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General

Prevalence and Associated Factors Related to Tobacco Consumption Among University Students in Malaysia

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Tobacco consumption is one of the major public health concerns worldwide. Moreover, alternative tobacco and nicotine products (ATNPs) are growing in popularity, especially among young adults in the past decade. The study aimed to determine the prevalence and associated sociodemographic factors of tobacco consumption among university students. A cross-sectional study was carried out among 338 university students of a private Malaysian university from March to April 2021. Data was collected using a self-administered online questionnaire with items including sociodemographic information, user status of tobacco consumption and types of tobacco product used. Descriptive statistics, Pearson's chi-square test, Fisher's exact test and simple and multiple logistic regression analyses were performed using the IBM SPSS version 26.0 to analyse the data. The prevalence of tobacco consumption in this study was 8.6% and the main tobacco product used was manufactured cigarettes. In Pearson's chi square test and Fisher's exact test, current use of tobacco was significantly associated with nationality, ethnicity, religion, school, current level of education and parents, siblings and friends use of tobacco (p<0.05). In simple and multiple logistic regression analysis, being non-Malaysian, Indian, Muslim, year 4 student and having parents or siblings who used tobacco, all had statistically significant associations with the current use of tobacco (p<0.05). Findings of this study showed that the use of tobacco among university students is concerning and warrants the need to develop and implement a strategic anti-tobacco program to limit this behaviour among university students.

HIGHLIGHTS

- About 8.6% of the study population were current tobacco users.
- Manufacture cigarettes were the main tobacco product used.
- Those who were non-Malaysians, Indians and Muslims had increased likelihoods of using tobacco.
- Study year and family history had an effect on the tendency of becoming a tobacco user.

1. INTRODUCTION

According to the World Health Organization (WHO), the tobacco epidemic is a major public health threat and it kills more than eight million people each year worldwide.[1] Globally, about 1.3 billion adults are tobacco users and about 30% of them are living in the Asia-Pacific region.[1,2] Cigarettes are the most commonly used tobacco product, but alternative tobacco and nicotine products (ATNPs), such as e-cigarettes and shisha are increasing in popularity, especially among the young adults, in the past decade. This popularity may be attributable to the marketing strategies of tobacco companies that claimed these products to be less harmful than regular cigarettes and could aid in smoking cessation.[3,4]

In Malaysia, the prevalence of tobacco consumption is high, with about 23.3% of Malaysians aged 15 and above reported being current tobacco users in 2019.[5] In fact, Malaysia was reported to have one of the highest prevalence e-cigarettes users at 14% by the International Tobacco Control Policy Evaluation Project (ITC Project) in comparison to other countries including Australia, United States, Canada and China.[6] Similar to the US, tobacco consumption is the predominant cause of premature and preventable deaths in Malaysia.[7] Hence, it is important to determine the factors associated with tobacco consumption, especially among young adults as tobacco initiation often begins during the late adolescent years.[8] Moreover, these young adults are the main targeted consumer groups of the tobacco industry.[9]

Tobacco consumption among adults and school-going adolescents have been widely studied, but there is less information available about this behaviour among young adults and university students in Malaysia.[10-12] Although both school-going adolescents and university students share many similarities, the latter group is in a vulnerable

period of exacerbating tobacco use as they undergo a transition from adolescence into adulthood.[13] This transition allows them for increased freedom and permissiveness of social norms, including tobacco use, as they enter university life. Also, these young adults are often easily influenced by their peers, social media and having increased academic and environmental stress, making them a targeted population for exploiting tobacco. A US study found that the proportion of smokers who begun between the age of 18 to 23 has increased by more than two-fold from 2002 to 2018.[14] These young adults not only smoke cigarettes but also use ANTPs and may even go for more than one tobacco product simultaneously.[15]

The current literature suggests that various factors are associated with the behaviour of tobacco consumption among university students in Malaysia. However, one of knowledge gap in this literature is the variance of tobacco type used among the students. Many of these studies only focused on one tobacco product at a time, with regular cigarettes being the most common tobacco product studied.[16-19] Therefore, although use of conventional cigarettes are well defined, there are limited studies in Malaysia that focus on ANTPs such as e-cigarettes and shisha. It is important to determine the main factors associated with the use of all types of tobacco as more and more types of novel ANTPs could be found in the market nowadays. Exploring this aspect is important as overlapping factors may be highlighted when designing effective tobacco prevention and cessation programs for this study population. In addition, early intervention can help curb tobacco use more effectively before the development of addictive behaviours.

Several studies in Malaysia that examined cigarette smoking among university students noted that being a male gender, a non-health science student, an advanced study year student and having family members and friends who smoked were the common factors associated with cigarette smoking among this study population.[16,18,20] It is common that males are more likely to engage in cigarette smoking than females as this behaviour is generally viewed as socially unacceptable among the latter group in Malaysia. Moreover, health science students are more likely to be aware of the health effects of smoking than non-health science students due to their course of study, which may influence their decision to smoke. Furthermore, students in advanced study years face greater academic stress than their juniors and may smoke for stress relief. Also, family and friends influence play a key role in smoking behaviour as the students may want to gain approval or fit in with their family and friends. Interestingly, religion also played an important role in smoking behaviour, as pointed out by Elkalmi et al.[21] The researchers had investigated the effect of religious beliefs on this behaviour among 323 Muslim university students of an institution in Malaysia and found out that those with stronger religious beliefs are more likely to avoid smoking.

