RESEARCH ARTICLE

Smoking among Secondary School Students in Kota Tinggi, Johor, Malaysia - Findings from a Cross-Sectional Study

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Abstract

Background: Smoking is a learnt behavior during adolescence and understanding the factor/s associated with smoking will assist in identifying suitable measures in combating the rising prevalence of smoking among adolescents. This research aimed to identify the factor/s associated with smoking among form four students in Kota Tinggi, Johor. Multistage sampling was used to select a representative sample of students in 2008 and data were collected using a self-administered validated questionnaire. This study revealed that the overall smoking prevalence was 19.0% with a significantly higher proportion of male smokers (35.8%) as compared to females (3.15%). Adolescents who were male (aOR 6.6, 95%CI 2.61-16.4), those who had peer/s who smoked (aOR 4.03, 95% CI 1.31-12.4), and those who studied in rural areas and Felda Settlements (aOR 4.59, 95 CI 1.11-18.0; aOR 9.42, 95%CI 3.91-29.1) were more likely to smoke in the past one week. On the other hand, adolescents with better knowledge on the hazards of smoking and negative attitudes towards smoking were less likely to smoke (aOR 0.51, 95%CI 0.37-0.72; aOR 0.67, 95%CI 0.46-0.99). Future promotional and interventional programmes on smoking should be considered and the above identified risk factors integrated to reduce smoking prevalence among students of school-going ages in Kota Tinggi. Johor.

Keywords: Adolescent smoking - weekly smoker - intrapersonal - interpersonal - Johor

Introduction

Diseases and mortality related to smoking are among the major public health problems in Malaysia. Smoking related mortality was identified as the main cause of death among the Malaysian population since 1980 (Ministry of Health 2003). Diseases related to smoking were also among the top 10 principal causes of hospitalization, which contributed almost 1/3 of Years of Life Lost (YLLs) and 17% of Disability Adjusted Life Years (DALYs) among the Malaysian adult population (Institute for Public Health, 2012). Therefore, reducing smoking prevalence to half by 2020 one of the main agendas of the Ministry of Health, Malaysia (Norsiah 2013).

Ample epidemiological studies had identified smoking as a behavior learnt and initiated during adolescence (USDHHS, 2004) and those who did not smoke during adolescence were unlikely to initiate smoking during their adulthood (USDHHS 2004). The earlier the individual initiated smoking, the higher the likelihood he/she will be inflicted by diseases related to smoking (USDHHS

2004). In addition, adolescents who smoked were more likely to be involved in other high-risk behaviors such as using illicit drugs (Chen et al., 2002) and engaging in unprotected sex (Busch et al., 2013).

Previous studies of smoking among adolescents identified that intrapersonal, interpersonal (relationships between the individual with others) and environmental factors influenced smoking behavior among adolescents. Some intrapersonal factors associated with adolescent smoking include lower levels of knowledge on hazards of smoking (Yan et al., 2014), positive attitudes towards smoking (Nazarzdeh et al., 2013) and low self-esteem (Karimy et al 2013; Nazarzdeh et al., 2013), perceived high smoking prevalence among peers, as well as perceived positive reactions of parents and society towards smoking. (Botvin et al., 1992; Otten et al., 2009). In contrast, having best friends (Kobus 2003; Simon-Morton and Farhat 2010, Jeganathan et al., 2013; Hiemstra et al., 2014) and family members who smoked (Shamsuddin and Harris; Leonard et al., 2011), perceived less cordial family relationship, unsatisfactory academic achievements (Lim

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et al., 2010), perceived lower socio-economic status and lower status in school were the associated interpersonal and environmental factors of smoking behavior among adolescents (Finkelstein et al., 2006).

Although several studies of adolescent smoking had been conducted in Malaysia, only a few investigated the intrapersonal, interpersonal and environmental factors in detail. Identifying the factor/s associated with smoking will assist local health authorities in formulating the appropriate measures to tackle the rising smoking prevalence among adolescents in a particular locality. This purpose of this paper was to describe the smoking prevalence as well as to identify the intra-, interpersonal and environmental factors associated with weekly smoking among Form four students aged 16 years old in Kota Tinggi in 2008.

