reported smoking FM cigarettes. Table 1 provides a comparison between FM and RYO cigarette smokers. RYO smokers were significantly more likely than FM smokers

Table 1 Number (percentage) of roll-your-own (RYO) and factory-made (FM) cigarette smokers among eligible participants categorized by demographic characteristics and comorbidity

Variables	RYO cigarettes smokers (n=191) n (%)	FM cigarettes smokers (n=194) n (%)	p-value
Gender			0.234
Male	165 (86.4)	159 (82)	
Female	26 (13.6)	35 (18)	
Age (years)			<0.001
18–35	69 (36.1)	117 (60.3)	
36–60	89 (46.6)	74 (38.1)	
>60	33 (17.3)	3 (1.5)	
Marital status			0.003
Single	70 (36.6)	96 (49.5)	
Married	101 (52.9)	71 (36.6)	
Separated	14 (7.3)	11 (5.7)	
Divorced	6 (3.1)	16 (8.2)	
Education			0.039
High school graduate or less	80 (41.9)	74 (38.1)	
Some college/Associate's degree	61 (31.9)	51 (26.3)	
Bachelor's degree or higher	45 (23.6)	64 (33.0)	
Uneducated	5 (2.6)	5 (2.6)	
Past-month income (THB)			0.014
<10,000	57 (29.8)	45 (23.2)	
10,000–30,000	84 (44.0)	116 (59.8)	
30,001–50,000	39 (20.4)	28 (14.4)	
>50,001	11 (5.8)	5 (2.6)	
Comorbidity			0.076
None	156 (79.6)	176 (90.7)	
Hypertension	14 (7.3)	9 (4.6)	
Diabetes	7 (3.7)	3 (1.5)	
Dyslipidemia	4 (2.1)	1 (0.5)	
Obesity	4 (2.1)	2 (1.0)	
Coronary artery disease	3 (1.6)	1 (0.5)	
Asthma	6 (3.1)	1 (0.5)	
Other respiratory diseases	1 (0.5)	1 (0.5)	

THB=Thai Baht

to be older (p-value<0.001), married (p-value=0.003), and have lower levels of education (p-value=0.039) and monthly income (p-value=0.014).

Smoking behavior and nicotine dependence

The most frequently reported reasons for using RYO cigarettes were low cost (96.3%) (p-value<0.001), taste (p-value<0.001), smell or pleasantness (p-value<0.001), and perceived lower harm (p-value<0.001). RYO smokers had a longer smoking duration (p-value<0.001) and smoked more cigarettes per day (p-value<0.001). Additionally, the Fagerström Test indicated that RYO smokers were more nicotine dependent (p-value<0.001) (Table 2).

Harm perceptions

Table 3 compares harm perceptions between RYO and FM cigarette smokers. Nearly 45.5% of RYO smokers believed that RYO cigarettes could be harmful to human health (p-value<0.001), and 30.4% perceived RYO cigarettes as less harmful than FM cigarettes (p-value< 0.001).

Table 2 Number (percentage) of roll-your-own (RYO) and factory-made (FM) cigarette smokers among eligible participants categorized by specific parameters

Variables	RYO cigarettes smokers (n=191) n (%)	FM cigarettes smokers (n=194) n (%)	p-value
Reasons for using			
Low cost	184 (96.3)	169 (87.1)	0.001
Pleasant or nicer smell	152 (79.6)	112 (57.7)	<0.001
Less harmful	140 (73.3)	108 (55.7)	<0.001
Quantity	178 (93.2)	179 (92.3)	0.727
Tasty	154 (80.6)	93 (47.9)	<0.001
Age at first use			0.009
<12	24 (12.6)	28 (14.4)	
12–18	70 (36.6)	97 (50.0)	
>18	97 (50.8)	69 (35.6)	
Years of active smoking			<0.001
1–10	69 (36.1)	118 (60.8)	
11–20	45 (23.6)	40 (20.6)	
>20	77 (40.3)	36 (18.6)	
Number of cigarettes smoked per day			0.001
<1	8 (4.2)	6 (3.1)	
1	9 (4.7)	14 (7.2)	
2–5	44 (23.0)	84 (43.3)	
6–10	70 (36.6)	53 (27.3)	
11–20	52 (27.2)	32 (16.5)	
>20	8 (4.2)	5 (2.6)	
Fagerström test for nicotine dependence			
0–2 very low	39 (20.4)	92 (47.4)	<0.001
3–4 low	40 (20.9)	52 (26.8)	
5 moderate	73 (38.2)	30 (15.5)	
6–7 high	26 (13.6)	18 (9.3)	
8–10 very high	13 (6.8)	2 (1.0)	

We performed the regression analysis for this study; however, the results did not yield statistically significant relationships. Despite this, we believe the additional analysis provides valuable context. To enhance the presentation, we have included an additional table summarizing the regression results, which supplements the chi-squared analysis used for group comparisons. The main findings remain consistent, as detailed in Supplementary Tables 1 and 2.