Other studies that investigated the use of ATNPs, such as e-cigarettes and shisha, among university students in Malaysia had found several similar factors to those of cigarette smoking, including male gender and having family members and friends who smoked.[16,19,22-24] Besides these factors, Goh et al. and Yusof et al. further pointed out that cigarette smoking status is also significantly associated with ATNP use among university students, whereby those who smoked cigarettes had a higher tendency to use ATNPs than non-smokers.[19,24] These smokers may have used ATNPs due to the misperception that these products are less harmful and addictive than regular cigarettes and could aid in smoking cessation.[24]

Given these findings, the objectives of this study are to determine the overall prevalence of tobacco consumption among university students and identify the types of tobacco products used by tobacco users. In addition, this study aims to determine the factors associated with tobacco consumption among the students, specifically sociodemographic factors. This study hopes to contribute to the body of knowledge of the general use of tobacco among young adults and the factors that encouraged this behaviour among this study population. Findings of the present study may also be used to inform tobacco prevention and cessation programs targeted for this study population who are the future leaders of the world.

2. MATERIALS AND METHODS

DESIGN

This was a cross-sectional study conducted among university students of Monash University Malaysia (MUM). A quantitative approach was used in this study. The data were collected from the 24th of March to the 16th of April 2021 using an anonymous, self-administered questionnaire. Email and poster invitations were sent to invite students to participate in an online survey. Since this was an online survey, consent was obtained from the participants if they were willing to participate in the study. The survey could be completed anonymously in approximately five to 10 minutes. Biweekly reminders to complete the survey were sent to the participants, thus providing an opportunity for them to take part in the survey for a total of four weeks.

RESEARCH INSTRUMENT

The survey instrument of this study was a self-administered questionnaire. The contents of the questionnaire were devised after a thorough literature review and validated by an expert of the field. A pilot study was also conducted to examine the face validity of the questionnaire. The questionnaire was divided into four sections. The first section consisted of ten sociodemographic-related questions. The questions in this section included gender, age, nationality, ethnicity, religion, school, current level of education, academic results and father's and mother's educational background. The second section consisted of three questions related to the use of tobacco products by the participants' close ones, including their parents, siblings and friends. The third section consisted of another three questions related to participants' status of tobacco consumption and they were adapted from the WHO Global Tobacco Surveil-

lance System (GTSS) 2011.[25] Slight modifications were made to the questions to suit the study. The user status was categorised into four statuses and defined based on the WHO criteria, whereby:

1. **Current daily tobacco users**: Those who currently use any tobacco product on a daily basis.
2. **Current occasional tobacco users**: Those who currently use any tobacco product on a less than daily basis.
3. **Former tobacco users**: Those who had previously used tobacco but do not currently use them.
4. **Non-users**: Those who had never used tobacco.

In this study, current daily and occasional tobacco users were combined into one category (current users) while former tobacco users and non-users were combined into one category (non-users), following the Report of the GATS Malaysia 2011.[26]

The fourth section of the questionnaire consisted of a list of tobacco products adapted from the Report of the GATS Malaysia 2011.[26] This section would only be answered by those who identified as current and former tobacco users. It would subsequently be categorised into five categories, namely 'manufactured cigarettes', 'e-cigarettes', 'shisha', 'other smoked tobacco products' and 'other smokeless tobacco products'. This categorisation was adapted from the previous work by Yusof et al.,[24] which investigated the use of ATNPs among a group of college students in Malaysia. In addition, based on the Report of the GATS Malaysia 2011, smoked tobacco products included bidis, shisha, cigars or cigarillos, curut, tobacco-filled pipes, kreteks and hand-rolled cigarettes while smokeless tobacco products included chewing tobacco products, such as betel quid with tobacco, paan masala, gutkha and snuff.[26]

SAMPLING AND SAMPLE SIZE CALCULATION

A simple random sampling was applied to gather the data from the university students in MUM. All MUM students were eligible to participate in this study and some inclusion and exclusion criteria were applied. Inclusion criteria of this study included being a current MUM student and aged 18 and above. Exclusion criteria included those who do not comprehend English and those who did not wish to participate in the survey.

The sample size for this study was calculated using the following formula:

$n = \frac{z^2 p(1-p)}{d^2}$,

where,

n = desired sample size,

z = 1.96 (at 95% CI),

p = prevalence of any tobacco product use among all adults in Malaysia

p = 23.3%. [In 2019, approximately 23.3% of Malaysian population aged 15 years and above were current any tobacco product user (National Health and Morbidity Survey (NHMS) 2019)]

p = 0.233

d = precision level (5%).

Therefore,

$n = \frac{1.96^2 \times 0.233(1-0.233)}{0.05^2}$

$n \approx 275$

A 10% non-response rate was taken into consideration to encounter for any missing values, resulting in a total of 303 participants required for this study.

ETHICAL APPROVAL

This study was approved by the Monash University Human Research Ethics Committee (MUHREC) (Project ID Number: 27083).

