RESEARCH ARTICLE

Incidence of Adverse Transition in Smoking Stages among Adolescents of Kinta, Perak

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Abstract

   <u>Background</u>: Few local studies have explored the process of adverse transition of smoking stages among adolescents. The present investigation aimed to identify adverse transitions prospectively from the early stages till the escalation of the stages after one year. <u>Materials and Methods</u>: Data were collected in two waves from a cohort of 2,552 adolescents aged 12-13 years old studying in 15 secondary schools based in Kinta, Perak. A multistage sampling method was used to select the schools and a self-administered structured questionnaire was applied to help categorize the participants into five different smoking stages. Nonsmokers were divided into never smokers and susceptible never smokers. Ever-smokers were categorized as experimenters, current smokers or ex-smokers. <u>Results:</u> Among the participants 46.8% were Malay, 33.5% Chinese and 17.1% Indians. At baseline, we had 85.3% non-smokers and 14.6% ever smokers. Incidence of adverse transition among all our participants was 24.1%, with a higher value among male participants (16.8%). A higher proportion of susceptible never smokers and experimenters progressed to current smoking stage compared to never smokers. <u>Conclusions:</u> This study highlights the changes and patterns of adverse transition among adolescents. Male adolescents, those who are susceptible to smoking and those who had already tried experimenting with cigarettes have a higher chance of escalating to a higher smoking stage.

Keywords: Adolescents - smoking stages - adverse transition - Perak, Malaysia

Introduction

   The long term health consequences and the immediate effects of tobacco use have been well documented for the last five decades. World Health Organization reported tobacco use to be linked to six of the eight main causes of death including cancer (World Health Organization, 2012). Although smoking is prevalent in all ages, adolescents are more vulnerable (Binu et al., 2010). Smoking among adolescents is a dynamic process involving progression through several stages (US Department of Health and Human Services, 2012).

   In Malaysia, the National Health Morbidity and Mortality Survey III, 2006 identified the prevalence of smoking among adolescents aged between 13-18 years old to 8.7% and Malaysian Global Youth Tobacco Survey, 2009 reported the prevalence to be 18.2%. There are also several local studies that have investigated not only on prevalence of smoking but also examined the factors associated with smoking (Naing et al., 2004; Lee et al., 2005; Al-Naggar et al., 2011). A study on oral cancer, found students to be more aware of unfavourable effects of tobacco use compared to working adults (Ghani et al., 2013). Unfortunately, most of these studies are cross-

sectional in nature and lack information on progression of smoking stages among adolescents.

   Long-term abstinence from tobacco use usually involves many unsuccessful attempts to quit and cessation after becoming nicotine dependent is difficult (Yasin et al., 2013). Hence, preventing smoking initiation, uptake and experimentation is important. In addition, identifying progression or adverse transition of smoking stages is crucial as it has been shown as an efficient way to understand the development of smoking behavior among adolescents (Mosavi-Jarrahi et al., 2004; Hampson et al., 2013). This study aims to examine the different stages of smoking and identify the incidence of adverse transition among adolescents.

Materials and Methods

Study design
   Longitudinal design with two point data collection was used in this study. This study cohort was carried out in Kinta educational institutions. Kinta is the largest district in Perak, Malaysia. As part of a longitudinal survey, started in February 2011, the incidence of adverse transition was studied over the period of one year.

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Setting and sample

Malaysian Ministry of Education has classifed all the schools as either urban or rural schools. Schools within a city or town municipality are considered as urban schools and the others are categorized as rural schools (Abdullah, 2003). Perak, state education department provided a list of secondary schools in Kinta, Perak. All government co-educational secondary schools within Kinta were included in this sampling frame whereas all religious based schools, vocational schools and boarding schools were excluded. Multistage sampling method was used to select the subjects. All Form One students aged between twelve to thirteen years old from fifteen secondary schools in Kinta, Perak were invited to participate in this study. The response rate was 90.7%. Attrition rate by the end of 12 months was 12.5% leading to a final sample of 2234 adolescents. Attrition was not selective and there were no consistent trends within the group that did not complete the survey at the end of 12 months.

