PREVALENCE OF SMOKING AND FACTORS ASSOCIATED WITH SMOKING STATUS AMONG MALE STUDENTS ATTENDING THE UNIVERSITI SAINS MALAYSIA

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Abstract. Smoking is a serious public health problem in Malaysia. The aims of this study were to determine the prevalence of smoking among full-time, undergraduate male students attending the Universiti Sains Malaysia and identify sociodemographic factors associated with their smoking status in order to inform smoking control programs for this study population. Study subjects in this cross-sectional study were chosen by stratified random sampling. Data were collected through face-to-face interviews following a structured questionnaire asking about subject smoking habits and their sociodemographic characteristics. Exclusion criteria for study subjects were lifelong learning students due to their part time status. Ordered probit analysis was used to identify factors associated with smoking status. A total of 450 subjects were included in the study; 52% were non-smokers (did not smoke any cigarettes), 14% were casual smokers (smoked ≤5 cigarettes daily) and 34% were compulsive smokers (smoked >5 cigarettes daily). In our study, factors significantly associated with a greater chance of smoking were Malay ethnicity (p <0.001), third year of study (p = 0.005), majoring in the arts (p <0.001), having a part time job (p <0.001), and having parents (p = 0.043) or siblings (p <0.001) who smoke. The factors associated with smoking status were being Malay, working on a part time basis, majoring in the arts, having a monthly household income of ≥RM8001, having a maternal education of secondary level and having a sibling who smoke. These factors should be taken into consideration when developing anti-smoking programs for the study population.

Keywords: cigarette smoking, prevalence, sociodemographic factors, smoking status, male university students, Malaysia

INTRODUCTION

Cigarette smoking is a major modifiable risk factor for a number of non-communicable diseases in Malaysia (Institute for Public Health Malaysia, 2015a). In 2003, one in every five deaths in Malaysia (10,000 deaths annually) was estimated to be caused by tobacco smoking and its complications (Ministry of Health Malaysia, 2003). In 2017, the three leading causes of death in Malaysia were ischemic heart disease (13.9%), cerebrovascular disease (7.1%) and cancers of the trachea, bronchi and lungs (2.3%) (Department of Statistics Malaysia, 2018). Despite these

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health risks, the prevalence of smoking among Malaysians aged ≥15 years during the past ten years has remained high: 23.1% (4.7 million) in 2011 and 22.8% (4.9 million) in 2015 (Institute for Public Health Malaysia, 2015b). In 2015, an estimated 43% of Malaysian men were active smokers while only an estimated 1.4% of Malaysian women were active smokers (Institute for Public Health Malaysia, 2015b). Equally concerning is the estimation that 94% of smokers consumed ≥5 cigarettes per day (Institute for Public Health Malaysia 2015b). In 2018, the Malaysian government spent an estimated RM3billion to treat smoking-related diseases, an amount equal to approximately 11.3% of the Malaysian government's total health budget that year (The Star, 2014; NSTOnline, 2017).

Several studies have examined smoking among school-age children and adults in Malaysia (Lee *et al*, 2005; Tan, 2012), but less is known about smoking among adolescents and young adults. This age group is important because lifelong habits often develop during these years (Nelson *et al*, 2008). Promoting healthy habits among adolescents and young adults may reduce future risk of lifestyle-related illnesses (Daw *et al*, 2017; Lawrence *et al*, 2017).

Some studies have addressed the prevalence of smoking among university students in Asia (Al-Naggar *et al*, 2011; Chirtkiatsakul *et al*, 2019; Niu *et al*, 2018; Sirilak, 2018). University students represent a unique population of young adults because most are transitioning from the confines of their family homes to independence at the university. They are encountering greater freedom and responsibility in making decisions, including smoking (Yahia *et al*, 2017). A previous study reported that education level is inversely associated with smoking (Tan *et al*, 2009). Better educated persons may be more cognizant of health risks and possess greater access to health information (Tan *et al*, 2012).