STATISTICAL ANALYSES

All analyses in this study were performed using the IBM Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). As most of the questions from the questionnaire were adapted from previously validated and published surveys, including the GTSS and other local studies, the use of these tested questions lends reliability and validity to this study.[24-26]

Descriptive statistics and inferential statistics were performed to attain the objectives of this study. Frequencies (n) and percentages (%) were calculated for all variables of this study, including the sociodemographic characteristics, tobacco consumption prevalence and tobacco product types. Mean and standard deviation (SD) were also calculated for the respondents' age. Additionally, pie charts and bar charts were used to describe the tobacco consumption and types of tobacco product used by tobacco users, respectively. Furthermore, Pearson's chi-square tests and Fisher's exact test were carried out to determine the associations between the user status of tobacco consumption and the sociodemographic characteristics of respondents. Simple and multiple logistic regression analyses were also carried out to examine the impact of the sociodemographic factors on the likelihood that the respondents would report being current tobacco users. Statistical significance was set at $p<0.05$ throughout this study.

3. RESULTS

SOCIODEMOGRAPHIC CHARACTERISTICS OF STUDY SAMPLE

Table 1 summarises the sociodemographic characteristics of this study sample. Of the 338 respondents, the majority were females (76.0%), local students (82.8%), Chinese (75.1%) and Buddhist (53.0%). The mean age of the respondents was 21.4 (±3.3) years old. The minimum and maximum ages were 18 and 56 years old, respectively. Most respondents came from the Science programme (41.7%) and were undergraduate students in their second year of study (41.1%). Almost three quarters (69.5%) of the respondents obtained mostly high distinction (HD) and distinction (D) in their academic studies. Slightly over half (51.8%) of the respondents' fathers obtained a bachelor's degree or higher while about three-fifths (58.9%) of respondents' mothers

Table 1. Sociodemographic characteristics of the respondents.

Variables	Frequency (Percentage)
Gender	
Male	86 (25.4%)
Female	252 (74.6)
Age (years)	
18-20	156 (46.2%)
21-25	159 (47.0%)
26-30	14 (4.1%)
>30	9 (2.1%)
Nationality	
Malaysian	280 (82.8%)
Non-Malaysian	58 (17.2%)
Ethnicity	
Malay	14 (4.1%)
Chinese	254 (75.1%)
Indian	25 (7.4%)
Others	45 (13.3%)
Religion	
Muslim	37 (10.9%)
Christian	72 (21.3%)
Buddhist	179 (53.0%)
Hindu	17 (5.0%)
Others	33 (9.8%)
School	
Arts and Social Sciences	6 (1.8%)
Business	23 (6.8%)
Engineering	39 (11.5%)
Information Technology	23 (6.8%)
Medicine and Health Science	18 (5.3%)
Pharmacy	88 (26.0%)
Science	141 (41.7%)
Current level of education	
Degree (Year 1)	67 (19.8%)
Degree (Year 2)	139 (41.1%)
Degree (Year 3)	58 (17.2%)
Degree (Year 4)	34 (10.1%)
Masters & PhD	40 (11.8%)
Academic achievement	
Mostly Credit (Cr) and Pass (P)	22 (6.5%)
Mostly Distinction (D) and Credit (Cr)	81 (24.0%)
Mostly High Distinction (HD) and Distinction (D)	235 (69.5%)
Father's highest level of education	
Bachelor's degree or higher	175 (51.8%)
College education or less	163 (48.2%)
Mother's highest level of education	
Bachelor's degree or higher	139 (41.1%)
College education or less	199 (58.9%)
Parents' use of tobacco products	
Yes	73 (21.6%)
No	265 (78.4%)
Siblings' use of tobacco products	
Yes	49 (14.5%)
No	289 (85.5%)
Friends' use of tobacco products	
Yes	214 (63.3%)
No	124 (36.7%)

obtained a college education or less. The majority of the respondents had parents (78.4%) and siblings (85.5%) who did not use any tobacco products. Most respondents also had friends who used tobacco products (63.3%).

PREVALENCE OF TOBACCO CONSUMPTION AMONG STUDY SAMPLE

Fig. 1 shows the distribution of respondents according to their user status of tobacco consumption. The majority of the respondents were non-users (88.8%), followed by current users (8.6%) and former users (2.7%).