Instrument

Students completed a self-administered structured questionnaire during school hours. Prior to data collection participants were given a brief introduction to study and they were assured that their responses will be kept confidential.

Description of smoking stages and adverse transition

Smoking stages was operationalized using a five level variable (Figure 1). Participants of this study were classified as non-smokers if they answered "Yes" to one question: "Have you ever smoked a cigarette, even one or two puffs?" and those who answered "No" were classified as ever smokers (NHMS III, 2006). Susceptibility to smoking was assessed among non-smokers using three questions to determine firm commitment not to smoke. Participants who answered "definitely no" to all three questions were identified as never smokers and those who choose any other answers were defined as susceptible never smokers (Michell et al., 1996). Ever smokers were further categorized as experimenters, current smokers and ex-smokers.

Similar questions were used to categorize the students' smoking stages after one year. The focus of this study was on adverse transition which is defined as transition from one smoking stage at Time 1 (the baseline) to a more unfavourable stage in Time 2 (12 months later) (Kim et al., 2006).

We identified four adverse transition groups in this study. Adverse Transition I comprise of never smokers progressing to become either a susceptible never smoker, experimenter, current smokers or ex-smoker. Adverse Transition II encompassed susceptible never smokers moving up to become experimenters, current smokers or ex-smokers. Adverse Transition III included progression of experimenter to current smoker. Adverse Transition IV covered ex-smokers who started smoking again (current smoking) (Table 2).

Data analyses

We used SPSS software version 15.0 to analyze the data. The procedures in complex samples add-on module in SPSS were used in the analyses. Data were weighted accordingly by assigning appropriate student and school weights that were adjusted for non-response.

Ethical considerations

Ethical approval was obtained from University Malaya Medical Centre Ethics Committee, Malaysian Ministry of Education and Perak State Education Department. Permission was also acquired from all the school heads.

Results

At Time 1, our sample consisted of 46.8% Malay, 33.5% Chinese and 17.1% Indian participants. At Time 1, we had 85.3% non-smoker and 14.6% ever smokers. Among the non-smokers 19.3% were susceptible never

Table 1. Smoking Stages of Participants in Kinta, Perak

Smoking Stages	Time 1 (n=2552)	95% Confidence Interval		Time 2 (n=2234)	95% Confidence Interval	
	%	Lower	Upper		Lower	Upper
Non-smokers						
Never smokers	66	63.9	68.1	61	58.6	63.2
Susceptible never smokers						
	19.3	17.7	21.2	18.6	16.8	20.5
Ever smokers						
Experimenters	6	5.1	7.1	5.3	4.3	6.5
Current smokers	5.5	4.7	6.6	11.9	10.4	13.5
Ex-smokers	3.1	2.4	3.9	3.2	2.4	4.2

