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Assessing the Factors Associated with Smoking at Public Universities with Smoke-Free Campus Policy in Malaysia

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The smoke-free campus policy in universities is one effort to combat smoking habits and to create non-smoking social norms. This is important, as young adulthood represents a critical period for the development of tobacco use. Thus, this study aimed to assess the factors associated with smoking at public universities with smoke-free campus policy in Malaysia. This was a cross-sectional study performed at the two public universities in Malaysia that were the earliest to have implemented the policy. The study involved a total of 1,063 respondents, stratified by the number of students and staff and aged ≥18 years. Data were collected from September 2019 to November 2019 using a self-administered online questionnaire. Among the respondents, 5.2% were smokers. The respondents had good knowledge of smoking (68.6%). The majority had negative attitudes (95.8%) and practices (89.7%) towards smoking. There were significant associations between smoking status and gender (p=<0.001; 95% CI 3.2,16.04), income level (p=0.02; 95% CI 1.16, 5.34), smoking attitude (p=0.003; 95% CI 0.12, 0.66), and practice (p=<0.001; 95% CI 0.09, 0.33). Our findings show that universities that implement a smoke-free campus policy have low smoking prevalence, good knowledge and negative attitude and practice toward smoking. However, we recommend that the relevant authorities consider all factors related to smoking status to combat smoking initiation, thereby establishing non-smoking social norms in universities.

Keywords: Smoking; KAP; Smoke-free Campus; Policy; University

I. INTRODUCTION

Smoking is a major avoidable cause of disease and premature morbidity and mortality. The negative impact of smoking on health is highly significant. This impact is not only due to increased morbidity and mortality but can also be attributed to the social and economic costs of smoking (US Department of Health and Human Services, 2014). Smoking has become a significant public health concern.

The 2019 Malaysian National Health and Morbidity Survey (NHMS) revealed that the overall prevalence of current smokers, defined as those currently using any smoked tobacco product, was 21.3%. An estimated 4.8 million Malaysians aged ≥15 years were current smokers (Institute for Public Health, 2019). Meanwhile, the 2011 Global Adult Tobacco Survey (GATS) Malaysia, a nationally representative household survey of persons aged ≥15 years, showed that smoking prevalence was 23.1%, equivalent to 4.7 million people (Mohd Yusoff *et al.*, 2011). The NHMS 2019 showed that, according to age, the prevalence of current smokers in the 15–19-year age group was 12.3%, and the prevalence peaked in the 30–34-year age group at 27.1% (Institute for Public Health, 2019). GATS Malaysia 2011 reported that the prevalence of current smokers in the 15–24-year age group

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was 16.7%, and the 25–44-year age group had the highest percentage of smokers (29.0%) (Mohd Yusoff *et al.*, 2011).

One target in the Non-Communicable Disease (NCD) Global Action Plan is a 30% relative reduction in the prevalence of current tobacco use in persons aged ≥15 years by 2025 (World Health Organization (WHO), 2016). Malaysia became a signatory to the WHO Framework Convention on Tobacco Control (FCTC) to protect present and future generations from the devastating health, social, environmental, and economic consequences of tobacco consumption and exposure to tobacco smoke. In line with the target of making Malaysia a Smoke-Free Country, the Ministry of Health Malaysia has aimed at reducing the number of smokers to 15% by 2025 and to <5% by 2045 (Ministry of Health Malaysia, 2016).

The government has made many efforts to combat the habit of smoking. The Ministry of Health Malaysia has formulated two main approaches to this: prevention activities to prevent non-smokers from starting to smoke, and rehabilitation and enforcement activities to encourage smokers to quit smoking. Tobacco control in Malaysia is regulated by the Control of Tobacco Products Regulation (CTPR) 2004. This includes the prohibition of smoking in smoke-free places; prohibition of underage smoking; banning tobacco advertising, promotion and sponsorship; and regulating tobacco packaging, labelling, cigarette standard emission and other issues (Al-Shami *et al.*, 2018; Institute for Public Health, 2019).

