BMC Public Health

RESEARCH

Open Access

Smoking cessation behavior, nicotine addiction, and mental health among current smokers in Klang Valley, Malaysia– a cross-sectional questionnaire survey

G. Sri Yogaprita Gunasegran[1], Palanisamy Sivanandy[2*], Pravinkumar Vishwanath Ingle[2], Priya Manirajan[2] and Chandrashekhar T. Sreeramareddy[3]

Abstract

Background Poor knowledge of smoking-related diseases is a major concern as smoking is associated with an increasing trend in smoking-related illnesses globally and in Malaysia. Our study aimed to investigate the knowledge of smoking tobacco, smoking behaviour, nicotine use, willingness to quit smoking, and level of stress, anxiety, and depression among current and former smokers in the Klang Valley of Malaysia.

Method A cross-sectional study was conducted online from March 2023 to January 2024, using a structured, validated questionnaire. Individuals with a history of active or previous smoking and living in the Klang Valley region of Malaysia were included using a convenience sampling technique. The study instrument consisted of six sections with 56 questions using varying response types, to collect the data.

Results Out of 395 respondents, the majority were male ($n=326$; 82.5%), between the ages of 41 and 50 ($n=107$; 27.1%). Around 183 (46.3%) had secondary-level education, 50% had an income below RM2000 ($n=210$), and 57.2% lived with family members. The majority of the respondents ($n=327$; 82.8%) knew or believed that smoking tobacco causes serious illness and were aware that smoking tobacco causes heart attack ($n=311$; 78.7%), and lung cancer ($n=310$; 78.4%). Despite knowing the consequences of smoking, the majority currently smoked ($n=273$; 86.1%) and found it difficult to refrain from smoking in places where it is forbidden ($n=153$; 38.7%). More than three-fourths are lived with smokers ($n=301$; 76.2%), and half of them ($n=208$; 52.7%) had attempted to quit smoking in the past 12 months but failed to continue. Women who smoke were about 4.5 times (AOR 4.48, 95%CI 2.06–9.76) more likely to attempt to quit, and individuals who reported seeing health warnings were 5.6 times more likely to make quit attempts. The participants exhibited varying levels of stress, anxiety, and depression, with 22.3% ($n=88$) experiencing severe stress, 37.7% ($n=149$) extreme anxiety, and 32.9% ($n=130$) moderate depression.

Conclusions Smoking tobacco was common among the respondents, despite their awareness of the consequences. The inability to sustain quitting smoking was also prevalent and needs to be addressed promptly to help them

*Correspondence:
Palanisamy Sivanandy
sivapalanisamy@yahoo.co.in

Full list of author information is available at the end of the article

successfully quit. Quitting smoking will enhance their physical, social, and psychosocial well-being and their overall health-related quality of life.

Keywords Behaviour, Depression, Knowledge, Nicotine use, Smoking, Willingness to quit

Introduction

Globally tobacco consumption significantly contributes to preventable mortality and non-communicable diseases, resulting in over eight million deaths each year [1–3]. In Malaysia, there is a substantial burden of smoking-related mortality and disease [1, 4, 5]. According to the National Health and Morbidity Survey 2019, a significant proportion of individuals aged 15 and above in Malaysia engage in smoking behavior, with 30.5% of smokers consuming more than 15 cigarettes per day [4]. A notable portion of the adult population in Malaysia, particularly individuals aged 25 to 44 with lower levels of education, engage in smoking [1, 3, 6]. The Malaysian Ministry of Health aims to reduce smoking prevalence from 22 to 15% by 2025 through the implementation of anti-smoking policies, regulations on tobacco products, and community intervention programs [7]. Cigarettes are the most commonly consumed tobacco product among male smokers in Malaysia (90%), followed by hand-rolled tobacco (40%). Additionally, 85.2% of them have the intention to quit smoking [3, 4, 6]. According to the Global Adult Tobacco Survey, about 60% of smokers were thinking about quitting [8].

The government allocates funding and conducts campaigns to enhance public awareness of mQuit services. The main objective of this service is to carry out smoking cessation programmes in Malaysia involving both the public and private sectors. It is a collaborative effort between the Ministry of Health and the Malaysian Academy of Pharmacy, but it has failed to achieve its target [9, 10]. Contributing factors to the failure to quit smoking include addiction, lack of motivation to quit, the presence of conducive environments for smoking and low awareness about the health effects of tobacco use [11–13]. Studies from China and Bangladesh have reported that low health literacy and lack of knowledge about the hazards of smoking were associated with a lack of intention to quit [14, 15]. Apart from addiction, long-term tobacco use is associated with psychosocial issues [16], increased morbidity and mortality [17], and healthcare expenditures for both individuals and the country [18, 19]. Studies have shown that smokers are more likely to experience anxiety and depression compared to non-smokers [20–24]. Understanding the knowledge about the health effects of tobacco smoking among the smokers, nicotine dependence, their intentions to quit, and the co-existence of psychological conditions among smokers is useful for smoking cessation policies and providing cessation services. Therefore, a study was conducted to assess knowledge of health effects, smoking behavior, nicotine addictions, intention to quit smoking, psychological health, and factors associated with intention to quit in Malaysia.

Materials and methods

Study design, population, and sample recruitment

A cross-sectional questionnaire-based survey was conducted among the general population of the Klang Valley region in Malaysia. The participants included individuals who currently smoke or have smoked in the past. The study was conducted over 10 months from March 2023 to January 2024. The sample size was calculated using the Raosoft sample size calculator, with a 95% confidence interval, a 5% margin of error, and a 50% response rate, resulting in an estimated sample size of 385. Participants had to be current or past smokers, 18 years or older, of any gender or race, and able to read, understand, and consent to respond to the questionnaire included in the study. Participants with incomplete survey responses or significant hearing, visual, or cognitive impairments were excluded.

Study questionnaires, ethics approval, data collection, and analysis

The study questionnaire was developed based on previous research [25, 26] and then adapted to suit the Malaysian context. The study instrument consists of six sections with 56 questions, taking almost 15–20 min to complete the survey. These questions cover demographics, knowledge about the harms of tobacco use, smoking behaviours, nicotine dependence, attempts and willingness to quit smoking, as well as levels of stress, anxiety, and depression.