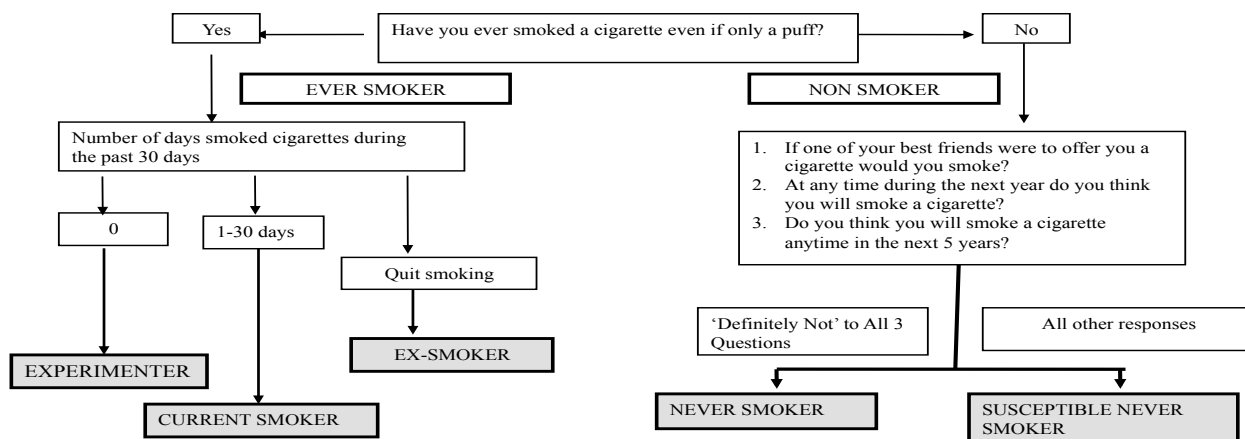*Weighted percentages are presented

Figure 1. Classification of Smoking Stages

smokers (refer to Table 1). Ever smokers were 6% experimenters, 5.5% current smokers and 3.1% ex-smokers. The proportion of never smokers, susceptible never smokers and also experimenters decreased at Time 2. However current smoking doubled, from 5.5% at Time 1 to 11.9% at Time 2.

Table 2 shows details regarding the smoking stages at baseline and twelve months later. There was a total of 1499 never smokers at baseline and 77.1% remained as never smokers (stable never smokers). Among the 22.8% Adverse Transition I (never smokers), 14.3% progressed to become susceptible never smokers, 4.3% had become experimenters, 3.6% became current smokers and 0.6% became ex-smokers. Among the susceptible never smokers 8.5% became experimenters, 15.5% became current smokers and 3.8% became ex-smokers. Adverse transition to current smoking was 43.5% among the experimenters (Adverse Transition III). A total of 36% of the ex-smokers became current smokers again (Adverse Transition IV).

A total of 24.1% (537) of the students moved to a more advanced stage of smoking. Table 3 compares the adverse transition among male and female particpants. Adverse transition was higher among the male participants, 16.8%. Among the baseline male never smokers 18.2% became susceptible never smokers, 6% became experimenter and a similar proportion became current smokers. The proportion of female susceptible never smokers (8.2%) who become experimenters was almost similar to their male counterpart (8.4%). None of the baseline female ex-smokers became current smokers again.

Table 2. Adverse Transtion of Smoking Stages among Adolescents in Kinta, Perak

Smoking stages at Time 1	Smoking stages at Time 2				
	Never smoker n (%)	Susceptible never smoker n (%)	Experimenter n (%)	Current smoker n (%)	Ex-smoker n (%)
Never smoker	1156 (77.2)	218 (14.3)	62 (4.3)	56 (3.6)	7 (0.6)
		<-------------- ---Adverse Transtion I------------ ---->			
Susceptible never smoker			33 (8.5)	62 (15.5)	10 (3.8)
			<-------Adverse Transtion II------->		
Experimenters				64 (43.5)	
			<-Adverse Transtion III->		
Ex-smoker				25 (36.0)	
			<-Adverse Transtion IV->		

*Actual number and weighted percentages are presented

Table 3. Adverse Transitions of Smoking Stages by Gender

Smoking stages at Time 1	Smoking stages at Time 2				
	Never smoker n (%)	Susceptible never smoker n (%)	Experimenter n (%)	Current smoker n (%)	Ex-smoker n (%)
Never smoker					
Female	710 (84.2)	94 (11.3)	21 (2.7)	16 (1.6)	2 (0.2)
Male	445 (68.3)	124 (18.2)	41 (6.3)	40 (6.1)	5 (1.1)
Susceptible never smoker					
Female			10 (8.2)	10 (9.0)	0 (0)
Male			23 (8.4)	52 (18.5)	10 (5.4)
Experimenters					
Female				8 (38.1)	
Male				56 (44.5)	
Ex-smoker					
Female				0 (0)	
Male				25 (44.6)	

*Actual number and weighted percentages are presented

Discussion

Adolescents in any smoking stage may have taken different pathways of smoking transition during the twelve months period (Kim H et al., 2006). In the present study, after 12 months (Time 2) some of the adolescents remained in the same stage, some had progressed to a higher stage of smoking and some regressed to a lower stage. The focus of this study was on adverse transition which is defined as transition from one smoking stage at Time 1 to a more adverse stage in Time 2. Adverse stage was taken as a stage that was more detrimental (Kim et al., 2006).