Table 3 Number (percentage) of roll-your-own (RYO) and factory-made (FM) cigarette smokers among eligible participants categorized by harm perceptions

Variables	RYO cigarettes smokers (n=191) n (%)	FM cigarettes smokers (n=194) n (%)	p-value
Do you think that FM cigarettes are less addictive and harmful than RYO cigarettes?			0.027
Completely agree	30 (15.7)	44 (22.7)	
Agree	38 (19.9)	46 (23.7)	
Neither agree nor disagree	44 (23.0)	52 (26.8)	
Slightly agree	17 (8.9)	7 (3.6)	
Disagree	62 (32.5)	45 (23.2)	
Do you think that RYO cigarettes are less addictive and harmful than FM cigarettes?			<0.001
Completely agree	41 (21.5)	23 (11.9)	
Agree	69 (36.1)	28 (14.4)	
Neither agree nor disagree	39 (20.4)	65 (33.5)	
Slightly agree	20 (10.5)	28 (14.4)	
Disagree	22 (11.5)	50 (25.8)	
How harmful do you think FM cigarettes are to your health?			0.016
Completely harmful	105 (55.0)	108 (55.7)	
Might be harmful	43 (22.5)	64 (33.3)	
Might be not harmful	30 (15.7)	17 (8.8)	
Completely not harmful	6 (3.1)	1 (0.5)	
Uncertain	7 (3.7)	4 (2.1)	
How harmful do you think RYO cigarettes are to your health?			<0.001
Completely harmful	72 (37.7)	102 (52.6)	
Might be harmful	87 (45.5)	46 (23.7)	
Might be not harmful	17 (8.9)	4 (2.1)	
Completely not harmful	8 (4.2)	7 (3.6)	
Uncertain	7 (3.7)	35 (18.0)	
How much more harmful do you think RYO cigarettes are to your health than FM cigarettes?			
More harmful	20 (10.5)	54 (27.8)	
Equally harmful	52 (27.2)	81 (41.8)	
Less harmful	58 (30.4)	11 (5.7)	<0.001
Do not know	52 (27.2)	47 (24.2)	
No answer	20 (10.5)	1 (0.5)	
Do you think FM cigarettes contain less nicotine than RYO cigarettes?	24 (12.6)	21 (10.8)	0.002
Completely agree	31 (16.2)	33 (17.0)	
Agree	60 (31.4)	89 (45.9)	
Neither agree nor disagree	35 (18.3)	35 (18.0)	
Slightly agree	41 (21.5)	16 (8.2)	
Disagree			

Table 3 Number (percentage) of roll-your-own (RYO) and factory-made (FM) cigarette smokers among eligible participants categorized by harm perceptions

Variables	RYO cigarettes smokers (n=191) n (%)	FM cigarettes smokers (n=194) n (%)	p-value
Do you think that RYO cigarettes contain less nicotine than FM cigarettes?			0.019
Completely agree	22 (11.5)	18 (9.3)	
Agree	54 (28.3)	30 (15.5)	
Neither agree nor disagree	76 (39.8)	101 (52.1)	
Slightly agree	22 (11.5)	29 (14.9)	
Disagree	17 (8.9)	16 (8.2)	
Do you think that FM cigarette smoking is more relaxing than non-smoking?			0.608
More relaxing	93 (48.7)	91 (46.9)	
Less relaxing	23 (12.0)	18 (9.3)	
Equally relaxing	52 (27.2)	54 (27.8)	
Uncertain	23 (12.0)	31 (16.0)	
Do you think that RYO cigarette smoking is more relaxing than non-smoking?			0.002
More relaxing	85 (44.5)	59 (30.4)	
Less relaxing	32 (16.8)	29 (14.9)	
Equally relaxing	58 (30.4)	68 (35.1)	
Uncertain	16 (8.4)	38 (19.6)	
Are you likely to distance yourself from friends who smoke?			0.029
Distance yourself from all friends who smoke	10 (5.2)	4 (2.1)	
Distance yourself from most friends who smoke	32 (16.8)	24 (12.4)	
Distance yourself from some friends who smoke	38 (19.9)	51 (26.3)	
Do not distance yourself	97 (50.8)	87 (44.8)	
Uncertain	14 (7.3)	28 (14.4)	
How difficult would it be for you to reduce or quit smoking?			0.649
Completely easy	15 (7.9)	13 (6.7)	
Might be easy	32 (16.8)	38 (19.6)	
Might be difficult	62 (32.5)	73 (37.6)	
Completely difficult	69 (36.1)	59 (30.4)	
Uncertain	13 (6.8)	11 (5.7)	