The study questionnaire is divided into five sections. The first section analyzes the demographic characteristics of the participants, including age, gender, ethnicity, educational attainment, employment status, and monthly income. The second section comprises six questions to assess the participants' understanding of smoking and familiarity with quit-smoking intervention. The third section consists of nine questions that analyze the participants' smoking habits. The fourth section consists of three questions assessing the participants' nicotine consumption using the Tobacco Smoking Questionnaire. The fifth section comprises nine questions that assess the participants' willingness to quit smoking using the Smoking Cessation Questionnaire. The final section includes 21 questions assessing the participants' levels of stress,

anxiety, and depression using the modified Depression, Anxiety, and Stress Scale – 21 items (DASS-21) questionnaire [27]. The questionnaire has been carefully crafted in both Malay and English languages and has been validated. Two certified independent bilingual translators converted the English version of the original questionnaires into Malay. One translator was adept in health care terms, and the other was fluent in informal language, slang, idioms, and emotional words in Malay. The Malay version was pretested by ten experts familiar with both languages and the questionnaire's content. Following the amendment, the translated questionnaires (Malay) were back-translated into the source language (English). Two independent translators translated the Malay versions of the questionnaires into English. They were completely unaware of the original version of the questionnaires and their subsequent back-translation. Final versions of questionnaires in English and Malay were completed and tested for face validity. The Cronbach's alpha value of the questionnaire was 0.867. Data obtained from the pilot study is not included in the final data collection. The study was approved by the International Medical University Joint Committee on Research and Ethics (IMU-JC), with approval number MPP1-2023(5).

This study was conducted using both online and face-to-face modes, with participants selected through convenient sampling methods. The survey questionnaire was distributed through social media platforms such as Facebook, Instagram, and WhatsApp. Face-to-face surveys involved distributing forms in public locations such as shopping malls, shops, parks, and hospitals. Informed consent was obtained from each participant before they were enrolled in the study. We received a total of 408 responses of which 13 responses were excluded due to incomplete data, and finally, 395 participants were included for the final data analysis. Among these 395 participants, 220 were recruited from online surveys conducted through social media platforms like Facebook, Instagram, and WhatsApp, whereas 175 participated through face-to-face surveys conducted by the researcher.

The data collected were tabulated and analyzed using Statistical Package for the Social Sciences (SPSS) version 28.0 [28]. In this study, the independent variables are demographic factors (age, sex, income range, ethnicity, employment status, and living status), participants' knowledge of smoking, smoking behavior, nicotine use, willingness to quit smoking, and levels of stress, anxiety, and depression. Descriptive statistics, frequency, mean, percentage, and student t-tests were utilized to analyze differences in smoking knowledge, behaviour, nicotine use, willingness to quit, and levels of stress, anxiety, and depression among smokers. A test-retest was conducted to assess the reproducibility of the items.

A binary logistic regression was conducted to evaluate the factors associated with quit attempts during the past 12 months as the dependent variable. Respondents' age, sex, education, job status, perceptions about the benefits of smoking, seeing health warnings on cigarette packs, knowledge about the health effects of smoking, DASS score, and FTND score were used as independent variables. Two models were developed: one with all factors entered (full model) and another with only those factors that were significant in univariate analyses. A p-value of less than 0.05 was considered statistically significant. The model fits were tested by R2 values, which were 0.30 and 0.40, which falling within the acceptable range, indicating a good model fit.

Results

Demographic characteristics of the participants

A total of 395 participants responded to the survey. The majority were males (82.5%) aged 41 to 50 years old. About half had received secondary education while a quarter had received higher education. Most of them earned less than RM2000 per month. Respondents were mostly Malays (58%) and Indians (22.5%) (Table 1).

Assessment of knowledge of smoking among the participants

A majority of the general public (82.8%) believed that smoking tobacco is causally linked to severe illnesses, such as heart attack, lung cancer, tooth discoloration, stroke, and asthma. The majority of them agreed that cigarette smoking, as well as passive smoking, are harmful to the health of smokers and non-smokers. The majority of the participants agreed that smoking cessation is beneficial (Supplement 1). Most of the respondents had excellent knowledge about the health hazards of smoking (Table 2).

Assessment of smoking behavior among the participants

The study revealed that 80% of participants were current smokers, began smoking between the ages of 11 and 15, smoked their first cigarette within 5 min of waking up, smoked more frequently during the first hour after waking, and one-third of them (36.2%) were smoking 11–20 cigarettes per day, and intended to continue smoking. The majority find it challenging to refrain from smoking in prohibited areas, and half of them smoke even when they are ill. The details are presented in the Supplementary Tables 2 and 3. Around 18.2% had a smoking behaviour score of above 75%, indicating a high level of smoking behaviour among them. The data are presented in Table 2.

Table 1 The details of the gender-wise distribution of demographic characteristics of the participants ($n = 395$)

Description	Number	Percent (%)
Sex		
Male	326	82.5%
Female	69	17.5%

	Male (n; %)	Female (n; %)	Total (n; %)	*P*-value
Age range (in years)				
Less than 20	2 (0.5)	0 (0)	2 (0.5)	45.13±5.28; 0.498
21-30	37 (9.4)	15 (3.8)	52 (13.2)	
31-40	72 (18.2)	27 (6.8)	99 (25.0)	
41-50	91 (23.0)	16 (4.1)	107 (27.1)	
51-60	73 (18.5)	6 (1.5)	79 (20)	
61-70	46 (11.6)	4 (1.1)	50 (12.7)	
71-80	5 (1.3)	1 (0.2)	6 (1.5)	
Level of education				
Never Been to school	3 (0.8)	0 (0)	3 (0.8)	0.462
Primary level	90 (22.8)	9 (2.3)	99 (25.1)	
Secondary level	173 (43.8)	10 (2.5)	183 (46.3)	
Diploma level	28 (7.1)	10 (2.5)	38 (9.6)	
University level	32 (8.1)	40 (10.1)	72 (18.2)	
Income range				
Below/Bawah RM 2000	185 (46.8)	16 (4.1)	201 (50.9)	0.0327*
RM 2000-RM 3000	77 (19.5)	11 (2.8)	88 (22.3)	
RM 3000-RM 4000	23 (5.8)	10 (2.5)	33 (8.3)	
RM 4000-RM 5000	12 (3.0)	6 (1.5)	18 (4.5)	
RM 5000-RM 10000	16 (4.1)	16 (4.1)	32 (8.2)	
Above RM 10000	14 (3.5)	9 (2.3)	23 (5.8)	
Ethnicity				
Malay	204 (51.6)	24 (6.1)	228 (57.7)	0.3860
Chinese	56 (14.2)	14 (3.5)	70 (17.7)	
Indian	59 (14.9)	30 (7.6)	89 (22.5)	
Others	7 (1.8)	1 (0.3)	8 (2.1)	
Employment status				
Employed	233 (59)	59 (14.9)	292 (73.9)	0.486
Unemployed	57 (14.4)	7 (1.8)	64 (16.2)	
Retired	36 (9.1)	3 (0.8)	39 (9.9)	
Living Status				
Alone	150 (38)	11 (2.8)	161 (40.8)	0.484
With Family	172 (43.5)	54 (13.6)	226 (57.2)	
With Others	4 (1.0)	4 (1.0)	8 (2.0)	