Through the Ministry of Health Malaysia, the Malaysian government has adopted several measures pertaining to smoking bans. Regulatory measures have been introduced through subnational jurisdictions that ban smoking in public places. The CTPR was introduced in 1993 to prohibit smoking in public areas. It started with seven types of public areas and was periodically amended to include more public areas. By 2015, a total of 38 types of public areas had been gazetted as smoke-free areas (Hock *et al.*, 2019). States, cities and local authorities could also adopt laws or other available legal instruments to prohibit smoking in public places under their respective bylaws (Krishnan, 2018).

After a good start in food premises and in the Parliament building, the Ministry of Health Malaysia expanded the smoking ban to institutions of higher learning in the country, covering all universities whether public or private. College and university campuses were considered smoke-free if they completely prohibited smoking in all indoor and outdoor areas, and tobacco-free if they prohibited both smoking and smokeless tobacco product use in all indoor and outdoor areas (Wang *et al.*, 2018). The smoke-free campus policy in higher learning institutions is an admirable initiative, as young adulthood represents a critical period for the development of tobacco use (Trad *et al.*, 2018). This age cohort coincides with a recognised period of health behaviour transition, including change from intention to regular smoking (Bartington *et al.*, 2020). The evidence demonstrates that most people try their first cigarette before the age of 18 years. Up to 99% of adult smokers first started smoking before the age of 26 years, and many smokers transition to regular daily use of smoking during young adulthood. A smoke-free campus policy can help protect students, faculty, staff members and guests from second-hand smoke exposure, reduce the social acceptability of smoking, help prevent youth and young adult smoking initiation, and increase smokers' efforts to quit smoking (Wang *et al.*, 2018).

To date, there have been many studies on the topic of smoking in Malaysia. However, there are limited published studies on the university community implementing a smoke-free campus policy. Given this gap in the literature, the present study was aimed to assess the factors associated with smoking among students and staff at public universities with smoke-free campus policy in Malaysia. Here, we determined the prevalence of smoking, knowledge of the smoke-free campus policy and smoking, attitude and practice toward smoking, and the factors associated with smoking status.

II. MATERIALS AND METHOD

This was a cross-sectional study involving the staff and students at public universities implementing a smoke-free campus policy. This study involved the two public universities in Malaysia that were the earliest to have implemented a smoke-free campus policy, i.e., in 2013, and that had been awarded a Blue Ribbon Certificate by MySihat (the Malaysian Health Promotion Board). The Blue Ribbon Campaign in Malaysia was initiated in 2013 as part of the MySihat initiative in accordance with the WHO campaign to recognise, acknowledge and honour the important roles played by

individuals, organisations and institutions in advocating a 100% smoke-free environment in both indoor and outdoor areas in workplaces, restaurants or hotels (SEATCA, n.d.; Serrano, 2012).

In 2019, the first university had a total of 32,026 students and 3,536 staff, while the second had 12,319 students and 2,079 staff. The inclusion criteria for this study were Malaysian, enrolled students and employed staff, age ≥18 years. Students or staff who did not understand Malay were excluded from the study because the questionnaire was in Malay. A total sample of 1,250 respondents were stratified by the number of students and staff according to each university. The response rate was 85%, where a total of 1,063 responses were obtained.

This study used a self-administered online questionnaire. The questionnaire was developed using items adopted from GATS and the questionnaire of the 2014 knowledge, attitude and practice towards smoking survey among International Islamic University Malaysia (IIUM) communities (Nurul 'Izzati *et al.*, 2016). Here, experts validated the content of the questionnaire, and a pilot study was conducted on the questionnaire's face validity to assess its acceptability and feasibility. It was subsequently modified prior to implementation. The questionnaire is divided into five sections. Section A involves sociodemographic variables and smoking status. Section B assesses the respondents' knowledge on the smoke-free campus policy, while Section C assesses the respondents' knowledge on smoking. Section D and E are related to attitude and practice towards smoking, respectively. Invitations to complete the questionnaire were disseminated through emails, during university events and activities, through staff and student e-newsletters and through promotion by representative bodies at the universities' main social media ads page. Data were collected from September 2019 to November 2019. Written consent was obtained from all respondents.

