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Development, validity, and reliability of harm perception and attitudes questionnaire for smokers of roll-your-own and factory-made cigarettes: A pilot study in Southern Thailand

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ABSTRACT

Background: Understanding roll-your-own (RYO) and factory-made (FM) cigarette smokers' perceptions of harm and their attitudes toward smoking is essential for identifying the barriers they face in effective smoking cessation counseling. However, there are few tools available for measuring these perceptions and attitudes among smokers of RYO and FM cigarettes.

Objective: This study aimed to develop and subsequently test the validity and reliability of a questionnaire designed to measure harm perception and attitudes among smokers of RYO and FM cigarettes in Thailand.

Materials and methods: 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 with experience in caring for smokers. The content validity of the questionnaire was measured by three experts. The Cronbach's alpha coefficient was used to measure the internal consistency and reliability of the questionnaire. Data from 30 adult RYO and FM cigarette smokers were considered for the test-retest of reliability, measured using the intraclass correlation coefficient.

Results: The harm perception and attitudes questionnaire for RYO and FM cigarette smokers demonstrated good content validity. The item content validity index of 21 out of 29 items was higher than 0.79, and the scale content validity index was 0.9. Additionally, Cronbach's alpha coefficient of 0.719 and the intraclass correlation coefficient of 0.975 (p<0.001) indicated the good reliability of the tool.

Conclusion: This study presented a validated questionnaire to assess harm perception and attitudes among smokers of RYO and FM cigarettes. The development and validation process ensured the tool's reliability and effectiveness in elucidating smoking behavior and facilitating targeted cessation interventions.

Introduction

Roll-your-own (RYO) cigarette smoking is the most common smoking habit in Thailand.[1] RYO cigarettes contain approximately 60% loose tobacco and are typically smoked without filters.[2] Consequently, RYO cigarette smoking may expose users to more cancer risks than factory-made (FM) cigarettes.[3] RYO cigarette smoking is associated with a high likelihood of developing esophageal[4] and laryngeal cancer.[5] However, the general perception worldwide is that RYO cigarettes are less harmful than FM cigarettes.[1,6-7] On the other hand, the perception that electronic cigarettes

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(e-cigarettes) were equally as harmful as cigarettes was the most commonly held view among adults who smoke.[8-10]

Tobacco control strategies include higher tobacco tax rates, graphic health warnings on tobacco packages, and the use of social media for education and encouraging smoking cessation.[11] Notably, RYO cigarettes have evaded these control strategies. Further, they are a less costly option than FM cigarettes.[6,12] RYO cigarettes are often locally grown, and smokers worldwide are more likely to roll their own cigarettes. Purchased RYO cigarettes frequently come without packaging, potentially shielding smokers from the government-mandated health warnings. In Thailand, RYO cigarette smokers are typically older, more likely to live in rural areas, have lower levels of education, and lack awareness of the adverse effects associated with smoking.[1,7] RYO cigarette smokers also appear to be more addicted compared with FM cigarette smokers.[13]

Thailand is grappling with a sizable level of tobacco use among its adult population, with recent data showing that approximately 23.9% of middle-income and 24.2% of upper middle-income adults were currently using tobacco,[13] representing nearly one-fourth of the adult population and a major public health concern. The government has enacted several policies under the Tobacco Products Control Act B.E. 2560 (2016), effective from July 2017.[14] Despite these comprehensive policies, the reduction in smoking prevalence has been insufficient to meet global health targets. Implementing the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) is ongoing, but challenges remain. The interventions in Thailand have been tailored to the local socio-cultural, economic, and regulatory environment, potentially limiting their generalizability to other regions without considering local conditions.[15]

Harm perception is a combination of hazards and outrage. The hazard component includes not only fear but also perceptions of magnitude and probability, which are components of risk perception. The outrage component encompasses emotional and behavioral responses, allowing for the examination of multifaceted reactions. Thus, harm perception may provide more information for predicting smoking behavior.[16,17] Assessing the harm perception of and attitudes toward smoking among smokers can help identify the barriers they face in effective smoking cessation counseling.

However, the available tools for measuring harm perception and attitudes among RYO and FM cigarette smokers are limited. We developed and tested the validity and reliability of a questionnaire designed to address the need for a simple tool for assessing harm perception and attitudes that measure the two factors among RYO and FM cigarette smokers.