*P-value less than 0.05 is considered statistically significant

Assessment of nicotine product usage and dependency among the participants

The study found that 74.2% of participants smoke tobacco daily, the majority smoke in their workplace, while 52.7% do not use nicotine at all. The details are presented in the Supplementary Table 4. More than two-thirds (69.9%) of participants had high nicotine dependency, with scores of 5 or higher, while 15.4% had moderate dependency. The details are presented in Table 2.

Assessment of willingness to quit smoking among the participants

The study found that over half of the participants (52.7%) had attempted to quit smoking in the past 12 months, whereas overall attempts in the past, 58% of the participants had tried to quit smoking. Methods used to quit smoking included electronic cigarettes, nicotine replacement therapy, traditional medicine, counseling methods, and quitline. The details are presented in the Supplementary Table 5. The study reveals that 53.9% of participants do not know what a smoking cessation program is, while 65.1% of participants said they have been influenced by

Table 2 Respondents' score on the knowledge of smoking, smoking behaviour, nicotine dependency, and willingness to quit smoking ($n = 395$)

	Number of respondents	Percentage (%)
Knowledge score and description		
< 50% (Poor Knowledge, Score 1–4)	71	18
50–75% (Satisfactory knowledge, Score 5–7.5)	18	4.6
> 75% (Excellent Knowledge, Score > 7.5)	306	77.5
Behaviour score and description		
< 50% (Low smoking behaviour)	200	50.6
50–75% (Medium smoking behaviour)	123	31.1
> 75% (High smoking behaviour)	72	18.2
Nicotine dependency score and description		
0–2 (Low nicotine dependency)	58	14.7
3–4 (Medium nicotine dependency)	61	15.4
≥ 5 (High nicotine dependency)	276	69.9
Willingness to quit smoking score and description		
< 50% (Low willingness to quit smoking)	226	57.2
50–75% (Medium willingness to quit smoking)	167	42.3
> 75% (High willingness to quit smoking)	02	0.5

cigarette package warning labels to think about quitting, and around one-third of respondents thought about quitting smoking within the next 12 months. The details are presented in the Supplementary Table 6. In terms of willingness to quit smoking, 57.2% of respondents had a score below 50%, indicating a low willingness to quit smoking. and only 0.5% had a score above 75%, indicating a high willingness. The details are presented in Table 2.

Assessment of stress, anxiety, and depression among smokers using the DASS-21 questionnaire

The study aimed to assess the impact of stress, anxiety, and depression on participants. The responses were categorised into four groups: "did not apply to them at all", "applied to them to some degree, or some of the time", "applied to them to a considerable degree, or a good part of the time", and "applied to them very much, or most of the time".

The assessment of stress among the participants showed that three-forth of them found it hard to wind down, tended to over-react to situations ($n = 298$; 75.4%), felt using a lot of nervous energy ($n = 295$; 74.7%), got agitated ($n = 293$; 74.2%), found it difficult to relax and were intolerant ($n = 291$; 73.7%), and felt rather touchy ($n = 292$; 73.9%).

The assessment of anxiety revealed that a similar proportion of participants experienced dryness of the mouth ($n = 303$; 76.7%), breathing difficulties ($n = 280$; 70.9%), trembling ($n = 273$; 69.1%), worried about situations ($n = 290$; 73.4%), felt close to panic ($n = 278$; 70.4%), heart's action in the absence of physical exertion ($n = 293$; 74.2%), and felt scared without any good reason ($n = 282$; 71.4%).

The assessment of depression showed that more than 70% of participants did not experience any positive feelings at all ($n = 286$; 72.4%), found it difficult to work up the initiative to do things ($n = 291$; 73.7%), felt like they had nothing to look forward to ($n = 281$; 71.1%), felt downhearted and blue ($n = 289$; 73.2%), unenthusiastic about anything ($n = 279$; 70.6%), felt they weren't worth much as a person ($n = 276$; 69.9%), and felt life was meaningless ($n = 277$; 70.1%). The details are presented in Supplementary Table 7.

The study revealed that participants had varying levels of stress, anxiety, and depression. Stress was commonly observed in 45.3% ($n = 179$) of the participants in varying magnitudes. Similarly, the majority of the study participants experienced anxiety ($n = 301$; 76.2%) and depression ($n = 297$; 75.2%) in varying magnitudes from mild to extremely severe levels. The details are presented in Table 3.

Correlation analysis of the responses

The Pearson correlation and chi-square test revealed a strong correlation between respondents' knowledge of smoking, smoking behaviour, nicotine product use, and willingness to quit smoking and their levels of stress, anxiety, and depression. The details are presented in Supplementary Table 8.