A. Variables

The respondents' smoking status was dichotomised and categorised into two groups: smoker; and non-smoker or ex-smoker. A smoker was defined as a person who is currently smoking and assigned '1'; an ex-smoker was a person who had already stopped smoking for at least 6 months and was categorised together with the non-smoker, and assigned '0'.

Knowledge on the smoke-free policy referred to the respondents' understanding and awareness of the smoke-free policy in Malaysia and the smoke-free campus policy, assessed through 23 true or false questions. Knowledge on smoking involved the respondents' understanding and awareness about facts on smoking and its adverse effects, including facts on second-hand smokers, and was assessed through 16 true or false questions. In both sections, respondents were required to answer 'yes', 'no' or 'do not know'. A correct answer was awarded 1 point while a wrong answer and 'do not know' were awarded 0 points. Respondents were categorised as knowledgeable if they scored ≥50%, and not knowledgeable if they scored <50%.

Attitude towards smoking referred to the respondents' feelings, beliefs, and level of agreement on smoking. A positive attitude indicated agreement on smoking, while a negative attitude indicated disagreement on smoking (i.e. not in favour of smoking). This was measured by 11 questions using a 5-point Likert scale. The scoring system for positive statements, i.e. negative attitude towards smoking, was: totally disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5; that for negative statements (i.e. positive attitude towards smoking) was: totally disagree = 5, disagree = 4, neutral = 3, agree = 2, strongly agree = 1. The total score was calculated and categorised as a negative attitude towards smoking if the respondent scored >60% or as a positive attitude towards smoking if the respondent scored ≥60%.

Practice referred to the practice towards prevention of smoking. It was measured by seven questions using a 5-point Likert scale on what the respondents do to avoid the smoking habit; for current smokers, it referred to what they do in their attempts to quit smoking. The scoring system for positive statements (i.e. negative practice towards smoking) was: totally disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5; that for negative statements (i.e. positive practice towards smoking) was: totally disagree = 5, disagree = 4, neutral = 3, agree = 2, strongly agree = 1. The total score was calculated and categorised as negative practice towards smoking if the respondent scored >60% or as positive practice towards smoking if the respondent scored ≤60%.

B. Data Analysis

The data were managed and analysed using SPSS version 21. Frequencies and percentages were used for the data description and summary. The Pearson chi-square test and Fisher's exact test were used for bivariate data analysis. Significance was determined at 5% level, with $p \leq 0.05$. All variables significant in the bivariate analysis were included in the binary logistic regression analysis. The associations between smoking status with sociodemographic characteristic, knowledge on smoke-free campus policy and smoking, and attitude and practice towards smoking were assessed with multivariate logistic regression analysis.

III. RESULTS AND DISCUSSION

This study involved a total of 1,063 respondents: 64% were female and 36% were male. Up to 87.9% of the respondents were students, while the rest were staff. Most of the respondents were aged 19–40 years (95.7%) and single (89.3%). The majority were Malay (77.7%) and Muslim (79.9%). Up to 65% of the respondents had diplomas and degrees, 6% had master or PhD degrees, while the remaining 29% had secondary education (PMR/SPM/STPM). Out of the 1,063 respondents, 55 (5.2%) were smokers and 1,008 (94.8%) were not.

Table 1. Sociodemographic Characteristics of the Respondents and Percentage of Smokers

		n	Percentage (%)
Gender	**Male**	383	36
	Female	680	64
Age	**19–40 years**	1,017	95.7
	≥41 years	46	4.3
Race	**Malay**	826	77.7
	Chinese	140	13.2
	Indian	44	4.1
	Other	53	5.0
Religion	**Islam**	849	79.9
	Other	214	20.1
Education Level	**PMR/SPM/STPM**	308	29
	Diploma/Degree	691	65
	Master/PhD	64	6
Role	**Student**	934	87.9
	Staff	129	12.1
Income	**<RM3,000**	961	90.4
	≥RM3,000	102	9.6
Marital Status	**Single**	949	89.3
	Married	114	10.7
Smoking Status	**Non-Smoker/Ex-Smoker**	1,008	94.8
	Smoker	55	5.2

The respondents' knowledge, attitude and practice towards smoking are shown in Table 2. Most respondents had good knowledge of the smoke-free policy (71.1%) and smoking (68.6%). Most respondents also had a negative attitude towards smoking (95.8%) and negative practice towards smoking (89.7%).