Consistent with other studies (Kaplan et al., 2008) we found non-smokers decreased when adolescents advanced in their academic education level (Form One to Form Two). On the increasing trend was current smoking. While recognizing that the risk of smoking decreases with age among adults (Cheah et al., 2012), studies among adolescents have found probability of becoming a smoker increases with age (Mosavi-Jarrahi et al., 2004; Ozawa et al., 2008). Therefore smoking prevention activities aimed at adolescents should target primary school children and focus largely on how to prevent uptake or initiation of smoking.

Adverse transitions was highest among never smokers, followed by susceptible never smokers than experimenters and lowest among ex-smokers. A higher proportion of both the male and female experimenters become current smokers compared to susceptible never smokers. Previous studies have established that experimental smokers have high risk of becoming regular smokers (Park et al., 2009). Similarly, a higher percentage of susceptible never smokers became current smokers when compared to never smokers. This illustrates that the risk of becoming a smoker increases with the progression of smoking stages. Thus, we need to start early and prevent adolescents from becoming susceptible to smoking or experimenting with cigarettes to counter the risk of becoming an established smoker during late adolescence.

Our findings among the baseline or Time 1 susceptible never smokers are consistent with previous studies that also reported a higher risk of adverse transition among susceptible never smokers (Kaplan, 2008). In this study, baseline susceptible never smokers allowed almost equal percentage of the female and male adolescents became experimenters. Susceptible male non-smokers are open to the possibility of smoking compared to never smokers who are committed to not smoking (Pierce et al., 2005). Studies have reported progression from never smoking to become susceptible never smokers as the first step to regular smoking (Leventhal et al., 1980; Pierce et al., 1996). As susceptibility of the adolescents increases the risk of initiation to three times (Huang et al., 2005). It is well known that regular smoking is a major contributor of premature deaths (CDC, 2000), so identifying susceptible and preventing adverse transition among adolescents in this group should be top priority in any anti-smoking activities.

Adverse transition among adolescents in this study was 24%. The incidence of adverse transition among the male adolescents was more than double of the incidence

among the female adolescents. This is consistent with other studies (Spelman, 2007; Guo, 2008) that found adverse transitions to be higher among male adolescents. However, there are also studies that found a greater risk of adverse transitions among females (Richmond, 1999; Lloyd-Richardson et al., 2002). Malaysia is similar to other Asian countries where parents are more protective and tend to pay more attention to their daughters. Smoking is also found to be more acceptable among males than females in the Asian communities (Thambypillai, 1985). We should not ignore the role of gender differences in our tobacco policy. We need to be concern and refute the acceptance of male smoking as being born male is found to be the single major risk factor for tobacco use (Morrow et al., 2003).

The major strengths of our study include a prospective design that follows an adolescent cohort over a period of one year. Nevertheless, there are limitations. Firstly, there is the possibility of under or over reporting as we based identification of smoking behavior among adolescents by using self-reports without any biochemical verifications. However, self-reports have been used by other researches and is found to be reliable (Benowitz et al., 2002; Dolcini et al., 2003). Generalizability of the results may be limited in some ways, as we examine the adverse transition among adolescents aged between 12-13 years old. Hence, any generalization of the results should be limited to adolescents within the same age group. The adverse transition rates among each smoking stage of any younger or older adolescents may differ from our findings.

In conclusion, this study highlights the changes and patterns of adverse transition among adolescents in Malaysia. Our findings adds to the knowledge that escalation of smoking stages among adolescents may dependent on each individuals' present smoking stage. Although risk of adverse transition is higher among male adolescents, susceptibility among female adolescents can lead them to become experimenter and current smokers. Efforts to reduce smoking among adolescents should take into account age, gender as well as identify the smoking stages to be able to target and carry out effective anti-smoking prevention activities. Non-smokers should not be neglected in any smoking prevention interventions as non-smokers also include those who are susceptible to smoke in the future.

Acknowledgements

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