In univariate analyses, female sex, Chinese ethnicity, perceived benefits of quitting, seeing health warnings, knowledge about smoking-related health effects, and FTND score were associated with quit attempts in the past year. However, when factors significant in univariate analyses only were added as independent variables in the regression model, perceived benefits from smoking and FTND score were no longer associated with

Table 3 The level of severity of stress, anxiety, and depression among the respondents ($n = 395$)

Severity Level	Stress (Score); *n* (%)	Anxiety (Score); *n* (%)	Depression (Score); *n* (%)
Normal	(0–14); 216 (54.7%)	(0–7); 94 (23.8%)	(0–9); 98 (24.8%)
Mild	(15–18); 32 (8.1%)	(8–9); 9 (2.3%)	(10–13); 21 (5.3%)
Moderate	(19–25); 27 (6.8%)	(10–14); 119 (30.1%)	(14–20); 130 (32.9%)
Severe	(26–33); 88 (22.3%)	(15–19); 24 (6.1%)	(21–27); 44 (11.1%)
Extremely Severe	(34+); 32 (8.1%)	(20+); 149 (37.7%)	(28+); 102 (25.8%)

Scores on the DASS-21 have been multiplied by 2 to calculate the final score as the DASS-21 calculation

Table 4 Factors associated with intentions to quit smoking among Malaysian smokers

Category	Univariate analyses		Parsimonious model		Full model	
	Unadjusted Odds Ratio (95% CI)	*P*-Value	Adjusted Odds Ratio (95% CI)	*P*-Value	Adjusted Odds Ratio (95% CI)	*P*-Value
Age	1.00 (0.99–1.02)	0.553			0.99 (0.97–1.02)	0.613
Sex						
Male	1					
Female	3.08 (1.76–5.37)	< 0.001*	4.51 (2.10–9.66)	< 0.001*	4.48 (2.06–9.76)	< 0.001*
Ethnicity						
Malay	1					
Indian	1.32 (0.67–2.48)	0.393	1.19 (0.54–2.66)	0.661	1.28 (0.57–2.86)	0.554
Chines	2.97 (1.70–5.19)	< 0.001*	2.29 (1.17–4.49)	0.016*	2.20 (1.11–4.36)	0.023
Education						
Primary/none	1					
Secondary level	1.44 (0.84–2.49)	0.185	1.79 (0.82–3.89)	0.141	1.46 (0.62–3.45)	0.385
Diploma/university	2.23 (1.41–3.70)	< 0.001	2.06 (1.04–4.06)	0.038	1.68 (0.80–3.51)	0.173
Employment						
Employed	1				1	
Unemployed/Retired	1.08 (0.70–1.72)	0.686			1.14 (0.57–2.29)	0.703
Income						
Below RM 2000	1				1	
> 2000	0.69 (0.46–1.02)	0.065			0.62 (0.32–1.18)	0.145
Benefits from quitting smoking						
Not at all	1		1		1	
Very Much	5.95 (3.29–10.78)	< 0.001*	1.79 (0.62–5.19)	0.285	1.76 (0.60–5.15)	0.303
Seeing health warnings leads to thoughts about quitting						
No	1		1		1	
Yes	6.37 (3.92–10.36)	< 0.001*	5.81 (3.27–10.35)	< 0.001*	5.67 (3.17–10.15)	< 0.001*
KNOW Score	1.24 (1.16–1.33)	< 0.001*	1.16 (1.03–1.31)	0.015*	1.18 (1.04–1.33)	0.011*
DASS Score	1.00 (0.99–1.01)	0.767			1.00 (0.99–1.02)	0.781
FTND Score	0.90 (0.84–0.97)	0.003*	0.93 (0.84–1.03)	0.153	0.92 (0.83–1.02	0.099

quit attempts. In the full model, all factors except education that were significant in the parsimonious model remained significantly associated with quit attempts.

Women who smoke were approximately 4.5 times more likely to make a quit attempt (AOR 4.48, 95% CI 2.06–9.76) compared to men. Chinese individuals who smoke were twice as likely to make a quit attempt compared to Malays.

Individuals who reported seeing health warnings were 5.6 times more likely to make quit attempts compared to those who did not see health warnings on cigarette packs. For each point increase in knowledge score, the odds of attempting to quit increased by a factor of 1.2. The details are presented in Table 4.

Discussion

The survey among middle-aged men with lower education and income levels revealed that they have good knowledge about the health effects of tobacco smoking. Those who smoked had moderate to high levels of nicotine dependence but less than half had attempted to quit while over half were willing to quit. Intention to quit was associated with female sex, Chinese race, a higher level of knowledge about health effects, and exposure to information about the health effects of tobacco smoking.

Our study found a higher prevalence of smoking among males, aged 30–60 years, urban dwellers, those educated up to the secondary level, and with an income lower than RM200 per month, similar to national health and morbidity survey data [3, 4, 29, 30]. Those with higher educational attainment are less likely to engage in smoking behavior, as they have greater knowledge and are more receptive to health information. Additionally, they have better stress management techniques, reducing the likelihood of turning to tobacco products for stress relief. A study by Lim, KH observed a lower prevalence of smoking among retirees compared to government employees, private sector employees, and self-employed individuals [1, 4]. Employed individuals may face more physical and psychosocial stress due to a lack of job autonomy, which may lead them to turn to smoking as a way to relax [22, 31]. Cultural and social influences play a major role in the prevalence of smoking among these age groups. On the other hand, older individuals are more susceptible to health issues due to the aging process and the onset of smoking-attributable health conditions, which can greatly influence their decision to quit smoking. Furthermore, individuals in poor health may need to visit healthcare facilities more frequently for treatment, increasing their exposure to anti-smoking messages.

Approximately three-fifths of participants lived with a family member who was a smoker or ex-smoker, which is consistent with previous studies [32, 33]. Married individuals receive greater social and psychological support to help them quit smoking [34, 35]. In a study from the United States, smokers who were married or living with a partner were more interested in quitting, or making quit attempts. Disapprobation from family members may play a role in an attempt to quit or successful quitting [35]. Harmful behaviours are common among Individuals who are single due to social isolation and lack spousal/family support [36, 37].

A higher awareness of smoking-related serious illnesses and the harms of second-hand smoke in our study is consistent with previous studies [38, 39]. The perceived health benefits of smoking cessation are similar to a previous study in which smokers expressed a desire to quit due to concerns over health risks and potential advantages [40]. The study found that the majority of participants were current smokers, in contrast to a study by Lim, et al. [41] in which most participants were non-smokers. In our study, most smokers reported smoking during the first hours after waking up, and more than one-third found it difficult to quit smoking in prohibited places. The smokers in our study had moderate to severe nicotine addiction. Previous studies have reported a comparable level of nicotine addiction using FTND [42–44]. The study found that more than one-third of participants smoked tobacco daily, similar to the study by Lim et al. [4] and Perski et al. [45]. Additionally, over half of the participants in the study did not smoke in their workplace, which is consistent with Kava et al.'s finding that 41% did not smoke while at their organization [46]. Smoke-free work places are common and smoke-free laws aim to protect employees from health hazards from secondhand smoke [47]. Employers have a responsibility to strictly implement smoke-free policies to provide a safe and healthy workplace. In our study, smokers reported that they did not smoke in places where it is prohibited, suggesting strict implementation of smoke-free policies.