Table 2. Respondents' Knowledge, Attitude and Practice towards Smoking

		n	%
Level of Knowledge of Smoke-Free Policy	**0–11 (<50%)**	307	28.9
	12–23 (>50%)	756	71.1
Level of Knowledge of Smoking	**0–8 (<50%)**	334	31.4
	9–16 (>50%)	729	68.6
Attitude Towards Smoking	**Negative**	1,018	95.8
	Positive	45	4.2
Practice Towards Smoking	**Negative**	953	89.7
	Positive	110	10.3

The bivariate analysis is shown in Table 3. The Pearson chi-square test revealed that gender ($p < 0.001$), role ($p = 0.002$), income ($p = 0.002$), marital status ($p = 0.001$), knowledge of smoking ($p = 0.045$) and practice towards smoking ($p < 0.05$) were significantly associated with smoking status. The Fisher's exact test also showed that there was a significant association between attitude towards smoking with smoking status ($p < 0.001$). However, the Pearson chi-square test showed no significant association between religion ($p = 0.474$), education level ($p = 0.093$) and knowledge of the smoke-free policy ($p = 0.07$) with smoking status; the Fisher's exact test showed no significant association with age ($p = 0.293$) and race ($p = 0.752$).

Table 3. Bivariate Analysis of Smoking Status

		Non-Smoker/ Ex-Smoker n (%)	Smoker n (%)	X^2 (*df*)	p-value
Gender	**Male**	336 (87.7)	47 (12.3)	61.47 (1)	<0.001*
	Female	672 (98.8)	8 (1.2)		
Age	**19–40 years**	966 (95.0)	51 (5.0)		0.293**
	≥41 years	42 (91.3)	4 (8.7)		
Race	**Malay**	781 (94.6)	45 (5.4)		0.752**
	Chinese	135 (96.4)	5 (3.6)		
	Indian	41 (93.2)	3 (6.8)		
	Other	51 (96.2)	2 (3.8)		
Religion	**Islam**	803 (94.6)	46 (5.4)	0.51 (1)	0.474*
	Other	205 (95.8)	9 (4.2)		
Education Level	**PMR/SPM/STPM**	292 (94.8)	16 (5.2)	4.75 (2)	0.093*
	Diploma/Degree	659 (95.4)	32 (4.6)		
	Master/PhD	57 (89.1)	7 (10.9)		
Role	**Student**	893 (95.6)	41 (4.4)	9.65 (1)	0.002*
	Staff	115 (89.1)	14 (10.9)		
Income	**<RM3,000**	918 (95.5)	43 (4.5)	9.99 (1)	0.002*
	≥RM3,000	90 (88.2)	12 (11.8)		
Marital Status	**Single**	907 (95.6)	42 (4.4)	10.10 (1)	0.001*
	Married	101 (88.6)	13 (11.4)		
Level of Knowledge on Smoke-Free Policy	**0–11 (<50%)**	297 (96.7)	10 (3.3)	3.23 (1)	0.070*
	12–23 (>50%)	711 (94.0)	45 (6.0)		
Level of Knowledge on Smoking	**0–8 (<50%)**	310 (92.8)	24 (7.2)	4.02 (1)	0.045*
	9–16 (>50%)	698 (95.7)	31 (4.3)		
Attitude Towards Smoking	**Negative**	978 (96.1)	40 (3.9)		<0.001**
	Positive	30 (66.7)	15 (33.3)		
Practice Towards Smoking	**Negative**	928 (97.4)	25 (2.6)	122.13(1)	<0.001*
	Positive	80 (72.7)	30 (27.3)		