Studies analyzing factors associated with smoking usually compare smokers with non-smokers (Chirtkiatsakul *et al*, 2019). Many smokers are nicotine dependent and consume multiple cigarettes daily but some (casual smokers) are not nicotine dependent (Shiffman *et al*, 1992; Shiffman *et al*, 1994). Casual smokers may smoke because of different reasons than nicotine dependent compulsive smokers (Shiffman *et al*, 1994). However, both casual and compulsive smokers are at increased risk of developing smoking related morbidities, such as cancer of the kidneys, pancreas, esophagus/trachea, and lungs and coronary heart disease (Luoto *et al*, 2000). Therefore, in this study, we aimed to determine the prevalence of smoking and the sociodemographic factors associated with smoking status of non-smokers (those who do not currently smoke), casual smokers (those who smoke ≤5 cigarettes daily) and compulsive smokers (those who smoke >5 cigarettes daily).

MATERIALS AND METHODS

Study subjects

Study subjects were selected by randomly approaching students at various campus sites and were all male undergraduate students attending the Universiti Sains Malaysia (USM). We excluded students from the School of Distance Education because they were usually working adults who were taking classes part-time online.

The minimum number of subjects for this study was calculated to be 338 based

on a total male undergraduate population of 2,798 students (5% margin of error, 95% confidence level) (Raosoft Inc, 2004; USM Admissions Office, unpublished data).

Study instrument and interviews

The study instrument used for our study was a structured questionnaire asking about student smoking habits; we also recorded sociodemographic characteristics of the participants. The questionnaire consisted of three parts: (1) sociodemographic characteristics (ethnicity, year and discipline of study, employment status, monthly household income bracket, highest parental education level, smoking status of parents and siblings), (2) subject smoking status and number of cigarettes smoked daily and (3) reasons for smoking or not smoking.

Subject ethnicity was categorized as Malay/*Bumiputera*, Chinese, Indian, or other. Subject study year was categorized as first, second, third, or fourth year. Subject majors were categorized as: sciences (biology, chemistry, computer science, industrial technology, mathematical sciences, pharmacy and physics) or the arts (arts, communication, education, housing, building and planning, humanities, language, literature and translation, management, and social sciences). Employment status was categorized as either working part time or not working. The household income level was categorized as low (≤RM4,000/month), middle (RM4,001-8000/month) and high (≥RM8001/month) (Department of Statistics Malaysia, 2017; Khazanah Research Institute, 2018) (RM1.00 = USD0.24 on 31 March 2020). The highest parental education level was categorized as primary, secondary or tertiary. The parental/sibling smoking status was categorized as smoker or non-smoker depending on if they were currently smoking or not.

The questionnaire was pilot-tested on ten students (not included in the study) from the School of Social Sciences selected using convenience sampling. The study instrument was revised based on the results of the pilot study to improve clarity. The study was conducted during December 2018 - February 2019.

Ethical considerations

The Human Research Ethics Committee of USM reviewed the study protocol and found no ethical issues (JEPeM Code: USM/JEPeM/19080469).

Statistical analysis

The data were analyzed using STATA 12 (StataCorp LLC, College Station, TX); descriptive analysis was used for all variables. The reference characteristics used for analysis of associations with smoking were Malay ethnicity, being a first year student, being a science major, coming from a low-income household and parental primary education level. Chi-square analysis was used to determine if smoking prevalence differed by sociodemographic factors.