Rates of quit attempts and quit intention of smokers in our study are consistent with existing literature [48–50]. Most smokers in our study attempted to quit smoking without assistance, believing it would be the most effective method, which is consistent with the results of the study done by Chean et al. [51]. More than half of the participants in the present study reported not knowing what a smoking cessation program is, which is also consistent with previous studies [10, 52, 53]. The association of intention to quit with knowledge about the health effects of smoking and having seen information about health effects suggests that increased awareness had not translated into seeking professional help from smoking cessation clinics. Improved outreach to smokers by interventions such as text-reminders, quit-lines, which are generally unavailable in developing countries, needs to be implemented [48].

Major depression has been linked to higher rates of daily smoking and increased levels of nicotine dependence [54–56]. Anxiety was found to be significantly higher in smokers compared to non-smokers [57, 58]. Cigarette smoking and nicotine dependence were associated with anxiety disorders, including panic disorder and generalized anxiety disorder [21, 59, 60]. Individuals with stress, and anxiety tend to smoke more cigarettes than healthy adults, perhaps as a coping strategy [20, 61]. Quitting smoking has been shown to improve psychological well-being, enhance mood and quality of life [62–64]. Therefore, we assessed psychological health and nicotine dependence. However, after adjustment, both factors were not associated with quitting. Nevertheless, assessment of psychological health as well as nicotine dependence are established clinical practices in smoking cessation clinics.

This study has several limitations. It was conducted only in the Klang Valley region of Malaysia with a small sample size. There may be a potential response bias. The study was on a convenience sample and results are not representative of the Malaysian population. Therefore, the statistical tests of significance should be cautiously interpreted, and inferences on the population cannot be made. The study also relies on self-reporting of smoking habits, nicotine consumption, stress levels, anxiety, and

depression, which could impact the accuracy of the findings. Additionally, the online nature of the study may bias the sample towards those with higher interest or motivation to respond.

Conclusion

This study examines the correlation between smokers' stress, anxiety, and depression and their comprehension of smoking, behaviors, nicotine consumption, and readiness to quit. It has been found that numerous smokers in this area have a limited understanding of smoking or hold misconceptions, while others are fully aware of the risks of smoking. Effective public health interventions and educational programs are crucial to enhancing smokers' knowledge and encouraging well-informed decision-making. The study emphasizes the importance of considering mental health in the development of smoking cessation programs, stressing the need for personalized learning strategies and readily accessible resources.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-23879-7.

Supplementary Material 1.

Acknowledgements
We would like to thank the management of IMU University for the necessary support in carrying out this research.

Authors' contributions
GSY: concept and design, data collection, statistical analysis, research writing, preparing, and submission of final manuscript. PS: concept and design, interpretation of results, preparing the final manuscript, revising, and approving the final manuscript. PVI: concept and design of the study, revising, and approving the final manuscript. CTS: concept and design of the study, revising, and approving the final manuscript. PM: concept and design of the study, interpretation of results, revising, and approving the final manuscript.

Funding
This study was funded by the IMU University, Kuala Lumpur, Malaysia, the grant approval number is MPP1-2023(05).

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
The proposal was approved by the Joint Committee on Research and Ethics of the IMU University (IMU-JC) [Project ID: MPP1-2023(05)]. The anonymity and confidentiality of the data were respected and maintained throughout the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]School of Pharmacy, IMU University, Kuala Lumpur 57000, Malaysia
[2]Department of Pharmacy Practice, School of Pharmacy, IMU University, Kuala Lumpur 57000, Malaysia
[3]Department of Public Health and Community Medicine and Institute of Research Development and Innovation, IMU University, Kuala Lumpur 57000, Malaysia

