



Original Research Article

Smoking among Rural School Adolescents in Malacca, Malaysia: The Family and Environmental Predictors

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ABSTRACT

Objective: The purpose of this study was to examine the family and environmental predictors contributing to smoking among rural school adolescents.

Materials and Methods: This was a case control study using cluster sampling (484 cases and 444 controls) among rural school adolescents in Malacca, Malaysia from May to August 2010. Binary logistic regression was used to determine the predictors of smoking which were family and environmental factors.

Results: Among the strongest predictors of smoking within family and environmental factors were mother smokes (Adjusted OR=6.24, 95% CI 1.61-24.18), influenced by being offered cigarette by friends (Adjusted OR=4.48, 95% CI 3.04-6.59), has friends who smoked (Adjusted OR=2.56, 95% CI 1.60-4.10), smoking forced by friends (Adjusted OR=2.47, 95% CI 1.39-4.39) and best friend smokes (Adjusted OR = 2.28, 95% CI 1.57-3.32).

Conclusions: Family and environmental factors must be taken into consideration in developing smoking behavior intervention programme for rural school adolescents.

Keywords: smoking, adolescent, rural school, family factor, environmental factor

INTRODUCTION

According to World Health Organizations, an adolescent is defined as young adults aged 10 to 19 years old which further can be divided into three subgroups. Those are early adolescence whom age group is from 10 to 13 years old, mid adolescence aged 14 to 15 years old and later adolescence which is 16 to 19 years

old. During the adolescence phase, they are actually undergoing a transition time in between children and adult. In the early adolescence group, they start to have abstracts thinking before shifted to mid adolescence which is more reflective in thinking. Once their development progress, this group of mid adolescence will enter into a new era whereby they will become more

distinct and determine with their own identity in order to prepare them to be adulthood. [1]

However, in the process of developing their own identity and behavior, there are many factors influencing these adolescents. Bronfenbrenner in 1979 believes that everything outside the individual such as families, friends, neighborhood, school as well as immediate forces such as laws, attitudes of societies will affect the development of the adolescents directly or indirectly. [2] From the Bronfenbrenner theory also, a conclusion can be made that human development actually is being contributed by a combination of the said factors. The importance of those factors must be identified in promoting them to be a good adult in their later life, helping them in managing their dismay and curiosity and eventually will prevent them from engaging the negative behaviors.

Determination of negative behavior also depends on the age group of the population. Some activity like driving is really harmful to the adolescence group especially to the early and mid adolescence but not to the adult group of age. However smoking is different where it brings harm to all groups of the population. It has been linked to negative behaviors such as drug use, school truancy and long term implications such as cardiovascular diseases, unplanned pregnancy, Diabetes Mellitus, mental and physical disability which finally may reduce the productivity of the country. [3,4,5,6,7]

In Malaysia, smoking is prevalent in adult as well as in adolescence which are 27.0% and 14.7% respectively. [8] The study done by National Health Morbidity Survey 2006 in Malaysia showed that there was a significant difference in prevalence of smoking among urban and rural adolescents ($p < 0.05$). Furthermore this study also showed increasing trends of smoking for this

particular age group where the prevalence was 17.9% (95%CI 16.7-19.1) in 1996 to 18.4% (95%CI 16.2-20.6) in 2006. [8] With this prevalence of smoking among the adolescence, preventive measures should be taken in order to prevent them from become smokers until their adulthood. In United States of America, most of the adult smokers started their tobacco used since adolescence. About 80% of adult smokers began smoking at the age of less than 18 years old and 90% of them started smoking at the age of less than 20 years old. [9]

Regarding individual factors influencing smoking, many studies have shown that gender, position in the sibling, awareness of the danger of smoking, having lunch at school, good self-image, good communication with parents, intake of alcohol are among the factors that will contribute to smoking among adolescence. [10,11,12,13,14,15]

Although adolescence spends more time with their peers compare to children but somehow or rather family members such as father, mother, siblings and others do influence adolescence behaviors in their own ways. [16] Lim et al found that adolescence in one of the district in Johore, Malaysia whose father was a smoker has a significant risk of three times to smoke compare to whom father is not a smoker. [10] Its also shows the similar significant risk to adolescence whose brother is a smoker, has higher risk to smoke. [17]

As everyone aware that the human behavioral development is very complicated. Although environmental factors do not seem directly have linkage with the adolescents but actually it also contributes significantly to the adolescent development. The environment is not only environment outside the house but anything surrounding the adolescence himself. Anybody in the adolescent's house who smokes will influence them to try smoking. [18] Peers who smoke and pressure from peers to

smoke also are important factors. [12,17] Adolescence that was schooling in rural school has a higher percentage to smoke compared to urban school which is 73.0% and 64.4% respectively. The scenario also applies for Malaysia where Lee et al [19] did a study in one of the states showed that prevalence of smoking among adolescence in rural areas was 15.3% and 12.8% from urban area ($P < 0.05$).