Given the three-category ordinal outcomes of smoking status (non-smokers, casual smokers, compulsive smokers), an ordered probability model was used to examine the sociodemographic factors associated with smoking status. The ordered probit model (McCullagh, 1980) used was as follows:

Smoking status

$$= \text{Non-smoker} \quad \text{if } -\infty < x\beta + u \le 0 \quad (1)$$

$$= \text{Casual smoker} \quad \text{if } 0 < x\beta + u \le u_1$$

$$= \text{Compulsive smoker} \quad \text{if } u_1 < x\beta + u \le u_2,$$

where x is a vector of independent variables, β is a vector of parameters, u is the random error term, and the u's are the threshold parameters describing the

smoking status categories. The probability of each category can be obtained from Eq (l). For example, the likelihood of being a compulsive smoker is:

$$\Pr(\text{Compulsive smoker}) = F(u_2 - x\beta) - F(u_1 - x\beta), \quad (2)$$

where F(•) is the cumulative distribution function. The maximum likelihood (ML) method was used to estimate the ordered probit model (Maddala, 1986). Based on ML estimates, the marginal effects of the explanatory variables were derived by differencing the category probabilities in Eq (2). These marginal effects were defined as the change in likelihood of being a non-smoker, casual smoker, or compulsive smoker when the value of the covariate increases by one unit.

RESULTS

Subject characteristics by smoking status are shown in Table 1. A total of 450 subjects were included in the study. Fifty-two percent of the subjects were non-smokers, 14% were casual smokers and 34% were compulsive smokers. Sixty-eight percent of subjects were ethnic Malay/*Bumiputera*, 20% ethnic Chinese, 8% ethnic Indian and 4% of other ethnic backgrounds; 29% of students were in their first year of studies, 21% second year, 27% third year and 23% fourth year; 54% of subjects majored in the arts while the rest majored in the sciences. Thirty-one percent of subjects had a part time job while the rest did not; 51% of subjects came from a family with a low household income level, 36% from a middle household income level and 14% from a high household income level. The most common paternal education level was secondary (51%), followed by tertiary (33%) and primary (17%). The most common maternal education level was secondary (52%), followed by tertiary (28%) and primary (20%). Thirty-two percent of subjects had a parent that smoked and 39% had a sibling that smoked.

The prevalence of compulsive smoking was significantly higher among ethnic Malay/*Bumiputera* (p <0.001) subjects. Students in their third year of study (p = 0.005), those majoring in the arts (p <0.001) and those having a part time job (p <0.001) had a significantly higher prevalence of compulsive smoking. The prevalence of casual and compulsive smoking were significantly higher among those with parents (p = 0.043) and siblings (p <0.001) who smoke (Table 1).

Compared to ethnic Malays (the baseline ethnicity), Chinese students were 36.7 percentage points (henceforth, points) more likely to be non-smokers (p <0.001), 8.5 points less likely to be casual smokers (p <0.001) and 28.1 points less likely to be compulsive smokers (p <0.001). Compared to ethnic Malays, ethnic Indian students were 17.9 points more likely to be non-smokers (p = 0.025) and 14.2 points less likely to be compulsive smokers (p = 0.014). Compared to ethnic Malays, other ethnicities were 27.8 points more likely to be non-smokers (p = 0.003), 7.1 points less likely to be casual smokers (p = 0.054) and 20.6 points less likely to be compulsive smokers (p = 0.001) (Table 2).

Arts students were 25.5 points less likely to be non-smokers (p <0.001) but 3.5 points more likely to be casual smokers (p = 0.001) and 21.9 points more likely to be compulsive smokers (p <0.001) than science students. Students who worked part-time were 13.9 points less likely to be non-smokers (p = 0.016) but 2.3 points more likely to be casual smokers (p = 0.058) and 11.6 points more likely to be compulsive smokers (p = 0.012) than non-

Table 1
Sociodemographic characteristics of study subjects by smoking status.