Received: 21 April 2024 / Accepted: 4 July 2025
Published online: 06 August 2025

References

1. Lim KH, Cheong YL, Lim HL, Kee CC, Ghazali SM, Pradmahan Singh BSG, Omar MA, Hashim MHM, Cheah YK, Lim JH. Assessment of association between smoking and all-cause mortality among Malaysian adult population: findings from a retrospective cohort study. Tob Induc Dis. 2022;20:50. https://doi.org/10.18332/tid/147656.
2. Awaisu A, Nik Mohamed MH, Abd Aziz N, Syed Sulaiman SA, Mohamad Noordin N, Muttalif AR, Ahmad Mahayiddin A. Tobacco use prevalence, knowledge, and attitudes among newly diagnosed tuberculosis patients in Penang state and Wilayah Persekutuan Kuala Lumpur, Malaysia. Tob Induc Dis. 2010;8(1):3. https://doi.org/10.1186/1617-9625-8.
3. Mohd Yusoff MF, Lim KH, Saminathan TA, Rodzlan Hasani WS, Robert Lourdes TG, Ghazali SM, Abd Hamid HA, Ab Majid NL, Mat Rifin H, Miaw Yn JL. The pattern in prevalence and sociodemographic factors of smoking in Malaysia, 2011–2019: findings from national surveys. Tob Induc Dis. 2022;20:84. https://doi.org/10.18332/tid/152410.
4. Lim KH, Teh CH, Pan S, Ling MY, Yusoff MFM, Ghazali SM, Kee CC, Lim KK, Chong KH, Lim HL. Prevalence and factors associated with smoking among adults in malaysia: findings from the National Health and Morbidity Survey (NHMS) 2015. Tob Induc Dis. 2018;16:01. https://doi.org/10.18332/tid/82190. PMID: 31516402; PMCID: PMC6659615.
5. Khaw WF, Chan YM, Nasaruddin NH, Alias N, Tan L, Ganapathy SS. Malaysian burden of disease: years of life lost due to premature deaths. BMC Public Health. 2023;23(1):1383. https://doi.org/10.1186/s12889-023-16309-z. PMID: 37464344; PMCID: PMC10355013.
6. Chow CY, Hasan MZ, Kamil AA. Prevalence and associated factors related to tobacco consumption among university students in Malaysia. Health Psychol Res. 2024;12:94232. https://doi.org/10.52965/001c.94232. PMID: 38469105; PMCID: PMC10927316.
7. Nor MN, Ross H, Thinng WBK, Ghani JA, Hassan N, Baharom N. Malaysia abridged simsmoke model - towards achieving 2025 and 2045 smoking prevalence targets. Mal J Med Health Sci. 2018;14(3):8–15.
8. Global Adult Tobacco Survey (GATS). Institute of public health. Ministry of Health Malaysia; 2023. Available online: https://iku.nih.gov.my/gats2023. cited 16 March 2025.
9. Kuang Hock L, Hui Li L, Chien Huey T, Yuvaneswary V, Sayan P, Muhd Yusoff MF, Kuang Kuay L, Miaw Yn L, Kee Chee C, Sumarni Mohd G. Support for smoke-free policy among Malaysian adults: findings from a population-based study. BMJ Open. 2019;9(2):e020304. https://doi.org/10.1136/bmjopen-2017-020304. PMID: 30760510; PMCID: PMC6377523.
10. Hasan SI, Kaai SC, Amer Nordin AS, Mohd Hairi F, Danaee M, Yee A, Ahmad Tajuddin NA, Kamaludin IS, Grey M, Yan M, Driezen P, Thompson ME, Quah ACK, Fong GT. Who are more likely to have quit intentions among Malaysian adult smokers? Findings from the 2020 ITC Malaysia survey. Int J Environ Res Public Health. 2022;19(5):3035. https://doi.org/10.3390/ijerph19053035. PMID: 35270727; PMCID: PMC8910535.
11. Guignard R, Quatremère G, Pasquereau A, Jartoux C, Salvaing L, Caline G, Beck F, Nguyen Thanh V. Barriers against and motivations for quitting smoking during the COVID-19 health crisis: results of a qualitative study in France. Int J Environ Res Public Health. 2022;19(20):13051. https://doi.org/10.3390/ijerph192013051. PMID: 36293628; PMCID: PMC9602125.
12. Martins RS, Junaid MU, Khan MS, Aziz N, Fazal ZZ, Umoodi M, Shah F, Khan JA. Factors motivating smoking cessation: a cross-sectional study in a lower-middle-income country. BMC Public Health. 2021;21(1):1419. https://doi.org/10.1186/s12889-021-11477-2. PMID: 34275456; PMCID: PMC8286564.
13. Trofor AC, Papadakis S, Lotrean LM, Radu-Loghin C, Eremia M, Mihaltan F, Driezen P, Kyriakos CN, Mons U, Demjén T, Nogueira SO, Fernández E, Tountas Y, Przewoźniak K, McNeill A, Fong GT, Vardavas CI. EUREST-PLUS consortium. Knowledge of the health risks of smoking and impact of cigarette warning labels among tobacco users in six European countries: findings from the