Materials and Methods

Data was obtained from a longitudinal study which aimed to evaluate the psychosocial effects on smoking initiation among Form 1,2 and 4 (aged 13, 14 and 16 years old) secondary school students in the Kota Tinggi district, Johor, from 2008-2010. This project was a collaborative study between the Institute for Medical Research (IMR) and Kota Tinggi District Health Office. IMR was responsible for the proposal development, study design and development of study instrument (questionnaire) whilst the Kota Tinggi health department coordinated data collection in the field. This study was approved by the Ministry of Education and the Johor State Education Department. Ethics clearance was granted by the Medical Research Ethics Committee, Ministry of Health, Malaysia.

Sampling

This study employed a two-stage proportionate to size sampling method to select a representative sample of secondary school students in the Kota Tinggi district. First stage sampling involved division of schools according to urban, rural and federal land settlement area (FELDA), and subsequently, at the second stage, schools were selected from each stratum. Simple random sampling method was used to select respondents from the enrolment list provided by each selected school based on random numbers generated from Epi-info version 6.04d. In this study, a total of 600 Form 4 respondents (aged 16 years old) were selected based on an incidence rate of 6%, non-response and attrition rate of 30% (in view of its longitudinal study design). Sampling method was explained in detail by (Lim et al., 2011).

Study protocol

Passive informed consent approach was utilized in the present study. Consent forms were distributed to the parents/guardians of all selected respondents through their school management authorities to brief and inform them on the objectives of the study as well as the voluntary basis of their participation. Parents/guardians who did not consent to their children's participation were asked to return the consent forms. Only students with permission from parents/guardians were recruited into the study. Data

were collected via self-administration. Ascertainment of the anonymity of answers, and the right to pull out or to skip certain item/s in the questionnaire were granted to all respondents in order to obtain the most genuine response from them. Respondents who had difficulties in comprehending certain item/s were guided by the research team members who included the principal investigator, trained research assistants and public health nurses. Completed questionnaires were concealed in envelopes. No teacher/s or school staffs were around during the data collection session.

Study instrument

A validated questionnaire by Hanjet et al. (2001) was used in the present study to determine the smoking status (either weekly or non-weekly smoker) of the respondents. However, pre-testing was conducted to further strengthen the use of this questionnaire in the present study and respondents who were involved in the pre-testing study were excluded from the actual study. Minor corrections were made on the questionnaire according to the outcomes and feedback in the pre-testing study. The dependent variable (weekly smoker) was determined by the question "*how often did you smoke in the last one month?*" with several choices of answer as "*every day*", "*almost every day*", "*once a week*", "*once a month*" and "*not at all*". Respondents who answered either "*every day*", "*almost every day*" or "*once a week*" were categorized as weekly smokers whilst those who answered "once a month" or "*not at all*" were categorized as non-weekly smokers.

Evaluation on the knowledge of smoking hazards and attitude was adapted from Ma et al. (2003) (Correct it) which consisted of 11 items, (five items to measure knowledge i.e Cigarette smoking is harmful to my health. and attitude towards smoking was measured by 6 items-Preventing teens from cigarette smoking is very important. Both knowledge and attitude variables were measured using a Likert-type scale which ranged from 1 to 4. (Try changing the sentence structure). The total score obtained was divided by the number of responding items; the higher the score, the higher the knowledge on smoking hazards and the more negative the attitude towards smoking.

A validated Malay version of Rosenberg self-esteem questionnaire (Jamil, 2006) which consisted of 10 items (score ranged from 0 to 3 for each item) was used to measure the level of self-esteem among adolescents. Those who scored less than 15 were classified into the category of low self-esteem and those who scored 15-30 were classified as having normal/high level of self-esteem.

Interpersonal factors (peer smoking, had family member/s who smoked and perceived prevalence of smoking among peer/s) which could have attributed to smoking among adolescents were identified from several items in the questionnaire, which included "*Among five of your best friends, how many of them smoke?*", "*Do your father or elder brother/s smoke?*", "*How many of your peer/s are smoking?*"

The academic achievement of respondents was determined based on previous examination results and categorized as mostly grade A and B or grade C to E. Family relationships was determined using 5 items (i.e my

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parents understand my feeling) in Likert scale. A higher score represents a better family relationship according to respondent's perception. (Change the sentence structure). The determination of self-perceived family, societal and school status was measured using the Subjective Social Status Scale-Youth Version (Goodman et al., 2001) which was validated prior to this survey and measured in Likert-type score which ranged from 1 to 10.