Discussion

This study aimed to examine the perception of harm and the level of nicotine dependence among adult smokers of RYO cigarettes compared to those using FM cigarettes. The findings suggest that RYO cigarette smokers exhibit higher levels of nicotine dependence and perceive RYO cigarettes as less harmful than FM cigarettes. The data highlight a significantly higher prevalence of smoking among men compared to women, with a 26-fold difference[24], which aligns with the 2021 statistical data on cigarette consumption in Thailand[24].

Regarding the factors influencing smoking initiation, previous research has shown that adolescent males exhibit higher rates of smoking initiation, often attributed to factors such as curiosity, inclination to experiment, pursuit of peer acceptance, and desire to attract attention from the opposite sex[25,26]. By contrast, females are often discouraged from smoking. Studies by Ubonban and Chanabun[25], and Yodnangrong et al.[26] reported higher smoking rates and increased smoking risk behaviors among adolescent males compared to females.

Socioeconomic factors also played a role in smoking behavior. Both FM and RYO cigarette consumers had monthly incomes ranging from 10,000 to 30,000 THB. However, RYO cigarette consumers allocated a larger proportion of their income to purchasing cigarettes, suggesting a preference for RYO cigarettes, likely due to their lower cost[7].

Additionally, education was a key factor shaping smoking behavior. FM cigarette consumers typically had higher education levels, ranging from high school to university, while RYO cigarette consumers generally had lower education levels, ranging from high school to vocational college. This educational discrepancy aligns with reports in previous studies[7,27], indicating that many RYO smokers possess only basic educationat the high school level.

Interestingly, while FM cigarette consumers exhibited a high level of awareness regarding the risks associated with both FM and RYO cigarettes, RYO smokers perceived the risks of FM cigarettes as moderate, while considering RYO cigarettes to be relatively less harmful. This suggests that while high school education provides sufficient knowledge about the dangers of FM cigarettes, it may lack comprehensive information on RYO cigarettes. Therefore, incorporating RYO cigarette-related knowledge into the high school curriculum could enhance awareness and address misconceptions[27,29].

Survey responses on the perceived harm of FM and RYO cigarettes revealed contrasting views among the consumers in both groups. FM cigarette consumers believed that both types were equally harmful, while RYO cigarette consumers considered RYO cigarettes to be less harmful than FM cigarettes. This perception aligns with Thailand's 2019 tobacco consumption report, which highlights a significant shift toward RYO cigarettes due to their cost-effectiveness[28]. Furthermore, this perception of RYO cigarettes as less harmful than other cigarette types is supported by the findings of Young et al.[8] Similarly, Joseph et al.[16] reinforced these findings, suggesting that consumers choose RYO cigarettes because they perceive them to be less harmful than FM cigarettes.

Attitudes toward smoking and its relaxing effects vary, as many individuals turn to smoking to manage stress, particularly in the context of social acceptance, especially from the opposite sex. A study on attitudes toward quitting smoking[19] found that both FM and RYO cigarette consumers were motivated to quit due to health concerns. However, most participants lacked confidence in their ability to quit immediately. RYO smokers were particularly doubtful about their ability to quit, despite being aware of the associated risks. This hesitation underscores the complexity of quitting smoking, which is influenced by social dynamics, family environments, and individual perceptions. Furthermore, misconceptions about cigarette sales, such as the belief that cigarettes are accessible to all ages and genders were common among participants[21]. These findings highlight the complexities surrounding smoking behaviors, attitudes toward quitting, and the need for targeted interventions that address misconceptions and promote informed decision-making.