Materials and methods

This pilot study consisted of two phases: 1) the development of the questionnaire and 2) the validation and reliability testing of the questionnaire. Figure 1 shows the steps that followed for questionnaire development, validation, and reliability testing. The processes conducted with a literature review, focus groups, and in-depth interviews to develop a list of items covering the relevant areas that should inform a questionnaire assessing harm perception and attitudes of RYO and FM cigarette smokers. Interview was performed after the participants gave written informed consent.

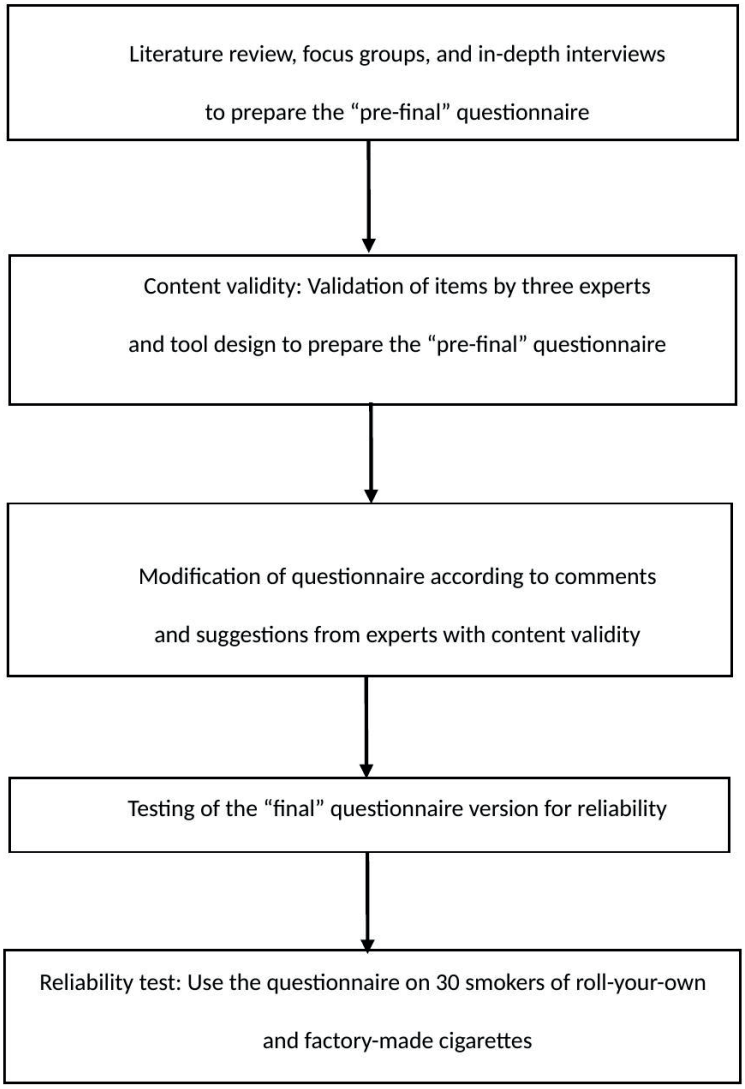


***Figure 1**. The steps that followed for questionnaire development, validation, and reliability testing.*

In Phase 1 (questionnaire development), eight adult smokers of RYO and FM cigarettes from a community in a southern region of Thailand were participated in focus groups. Conducting a focus group entailed defining clear objectives and research questions. As mentioned previously, participants were carefully identified and selected based on relevant criteria. A structured discussion guide was developed to delineate topics and questions pertinent to key areas of interest. The focus group session was then conducted, during which detailed notes were taken to capture key points. Subsequently, the collected data was analyzed in alignment with the study's objectives and questions.

For the in-depth interviews, we extended invitations to two physical therapists, one physician and one nurse, who possessed substantial three years' experience in providing education, screen for tobacco use and incorporate cessation strategies to smokers of RYO and FM cigarettes. In-depth interviews included an open-ended, discovery-oriented approach utilized to acquire comprehensive insights on several key areas, including perceptions of harm, attitudes toward smoking, factors influencing perceptions of harm and attitudes, and the health impacts associated with smoking. Data were collected from March 2022 to May 2023.