Despite many studies have been shown that family and peer factors are among the strongest independent factors contributing to cigarettes smoking among adolescents, however in Malaysia, much less is known on the predictive factors which focus into the influence of both effect of family and environmental factors on smoking especially among the rural community. Furthermore, majority of the study is a cross sectional studies which only able to show the association between smoking and factors influence it. In contrast to case control study, it is able to present the risk factors of smoking in order to get a better predictive model. To extend of this research, smoking among adolescence in a rural school was being chosen since there is higher prevalent of smoking among adolescence in a rural area in Malaysia was noted. [8]

The result of this study expected to be able to determine the family and environmental factors that really contribute to smoking particularly for rural adolescence especially in Malaysia which should be identified in order to design more effective intervention programme.

MATERIALS AND METHODS

This study was an unmatched case control study conducted in Malacca, from May till August 2010. Malacca is one of the 12 states in Peninsular Malaysia with an area of 1 664 kilometer square and a population of 771.5 thousands. It has three

districts named Alor Gajah, Jasin and Central Malacca. [20]

Educational systems in Malaysia consist of primary, secondary and tertiary levels. Primary level included preschool and primary school. Secondary level means that school children whom are schooling in secondary schools age 13 to 17 years old or 19 years old and tertiary level are students in colleges or universities for their certificate, diploma or degree. The 13 years old is in Form One and 17 years old is in Form Five. Then they have an option whether to continue their secondary school at Form Six which is 18 and 19 years old or going to tertiary level. All those three levels of educational systems are sponsored either by government or private agencies. However in this study, only government secondary schools were chosen.

Malacca itself has 73 secondary schools but only 59 schools are using normal curriculum. All these secondary schools are divided into urban school, suburban school and rural school. Out of 59 schools, 34 of them are rural schools which comprised of 13 385 students.

The study populations were all 14 years old rural school students in Malacca. The sample size was calculated using Schlesselman whereby the alpha was taken at the level of 0.05 ($Z_{1-\alpha/2}$) with 80% power ($Z_{1-\beta}$). [21] The minimum sample size calculated was 770 with 385 for cases and 385 for control. However, design effect and 20% of no response rate were considered and give rise to 924 respondents. All the 34 rural schools were listed regardless of the district. A cluster sampling was used and about 11 schools were selected using simple random sampling by drawing lots.

After selection of the school, all students were given screening questionnaire in order to group them as smoker (case) or non smoker (control). From the screening, all students who admitted themselves as smokers were chosen as cases and followed

by the controls which were chosen by simple random sampling. Finally the total respondents in this study were 928 whereby 484 of them were cases and 444 were controls. These total respondents answered the exact questionnaires which able to determine the independent or the extrinsic factors which were the predictor of the model.

The inclusion criteria for the cases group were from two school children who were smoking, schooling in normal education schools, schooling in multiracial schools, and schooling in a type of non boarding schools (not fully staying in the school hostels). Whereas the inclusion criteria for the control group were similar with the cases group except for the smoking status.

Smoking status was the outcome measured in this study with a family and environmental factors become factors that will predict the outcome. Smoking in this study was defined as ever tried cigarette smoking even one or two puffs in their lifetime. [5] There were 22 independent variables being determined which consisted of 13 variables for the family factor and 9 variables for the environmental factor.

A self-administered questionnaire was used in the data collection. The questionnaire was sent to four expert panels such as a clinical psychologist, a medical anthropologist, a public health specialist which experienced in the tobacco control programme of the country and a health promotion specialist. Test-retest using kappa statistics also being done since the option of the answer is categorical data. The difference between the test and retest was 14 days. [22] Kappa agreement on every each statement was more than 0.3.

In Malaysia, smoking among secondary school was prohibited therefore anonymity of each respondent was important during the data collection whereby the process did not involve the

teacher or any of the school representative. Approval for doing the study was obtained from the Ministry of Education Malaysia and the ethics approval obtained from National University of Malaysia Ethical Committee.

Statistical methods: All the data were analysed using Statistical Package of Social Science version 22. Bivariate analyses such as Chi Square Test and Mann Whitney U test were conducted and the predictors were determined by using Binary Logistic Regression and the predictor model for smoking was developed. The odds ratio of smoking and the predictors were considered significant if the 95% confidence intervals did not overlap.

RESULTS

There were 928 respondents participated in the study whereby cases accounted for 484 and 444 was the controls. The mean age (year) at which smoking was first tried among the cases was 11.39 ± 2.107 .