Characteristics	Non-smoker (n = 235) (52%)	Casual smoker (n = 63) (14%)	Compulsive smoker (n = 152) (34%)	Total (n = 450) (100%)	p-value
	Number (%)	Number (%)	Number (%)	Number (%)	
Ethnicity					<0.001
Malay/*Bumiputera*	136 (45)	29 (10)	140 (46)	305 (68)	
Chinese	67 (75)	19 (21)	4 (4)	90 (20)	
Indian	21 (57)	11 (30)	5 (14)	37 (8)	
Others	11 (61)	4 (22)	3 (17)	18 (4)	
Year of study					0.005
First	70 (54)	18 (14)	42 (32)	130 (29)	
Second	59 (63)	16 (17)	18 (19)	93 (21)	
Third	49 (40)	17 (14)	57 (46)	123 (27)	
Fourth	55 (53)	12 (12)	37 (36)	104 (23)	
Type of major					<0.001
Sciences	129 (63)	22 (11)	55 (27)	206 (46)	
Arts	106 (43)	41 (17)	97 (40)	244 (54)	
Employment status					<0.001
Not working	176 (57)	49 (16)	86 (28)	311 (69)	
Part-time	59 (42)	14 (10)	66 (47)	139 (31)	
Household income level in RM/month					0.688
≤4000 (low)	121 (53)	32 (14)	75 (33)	228 (51)	
4001-8000 (medium)	84 (52)	25 (16)	52 (32)	161 (36)	
≥8001 (high)	30 (49)	6 (10)	25 41)	61 (14)	
Paternal education level					0.564
Primary	42 (56)	7 (9)	26 (35)	75 (17)	
Secondary	112 (49)	36 (16)	80 (35)	228 (51)	
Tertiary	81 (55)	20 (14)	46 (31)	147 (33)	
Maternal education level					0.523
Primary	40 (45)	14 (16)	35 (39)	89 (20)	
Secondary	130 (56)	32 (14)	72 (31)	234 (52)	
Tertiary	65 (51)	17 (13)	45 (35)	127 (28)	
Parental smoking status					0.043
Non-smoker	172 (56)	37 (12)	98 (32)	307 (68)	
Smoker	63 (44)	26 (18)	54 (38)	143 (32)	
Siblings smoking status					<0.001
Non-smoker	183 (67)	39 (14)	53 (19)	275 (61)	
Smoker	52 (30)	24 (14)	99 (57)	175 (39)	

RM: Ringgit Malaysia.

Table 2
Ordered probit regression analysis of factors associated with smoking status among study subjects.

Independent variables	Non–smoker			Casual smoker			Compulsive smoker		
	Marginal effect* (% points)	(95% CI)	*p*-value	Marginal effect* (% points)	(95% CI)	*p*-value	Marginal effect* (% points)	(95% CI)	*p*-value
Ethnicity									
Malay/*Bumiputera*	reference			reference			reference		
Chinese	36.7	(26.3, 47.1)	<0.001	-8.5	(-12.7, -4.3)	<0.001	-28.1	(-35.5, -20.8)	<0.001
Indian	17.9	(2.2, 33.5)	0.025	-3.7	(-8.2, 0.8)	0.107	-14.2	(-25.5, -2.8)	0.014
Others	27.8	(9.2, 46.3)	0.003	-7.1	(-14.4, 0.1)	0.054	-20.6	(-32.3, -9.0)	0.001
Year of study									
First	reference			reference			reference		
Second	10.3	(-3.3, 23.9)	0.139	-1.7	(-4.4, 1.0)	0.223	-8.6	(-19.6, 2.4)	0.125
Third	-9.5	(-22.8, 3.9)	0.165	1.0	(-0.2, 2.3)	0.109	8.4	(-3.8, 20.7)	0.176
Fourth	-4.5	(-18.5, 9.5)	0.527	0.5	(-1.0, 2.1)	0.484	4.0	(-8.5, 16.5)	0.533
Type of major									
Sciences	reference			reference			reference		
Arts	-25.5	(-35.4, -15.5)	<0.001	3.5	(1.4, 5.7)	0.001	21.9	(13.3, 30.5)	<0.001
Employment status									
Not working	reference			reference			reference		
Part-time	-13.9	(-25.1, -2.6)	0.016	2.3	(-0.1, 4.6)	0.058	11.6	(2.5, 20.6)	0.012
Household income (RM/month)									
≤4000 (low)	reference			reference			reference		
4001-8000 (medium)	-1.0	(-13.6, 11.6)	0.879	0.1	(-1.5, 1.8)	0.878	0.8	(-10.1, 11.8)	0.879
≥8001 (high)	-14.2	(-32.9, 4.5)	0.136	1.1	(0.2, 1.9)	0.014	13.1	(-5.3, 31.6)	0.163
Paternal education level									
Primary	reference			reference			reference		
Secondary	-8.4	(-26.3, 9.5)	0.358	1.1	(-1.3, 3.6)	0.372	7.3	(-8.2, 22.8)	0.358
Tertiary	-5.4	(-28.7, 17.9)	0.650	0.7	(-2.0, 3.3)	0.625	4.7	(-15.9, 25.4)	0.654