EUREST-PLUS ITC Europe surveys. Tob Induc Dis. 2019;16:A10. https://doi.org/10.18332/tid/99542.
14. Sun S, Yu H, Ling J, Yao D, Chen H, Liu G. The influence of health literacy and knowledge about smoking hazards on the intention to quit smoking and its intensity: an empirical study based on the data of china's health literacy investigation. BMC Public Health. 2023;23(1):2355. https://doi.org/10.1186/s12889-023-17292-1.
15. Naznin E, George J, Driezen P, et al. Trend over time on knowledge of the health effects of cigarette smoking and smokeless tobacco use in Bangladesh: findings from the international tobacco control policy evaluation Bangladesh surveys. Drug Alcohol Rev. 2023;42(7):1838–49. https://doi.org/10.1111/dar.13735.
16. Peltzer K, Pengpid S. Tobacco use and associated mental symptoms and health risk behaviours amongst individuals 15 years or older in South Africa. S Afr J Psychiatr. 2020;26:1499. https://doi.org/10.4102/sajpsychiatry.v26.i0.1499. PMID: 33240550; PMCID: PMC7669997.
17. Kock L, Brown J, Cox S, McNeill A, Robson D, Shahab L, Tattan-Birch H, Brose LS. Association of psychological distress with smoking cessation, duration of abstinence from smoking, and use of non-combustible nicotine-containing products: a cross-sectional population survey in great Britain. Addict Behav. 2023;138:107570 Epub 2022 Dec 2. PMID: 36493683.
18. Lakshmi R, Romate J, Rajkumar E, George AJ, Wajid M. Factors influencing tobacco use behaviour initiation - from the perspective of the Capability, Opportunity, Motivation- Behaviour (COM-B) model. Heliyon. 2023;9(6):e16385 PMID: 37292260; PMCID: PMC10245169.
19. Philip KE, Bu F, Polkey MI, Brown J, Steptoe A, Hopkinson NS, Fancourt D. Relationship of smoking with current and future social isolation and loneliness: 12-year follow-up of older adults in England. Lancet Reg Health Eur. 2022;14:100302. PMID: 35036984; PMCID: PMC8743222.
20. Ariaratnam S, Kee CC, Krishnapillai AD, Sanaudi R, Tohit NM, Ho KB, Ghazali SS, Omar MA. Smoking status and its relationship with depression among the elderly population in malaysia: findings from the National health and morbidity survey 2018. Tob Induc Dis. 2023;21:109. https://doi.org/10.18332/tid/169682. PMID: 37654502; PMCID: PMC10467346.
21. Hahad O, Beutel M, Gilan DA, Michal M, Schulz A, Pfeiffer N, König J, Lackner K, Wild P, Daiber A, Münzel T. The association of smoking and smoking cessation with prevalent and incident symptoms of depression, anxiety, and sleep disturbance in the general population. J Affect Disord. 2022;313:100–9. Epub 2022 Jun 28. PMID: 35777492.
22. Howes S, Hartmann-Boyce J, Livingstone-Banks J, Hong B, Lindson N. Antidepressants for smoking cessation. Cochrane Database Syst Rev. 2020;4(4):CD000031. https://doi.org/10.1002/14651858.CD000031.pub5.
23. Tedeschi GJ, Cummins SE, Anderson CM, Anthenelli RM, Zhuang YL, Zhu SH. Smokers with self-reported mental health conditions: a case for screening in the context of tobacco cessation services. PLoS ONE. 2016;11(7):e0159127. https://doi.org/10.1371/journal.pone.0159127.
24. Akambase JA, Miller NE, Garrison GM, Stadem P, Talley H, Angstman KB. Depression outcomes in smokers and nonsmokers: comparison of collaborative care management versus usual care. J Prim Care Community Health. 2019;10:2150132719861265. https://doi.org/10.1177/2150132719861265.
25. Papadakis S, Anastasaki M, Papadakaki M, Antonopoulou M, Chliveros C, Daskalaki C, Varthalis D, Triantafyllou S, Vasilaki I, McEwen A, Lionis C. Very brief advice' (VBA) on smoking in family practice: a qualitative evaluation of the tobacco user's perspective. BMC Fam Pract. 2020;21(1): 121. https://doi.org/10.1186/s12875-020-01195-w.
26. Lim HL, Heng PP, Teh CH, Kee CC, Sumarni MG, Lim KH, Lim JH. Prevalence of smoking and its associated risk factors among secondary school students in Kelantan, Malaysia. 2020;6(1):44–50. Available from: https://medic.upm.edu.my/upload/dokumen/2020011611573107_MJMHS_0417.pdf. Accessed 18 Aug 2023.
27. Administrator. DASS21 questionnaire. 2016. Available from https://maic.qld.gov.au/wp-content/uploads/2016/07/DASS-21.pdf. Accessed 15 Jul 2023.
28. IBM Corp. IBM SPSS statistics for windows (Version 28.0) [Computer software]. Chicago, IL, USA: IBM Corp SPSS Inc.; 2021.
29. Barrington-Trimis JL, Braymiller JL, Unger JB, McConnell R, Stokes A, Leventhal AM, Sargent JD, Samet JM, Goodwin RD. Trends in the age of cigarette smoking initiation among young adults in the US from 2002 to 2018. JAMA Netw Open. 2020;3(10):e2019022. https://doi.org/10.1001/jamanetworkopen.2020.19022.
30. Cornelius ME, Loretan CG, Jamal A, Davis Lynn BC, Mayer M, Alcantara IC, Neff L. Tobacco product use among adults - United States, 2021. MMWR Morb Mortal Wkly Rep. 2023;72(18):475–83. https://doi.org/10.15585/mmwr.mm7218a1.
31. Jahnel T, Ferguson SG, Shiffman S, Schüz B. Daily stress as link between disadvantage and smoking: an ecological momentary assessment study. BMC Public Health. 2019;19(1):1284. https://doi.org/10.1186/s12889-019-7631-2. PMID: 31606051; PMCID: PMC6790015.
32. Poole R, Carver H, Anagnostou D, Edwards A, Moore G, Smith P, Wood F, Brain K. Tobacco use, smoking identities and pathways into and out of smoking among young adults: a meta-ethnography. Subst Abuse Treat Prev Policy. 2022;17(1):24. https://doi.org/10.1186/s13011-022-00451-9. PMID: 35346260; PMCID: PMC8960094.
33. Nagawa CS, Pbert L, Wang B, Cutrona SL, Davis M, Lemon SC, Sadasivam RS. Association between family or peer views towards tobacco use and past 30-day smoking cessation among adults with mental health problems. Prev Med Rep. 2022;28:101886. PMID: 35855923; PMCID: PMC9287352.
34. Takagi D, Kondo N, Takada M, Hashimoto H. Differences in spousal influence on smoking cessation by gender and education among Japanese couples. BMC Public Health. 2014;14:1184. https://doi.org/10.1186/1471-2458-14-1184.
35. Faseru B, Richter KP, Scheuermann TS, Park EW. Enhancing partner support to improve smoking cessation. Cochrane Database Syst Rev. 2018;8(8):CD002928. https://doi.org/10.1002/14651858.CD002928.pub4. PMID: 30101972; PMCID: PMC6326744.
36. Ramsey MW Jr, Chen-Sankey JC, Reese-Smith J, Choi K. Association between marital status and cigarette smoking: variation by race and ethnicity. Prev Med. 2019;119:48–51. https://doi.org/10.1016/j.ypmed.2018.12.010.
37. Britton M, Haddad S, Derrick JL. Perceived partner responsiveness predicts smoking cessation in single-smoker couples. Addict Behav. 2019;88:122–8. https://doi.org/10.1016/j.addbeh.2018.08.026.
38. Mohd Kamaruzaman BNA, Ismail MI, Abdul Rashid RA, Sharizal SI, Othman DAS. A cross-sectional study on knowledge and perception about smoking tobacco products among students in University of Cyberjaya. Malays J Med Sci. 2021;17(11):19–25.
39. Dawood OT, Rashan MA, Hassali MA, Saleem F. Knowledge and perception about health risks of cigarette smoking among Iraqi smokers. J Pharm Bioallied Sci. 2016;8(2):146–51. https://doi.org/10.4103/0975-7406.171738. PMID: 27134468; PMCID: PMC4832906.
40. Wang JH, Yang YF, Zhao SL, Liu HT, Xiao L, Sun L, Wu X, Yuan DC, Ma LY, Ju BZ, Liu JP. Attitudes and influencing factors associated with smoking cessation: an online cross-sectional survey in China. Tob Induc Dis. 2023;21:87. https://doi.org/10.18332/tid/166108.
41. Lim KH, Yun YX, Cheong YL, Sulaiman N, Mahadzir ME, Lim JH, Hashim MHM, Lim HL. Construct validity and reliability of the Malay version of the Fagerström test for nicotine dependence (FTND): a confirmatory factor analysis. Tob Induc Dis. 2023;21:36. https://doi.org/10.18332/tid/159624. PMID: 36909814; PMCID: PMC9993235.
42. Lim KH, Cheong YL, Sulaiman N, Yah XY, Mahadzir ME, Lim JH, Kee CC, Mohd Ghazali S, Lim HL. Agreement between the Fagerström test for nicotine dependence (FTND) and the heaviness of smoking index (HSI) for assessing the intensity of nicotine dependence among daily smokers. Tob Induc Dis. 2022;20:105. https://doi.org/10.18332/tid/155376.
43. Liu Z, Li YH, Cui ZY, Li L, Nie XQ, Yu CD, Shan GL, Zhou XM, Qin R, Cheng AQ, Chung KF, Chen ZM, Xiao D, Wang C. Prevalence of tobacco dependence and associated factors in china: findings from nationwide China health literacy survey during 2018-19. Lancet Reg Health West Pac. 2022;24:100464. https://doi.org/10.1016/j.lanwpc.2022.100464.
44. Machulska A, Woud ML, Brailovskaia J, Margraf J, Klucken T. Nicotine-related interpretation biases in cigarette smoking individuals. Sci Rep. 2024;14(1):4796. https://doi.org/10.1038/s41598-024-55256-6. PMID: 38413636; PMCID: PMC10899185.
45. Perski O, Garnett C, Shahab L, Brown J, West R. Associations between smoking status and bodily pain in a cross-sectional survey of UK respondents. Addict Behav. 2020;102:106229. https://doi.org/10.1016/j.addbeh.2019.106229.
46. Kava CM, Parker EA, Baquero B, Curry SJ, Gilbert PA, Sauder M, Sewell DK. Organizational culture and the adoption of anti-smoking initiatives at small to very small workplaces: an organizational level analysis. Tob Prev Cessat. 2018;4:39. https://doi.org/10.18332/tpc/100403. PMID: 32411865; PMCID: PMC7205048.
47. Tabacco Control Laws. Legislation by country/jurisdiction. Malaysia. Available from: https://www.tobaccocontrollaws.org/legislation/malaysia#:~:text=Sales%20Restrictions,under%20the%20age%20of%2018. Accessed 21 March 2025.