In Phase 2, content validation was evaluated by three experts with at least three years' experience in caring for smokers or conducting research with cigarette smokers, and who had developed or used questionnaires. This panel included two physical therapist instructors and one nurse. The reliability test was performed with 30 adult smokers of RYO and FM cigarettes. Participants in the focus groups and reliability test met the inclusion criteria: aged 18 or older, active smoker of RYO or FM cigarettes, good communication ability, and willingness to cooperate. The exclusion criteria included the inability to communicate in, read, or understand the Thai language and smoking both RYO and FM cigarettes. Data was collected through face-to-face interviews. Adult RYO and FM cigarette smokers were asked the level of agreement questionnaire. The responses were classified according to their harm perception and attitudes toward smoking.

Development of the questionnaire

Literature on harm perception, attitude, factors affecting harm perception and attitude, and the effects of smoking on health were reviewed. The questionnaire included three parts: 1) Harm perceptions, with four items; 2) Attitudes toward smoking, with 20 items; and 3) Attitudes toward smoking cessation, with five items. The focus group among eight smokers of RYO and FM cigarettes to explore their harm perception, attitudes toward smoking, and attitudes toward smoking cessation were conducted. The participants were recruited from communities in a Southern region of Thailand using convenience sampling. We also conducted four in-depth interviews with healthcare experts.

Content validity test

To determine the relevance of the items on harm perception and attitudes, the content validity for scales (S-CVI) and item content validity index (I-CVI) were measured, thereby ensuring consistency with the objective content. The content validation was evaluated by three experts, who rated each item based on its relevance to the objectives for calculating the I-CVI using a 4-point scale: 1 (*not relevant to the measured domain*), 2 (*somewhat relevant to the measured domain*), 3 (*quite relevant to the measured domain*), and 4 (*highly relevant to the measured domain*). The I-CVI index for the three experts must be equal to 1.0 indicating a good content validity.[18] The universal agreement (UA) scores was assessed which obtains the S-CVI/UA, representing the proportion of items achieving a rating of 3 or 4 by all the content experts.[19] An S-CVI/UA index of at least 0.8 is considered acceptable.[20]

Reliability test

The reliability of the questionnaire was tested with 30 participants that are based on the intra-class correlation test from Cronbach's alpha coefficient result. A sample size of 30 respondents who smoked RYO or FM cigarettes has been proposed sufficiently to assess the reliability of the questionnaire.[21] The Cronbach's alpha coefficient was classified into four cutoff points: ≤0.5 (*low internal consistency reliability*), 0.5-0.7 (*moderate internal consistency reliability*), 0.7-0.9 (*high internal consistency reliability*), and ≥0.9 (*excellent internal consistency reliability*).[22] Acceptable value for Cronbach's alpha coefficient is typically above 0.7.[23]

Next, the test-retest reliability with the intraclass correlation coefficient (ICC) for a two-day interval was evaluated.[24] The ICC index ranges from 0 to 1, which is the ICC values of 0.5 and below, 0.5-0.75, 0.75-0.9, and 0.90 and above indicate poor, moderate, good, and excellent reliability, respectively.[25] An ICC index of 0.75 or higher is considered acceptable.[26]

The data were processed and analyzed using IBM SPSS Statistics for Windows, version 26 (SPSS Inc, Chicago, IL). The statistical significance level was set at $p<0.05$.

Results

Demographic data

The demographic data of 30 respondents to assess the test-retest reliability of the questionnaire is presented in Table 1. Most of participants (63.3%) were FM cigarette smokers.

Table 1. Demographic characteristics of the FM and RYO cigarette smokers (N=30).

Characteristics	N	%
Sex		
Male	30	100.0
Age (years)		
18–35	13	43.3
35–60	16	53.3
>60	1	3.3
Marital status		
Single	15	50.0
Married	11	36.7
Separated	3	10
Divorced	1	3.3
Education level		
Primary school	3	10.0
Secondary school	13	43.3
Diploma school	10	33.3
Bachelor's degree	3	10.0
Non-formal education	1	3.3
Past month income		
<10,000 THB	12	40.0
10,000–30,000 THB	17	56.7
30,001–50,000 THB	1	3.3
Occupation		
Employee	20	66.7
Government official	5	16.7
Others	5	16.7
Comorbidity		
None	25	83.3
Hypertension	5	16.7

***Note**: 1 THB = 0.03485 USD, as of June, 20*

Validity

A total of 21 of the 29 items of the harm perception and attitudes questionnaire showed an I-CVI higher than 0.79, indicating that item content validity was at an acceptable level. The S-CVI index of the harm perception and attitudes questionnaire was 0.9, indicating an acceptable level of content validity (Table 2).