Statistical analyses

Descriptive statistics were used to describe the background and sociodemography of the respondents. Chi-Square analysis was used to determine the association between categorical variable/s and dependent variable while the differences in mean scores of continuous variables (knowledge and attitude on smoking between weekly and non- smokers) was determined via independent t-test. Independent variables with p value less than 0.25 were included into the model for multivariable logistic regression to evaluate the real effect of each independent variable after controlling the confounding effects of

other independent variables. Two-way interactions were tested among the significant variables in the final model and no significant interactions were detected among them ($p<0.05$). Hosmer-Lemeshow goodness showed a p-value of 0.48, which indicated that the model was fit. All statistical analyses were performed at 95% confidence level using SPSS version 18.

Results

A total of 554 students responded to the questionnaire, giving a response rate of 92.3%. Majority of them were female (52.1%, n=289) and studied in schools located in the FELDA area (65.7%, n=364). Almost one-fifth of the respondents were weekly smokers and most of them were males (35.8 vs 3.1%. $p<0.001$), studied in FELDA schools (22.8% vs 18.1% and 7.6%, p=0.001), had at least one close friend who smoked (32.1% vs 2.1%, $p<0.001$), and had poor academic achievements (23.4 % vs 10.2%, $p<0.001$). However, no significant associations were observed between father's and elderly brother's smoking

Table 1. Socio-demographic Characteristics of Schooling Adolescents in Kota Tinggi

Variable	Smoking Status		Chi-square value	p value
	Weekly smoker n (%)	Non-smoker n(%)		
Gender				
Male	95 (35.8)	170(64.2)	96.8	<0.001
Female	9 (3.1)	279(96.9)		
Locality of Schools				
Urban	9(7.6)	109(90.4)	13.4	0.001
Rural	13(18.1)	59(81.9)		
FELDA	83(22.8)	281(77.2)		
Father Smoked				
Yes	55(19.9)	222(80.1)	0.33	0.56
No	37(17.8)	171(82.2)		
Elder Brother Smoked				
Yes	54(19.0)	230(81.0)	0.15	0.7
No	16(17.2)	77(82.8)		
Number of best friend/s smoked				
0	5(2.1)	234(97.9)	78.7	<0.001
1-5	100(32.1)	212(67.9)		
Academic Performance				
Mostly A & B	19(10.2)	168(89.8)	14.1	<0.001
Mostly C ,D & E	82(23.4)	331(76.6)		
Perceived prevalence of peer smoking				
None to few	18(13.4)	116(86.6)	3.42	0.06
Many to a lot	86(20.6)	331(79.4)		

Table 2. Intra- and Interpersonal Factors among Schooling Adolescent in Kota Tinggi

Variables	Weekly smoker		T value	p value
	Yes Mean (sd)	No Mean (sd)		
Knowledge level on hazards of smoking	2.49(1.09)	3.38(0.87)	7.78	<0.001
Negative attitude toward smoking	1.56(0.71)	2.09(0.64)	7	<0.001
Perceived societal disapproval on adolescent smoking	4.66(2.05)	5.54(1.97)	4.06	<0.001
Perceived parental disapproval on smoking	6.00(1.59)	6.61(1.18)	3.64	<0.001
Family relationship score	4.26(0.76)	4.34(0.69)	1.08	0.28
Perceived family status in the society	5.05(1.57)	5.16(1.75)	0.55	0.58
Perceived individual status in school	5.14(1.93)	4.48(1.82)	-3.06	0.001
Self-esteem	16.89(3.91)	17.69(3.86)	1.89	0.059

Table 3. Table 3: Multivariable Binary Logistic Regression analysis of Weekly Smoking and Selected Socio-Demographic, Intra- And Interpersonal Factors

Variables	Adjusted Odd Ratio	95 CI	p Value
Gender			
Male	6.6	2.61-16.4	<0.001
Female	1		
Locality of Schools			
Urban	1		
Rural	4.59	1.11-18.1	0.03
FELDA	9.42	3.04-29.1	<0.001
Number of best friend/s smoked			
0	1		
1-5	4.03	1.31-12.4	0.015
Academic Performance			
Mostly A & B	1		
Mostly C ,D & E	2.47	1.73-3.15	0.02
Perceive prevalence of peer smoking			
None to few	1		
Many to a lot	1.35	0.63-2.91	0.44
Self-esteem	0.93	0.86-1.02	0.12
Knowledge level on hazards of smoking	0.51	0.37-0.72	<0.001
Negative attitude toward smoking	0.67	0.46-0.99	0.047
Perceived societal disapproval on adolescent smoking	0.91	0.77-1.06	0.23
Perceived parental disapproval on adolescent smoking	0.98	0.81-1.12	0.86
Family relationship score	0.86	0.56-1.31	0.47
Perceived individual status in school	1.02	0.87-1.20	0.78

*Hosmer Lemeshow test Chi Square Value 7.53 df=8 p=0.48

status with the smoker category (Table 1).