Sociodemographic characteristics: Majority of the male (88.2%) respondents were smoking compared to female (11.8%). Malay-was the predominant ethnicity for both groups of cases (91.7%) and controls (73.4%) as well as Muslim religiosity which were 92.1% and 74.1% respectively. Respondents from both of the groups were staying in a complete family which means with parents and siblings or grandparents. As the level of education both the cases and controls group showed that their father had the level of education until Form Five (MCE/SPM), however the mother of the cases group also had education until Form Five but the controls group was only until Form Three (LCE/SRP/PMR).

Family factor: There were many risk factors of smoking assessed under the family factors. Majority of the cases and controls showed that their parents spend time with

them (78.6% cases and 87.7% control), parents were not interested in smoking issue (78.9% cases and 82.0% controls), parents will be angry if they smoke (82.2% cases and 88.3% controls), parents did advice on the danger of smoking during watching smoking activity in the television or cinema

together (78.6% cases and 87.7% controls), and parents prohibited them from watching sexual movie, drug abused and ferocity in the television or cinema when watching together (73.1% cases and 81.1% controls) (Table 1).

Table 1: Crude Odds Ratio and 95% Confidence Intervals between case and control by family factors

Family factors	Category		Crude Odds Ratio	95% CI
	Case N (%)	Control N (%)		
Father smokes				
Yes	299 (62.8)	235 (53.4)	1.474	1.132-1.919
No	177 (37.2)	205 (46.6)	1	
Mother smokes				
Yes	15 (3.2)	4 (0.9)	3.563	1.173-10.817
No	460 (96.8)	437 (99.1)	1	
Sister/Brother smokes				
Yes	168 (35.4)	88 (20.0)	2.190	1.622-2.956
No	306 (64.6)	351 (80.0)	1	
Grandparents smoke				
Yes	138 (29.1)	84 (19.4)	1.696	1.244-2.313
No	337 (70.9)	348 (80.6)	1	
Other people (except parents, siblings, grandparents) in the house smokes?				
Yes	116 (24.2)	66 (15.2)	1.777	1.271-2.485
No	363 (75.8)	367 (84.8)	1	
Regulations on smoking among family				
Not allowed	283 (58.5)	353 (79.5)	0.363	0.271-0.486
Allowed	201 (41.5)	91 (20.5)	1	
Ever discussed on the danger of smoking with parent?				
Never				
Yes	249 (52.1)	200 (45.1)	1.321	1.019-1.712
	229 (47.9)	243 (54.9)	1	
Parents have regulations on smoking that need to follow				
Yes	192 (40.5)	181 (42.0)	0.940	0.721-1.226
No	282 (59.5)	250 (58.0)	1	
Parents always around when we need their attention				
Yes	319 (67.3)	327 (71.1)	0.680	0.509-0.908
No	155 (32.7)	108 (24.8)	1	
Parents spent their time				
Yes	374 (78.6)	384 (87.7)	0.516	0.360-0.739
No	102 (21.4)	54 (12.3)	1	
Parents interested to discuss on smoking issue				
Yes	102 (21.1)	80 (18.0)	1.215	
No	382 (78.9)	364 (82.0)	1	0.877-1.683
Discuss with parents on how to refuse smoking by friends				
Yes	162 (33.5)	168 (37.8)	0.827	0.632-1.082
No	322 (66.5)	276 (62.2)	1	
Parents were angry if smoking				
Yes	398 (82.2)	392 (88.3)	0.614	0.423-0.890
No	86 (17.8)	52 (11.7)	1	
Parents advised on the danger of smoking while watching smoking activity in the television or cinema together				
Yes	374 (78.6)	384 (87.7)	0.516	0.360-0.739
No	102 (21.4)	54 (12.3)	1	
Parental restriction from watching sexual movie, drug used and violence in the television or cinema when watching together				
Yes	350 (73.1)	355 (81.1)	0.634	0.464-0.867
No	129 (26.9)	83 (18.9)	1	

Table 1 shows that the risk of smoking was higher among respondents whose mother was smoking as compared to never smoke (OR = 3.563; 95% CI 1.2 to 10.8). Cases whom sister or brother was smoking as compared to none (OR = 2.2, 95%CI 1.6 to 2.9) and people stay along at home (except parents, siblings, grandparents) were smoking as compared to none (OR = 1.8, 95% CI 1.3 to 2.5) were among the significant risk factors. There were many other risks factors which also contributed to smoking in this family factor such as father smokes (OR = 1.474; 95%CI 1.13 to 1.9), grandparents smoke (OR = 1.696; 95%CI 1.2 to 2.3) and never discuss on the danger of smoking with parents (OR = 1.321; 95%CI 1.01 to 1.71).