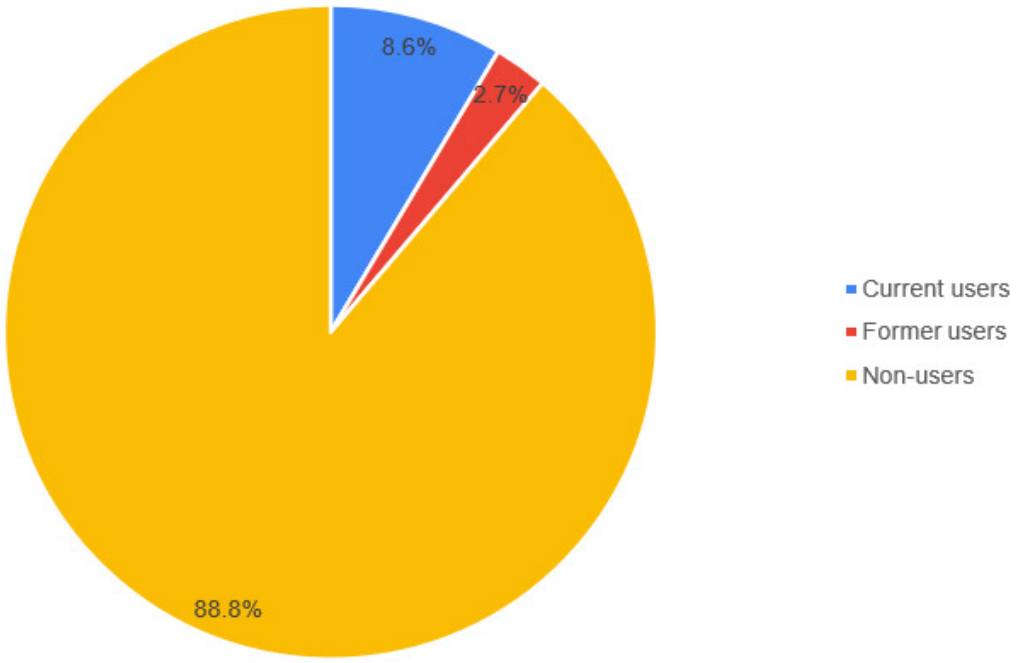

Figure 1. Distribution of respondents according to their tobacco consumption user status.

TYPES OF TOBACCO PRODUCT USED BY TOBACCO USERS OF STUDY SAMPLE

The types of tobacco products used among the respondents according to their user status of tobacco consumption are given in **Fig. 2**. Most of the current users smoked manufactured cigarettes (7.1%), followed by shisha (6.8%), e-cigarettes (6.5%), other smoked tobacco products (4.1%) and other smokeless tobacco products (0.9%). Most of the former users had used e-cigarettes (2.1%), followed by shisha (1.8%), manufactured cigarettes (0.9%) and other smoked tobacco products (0.3%).

SOCIODEMOGRAPHIC FACTORS RELATED TO TOBACCO CONSUMPTION

Table 2 illustrates the association between the user status of tobacco consumption and the sociodemographic characteristics. The results demonstrated that nationality, ethnicity, religion, school and current level of education were significantly associated with the user status of tobacco consumption. The prevalence of current tobacco consumption was higher among non-Malaysians compared with Malaysians, which were 25.9% and 5.0%, respectively (p<0.0005). Furthermore, Malay students had the highest prevalence of current tobacco consumption compared with students of other ethnicities (28.6%, p<0.0005). Also, most of the current tobacco users were Muslim students, with a prevalence of 37.8% (p<0.0005). Among all schools, students from the Business programme showed the highest prevalence of current tobacco consumption, which was 17.4% (p=0.002). In addition, most of the current tobacco users were undergraduate students in their third year of study (19.0%, p=0.001). Parents' use, siblings' use and friends' use of tobacco were also significantly associated with the user status of tobacco consumption. Compared with students whose parents were non-users, students whose parents were tobacco users showed a higher percentage of reporting current tobacco use, which were 6.4% and 16.4%, respectively (p=0.007). Moreover, students whose siblings were tobacco users had a higher current tobacco use prevalence compared with those whose siblings were non-users (26.5% *vs.* 5.5%, p<0.0005). Besides family members, students whose friends were users of tobacco showed a higher percentage of current tobacco use than those whose friends were non-users (13.6% *vs.* 0%, p<0.0005). However, other sociodemographic characteristics, including gender, age, academic results and father's and mother's highest level of education were not significantly associated with the user status of tobacco consumption.

Table 3 summarises the results of the simple and multiple logistic regression analyses of the sociodemographic factors associated with tobacco consumption. A simple logistic regression analysis was performed to determine the relationship between the user status of tobacco consumption (current user and non-user) and the sociodemographic characteristics of respondents. This analysis showed that current tobacco consumption was less likely to be reported among Malaysians (OR = 0.151, CI = 0.07-0.34, p<0.0005) and Chinese (OR = 0.101, CI = 0.04-0.27, p<0.0005), but more likely to be reported among Muslims (OR = 9.435, CI = 1.95-45.66, p=0.005), undergraduate third-year students (OR = 15.447, CI =1.93-123.77, p=0.010), Masters and PhD students (OR = 11.647, CI = 1.35-100.70, p=0.026), students whose parents were tobacco users (OR = 2.870, CI = 1.30-6.33, p=0.009) and students whose siblings were tobacco users (OR = 6.161, CI = 2.74-13.85, p<0.0005). However, other sociodemographic characteristics, such as gen-