On the other hand, non-smokers showed significantly better knowledge on the health hazards of smoking and had a more negative attitude towards smoking compared to their weekly smoker counterparts. They also perceived more negative reaction from society and parents on adolescent smoking. Of note, the weekly smokers perceived a significantly higher individual status in school compared to the non-weekly smokers (5.14 *vs* 4.48, p<0.001) (Table 2).

Multiple logistic regression (Table 3) revealed that adolescents who were male (aOR 6.6, 95% CI: 2.6-16.4), studied in rural and, particularly FELDA schools (aOR 4.6, 95% CI: 1.1-18.1; aOR 9.4, 95% CI: 3.0-29.1) and had at least one best friend who smoked (aOR 4.0, 95% CI: 1.3-12.4) were more likely to be weekly smokers. In contrast, respondents with better knowledge on smoking hazards (aOR 0.51, 95%CI: 0.37-0.72) and negative attitudes towards smoking (aOR 0.67, 95%CI: 0.46-0.99) were less likely to become weekly smokers. However, the significant association of the smoker category with self-perceived negative reactions from society and parents on smoking as shown in the univariate analysis (Table 2) was lost in the multivariable model (Table 3).

Discussion

This study revealed that the prevalence of smoking among form-four students was 19.0%, with an significantly higher proportion of male smokers (35.8%) compared to female smokers (3.1%). This prevalence had been documented in previous reports of smoking among male adolescents in Malaysia (Naing et al., 2004, Institute for Public Health, 2008; Lim et al., 2010; Jeganathan et al., 2013; Lim et al., 2014; Caszo et al., 2015). Social norm which accepts smoking among males may be one of the contributing factors, and this speculation was corroborated by a study in United States which found that the prevalence of smoking among females had increased in relation to higher societal acceptance of female smoking (Waldron, 1991). Furthermore, it can be stipulated that a smoking male adult could act as a role model for a male adolescent since smoking is a learned behavior. In addition, social learning theory posits that the learning process is more effective among individuals of same gender (Bandura 1977). On a brighter note, the overall prevalence of smoking among males as well as females were lower compared to those observed in the same locality three years ago. The prevalence of smoking among male students had reduced significantly from 54.1% in 2005 to 35.8% in 2008 (Lim et al., 2006). The smoking prevalence among male students as determined in the present study was almost comparable to those reported by Naing et al (2004) among male adolescents aged 16 and 17 years in Kota Bharu, Kelantan (35.9%), but it was slightly higher than the national prevalence of 30.5% as reported by Manimaran (2003) among adolescents aged 13-15 years. And 6.1% among 12-13 years old school going adolescents in Kinta, Perak (Jeganathan et al., 2013). Moreover, it was also higher than the 7.8% and 13.5% as reported by Rao et al. (2014) among male adolescents of 13-15 years old in South Asia and in China (Ma et al., 2008) respectively. On the other hand, the prevalence of smoking among female students (3.1%) was significantly lower than those observed among a national sample of female students aged 13-15 years (5.3%) (Manimaran

2003). Differences in the proportion of ethnics between the present study and the national study might be one of the plausible reasons for the disparity in smoking prevalence among adolescents of similar age.

There was no association between having a family member (father and/or brother) who smoked with becoming a weekly smoker. On the contrary, adolescents who was exposed to peer/s smoking exhibited significant association with becoming a weekly smoker. These findings were in agreement with those reported by Villanti et al. (2011). Such findings were explained by the human development theory which theorizes that adolescence is a transition period for young individuals to search for their identities. Hence, they will spend more time and are more invested in their closest friends who have similar characteristics and therefore peer behavior will be their reference or role model. Santrock 2005) In addition, Bauman and Ennett (1996) postulated that smokers may befriend other smokers as they share similar characteristics and project their smoking behavior onto their peers. This study reaffirmed the suggestion by Kandel and Lesser (1972) that the normative influence of parent and peer smoking do not follow a hydraulic model (in which this model suggested parallel increment of both parent and peer influence) whereby our study found that peer influence increased and parental influence decreased an adolescent's tendency to smoke. In contrast, the present findings demonstrated that the effect of self-perceived parental disapproval on smoking waned as these adolescents age and the absence of association between family relationships with weekly smokers had indirectly substantiated the speculation that family had less influence in adolescent smoking. This confirms the finding of Sawyer and Stevenson (2008). However, this was contradictory to those findings observed by Shamsuddin and Harris (2000) among secondary school students in Kelantan, Malaysia, Shokib et a. (2005) among adolescents in China and Kristjansson et al. (2010) which had demonstrated an inverse relationship (protective effect) of perceived parental support and adolescent smoking (Catanzaro and Laurent, 2004; Kristjansson et al., 2010). It can be postulated that such contrasting findings may be because the study by Shamsuddin and Haris (2001) was conducted in a rural area in Kelantan, whereby most of the respondents were more likely to have conformed to the practices and health behaviors of their parents. In addition, respondents recruited in Shokib et al. (2005)'s study were comparatively younger than those in the present study, and therefore, they were more likely to be influenced by their parents and older siblings.