Table 2 (Continued)

Independent variables	Non–smoker			Casual smoker			Compulsive smoker		
	Marginal effect* (% points)	(95% CI)	*p*-value	Marginal effect* (% points)	(95% CI)	*p*-value	Marginal effect* (% points)	(95% CI)	*p*-value
Maternal education level									
Primary	reference			reference			reference		
Secondary	25.8	(10.2, 41.4)	0.001	-3.2	(–5.5, -0.8)	0.008	-22.7	(-36.5, -8.8)	0.001
Tertiary	8.6	(-13.8, 31.1)	0.452	-1.3	(-5.2, 2.5)	0.507	-7.3	(-26.0, 11.3)	0.442
Parental smoking status									
Non-smoker	reference			reference			reference		
Smoker	-7.7	(-19.0, 3.6)	0.182	0.9	(-0.4, 2.2)	0.159	6.8	(-3.3, 16.9)	0.189
Siblings smoking status									
Non-smoker	reference			reference			reference		
Smoker	-32.1	(-42.4, -21.9)	<0.001	2.8	(1.0, 4.7)	0.002	29.3	(19.4, 39.2)	<0.001

* Negative values denote "less likely"; positive values denote "more likely"; RM: Ringgit Malaysia.

working students. By income level, students from high-income (≥RM8001/month) households were 1.1 points (p = 0.014) more likely to smoke in a casual manner than students from low-income (≤RM4000/month) households.

Subjects whose mothers had a secondary level education were 25.8 points more likely to be non-smokers (p = 0.001), 3.2 points less likely to be casual smokers (p = 0.008) and 22.7 points less likely to be compulsive smokers (p = 0.001) than subjects whose mothers had a primary level education. Subjects whose siblings smoked were 32.1 points less likely to be non-smokers (p <0.001), 2.8 points more likely to be casual smokers (p = 0.002) and 29.3 points points more likely to be compulsive smokers (p <0.001) than subjects whose siblings did not smoke.

DISCUSSION

In this study, we examined the prevalence of smoking and the factors associated with smoking status among male full-time undergraduate students attending the Universiti Sains Malaysia. In our study, ethnic Malay students were significantly more likely to be casual and compulsive smokers than other ethnicities, similar to the findings from other studies (Tan *et al*, 2009; Tan, 2012). Smoking

control programs at the USM should target Malay students with education programs, including sermons delivered at university mosques highlighting the harmful effects of smoking and emphasizing cigarette smoking is *haram* (forbidden or unlawful) according to the religious edicts (*fatwa*) of the Malaysian National *Fatwa* Committee (Juni, 2014; Asuhaimi *et al*, 2017). Anti-smoking campaigns should also be conducted in Malay language media platforms (*eg* newspapers, popular magazines, television programs, and radio channels). Malay celebrities can be employed as spokespersons to act as role models highlighting the harmful effects of cigarette smoking.

In our study, arts majors were more likely to be casual or compulsive smokers than science majors. Similar findings were reported from Japan (Kitamura *et al,* 2003) and Ireland (Murphy *et al*, 2019). Students studying the sciences may be more aware of the dangers of smoking and more likely to abstain from smoking (Kitamura *et al*, 2003). Smoking control programs at the USM need to target students studying in the arts. This should include testimonials as well as statistics and the scientific reasons to not smoke (Hinyard and Kreuter, 2007; Durkin *et al*, 2009; Kim, 2019).