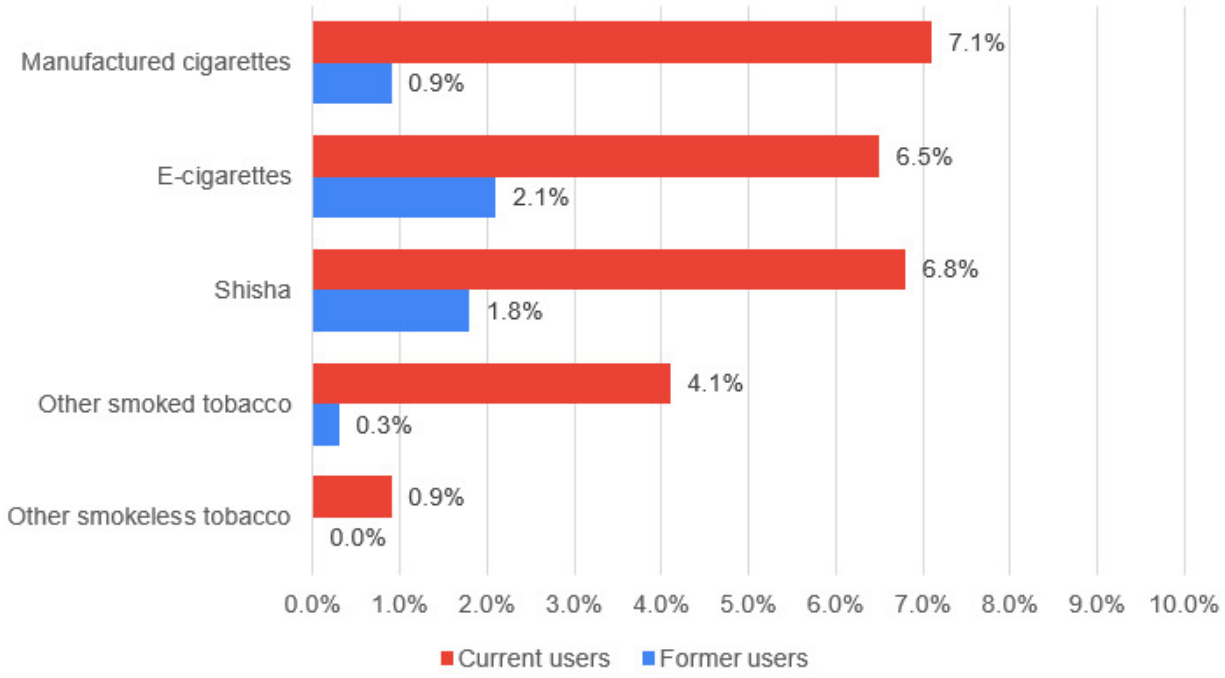

Figure 2. Types of tobacco products used among the respondents according to their tobacco consumption user status.

der, age, academic results and father's and mother's highest level of education did not show any significant association with user status of tobacco consumption in the analysis of simple logistic regression.

Furthermore, multiple logistic regression analysis was conducted to examine the impact of some sociodemographic factors on the likelihood that the respondents would report being current tobacco users. This analysis showed that Malaysian students had lower odds (0.1 times) of being current tobacco users compared with non-Malaysian students (CI = 0.02-0.64, p=0.014). Meanwhile, Indian students were 19 times more likely to use these products than students of other ethnicities (CI = 1.71-216.24, p=0.017). In addition, Muslim students had an increased likelihood of using tobacco by 22 times in comparison with students of other religions (CI = 2.18-212.13, p=0.009). Compared with undergraduate students in their first year of study, students in their fourth year of study had higher odds (21.4 times) to be current tobacco users (CI = 1.82-252.73, p=0.015). This analysis also indicated that students whose parents used tobacco had an increased likelihood of using tobacco by three times than those whose parents were non-users (CI =1.12-10.71, p=0.031). Moreover, students whose siblings were tobacco users were six times more likely to be using these products than those whose siblings were non-users (CI = 1.91-20.25, p=0.002).

4. DISCUSSION

PREVALENCE OF TOBACCO CONSUMPTION

The prevalence of tobacco consumption in this study was 8.6%. It was comparatively lower than the national average (23.3%) for Malaysian adults aged above 15, as reported in the Malaysia NHMS 2019.[5] Although the number of responses from tobacco users might have been much lower than that of non-users in this study, one could assume that the prevalence of tobacco consumption among university students was low. This finding was very encouraging, especially for those who aimed to reduce tobacco use among university students. Besides the NHMS 2019 survey, the tobacco consumption prevalence of this study was also slightly lower compared with other previous local studies conducted among college and university students, such as those by Yusof et al. at 14.4% and Elkami et al. at 19.3%.[21,24] This difference might be attributed to the recent implementation of smoke-free policies in various university campuses in Malaysia, including the university where this study was carried out. Students might also be well aware of the health risks of using tobacco as a result of the efforts of the government and non-government organisations to raise awareness of the health consequences of tobacco use among the public. Such awareness could influence their decision to initiate tobacco use. However, more prevalent findings have been documented elsewhere. A study in Yemen reported a smoking prevalence of 33.1% among university students while another study in the US reported a tobacco use prevalence of 23.1% among college students.[27,28]

Concerning the tobacco product types, this study revealed a higher prevalence of manufactured cigarettes (7.1%), e-cigarettes (6.5%) and shisha (6.8%) use as compared with other types of tobacco products (**Fig. 2**). According to the GATS Malaysia 2011, the percentage of current cigarette smokers was 20.1% among Malaysian adults aged over 15.[26] The overall prevalence of shisha smokers and

Table 2. Association between the user status of tobacco consumption and their sociodemographic characteristics.