The present study demonstrated that better knowledge on the harmful effects of smoking conferred protective effect against smoking and such findings was in line with those reported by Yan et al. (2014) among adolescents in China. In addition, Larsen and Colin (2009) also found that respondents who perceived the detrimental effects of smoking were less likely to initiate smoking or become daily smokers. Furthermore, our findings were substantiated by Halpen Fisher et al. (2005) and Song et al. (2009) who reported that adolescents who perceived health risks of smoking correlated negatively,

and perceived benefits of smoking correlated positively with becoming smokers. According to Strecher and Rosenstock's (1997) Health Belief Model, behavioral change occurs when individuals' perceived overall threat of an undesirable behavior (smoking or one's perceived susceptibility to smoking-related cancer and diseases or their perceived severity of smoking-related cancer and diseases), outweighs their perceived benefits from smoking and perceived barriers to change their smoking behavior. This model can thus partly explain the lower likelihood of becoming weekly smokers for those who had better knowledge of smoking hazards.

The inverse relationship between negative attitudes towards smoking and becoming a weekly smoker among Malaysian adolescents was consistent with the findings by Nazarzadeh (2013) among Iranian adolescents, Wiium et al (2006) and de Leeuw et al., (2008) who reported positive attitude and smoking behavior among adolescents. However, Larsen et al. (2009) found that beliefs and opinions about smoking did not predict smoking uptake when socio-demographic, environmental, and behavioural factors were taken into account. Additionally, Tyas et al (1998) in their critical review on literature were unable to observe the negative association (between attitude and smoking) after controlling the confounding effect of smoking among friends. The finding in this study was in accordance with the theory of attitude-behavior relationship (Ajzen and Madden, 1986) .

The present study was unable to prove that high self-esteem was a protective factor from smoking among adolescents as demonstrated by previous cross-sectional and longitudinal studies. Nonetheless, the present findings were in line with those reported by Glendinning (2001) who found no association between 750 adolescents aged 11-15 and self esteem in a 5 yea longitudinal studyas well as by Mullan and NicGabhainn (2002) among a large sample of Irish school children. In contrast, a meta-analysis study which was conducted by Nazarzadeh et al. (2013) among Iranian male adolescents concluded that adolescents with low self-esteem were more likely to smoke OR 1.07 (95% CI: 1.03-1.11), Karimy and colleague (2013) who reported a protective effect OR 0.67(95% CI 0.55-0.82) of self esteem against hookah smoking among Iranian male adolescents and Yang et al (2013) who revealed a negative relationship between smoking and self esteem. Nevertheless, findings from the present study and several previous studies in different countries (Glendinning (2001); Mullan and NicGabhainn 2002) challenged the postulation by few authors (Yang et al., 2014; McPhie and Rawana 2012) that adolescents of lower self-esteem were more likely to suffer mentally and emotionally and hence were more susceptible to substance abuse such as smoking. According to Mullan and NicGabhainn (2002), the self-esteem deficit theory was too simplistic to elucidate its association with health risk behaviour. However, a properly planned national study among a representative sample of Malaysian adolescents is warranted in order to explicate this association since cultural differences may have contributed to the contradictory findings as reported in previous studies.