* Pearson chi-square test
** Fisher's exact test

Multivariate logistic regression analysis (Table 4) revealed that male respondents had seven times higher odds of smoking than female respondents (p <0.001). The odds of smoking among those with income of ≥RM3,000 was 2.48 higher (95% confidence interval (CI) 1.16, 5.34) compared to those with income of <RM3,000 (p = 0.02). Regarding knowledge, attitude, and practice, only attitude and practice towards smoking were significantly associated with smoking status, where respondents with negative attitude and practice towards smoking had lower odds of smoking, with an adjusted odds ratio (OR) of 0.28 (95% CI 0.12, 0.66) and 0.17 (95% CI 0.09, 0.33), respectively. The adjusted analyses revealed no significant differences in smoking status by age, role, marital status, and knowledge level.

Table 4. Multivariate Analysis of Smoking Status

Variable	Adjusted OR	(95% CI OR)	p-value
Gender			<0.001
Male	7.24	(3.2, 16.04)	
Female	1		
Age	0.98	(0.92, 1.05)	0.68
Role			0.87
Student	0.86	(0.14, 5.37)	
Staff	1		
Income			0.02
<RM3,000	1	(1.16, 5.34)	
≥RM3,000	2.48		
Marital Status			0.47
Single	0.8	(0.23, 2.75)	
Married	1		
Knowledge on Smoking			0.64
0–8 (<50%)	1		
9–16 (>50%)	0.8	(0.45, 1.62)	
Attitude Towards Smoking			0.003
Negative	0.28	(0.12, 0.66)	
Positive	1		
Practice Towards Smoking			<0.001
Negative	0.17	(0.09, 0.33)	
Positive	1		

A. Discussion

This study was aimed to assess the factors associated with smoking among students and staff at public universities with smoke-free campus policy in Malaysia Our results show that 5.2% of the respondents were smokers. The respondents had good knowledge of the smoke-free campus policy and smoking. The majority had negative attitude and practice towards smoking.

In the present study, the prevalence of smoking was very low compared to the overall prevalence of smokers in Malaysia reported in the 2019 NHMS, i.e. 21.3% (Institute for Public Health, 2019) and GATS 2011, i.e. 23%. There are negative associations between the adoption of smoke-free policies and smoking behaviours (Seo *et al.*, 2011; Trad *et al.*, 2018). The smoke-free campus policy has been associated with a drop in student smoking rates; fewer students smoked and reported intention to smoke on campus (Seo *et al.*, 2011; Fallin, Roditis & Glantz, 2015; Blake *et al.*, 2020; Wray *et al.*, 2020). The low prevalence in the present study potentially resulted from the implementation of the smoke-free campus policy in the universities.

A meta-analysis published in 2015 has suggested that smoke-free policies on university campuses result in reduced smoking rates of 14.7% after 1 year and 8.3% after 3 years (Lupton & Townsend, 2015). The universities involved in the present study have implemented this policy for about 6 years. A 2014 study of a similar population, i.e. the students and staff of a university in Malaysia, but without a smoke-free policy, showed a prevalence of smoking of 18.3% (Nurul 'Izzati *et al.*, 2016). Several studies from other countries involving similar populations of university communities implementing the smoke-free campus policy also reported a lower prevalence of smoking as compared to the general population such as in the United Kingdom (Bartington *et al.*, 2020), the United States (Blake *et al.*, 2020; Wray *et al.*, 2020), Western Australia (Burns *et al.*, 2013) and Vietnam (Nguyen *et al.*, 2020).