Table 2. Content validity of the harm perception and attitudes questionnaire.

Items of the harm perception and attitudes questionnaire	I-CVI	S-CVI
Harm perception		**0.90**
Q1: Do you think that RYO cigarettes are less addictive and harmful than FM cigarettes?	1 (>0.79)	
Q2: Are you aware that RYO cigarettes can cause serious diseases, such as cancer, emphysema, and heart disease?	1 (>0.79)	
Q3: Are you aware that FM cigarettes can cause serious diseases, such as cancer, emphysema, and heart disease?	1 (>0.79)	
Q4: Do you think that RYO cigarettes contain less nicotine than FM cigarettes?	0.67 (<0.79)	
Attitudes toward smoking		
Q5: Do you think there are more men who smoke FM cigarettes than those who smoke non-FM cigarettes?	0.67 (<0.79)	
Q6: Do you think there are more men who smoke RYO cigarettes than those who smoke non-RYO cigarettes?	0.67 (<0.79)	
Q7: Do you think there are more women who smoke FM cigarettes than those who smoke non-FM cigarettes?	0.67 (<0.79)	
Q8: Do you think there are more female who smoke RYO cigarettes than those who smoke non-RYO cigarettes?	0.67 (<0.79)	
Q9: Do you think that FM cigarette smoking is more relaxing than non-smoking?	1 (>0.79)	
Q10: Do you think that RYO cigarette smoking is more relaxing than non-smoking?	1 (>0.79)	
Q11: Do you think that men who smoke FM cigarettes are more attractive than those who don't smoke FM cigarettes?	1 (>0.79)	
Q12: Do you think that men who smoke RYO cigarettes are more attractive than those who don't smoke RYO cigarettes?	1 (>0.79)	
Q13: Do you think that women who smoke FM cigarettes are more attractive than those who don't smoke FM cigarettes?	1 (>0.79)	
Q14: Do you think that women who smoke RYO cigarettes are more attractive than those who don't smoke RYO cigarettes?	1 (>0.79)	
Q15: What should you do if a friend or close friend invites you to smoke FM or RYO cigarettes?	1 (>0.79)	
Q16: How difficult would it be for you to reduce or quit smoking?	1 (>0.79)	
Q17: Do you think FM cigarettes are harmful to your health?	1 (>0.79)	
Q18: Do you think RYO cigarettes are harmful to your health?	1 (>0.79)	
Q19: Do you think RYO cigarettes are more or less harmful to your health compared with FM cigarettes?	1 (>0.79)	
Q20: Are you likely to distance yourself from friends who smoke?	0.67 (<0.79)	
Q21: What are your thoughts on men who smoke FM cigarettes?	1 (>0.79)	
Q22: What are your thoughts on men who smoke RYO cigarettes?	1 (>0.79)	
Q23: What are your thoughts on women who smoke FM cigarettes?	1 (>0.79)	
Q24: What are your thoughts on women who smoke RYO cigarettes?	1 (>0.79)	

Table 2. Content validity of the harm perception and attitudes questionnaire (*continued*).

Items of the harm perception and attitudes questionnaire	I-CVI	S-CVI
Attitudes toward smoking cessation		
Q25: Are you thinking of quitting smoking FM or RYO cigarettes from now on?	1 (>0.79)	
Q26: Have you made efforts to quit smoking FM or RYO cigarettes within the past three months?	1 (>0.79)	
Q27: If you want to quit smoking, FM RYO cigarettes can be discontinued?	1 (>0.79)	
Q28: Have you ever received help or given advice on how to quit smoking FM or RYO cigarettes?	0.67 (<0.79)	
Q29: How much time do you think you will need to quit smoking?	0.67 (<0.79)	

***Note**: FM: factory-made cigarettes, RYO: roll-your-own (RYO) cigarettes, S-CVI: scale level content validity index, I-CVI: item content validity index.*

Reliability

Regarding the internal consistency reliability of the harm perception and attitudes questionnaire, the Cronbach's alpha coefficient of 0.719 indicated acceptable internal consistency. The test-retest reliability using ICC between the first and second scores of the questionnaire indicated very high reliability (0.975; $p<0.001$).