Variables	User status of tobacco consumption		Pearson's χ^2/ Fisher's exact test	*p-value*
	Current users Frequency (Percentage)	Non-users Frequency (Percentage)		
Gender			0.077[p]	0.782
Male	8 (9.3%)	78 (90.7%)		
Female	21 (8.3%)	231 (91.7%)		
Age (years)			6.769[f]	0.058
18-20	8 (5.1%)	148 (94.9%)		
21-25	17 (10.7%)	142 (89.3%)		
26-30	2 (14.3%)	12 (85.7%)		
>30	2 (22.2%)	7 (77.8%)		
Nationality			26.660[p]	<0.0005*
Malaysian	14 (5.0%)	266 (95.0%)		
Non-Malaysian	15 (25.9%)	43 (74.1%)		
Ethnicity			34.260[f]	<0.0005*
Malay	4 (28.6%)	10 (71.4%)		
Chinese	8 (3.1%)	246 (96.9%)		
Indian	6 (24.0%)	19 (76.0%)		
Others	11 (24.4%)	34 (75.6%)		
Religion			36.256[f]	<0.0005*
Muslim	14 (37.8%)	23 (62.2%)		
Christian	5 (6.9%)	67 (93.1%)		
Buddhist	5 (2.8%)	174 (97.2%)		
Hindu	3 (17.6%)	14 (82.4%)		
Others	2 (6.1%)	31 (93.9%)		
School			19.344[f]	0.002*
Arts and Social Sciences	1 (16.7%)	5 (83.3%)		
Business	4 (17.4%)	19 (82.6%)		
Engineering	3 (7.7%)	36 (92.3%)		
Information Technology	1 (4.3%)	22 (95.7%)		
Medicine and Health Science	2 (11.1%)	16 (88.9%)		
Pharmacy	0 (0.0%)	88 (100.0%)		
Science	18 (12.8%)	123 (87.2%)		
Current level of education			16.741[f]	0.001*
Degree (Year 1)	1 (1.5%)	66 (98.5%)		
Degree (Year 2)	7 (5.0%)	132 (95.0%)		
Degree (Year 3)	11 (19.0%)	47 (81.0%)		
Degree (Year 4)	4 (11.8%)	30 (88.2%)		
Masters & PhD	6 (15.0%)	34 (85.0%)		
Academic results			1.503[f]	0.501
Mostly Credit (Cr) and Pass (P)	3 (13.6%)	19 (86.4%)		
Mostly Distinction (D) and Credit (Cr)	8 (9.8%)	74 (90.2%)		
Mostly High Distinction (HD) and Distinction (D)	18 (7.7%)	216 (92.3%)		
Father's highest level of education			1.346[p]	0.246
Bachelor's degree or higher	18 (10.3%)	157 (89.7%)		
College education or less	11 (6.7%)	152 (93.3%)		
Mother's highest level of education			0.670[p]	0.413
Bachelor's degree or higher	14 (10.1%)	125 (89.9%)		
College education or less	15 (7.5%)	184 (92.5%)		
Parents' use of tobacco products			7.331[p]	0.007*
Yes	12 (16.4%)	61 (83.6%)		
No	17 (6.4%)	248 (93.6%)		
Siblings' use of tobacco products			23.543[p]	<0.0005*
Yes	13 (26.5%)	36 (73.5%)		
No	16 (5.5%)	273 (94.5%)		
Friends' use of tobacco products			18.381[p]	<0.0005*
Yes	29 (13.6%)	185 (86.4%)		
No	0 (0.0%)	124 (100.0%)		

[p]: Values from Pearson's chi-square test.

[f]: Values from Fisher's exact test.

*: Statistically significant results at $p<0.05$

Table 3. Simple and multiple logistic regression analyses of the sociodemographic factors associated with tobacco consumption among university students.

Variables	Crude Odds Ratio (95% CI)	*p*-value	Adjusted Odds Ratio (95% CI)	*p-value*
Gender				
Male[Ref.]	1.000			
Female	0.886 (0.38–2.08)	0.782	–	–
Age (years)				
18-20	0.189 (0.03–1.06)	0.059	–	–
21-25	0.419 (0.08–2.18)	0.301	–	–
26-30	0.583 (0.07–5.11)	0.626	–	–
>30[Ref.]	1.000			
Nationality				
Malaysian	0.151 (0.07–0.34)	<0.0005*	0.114 (0.02–0.64)	0.014*
Non-Malaysian[Ref.]	1.000		1.000	
Ethnicity				
Malay	1.236 (0.32–4.74)	0.757	0.924 (0.09–9.48)	0.947
Chinese	0.101 (0.04–0.27)	<0.0005*	3.266 (0.28–38.23)	0.346
Indian	0.976 (0.31–3.06)	0.967	19.248 (1.71–216.24)	0.017*
Others [Ref.]	1.000		1.000	
Religion				
Muslim	9.435 (1.95–45.66)	0.005*	21.487 (2.18–212.13)	0.009*
Christian	1.157 (0.21–6.30)	0.866	1.195 (0.15–9.35)	0.865
Buddhist	0.445 (0.08–2.40)	0.346	0.928 (0.12–7.10)	0.943
Hindu	3.321 (0.50–22.15)	0.215	0.560 (0.04–7.75)	0.665
Others [Ref.]	1.000		1.000	
Current level of education				
Degree (Year 1) [Ref.]	1.000		1.000	
Degree (Year 2)	3.500 (0.42-29.04)	0.246	2.747 (0.29-26.49)	0.382
Degree (Year 3)	15.447 (1.93-123.77)	0.010*	8.081 (0.85-77.00)	0.069
Degree (Year 4)	8.800 (0.94-82.12)	0.056	21.440 (1.82-252.73)	0.015*
Masters & PhD	11.647 (1.35-100.70)	0.026*	6.317 (0.64-62.753)	0.116
Academic results				
Mostly Credit (Cr) and Pass (P) [Ref.]	1.000			
Mostly Distinction (D) and Credit (Cr)	0.685 (0.17–2.83)	0.601	–	–
Mostly High Distinction (HD) and Distinction (D)	0.528 (0.14–1.95)	0.339	–	–
Father's highest level of education				
Bachelor's degree or higher	1.584 (0.72–3.47)	0.249	–	–
College education or less [Ref.]	1.000			
Mother's highest level of education				
Bachelor's degree or higher	1.374 (0.64–2.95)	0.415	–	–
College education or less [Ref.]	1.000			
Parents' use of tobacco products				
Yes	2.870 (1.30–6.33)	0.009*	3.467 (1.12–10.71)	0.031*
No [Ref.]	1.000		1.000	
Siblings' use of tobacco products				
Yes	6.161 (2.74–13.85)	<0.0005*	6.217 (1.91–20.25)	0.002*
No [Ref.]	1.000		1.000	