Here, we found that male gender is a strong predictor for becoming a smoker. Smoking is considered a normal habit among men (Al-Shami *et al.*, 2018; Nur Atikah *et al.*, 2019). In Asian countries, including Malaysia, smoking is a traditionally acceptable behaviour for men but not for women (Zainol Abidin *et al.*, 2014; Nur Atikah *et al.*, 2019). The NHMS 2019 revealed that 30 times more men than women were smokers (Institute for Public Health, 2019). GATS Malaysia 2011 also showed a higher percentage of smokers among men. Studies among school-going adolescents (Lim *et al.*, 2017), university students and staff in Malaysia (Nurul 'Izzati *et al.*, 2016; Al-Shami *et al.*, 2018) and in other countries (Smith & Umenai, 2000; Wang *et al.*, 2018; Bartington *et al.*, 2020; Blake *et al.*, 2020; Al Omari *et al.*, 2021) have reported a similar pattern to that in the present study, where a higher percentage of smokers were male. All these studies, and several other studies on different population groups (Fallin, Roditis & Glantz, 2015; Yasin *et al.*, 2016; Laila M. Kamel, Abeer A. Abdel Khalik, 2019; Quintana *et al.*, 2019; Mustafizur Rahman & Ismail Tareque, 2020; Nurmansyah *et al.*, 2021) have reported a significant association between gender and smoking status, similar to

our study, where men had higher odds for smoking compared to women.

Our study also reveals higher odds of smoking among the higher-income group (≥RM3,000) compared to those with lower income (<RM3,000). On the contrary, a review that examined published studies conducted in Malaysia from 1996 to 2015 showed that smoking prevalence was highest among those with lower incomes (Hum, Hsien & Nantha, 2016). A 2007 study based on the findings of the Third NHMS (NHMS-3), which consisted of 34,539 observations, also showed that lower-income earners were more likely to smoke as compared to those who earned more (Cheah & Naidu, 2012). People with high income levels and socioeconomic status are more likely to be non-smokers (Cheah & Naidu, 2012; Xu *et al.*, 2015). This differing finding might be due to majority of the respondents in the present study being students, who have no income and were therefore categorised under income < RM3,000. The lack of personal income and the dependence on family financial support may hinder smoking among students, hence contributing to the higher proportion of smoking among the higher-income group. Also, based on the NHMS-3 findings, those who are employed are more likely to smoke than those who are unemployed. One plausible explanation for this finding is that those who are employed are usually more financially independent and thus would be more capable of purchasing tobacco products (Cheah & Naidu, 2012).

The present study showed that the respondents had good knowledge of smoking and the smoke-free campus policy. A 2012 study involving pharmacy students (Al-Shami *et al.*, 2018) and a 2014 study involving IIUM Kuantan students and staff (Nurul 'Izzati *et al.*, 2016) also showed good knowledge among most of the respondents. Other studies on university communities in other countries have also reported good knowledge on smoking (Xu *et al.*, 2015; Quintana *et al.*, 2019; Blake *et al.*, 2020; Al Omari *et al.*, 2021). In addition, a high education level has been recognised as being associated with good knowledge; this too can contribute to the success of the universities' smoke-free campus policy. Increased knowledge had been associated with implementation of the smoke-free policy in many different populations in Malaysia and in other countries (Smith & Umenai, 2000; Haddad & Malak, 2002; Lim *et al.*, 2017; Jaafar *et al.*, 2019; Quintana *et al.*, 2019; Alves, Precioso & Becoña, 2020). A 2-phase cross-sectional study of undergraduate students in Vietnam showed significant increases in knowledge of the harmful effect of smoking and of smoke-free legislation 1 year after the enactment of Vietnamese Tobacco Control Legislation (Nguyen *et al.*, 2020).

However, in the present study, there was no significant association between knowledge of smoking and smoking status. Regardless of their smoking status, most of the respondents had good knowledge of the harmful effects of smoking and the smoke-free policy. Several other studies support this lack of association. These include the studies on IIUM students and staff (Nurul 'Izzati *et al.*, 2016; Al-Shami *et al.*, 2018), senior secondary school students in Indonesia (Nurmansyah *et al.*, 2021) and allied health sciences university students in Japan (Smith & Umenai, 2000) and China (Xu *et al.*, 2015). The studies revealed no difference in the level of knowledge on smoking among smokers and non-smokers, and knowledge did not necessarily translate into health behavioural outcomes (Smith & Umenai, 2000; Xu *et al.*, 2015; Nurul 'Izzati *et al.*, 2016; Al-Shami *et al.*, 2018; Nurmansyah *et al.*, 2021). It has been concluded that despite having good knowledge, the pleasure and enjoyment of smoking, in addition to the belief that smoking can overcome stress, are factors that compel people to smoke (Al-Shami *et al.*, 2018).