Discussion

The resultant questionnaire, addressing harm perception and smoking attitudes, exhibited favorable content validity and high internal consistency, ensuring its reliability for subsequent research endeavors. A deeper exploration into harm perception, encompassing both cognitive aspects (e.g., fear or hazard) and emotional dimensions (e.g., outrage), becomes pivotal for predicting smoking behavior and designing effective cessation interventions.[6] The results highlight that RYO smokers found emotional reassurance in product simplicity despite recognizing health risks, while FM smokers associated harm with chemical additives, reflecting a rational risk assessment.[27,28] Effective interventions must address both components. Unlike previous tools, this survey uniquely measures subtle beliefs, such as RYO naturalness and FM additive suspicion, while distinguishing health perceptions from cost considerations.

Validity and reliability

The content validity of the questionnaire was established through a comprehensive literature review and consultations with medical professionals possessing extensive experience in caring for smokers of RYO and FM cigarettes. The content validity of our questionnaire was established through a meticulous literature review and consultations with experts who have excellent on the education and technology fields. Including items that cover a wide spectrum of relevant topics increased the questionnaire's relevance and comprehensiveness. Furthermore, engagement with focus groups including adult RYO and FM cigarette smokers, alongside in-depth interviews with medical professionals experienced in caring for RYO and FM cigarette smokers, enhanced the questionnaire's clarity and content validity. Regarding reliability of the harm perception and attitudes questionnaire, the questionnaire exhibited high internal consistency, as indicated by a Cronbach's alpha coefficient of 0.719, signifying an acceptable level of internal consistency among the questionnaire items, affirming their consistent measurement of the underlying constructs.

I- and S-CVI index of the harm perception and attitudes questionnaire were presented to assess construct validity. The CVI revealed a distinct factor structure consisting of three factors—harm perceptions, attitudes toward smoking, and attitudes toward smoking cessation. Each factor exhibited strong factor loadings, confirming that the questionnaire items effectively measured the intended constructs.

Smoking behaviors in Southern Thailand

The use of the questionnaire in Thailand and Asia provides a culturally unique voice to the international debate regarding smoking behavior. For instance, the study established that RYO cigarettes in Thailand are not just an inexpensive alternative but also a rural cultural norm. This type of cultural setting influences harm perception and attitudes differently compared to Western countries where RYO use is specialized and translates to individuality. Through access to these regional variations, the questionnaire provides data crucial to the development of culturally specific public health interventions, particularly for disadvantaged populations like Southeast Asia.

Smoking continues to pose a significant public health concern in Thailand, contributing to over 50,000 deaths annually.[29] The smoking prevalence among Thai adults decreased from 32% in 1991 to 20.7% in 2009; however, since 2009, it has remained stable at around 19-20%. Understanding the diverse smoking behaviors requires exploring cultural and socio-economic factors.[30] Cultural factors significantly shape smoking behaviors, with varying perceptions influenced by local norms and traditions.[29] For instance, in Southern part of Thailand, smoking is often revealed as a rite of passage or a social activity.

Socio-economic status (SES) significantly impacts smoking behaviors. Previous research reported a strong relationship between SES indicators and smoking habits in the Thai population, suggesting that economic factors

like income and education level can influence smoking prevalence.[31] Thus, lower SES groups might have higher smoking rates due to less access to health education and resources. Consistent with this theory that most participants had low to mid-income levels.

Gender differences are also presented in smoking behaviors in Thailand.[29] While men have traditionally been more likely to smoke, recent concerns have been raised about rising smoking rates among women.[32] In this study, all participants were men, which may be due to changing societal roles, higher stress, or targeted marketing by tobacco companies. Studies have shown that women's smoking behavior notably differ from men's, especially in terms of place of residence and occupational status,[33] highlighting the need for gender-specific studies and interventions.

Education levels in Thailand significantly may affect smoking habits and prevalence. Previous evidence documented that lower education levels correlated with higher smoking rates and a preference for RYO cigarettes, while higher education levels were associated with reduced smoking rates, especially among men.[33] Therefore, it was consistency with the results in this study that most participants had an education level below a bachelor's degree.

Smoking behaviors in Thailand are influenced by a complex interplay of cultural, socio-economic, and gender-specific factors.[33] Effective tobacco control and cessation interventions must consider these diverse influences to be successful. Recognizing and addressing these varied factors can help tailor public health policies that are culturally sensitive and effective in reducing smoking prevalence across different Thai populations.