In our study, subjects with part time jobs were more likely to be casual or compulsive smokers than those who did not work. This supports previous studies that show being in the workplace is associated with a greater likelihood for adolescent workers to start smoking (Chen *et al*, 2006; Do and Finkelstein, 2012). Workplaces hiring student workers may be appropriate targets for smoking control programs and should be monitored for smoking influences (Ramchand *et al*, 2007; Do and Finkelstein, 2012).

In our study, subjects from higher income households were more likely to be casual smokers than those from lower income households. This supports the hypothesis children from affluent households were better able to afford tobacco (Cawley *et al*, 2006; Heo *et al*, 2014). This also reflects adult smoking patterns in Malaysia where the wealthy are more likely to be smokers (Tan *et al*, 2016). Smoking control programs at the USM should educate these students about the hazards of smoking.

In our study, subjects with a mother with a secondary education level were less likely to smoke than those with a mother with a primary education level. Our finding is similar to the results of other studies from Malaysia (Chirtkiatsakul *et al*, 2019), the United States (Villanti *et al*, 2017) and the United Kingdom (Taylor-Robinson *et al*, 2017). Smoking control programs at the USM should target students with mothers who have lower education levels, educating them on smoking hazards.

In our study, subjects whose siblings smoked were significantly more likely to be casual and compulsive smokers, similar to the findings of other studies (Harakeh *et al*, 2007; Tjora *et al*, 2011). An individual's cognitive views regarding the acceptability of smoking are different in those who have a smoking sibling (Schultz *et al,* 2010). Smoking control programs at the USM should target students with smoking siblings encouraging them to be positive role models for not smoking to their smoking siblings.

There were several limitations to our study. Although we counted cigarettes smoked daily, we did not include e-cigarettes, which is increasing in popularity in Malaysia (Tee and Low, 2019). Further studies should take this

group into consideration. In our study, we did not include some factors, such as course workloads, student grades, participation in physical activity and alcohol consumption and did not conduct our study longitudinally which could further increase our understanding of this subject, such as the incidence of smoking initiation during study. Our study was limited to only one institution, so our results cannot be applied to other universities. Further studies should be multi-institutional to obtain a broader picture of the problem among university students in Malaysia.

In our study, ethnicity, year of study, type of major, working a part time job, family income level, maternal education, parental smoking and sibling smoking were factors associated with smoking among study subjects. Smoking cessation programs at the USM need to take the above factors into consideration when developing strategies for the study population.

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REFERENCES

Al-Naggar RA, Al-Dubai SAR, Al-Naggar TH, Chen R, Al-Jashamy K. Prevalence and associated factors of smoking among Malaysian university students. *Asian Pac J Cancer Prev* 2011; 12: 619-24.

Asuhaimi FA, Pauzai NA, Makhtar M, Asari K. The role and position of fatwa in Malaysian court. *Pertanika J Soc Sci Hum* 2017; 25: 227-38.

Cawley J, Markowitz S, Tauras J. Obesity, cigarette prices, youth access kaws, and adolescent smoking initiation. *East Econ J* 2006; 32: 149-70.

Chen CY, Chen WC, Lew-Ting CY, *et al*. Employment experience in relation to alcohol, tobacco, and betel nut use among youth in Taiwan. *Drug Alcohol Depend* 2006; 84: 273-80.

Chirtkiatsakul B, Jani R, Abdul Kadir R, Nordin ASA, Azizi R. Prevalence of and factors associated with smoking among University of Malaya students in Malaysia. *Southeast Asian J Trop Med Public Health* 2019; 50: 1202-11.

Daw J, Margolis R, Wright L. Emerging adulthood, emergent health lifestyles: sociodemographic determinants of trajectories of smoking, binge drinking, obesity, and sedentary behavior. *J Health Soc Behav* 2017; 58: 181-97.