This study found notable differences in nicotine addiction levels between RYO and FM cigarette users, further supported by statistically significant variations in the Fagerström Test scores. Specifically, RYO cigarette users showed a higher propensity for nicotine addiction than FM cigarette users. This finding aligns with that reported by Joseph et al.[16], who explored disparities in nicotine cravings, smoke exposure, and consumer characteristics between RYO and FM cigarette users. Our results also indicated that RYO cigarette users had elevated levels of nicotine craving compared to FM cigarette users. Additionally, most FM cigarette users tended to smoke within 31–60 minutes of waking up, whereas RYO cigarette users were more likely to smoke within 6–30 minutes of waking up. This pattern

is consistent with findings by Benjakul et al.[2], who reported that RYO cigarette users consumed their first cigarette within 30 minutes of waking up more frequently than FM cigarette users (64.3% vs. 57.6%, respectively). The timing of initial cigarette consumption after waking up serves as an indicator of nicotine addiction levels.

Nicotine addiction is associated with significant health risks, including heart disease, diabetes, hypertension, chronic respiratory ailments, and cancer[30]. Nicotine consumption also leads to increased heart rate and blood pressure. This is consistent with the current study's observation of hypertension prevalence at 4.60% among FM cigarette users and 7.30% among RYO cigarette users. The prevalence of diabetes was 1.50% among FM cigarette users and 3.70% among RYO cigarette users, while high blood cholesterol levels were observed in 0.50% of FM cigarette users and 2.10% of RYO cigarette users[23].

Furthermore, nicotine increases the risk of developing conditions such as emphysema, bronchitis, heart disease, and respiratory disorders. Interestingly, one study found that RYO cigarette users had a higher prevalence of asthma (3.10%) compared to FM cigarette users (0.50%)[23]. These differences may be due to variations in age, demographics, and nicotine addiction levels among the respective user groups.

The finding that RYO cigarette users exhibited higher nicotine dependence than FM cigarette users was unexpected, as previous research suggested comparable or lower levels of dependence in RYO smokers. Studies by Joseph et al.[16] and Young et al.[8] reported that RYO smokers perceive these cigarettes as less harmful and exhibit lower levels of dependence. However, our findings demonstrated significantly higher nicotine dependence in RYO smokers, which could be attributed to regional differences in smoking habits and the higher nicotine content of locally produced RYO tobacco. These results suggest that RYO cigarette users may require more intensive nicotine dependence interventions than previously thought, which has implications for tobacco control strategies and cessation programs tailored to the unique dependence profiles of RYO smokers. Additionally, the current smoking landscape has shifted significantly with the rise of e-cigarettes and other vaping products. While traditional cigarette smoking rates have generally declined in many regions, the use of e-cigarettes has surged, particularly among younger populations. This shift has prompted ongoing debate about the relative harm of e-cigarettes compared to conventional smoking. Recent studies suggest that while e-cigarettes are often perceived as less harmful than traditional cigarettes, this perception varies by population and product type. Some users believe e-cigarettes are safer due to the absence of combustion, but misconceptions about their potential risks remain widespread. Research by McNeill et al.[31] suggests that while e-cigarettes likely pose fewer health risks than smoking, their long-term health effects are still not fully understood. To guide future research, it is crucial to explore how perceptions of harm influence usage patterns, especially among younger individuals and dual users (those who smoke both e-cigarettes and traditional cigarettes), as these products could serve as both harm reduction tools and gateways to nicotine addiction.

Limitations

This study lacked data on nicotine levels in the RYO tobacco used by participants. In addition, we did not investigate the causal factors related to attitudes toward harm and nicotine addiction, such as personal preferences, media influence, or the smoking behaviors of close acquaintances. Future research should investigate the chemical composition of RYO cigarettes to provide a clearer understanding of their impact on nicotine dependence. Also, future research should address this gap by exploring the various factors that contribute to smoking behavior. Additionally, this study did not examine data based on the

participants' residential locations by region. Future studies should investigate how regional differences in residential locations influence attitudes and smoking behaviors, as tobacco production areas have been shown to impact these factors.

Conclusion

This study provides valuable insights into the factors influencing smoking behaviors and risk perceptions among RYO and FM cigarette users, highlighting the impact of demographic, socioeconomic, and educational factors. The findings emphasize the importance of targeted interventions and educational initiatives tailored to specific demographic groups. By understanding the demographic characteristics, socioeconomic factors, and attitudes of research participants, we can better address the nuanced dynamics of smoking behaviors and harm perception. Overall, this study underscores the need for effective interventions and educational programs that specifically target the smoking-related health risks faced by different demographic groups.

Conflict of interest

The authors declare no conflicts of interest.