A model of harm perception and RYO and FM cigarette attitudes must combine individual, sociocultural, and policy determinants. Harm perception worldwide is influenced by risk perceptions of smoking based on tobacco marketing, packaging, and public health messages.[34] RYO cigarettes are commonly perceived as less harmful based on "natural" imagery even though there is proof that it contains increased toxicant levels.[12] The smoking habits in Asia are influenced by norms, customs, and economics, where RYO cigarette price and cultural self-sufficiency are factors that ensure popularity. Thailand's tobacco control measures, including taxation and health warning measures, impact perceptions[35], although RYO cigarette smoking remains in poor communities owing to affordability and lower harm perceptions. These are the recommendations that inform targeted interventions in Thailand and Asia.

Limitations and future directions

In the preliminary phases of questionnaire development, only the southern part of Thailand is used for the initial evaluation to identify major issues before expanding to other areas. Despite these challenges, this pilot study provides valuable insights for public health strategies aimed at reducing smoking prevalence and fostering informed decision-making among smokers.

This pilot study's sample size was relatively small, necessitating further validation with a larger and more diverse sample. Conducting a Confirmatory Factor Analysis (CFA) represents a critical next step in this research. This analysis will evaluate the factor structure of the questionnaire, ensuring that the items correspond to the hypothesized dimensions of harm perception and attitudes, thereby strengthening the instrument's validity and alignment with the study's theoretical framework. These limitations underscore the need for future research endeavors to encompass broader participant demographics and delve into multifaceted aspects of smoking behavior and related perceptions.

Recommendations

The research and educational potential of the questionnaire is limited by the lack of harm perception and smoking attitude items. Optimal design necessitates well-defined, validated items that are concordant with study aims. Refinement must involve the addition of detailed, focused items, with pilot testing to determine reliability and validity. The cyclical process is needed for the development of a strong instrument that will provide useful information and make a useful contribution to research and practice in this area. It provides researchers with a reliable and valid tool to examine the ethical considerations and harm perception linked to RYO and FM cigarette smoking in southern Thailand. One noteworthy insight of our study is the heightened levels of addiction observed among RYO and FM cigarette smokers. Our findings highlight the importance of understanding risk perceptions and ethical considerations related to harm perception associated with RYO and FM cigarette smoking in southern Thailand. This newly developed scale provides a valuable tool to healthcare providers and policymakers for assessing and addressing barriers to accessing information and understanding harmful perceptions of cigarette smoking, thereby improving public health outcomes. This situation can be partly attributed to the convenient availability of locally grown tobacco, coupled with the practice of personally RYO cigarettes. This personalized approach to RYO smoking also results in diminished exposure to mandated health warnings, pointing toward a regulatory gap necessitating attention.

Responses to questionnaires on smoking behaviors can vary significantly based on socio-economic status, cultural background, and other demographic factors, which can complicate the generalization of findings and the development of effective public health interventions across different groups.[36] While questionnaires are useful for assessing harm perceptions and attitudes towards smoking, their effectiveness is limited by issues such as self-report bias, lack of specificity, predictive power, broad response variability, and social desirability effects.[37] A gap in research on localized harm perceptions of tobacco use in Thailand highlights the need for research on these perceptions to inform targeted public health strategies and enhance smoking cessation programs and policies.

Conclusions

Data received through this questionnaire can be used to inform evidence-based targeted public health interventions. For example, the myth that is established that RYO cigarettes are safer because of their perceived naturalness can be utilized to frame the creation of education campaigns against this myth. In addition, understanding economic motivators for the consumption of RYO could provide the foundation for policies like price controls or programs subsidizing quit aids, correcting the economic drivers of smoking behaviors. These applications are in line with the general aim of reducing the prevalence of smoking by directing interventions to the specific attitudes and perceptions revealed in the study. The methodological consistency employed during the development and validation phases instills confidence in the tool's efficacy and reliability, offering a promising avenue for gaining a deeper understanding of smoking behavior and crafting targeted cessation interventions tailored to these distinct smoking cohorts.

Ethic approval

This study was approved by the Human Research Ethics Committee, Faculty of Medicine, Prince of Songkla University (No. 64-489-30-2).

Conflict of interests

The authors declare that the research was conducted in the absence of any commercial of financial relationships that could be construed as a potential conflict of interest.

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