Department of Statistics Malaysia. Press release: statistics on causes of death, Malaysia, 2018 [cited 2019 Dec 08]. Available from: URL: https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=aWg2VjJkZHhYcDdEM3JQSGloeTVlZz09

Department of Statistics Malaysia. Report of household income and basic amenities survey 2016, 2017 [cited 2019 Dec 08]. Available from: URL: https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=120&bul_id=RUZ5REwveU1ra1hGL21JWVlPRmU2Zz09&menu_id=amVoWU54UTl0a21NWmdhMjFMMWcyZz09

Do YK, Finkelstein EA. Youth employment, income, and smoking initiation: results from Korean panel data. *J Adolesc Health* 2012; 51: 226-32.

Durkin SJ, Biener L, Wakefield MA. Effects of different types of antismoking ads on reducing disparities in smoking cessation among socioeconomic subgroups. *Am J Public Health* 2009; 99: 2217-23.

Harakeh Z, Engels RCME, Vermulst AA, DeVries H, Scholte RJH. The influence of best friends and siblings on adolescent smoking: a longitudinal study. *Psychol*

Health 2007; 22: 269-89.

Heo J, Oh J, Subramanian SV, Kawachi I. Household and school-level influences on smoking behavior among Korean adolescents: a multilevel analysis. *PLoS One* 2014; 9: e98683.

Hinyard LJ, Kreuter MW. Using narrative communication as a tool for health behavior change: a conceptual, theoretical, and empirical overview. *Health Educ Behav* 2007; 34: 777-92.

Institute for Public Health Malaysia. National Health & Morbidity Survey 2015. Vol. II: Noncommunicable diseases, risk factors & other health problems, 2015a [cited 2019 Dec 08]. Available from: URL: https://www.moh.gov.my/moh/resources/nhmsreport2015vol2.pdf

Institute for Public Health Malaysia. National Health & Morbidity Survey 2015. Report on smoking status among Malaysian adults, 2015b [cited 2019 Dec 08]. Available from: URL: https://www.moh.gov.my/moh/resources/NHMS2015-VolumeV.pdf

Juni MH. Tobacco use is prohibited (Haram) in Islam. *Int J Public Health Clin Sci* 2014; 1: 19-28.

Khazanah Research Institute. The state of households 2018: different realities, 2018 [cited 2019 Dec 08]. Available from: URL: http://www.krinstitute.org/Publications-@-The_State_of_Households_2018_-_Different_Realities.aspx

Kim M. When similarity strikes back: conditional persuasive effects of character-audience similarity in anti-smoking campaign. *Hum Commun Res* 2019; 45: 52-77.

Kitamura T, Kawamura T, Aono M, *et al*. Multiphasic epidemiological analyses on smoking habits among undergraduate students in Japan. *Asian Pac J Cancer Prev* 2003; 4: 141-5.

Lawrence E, Mollborn S, Hummer R. Health lifestyles across the transition to adulthood: implications for health. *Soc Sci Med* 2017; 193: 23-32.

Lee LK, Paul CYC, Kam CW, Jagmohni K. Smoking among secondary school students in Negeri Sembilan, Malaysia. *Asia Pac J Public Health* 2005; 17: 130-6.

Luoto R, Uutela A, Puska P. Occasional smoking increases total and cardiovascular mortality among men. *Nicotine Tob Res* 2000; 2: 133-9.

Maddala GS. Limited-dependent and qualitative variables in econometrics. 1986. Cambridge, UK: Cambridge University Press; 1986.

McCullagh P. Regression models for ordinal data. *J R Statist Soc* 1980; 42: 109-27.

Ministry of Health Malaysia. Clinical practice guidelines on treatment of tobacco smoking and dependence, 2003 [cited 2019 Dec 12]. Available from: URL: http://www.acadmed.org.my/view_file.cfm?fileid=185

Murphy JJ, MacDonncha C, Murphy MH, *et al*. Identification of health-related behavioural clusters and their association with demographic characteristics in Irish university students. *BMC Public Health* 2019; 19: 121.