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Supplementary Table 1 Estimates of the linear regression model of harm perception and predictor factors

Perception of harm	3.1			3.2			3.3			3.4			3.5			3.6		
	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value
Predictor																		
Gender (Male=1, Female=2)	−1.475	2.318	0.350	4.912	3.173	0.947	5.946	1.932	0.075	1.266	2.053	0.861	−0.031	2.390	0.334	1.859	2.460	0.349
Age (18–35=1, 35–60=2, >60=3)	−2.611	1.382		2.268	1.892		1.314	1.152		0.185	1.224		0.591	1.425		3.893	1.467	
Marital status (Single=1, Married=2, Separated=3, Divorced=4)	2.095	1.269		−2.839	1.738		−1.173	1.058		−0.111	1.124		−0.963	1.309		−3.395	1.347	
Education (Uneducated =1, High school graduate or less=2, Some college/ Associate's degree=3, Bachelor's degree or higher=4)	−0.018	0.264		0.218	0.361		0.086	0.220		−0.028	0.234		−0.026	0.272		0.313	0.280	
Past-month income (<10,000 THB=1, 10,000–30,000 THB=2, 30,001–50,000 THB=3, >50,001 THB=4)	0.373	0.457		−0.962	0.626		−0.622	0.381		−0.016	0.405		−0.648	0.471		−1.526	0.485	
Comorbidity (None=1, Hypertension=2, Diabetes=3, Dyslipidemia=4, Obesity=5, Coronary artery disease=6, Asthma=7, Other respiratory diseases=8)	0.023	0.102		0.041	0.140		0.098	0.085		−0.117	0.091		−0.102	0.106		0.181	0.109	

Supplementary Table 1 (continued)

Perception of harm	3.1			3.2			3.3			3.4			3.5			3.6		
	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value	B	SE B	p-value
Cigarette type (RYO=1, FM=2, Other=3)	0.962	0.464		−0.918	0.636		−0.358	0.387		−0.216	0.411		0.074	0.479		−0.549	0.493	
First smoke (<12 yrs.=1, 12–18 yr=2, >19 yrs.=3)	0.496	0.516		−0.058	0.707		−0.693	0.431		−0.421	0.457		0.674	0.532		0.290	0.548	
Time for a smoke (1–10 yrs=1, 11–20 yrs=2, >21 yrs=3)	−0.023	0.480		1.090	0.657		1.034	0.400		0.630	0.425		0.508	0.494		1.606	0.509	
Number of cigarettes per day (<1=1, 1=2, 2–5=3, 6–10=4, 11–20=5, >21=6)	−0.139	0.302		−0.045	0.414		−0.201	0.252		−0.169	0.268		−0.072	0.312		−0.033	0.321	
How much do you spend on cigarettes (1–50 THB =1, 50–100 THB =2, >100 THB=3, Get it for free=4)	−0.590	0.342		−0.169	0.468		−0.486	0.285		0.096	0.303		0.148	0.352		0.018	0.363	

B=unstandardized B, SE B=standard error of the coefficient, RYO=roll-your-own, FM=factory-made

Supplementary Table 2 Estimates of the linear regression model of nicotine dependence and predictor factors

Predictor	Nicotine dependence (Very low level of dependence on nicotine=1, Low dependence=2, Medium dependence=3, High dependence=4, Very high dependence=5)		
	B	SE B	p-value
Gender (Male=1, Female=2)	-1.269	1.571	0.146
Age (18–35=1, 35–60= 2, >60=3)	-0.344	0.937	
Marital status (Single=1, Married=2, Separated=3, Divorced=4)	0.020	0.860	
Education (Uneducated=1, High school graduate or less=2, Some college/ Associate's degree=3, Bachelor's degree or higher=4)	-0.433	0.179	
Past-month income (<10,000 THB=1, 10,000–30,000 THB=2, 30,001–50,000 THB=3, >50,001 THB=4)	0.323	0.310	
Comorbidity (None=1, Hypertension=2, Diabetes=3, Dyslipidemia=4, Obesity=5, Coronary artery disease=6, Asthma=7, Other respiratory diseases=8)	-0.065	0.069	
Cigarette type (RYO=1, FM=2, Other=3)	0.061	0.315	
First smoke (<12 yrs=1, 12-18 yrs=2, >19 yrs.=3)	-0.222	0.350	
Time for a smoke (1-10 yrs=1, 11-20 yrs=2, >21 yrs=3)	0.300	0.325	
Number of cigarettes per day (<1=1, 1=2, 2-5=3, 6-10=4, 11-20=5, >21=6)	-0.046	0.205	
How much do you spend on cigarettes (1-50 THB=1, 50-100 THB=2, >100 THB=3, Get it for free=4)	0.132	0.232	

B=unstandardized B, SE B=standard error of the coefficient, RYO=roll-your-own, FM=factory-made