[Ref.]: Reference category

*Statistically significant results at $p<0.05$

e-cigarette users were much lower, which were 0.6% and 0.8%, respectively.[26] Meanwhile, the more recent NHMS 2019 survey reported that 20.8% of adults in Malaysia were current cigarette smokers and another 4.9% were e-cigarette users.[5] However, the prevalence of tobacco consumption of this study was not comparable to those reported in both GATS Malaysia 2011 and NHMS 2019 due to the smaller sample size of this study. Nonetheless, these findings support the need for effective interventions to combat the tobacco epidemic in this country.

Manufactured cigarettes (7.1%) were the most popular tobacco product used among the tobacco users of this study. This finding was similar to those reported in the GATS Malaysia 2011.[26] However, ATNPs, especially e-cigarettes and shisha, have been gradually rising in popularity in recent years. The findings of this study showed that the prevalence of e-cigarettes (6.5%) and shisha (6.8%) used were comparable to those of manufactured cigarettes (7.1%). The increasing prevalence of these products might be attributed to the marketing of these products through the internet.[24] Many users also commented that e-cigarette and shisha use were cool, trendy and relatively cheaper than manufactured cigarettes.[29,30] Another major contributory factor is the misconception that these ATNPs were relatively less harmful than cigarettes.[29,30] Thus, many smokers used them as smoking cessation aid while main-

taining the feeling of smoking mimicked by these products.[29,30]

In comparison with manufactured cigarettes, e-cigarettes and shisha use, only a moderate percentage of students used other types of smoked tobacco products (4.1%) and a very low percentage of them (0.3%) reported using these products in the past. This might be attributed to the culturally acceptable norms of using these smoked tobacco products and the affordability and accessibility of these products.[31] Meanwhile, the NHMS 2019 survey reported that the overall prevalence of smokeless tobacco was about 6.5%. Contrastingly, only 0.9% of students in this study reported being current users of other smokeless tobacco products and none of them used these products in the past. The lower prevalence of these products might be because they were viewed as old fashioned among the young adults.

The rates of former users were generally lower than current users for all tobacco types in this study (**Fig. 2**). Former users might have used tobacco products out of curiosity and for experimentation purposes. Rashid and Azizah carried out a study to examine the smoking habits among a group of medical students and they found that the major reasons former users stopped tobacco use included health concerns, financial burdens of tobacco purchase and cigarettes' distasteful smell.[32]

SOCIODEMOGRAPHIC FACTORS RELATED TO TOBACCO CONSUMPTION

In the present study, several sociodemographic characteristics were shown to be significantly associated with tobacco consumption among university students (Table 2). Nationality was one of the significant factors associated with tobacco consumption in the present study. Moreover, Malaysian students had lower likelihoods of using tobacco products compared with non-Malaysian students (AOR = 0.114, CI = 0.02-0.64). This was not surprising as the MUM campus is homed to students from various nationalities and the cultures across the globe differed extensively in their views on tobacco consumption. Tobacco consumption might be a cultural norm in some countries, such as China and Indonesia. Thus, tobacco consumption rates differ from country to country. In comparison with the neighbouring countries, the overall prevalence of current smokers in Malaysia (23.1%) was similar to that in Thailand (23.7%) but was relatively lower than that in Indonesia (34.8%), as reported by the GATS 2011.[33,34] The relationship between culture and tobacco consumption suggested that modifying cultural norms could aid in the fight against the tobacco epidemic. Implementation of anti-tobacco policies and initiation of educational campaigns about the risk of tobacco consumption could create an anti-tobacco norm and reduce tobacco consumption rates.

Concurrent with nationality, ethnicity was another significant factor linked to tobacco consumption in this study. This association between ethnicity and tobacco consumption had been demonstrated in previous studies and the NHMS 2015 survey.[11,19,35] Compared with students of other ethnicities, Indian students had increased odds by 19 times to be using tobacco (AOR = 19.248, CI = 1.71-216.24). This finding was in contrast to those of the analysis of the NHMS 2015 survey, whereby Malays were more likely to smoke compared with other ethnic groups.[35] However, various other extrinsic and intrinsic factors, including religion, culture and perceived societal norms, might also play a part in the association between ethnicity and tobacco consumption. Furthermore, a recent US study suggested that genetic ancestry and socioeconomic factors could contribute to tobacco use across ethnic population groups.[36] Nonetheless, the finding of this study highlighted the relevance of identifying higher tobacco consumption rates within and across ethnic population groups to gain a deeper understanding and address these disparities.