In the present study, no association was found between

perceived prevalence of peer smoking and weekly smoking. The present findings were not in agreement with findings from other studies conducted elsewhere and the conformity hypotheses which suggested that the perception of commonness of a behavior will lead to later adoption of such behavior. Botvin et al. (1992) found that the greater the estimated proportion of smoking peers, the higher the likelihood of adopting smoking in the future. Otten et al. (2009) in their longitudinal study revealed that respondents who perceived higher prevalence of peer smoking were 52% more likely to smoke after a period of a year. Furthermore, Wang et al. (2011) demonstrated that perceived smoking norms was positively associated with increased levels of smoking over time among adolescents. This resonated with findings by Eisenberg and Forster 2003 who found that among 3128 girls and 3146 boys, there was a significant positive association between perceived prevalence of peer smoking and weekly smoking (aOR 0.88, 95%CI 0.80-0.98). However, our result was in line with the outcome of a longitudinal study by Lim et al. (2011) in the same locality. One of the plausible reasons for the above opposing findings may be attributed to the different types of norm measured, as this current study only concentrated on descriptive norm (norm of is and characterize the perception of what most people do (Cialdini et al., 1991) and did not measure other type of social norm (i.e injunctive norm) directly . As Wiium and colleague (2006) suggested measurement of several type of social norm will strengthen and show the real effect of social norm toward the measured behavior (smoking) might be contribute factors to the contradicted finding to those study. Future studies with other types of social norm are strongly recommended to elucidate the dynamics of this variable in influencing adolescent smoking.

There was an association between academic achievement was with weekly smoking in the univariate analysis, and this remained the same even after controlling the effects of other independent variables. The finding is in line with Park et al. (2011) who demonstrated that adolescents with the poorest academic achievement smoked the most. Doku et al. (2010) also found that Finnish adolescents who scored lower grades were at higher risk of early smoking initiation. Additionally, a review by Bradley and Greene (2013) on 28 studies, revealed 100% an inverse association between tobacco use and academic achievements. Furthermore, 10 longitudinal studies reported that those who used tobacco performed less well academically in school than their non-smoking peers. Good academic achievements might be the manifestation of cognitive gains which assist adolescents to understand and react rationally towards the information of healthy behaviors which drive them away from the smoking behavior (Pennanen et al., 2011). In addition, respondents with good academic achievements might have the aspiration and vision to excel academically in the future with full commitment and attention to achieve their goals, thus not straying from unhealthy or unwanted activities. (ie which will sway them away from their targeted goal

The findings of the present study on the association

between perceived family status in the society and individual status in schools with weekly smoking were contradictory to the findings from the Monitoring the Future Study by Finkelstein (2006) and Hanson et al., 2007. Finkelstein and his colleague observed an inverse association between parental education (proxy to family status) and 30-day smoking prevalence among eighth grade students. Of note, the least educated parents were associated with a three-fold higher smoking prevalence compared to the most educated group. Among 10th graders this difference was two-fold. Finkelstein et al. (2006) also suggested that ranking in school as a proxy measurement of various positive dimensions of adolescents' social status, i.e good academic achievement, good personal characteristics which earn the respect from their peers. However, respondents in the current study might interpret SSSS differently from previous studies, in which they might perceive smoking will make them popular and respected by their peers. Future longitudinal studies are recommended to investigate how respondents interpret popularity and respect by others and the mechanism which contribute to smoking behaviour.

Malaysian adolescent respondents who resided in rural and Felda areas were more likely to smoke compared to their urban counterparts. A higher prevalence of smoking adults in rural and Felda areas as reported in the National Health and Morbidity Survey (Institute for Public Health 2011) may be one of the contributing factors for the above findings. The presence of smoking adults in the family or surrounding may act as a role model for adolescents to emulate their smoking behavior. Furthermore, the extension of smoke-free areas and prohibition of smoking in most public places and certain indoor areas in the urban settlements may be attributed to the lower prevalence of smoking among urban adolescents.

As with other epidemiological studies, the present study was subjected to limitations. The data collected from Phase 1 of the study did not allow the establishment of a causal relationship between independent and dependent variables. In addition, the survey nature was self-administered and therefore there is self-reported bias and a tendency to under-report the smoking status as well as a inclination to report socially desirable responses. Nonetheless, efforts such as adoption of "bogus pipe line" method and assurance of anonymity was undertaken to minimize possible biases.

In conclusion, the present study demonstrated few factors which were associated with smoking among Malaysian adolescents as those reported in other studies. On the other hand, a reduction in the prevalence of smoking as compared to those reported three years ago in the same locality is in fact very encouraging. Nonetheless, intensive interventional measures should be undertaken together with all relevant stakeholders among adolescents particularly those with risk factors as identified in the present study in order to significantly and effectively reduce the prevalence of adolescent smoking and subsequently reduce the burden of smoking-related morbidity and mortality in Malaysia.

100.0   6.3

75.0   56.3

50.0

25.0   31.3

0

Newly diagnosed without treatment

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