Nelson MC, Story M, Larson NI, Neumark-Sztainer D, Lytle LA. Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity* 2008; 16: 2205-11.

Niu L, Liu Y, Luo D, Xiao S. Current smoking behavior among medical students in mainland China: a systematic review and meta-analysis. *Asia Pac J Public Heathl* 2018; 30: 610-23.

NSTOnline. 2018 Budget: priority given to rakyat's healthcare needs. New Straits Times 2017 Oct 29 [cited 2019 Dec 12]. Available from: URL: https://www.nst.com.my/news/nation/2017/10/296500/2018-budget-priority-given-rakyats-healthcare-needs

Ramchand R, Ialongo NS, Chilcoat HD. The effect of working for pay on adolescent tobacco use. *Am J Public Health* 2007; 97: 2056-62.

Raosoft Inc. Sample size calculator, 2004 [cited 2020 Mar 20]. Available from: URL: http://www.raosoft.com/samplesize.html

Schultz ASH, Nowatzki J, Dunn DA, Griffith EJ. Effects of socialization in the household on youth susceptibility to smoking: a secondary analysis of the 2004/05 Canadian Youth Smoking Survey. *Chronic Dis Can* 2010; 30: 71-7.

Shiffman S, Kassel JD, Paty J, Gnys M, Zettler-Segal M. Smoking typology profiles of chippers and regular smokers. *J Subst Abuse* 1994; 6: 21-35.

Shiffman S, Zettler-Segal M, Kassel J, Paty J, Benowitz NL, O'Brien G. Nicotine elimination and tolerance in non-dependent cigarette smokers. *Psychopharmacology* 1992; 109: 449-56.

Sirilak S. The prevalence of alcohol, smoking and illicit substance use among Thai university students and associated selected factors. *Southeast Asian J Trop Med Public Health* 2018; 49: 1084-90.

Tan AKG. Distinguishing between non-smokers, casual smokers, and compulsive smokers: evidence from Malaysia. *Atl Econ J* 2012; 40: 173-84.

Tan AKG, Yen ST, Feisul MI. Determinants of body weight status in Malaysia: an ethnic comparison. *Int J Public Health* 2012; 57: 279-88.

Tan AKG, Yen ST, Hasan AR. Cigarette and alcohol expenditures in Malaysia: implications for anti-smoking and drinking policies. *Asian Econ J* 2016; 30: 401-21.

Tan AKG, Yen ST, Nayga Jr RM. Role of education in cigarette smoking: an analysis of Malaysian household survey data. *Asian Econ J* 2009; 23: 1-17.

Taylor-Robinson DC, Wickham S, Campbell M, Robinson J, Pearce A, Barr B. Are social inequalities in early childhood smoking initiation explained by exposure to adult smoking? Findings from the UK Millennium Cohort Study. *PLoS One* 2017; 12: e0178633.

Tee GH, Low WY. Electronic cigarettes use among adults and adolescents in Malaysia: a public health concern? *Asia Pac J Public Health* 2019; 31: 4S-5S.

The Star. Government spends RM3bil annually to treat smoking-related diseases. The Star Newspaper 2014 Jun 24 [cited 2019 Dec 08]. Available from: URL: https://www.thestar.com.my/news/community/2014/06/24/costly-treatments-government-spends-rm3bil-annually-to-treat-smokingrelated-diseases

Tjora T, Hetland J, Aarø L, Overland S. Distal and proximal family predictors of adolescents' smoking initiation and development: a longitudinal latent curve model analysis. *BMC Public Health* 2011; 11: 911.

Villanti AC, Johnson AL, Rath JM. Beyond education and income: identifying novel socioeconomic correlates of cigarette use in U.S. young adults. *Prev Med* 2017; 104: 63-70.

Yahia N, Brown C, Potter S, *et al*. Night eating syndrome and its association with weight status, physical activity, eating habits, smoking status, and sleep patterns among college students. *Eat Weight Disord* 2017; 22: 421-33.