A significant association between religion and tobacco consumption was found in this study. Muslim students showed the highest prevalence of current tobacco use compared with students of other religions (37.8%). Moreover, they were 21 times more likely to be using tobacco compared with students of other religions (AOR = 21.487; CI = 2.18-212.13). This was in agreement with the findings of the GATS Malaysia 2011 survey, which reported that current tobacco use prevalence was relatively higher among Muslims (26.2%) than non-Muslims (19.5%).[26] An older local study conducted among medical students noted that religion was one of the factors that abstained non-smokers from smoking.[32] Most religions also usually discourage risky behaviours such as tobacco consumption. Elkalmi et al. pointed out that university students who actively participate in religious activities were more likely to avoid tobacco consumption than those who were not involved in such activities.[21]

Furthermore, the school was significantly associated with tobacco consumption among university students in this study. Higher tobacco consumption prevalence was observed generally among students whose courses were not related to health science in comparison with students whose courses were health science-related. This finding was consistent with a similar study conducted among a group of university students in Malaysia, whereby non-medical students had higher odds of smoking cigarettes than medical students.[18] The higher prevalence of usage of ATNPs, such as e-cigarettes and shisha, among non-health science students had also been reported by several other researchers, in agreement with the findings of this study.[37-39] These discrepancies might be attributed to the impact of the nature of the study of health science students on their decision to initiate tobacco use.

Besides the school, the current level of education was also a significant factor associated with tobacco consumption. This study found that current tobacco users were mostly senior students in their advanced study years. Undergraduate fourth-year students had an increased odds of using tobacco by 21 times compared with undergraduate first-year students (AOR = 21.440, CI = 1.82-252.73). Similar findings were obtained by previous local and international studies.[17,27,40] Nasser and Zhang suggested that this might be because senior students had longer exposure to older tobacco users within the university environment, such as uni-

versity lecturers and older friends, who could have significant influence on their views on tobacco consumption.[27] In addition, the increased amount of stress experienced during advanced study years could also be a contributing factor for senior students to use tobacco as a stress reliever. This finding indicated that junior students are important targets for anti-tobacco activities while senior students ought to be given specific education about quitting tobacco use.

Parental and sibling influences were among the significant factors linked to the behaviour of tobacco consumption among university students of the current study. These associations might be attributed to the social learning theory, which postulated that young individuals observe and emulate their role models, such as parents and siblings, around them who use tobacco and reinforcements may influence them to anticipate rewarding consequences from tobacco use.[41] In this study, students whose parents were tobacco users were three times more likely to use tobacco compared with those with parents who were non-users (AOR = 3.467, CI = 1.12-10.71). Additionally, students who had siblings that used tobacco were six times more likely to use tobacco than those with siblings that do not use tobacco (AOR = 6.317; CI = 0.64-62.753). These findings were consistent with previous literature, wherein there were more tobacco users among those whose family members used tobacco.[22,42,43] In addition, one's interest to use tobacco is typically enhanced when exposed to a smoking environment at home.

Besides family members' influences, peer use of tobacco also significantly influenced tobacco consumption among the students. Having more friends who use tobacco predicted the odds of tobacco initiation.[42,44] Another key finding was that all of the current tobacco users of this study had friends who were tobacco users (Table 2). Similar findings had been reported elsewhere, whereby one's behaviour of tobacco use was significantly influenced by having more friends who also engage in this behaviour.[24,43,45] Once again, the social environment plays a role in influencing tobacco initiation and consumption. Peer influence may be further enhanced via social media, which allows university students to share their experiences and practices of tobacco use.[46]

However, other sociodemographic characteristics, including gender, age, academic results, father's and mother's highest level of education, did not show any significant association with the tobacco consumption behaviour among university students of the current study. These findings were in contrast to those of other studies reported elsewhere, which noted that these sociodemographic characteristics were significantly associated with tobacco consumption among young adults.[19,47,48] Policymakers may consider these findings and not emphasise on these factors when drawing up preventive and cessation programmes for tobacco use among young adults.

LIMITATIONS

The main limitation of this study is that data of this study was only collected from a private university in Malaysia within a limited time duration. Therefore, the results obtained may not represent the entire population of university students and have limited generalizability. Larger studies that include university students from other states of Malaysia may be conducted in future studies to address this issue. Moreover, reporting bias may be present as self-reporting mechanisms were used to collect data in this study. Furthermore, cross-sectional methods were used to collect data, thus causal relationships cannot be determined from the results of this study. Last but not least, there are numerous factors related to the use of tobacco but this study had only investigated the common factors, including age, gender and the use of tobacco by family and friends.

5. CONCLUSION

This study provides an overview of the prevalence and the overlapping factors of the use various types of tobacco among university students in Malaysia. In this study, the overall prevalence of tobacco consumption was 8.6% with manufactured cigarettes, e-cigarettes and shisha being the few popular tobacco products used among tobacco users. Moreover, this study found that nationality, ethnicity, religion, school and current level of education were significantly associated with the current use of tobacco products. Besides these factors, parents' use, siblings' use and friends' use of tobacco products were also strong determinants of tobacco consumption in this study. Tobacco use, especially novel ANTPs, among young adults has been on the rise in recent years. Considering the detrimental effects of tobacco use on human health, all types of tobacco use need to be discouraged. Anti-tobacco programs and policies targeting young adults may take these findings into consideration when devising and conducting such programs and policies to prevent and reduce this behaviour among this vulnerable group. Further research may focus on other economic and psychosocial determinants, such as mental satisfaction and attitude towards tobacco control policies, as a means of identifying effective methods for encouraging tobacco cessation and preventing tobacco consumption among university students. Nevertheless, effective tobacco control requires the efforts of not only the policymakers but also the academics and communities to end tobacco-related illnesses.

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CONFLICT OF INTEREST

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