In the present study, most of the students and staff had a negative attitude towards smoking. A significant difference in attitude towards smoking between different education levels has been reported. A high education level increases the favourable smoking-related attitude (Nurul 'Izzati *et al.*, 2016; Alves, Precioso & Becoña, 2020). In Malaysia, previous studies conducted at IIUM have also reported a negative attitude towards smoking (Nurul 'Izzati *et al.*, 2016; Al-Shami *et al.*, 2018). The smoke-free policy also contributes to the attitude towards smoking. Strong smoke-free policies are associated with favourable attitude (Rashid *et al.*, 2014). It has been suggested that smoke-free policies change the perceived norms related to smoking in a community, making smoking less socially acceptable. Many studies have found a negative general attitude towards smoking among university communities where a smoke-free policy is implemented, such as in Australia (Burns *et al.*, 2013), the United States (Blake

et al., 2020), Japan (Smith & Umenai, 2000) and Jordan (Haddad & Malak, 2002).

A longitudinal analysis of public universities in Indiana, USA, found improvements in the students' smoking attitude after a smoke-free policy had been implemented (Seo *et al.*, 2011). Attitude towards smoking is essential, as it plays an important role in initiating and maintaining self-motivated smoking, and also stimulus to quit smoking (Haddad & Malak, 2002). As we, and the IIUM study (Nurul 'Izzati *et al.*, 2016) and university communities in many other countries have established, attitude is significantly associated with smoking status. A study of adolescents in Melaka, the first state in Malaysia to introduce smoke-free legislation, also established that a negative attitude towards smoking was significantly associated with a lower likelihood of having attempted smoking (Zainol Abidin *et al.*, 2014).

Our study also shows that most of respondents have a negative practice towards smoking, which means that the majority act to avoid the smoking habit, and those who currently smoke attempt to quit smoking. This is similar to the IIUM study, where there was a high level of practice towards preventing smoking among the students and staff (Nurul 'Izzati *et al.*, 2016). The smoke-free policy helps reduce smoking initiation among youth and motivates current smokers to quit (Seo *et al.*, 2011; Wang *et al.*, 2018). Moreover, we have also shown that a negative practice towards smoking is significantly associated with smoking status.

Our study has its limitations. Males were slightly underrepresented, comprising only 36% of respondents. However, this response pattern is similar to that of other campus smoking studies (Bartington *et al.*, 2020). The use of a self-administered online questionnaire may have been limited by the respondents' bias. Given the cross-sectional nature of the study, we were only able to explore the associations between dependent and independent variables without establishing the causal relationship. We were unable to demonstrate the changes in knowledge, attitude, and practice towards smoking in comparison to before the implementation of the smoke-free policy. Our study involved the students and staff of universities implementing the smoke-free policy; thus, it may not be generalisable to all university communities and other youth in Malaysia. Despite the limitations, our study presents a detailed analysis of the knowledge, attitude and practice towards smoking, and the various sociodemographic determinants of smoking, which is generalisable to other university communities implementing a smoke-free policy.

IV. CONCLUSION

Overall, we found a low prevalence of smoking in the two public universities. Most of the respondents have good knowledge of the smoke-free campus policy and smoking, and a negative attitude and practice towards smoking. There is a significant association between smoking status and gender, income, and attitude and practice toward smoking. The smoke-free policy might have contributed to the low smoking prevalence, good knowledge and negative attitude and practice towards smoking; hence, we recommend that universities sustain and actively promote the implementation of this policy. However, we also recommend that the relevant authorities consider all factors related to smoking status to combat smoking initiation in university. In addition, effective smoking cessation services should be provided to encourage and help smokers to quit, thereby establishing non-smoking social norms among the university community.

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