48. Sreeramareddy CT, Kuan LP. Smoking cessation and utilization of cessation assistance in 13 low- and middle-income countries - changes between two survey rounds of global adult tobacco surveys, 2009–2021. J Epidemiol Glob Health. 2024. https://doi.org/10.1007/s44197-024-00283-9.
49. Fucito LM, Redeker NS, Ball SA, Toll BA, Ikomi JT, Carroll KM. Integrating a behavioural sleep intervention into smoking cessation treatment for smokers with insomnia: a randomised pilot study. J Smok Cessat. 2014;9(1):31–8. https://doi.org/10.1017/jsc.2013.19.
50. Yasin SM, Moy FM, Retneswari M, Isahak M, Koh D. Timing and risk factors associated with relapse among smokers attempting to quit in Malaysia. Int J Tuberc Lung Dis. 2012;16(7):980–5. https://doi.org/10.5588/ijtld.11.0748.
51. Chean KY, Goh LG, Liew KW, Tan CC, Choi XL, Tan KC, Ooi ST. Barriers to smoking cessation: a qualitative study from the perspective of primary care in Malaysia. BMJ Open. 2019;9(7):e025491. https://doi.org/10.1136/bmjopen-2018-025491.
52. Sakka S, Al-Shatanawi TN, Bataineh DZ, Haddad W, Al Tamimi S, Al Salamat H, Al-Mistarehi AH, Alsulaiman J, Kheirallah K. Knowledge, attitude, practice and perceived barriers towards smoking cessation services among community pharmacists. Pharm Pract (Granada). 2022;20(1):2637. https://doi.org/10.18549/PharmPract.2022.1.2637.
53. Hirko KA, Moore P, An LC, Hawley ST. Tobacco cessation motivations, preferences, and barriers among rural smokers: implications for optimizing referrals in clinical practice. AJPM Focus. 2022;2(1):100057. https://doi.org/10.1016/j.focus.2022.100057.
54. Wang P, Abdin E, Asharani PV, Seet V, Devi F, Roystonn K, Lee YY, Cetty L, Teh WL, Verma S, Mok YM, Subramaniam M. Nicotine dependence in patients with major depressive disorder and psychotic disorders and its relationship with quality of life. Int J Environ Res Public Health. 2021;18(24):13035. https://doi.org/10.3390/ijerph182413035.
55. Kang SH, Jeong W, Jang SI, Park EC. The effect of depression status change on daily cigarette smoking amount according to sex: an eleven-year follow up study of the Korea welfare panel study. BMC Public Health. 2021;21(1):1304. https://doi.org/10.1186/s12889-021-11362-y.
56. Piirtola M, Kaprio J, Baker TB, Piasecki TM, Piper ME, Korhonen T. The associations of smoking dependence motives with depression among daily smokers. Addiction. 2021;116(8):2162–74. https://doi.org/10.1111/add.15390.
57. Abd Rashid R, Kanagasundram S, Danaee M, et al. The prevalence of smoking, determinants and chance of psychological problems among smokers in an urban community housing project in Malaysia. Int J Environ Res Public Health. 2019;16(10): 1762. https://doi.org/10.3390/ijerph16101762.
58. Vong V, Simpson-Yap S, Phaiju S, et al. The association between tobacco smoking and depression and anxiety in people with multiple sclerosis: a systematic review. Mult Scler Relat Disord. 2023;70:104501. https://doi.org/10.1016/j.msard.2023.104501.
59. Zimmermann M, Chong AK, Vechiu C, Papa A. Modifiable risk and protective factors for anxiety disorders among adults: a systematic review. Psychiatry Res. 2020;285: 112705. https://doi.org/10.1016/j.psychres.2019.112705.
60. Shafiee A, Goodarzi M, Firouzabadi SR, Mohammadi I, Sadeghi D, Zarei M, Abdollahi A, Kolahdooz A, Bakhtiyari M. Investigating the relationship between smoking and panic disorder: a cross-sectional study among US adults. Depress Anxiety. 2024;2024:8530368. https://doi.org/10.1155/2024/8530368.
61. Wu AD, Gao M, Aveyard P, Taylor G. Smoking cessation and changes in anxiety and depression in adults with and without psychiatric disorders. JAMA Netw Open. 2023;6(5):e2316111. https://doi.org/10.1001/jamanetworkopen.2023.16111. PMID: 37256615; PMCID: PMC10233414.
62. Taylor GM, Lindson N, Farley A, Leinberger-Jabari A, Sawyer K, Te Water Naudé R, Theodoulou A, King N, Burke C, Aveyard P. Smoking cessation for improving mental health. Cochrane Database Syst Rev. 2021;3(3):CD013522. https://doi.org/10.1002/14651858.CD013522.pub2. PMID: 33687070; PMCID: PMC8121093.
63. Mahase E. Stopping smoking may improve mental health, cochrane review finds. BMJ. 2021;372:n676. https://doi.org/10.1136/bmj.n676. PMID: 33692034.
64. Mezzoiuso AG, Odone A, Signorelli C, Russo AG. Association between smoking and cancers among women: results from the fricam multisite cohort study. J Cancer. 2021;12(11):3136–44. https://doi.org/10.7150/jca.54624. PMID: 33976723; PMCID: PMC8100791.

Publisher's Note