However parents were always available when needed (OR = 0.680; 95%CI 0.5 to 0.9) and parents spent time with their children (OR = 0.516; 95%CI 0.4 to 0.7) were the protective factors. Other protective factors that also revealed significant differences were found between cases and controls with regards to parents angry if smoking (OR = 1.474; 95%CI 1.13 to 1.9), parents had advised on the danger of smoking during watching smoking activity in the television or cinema together (OR = 0.715; 95%CI 0.5 to 0.9), and parents prohibit from watching sexual movie, drug abused and ferocity in the television or cinema when watching together (OR = 0.634; 95%CI 0.464 to 0.867) were the protective factors.

Environmental factor: Most of the environmental variables accounted significant relationship between cases and controls. More than 80% of cases compared to control had friends who were smoking and had read the health information on the cigarette box. Cases were less likely than controls in terms of awareness of having cigarette among adolescents was an offence, however it is significant protective factor (OR = 0.5; 95%CI 0.3 - 0.8). The difference

between other variables with cases and controls were in Table 2.

Peers were among the important person that able to influence adolescent to smoke. As in this study friends who offer cigarettes was the most significant risk factor whereby cases that had experienced in being offered the cigarette were almost 12 times to smoke rather than not being offered (OR = 11.869; 95%CI 8.7 to 16.2). Similarly to other variables such as having friends who were smoking compared to none (OR = 8.5, 95%CI 5.8 to 12.6), had best friends who smoke (OR = 6.0; 95%CI 4.5 to 8.0), had friends force to smoke (OR = 5.3; 95%CI 3.3 to 8.5) and being offered to receive materials with cigarette brand (OR = 5.0; 95%CI 3.1 to 8.2). The other significant risk factors were in Table 2.

Predictors Model of Smoking: All the significant variables under bivariate analysis were included in the Binary Logistic Regression in order to develop the model to predict adolescent smoking. The model was found to be a best fit model indicating that the assumed hypotheses are accepted. Forward stepwise logistic regression indicated that 9 variables were significant predictors of smoking with 80% correctly assigned by the model. The predictors of smoking were mother smokes (Adjusted OR=6.24, 95%CI 1.61-24.18), influenced by being offered cigarette by friends (Adjusted OR=4.48, 95% CI 3.04-6.59), has friends who smoked (Adjusted OR=2.56, 95% CI 1.60-4.10), smoking forced by friends (Adjusted OR=2.47, 95% CI 1.39-4.39), best friend smokes (Adjusted OR = 2.28, 95%CI 1.57-3.32), has received offerings with cigarette brand label (Adjusted OR= 2.21, 95%CI 1.18-4.11), has read health information on the cigarette box (Adjusted OR=1.84, 95%CI 1.18-2.89) and had heard about 'No Smoking' campaign (Adjusted OR=1.83, 95% CI 1.11-3.01). Where as knows that cigarette cannot be sold to adolescents less than 18 years old (Adjusted OR= 0.324, 95% CI 0.17-0.62) and regulations on smoking in the family

(Adjusted OR=0.61, 95% CI 0.41-0.90) were protective predictors of smoking for these adolescents.

The Hosmer-Lemeshow goodness of fit was not significant (p=0.559) and only 68.0% of smoking was explained by this smoking model since Nagelkerke R was 0.501.

Table 2: Crude Odds Ratio and 95% Confidence Intervals between case and control by environmental factors

Environmental factor	Category		Crude Odds Ratio	95% CI
	Case N (%)	Control N (%)		
Has friends who smoke				
Yes	442 (92.3)	250 (58.3)	8.553	5.812-12.588
No	37 (7.7)	179 (41.7)	1	
Friends offered cigarette				
Yes	357 (74.7)	87 (19.9)	11.869	8.684-16.223
No	121 (25.3)	350 (80.1)	1	
Friend forces to smoke				
Yes	105 (21.9)	22 (5.0)	5.295	3.275-8.559
No	375 (78.1)	416 (95.0)	1	
Best friend smokes				
Yes	284 (59.5)	87 (19.7)	6.004	4.460-8.084
No	193 (40.5)	355 (80.3)	1	
Has admired artiste who smoke				
Yes	115 (24.6)	75 (17.1)	1.586	1.146-2.196
No	352 (75.4)	364 (82.9)	1	
Has received offerings with cigarette brand label				
Yes	96 (20.1)	21 (4.8)	5.014	3.065-8.202
No	382 (79.9)	419 (95.2)	1	
Agree with a new way such as pen, t-shirt, belt to advertise				
Yes	139 (29.4)	103 (23.6)	1.345	1.000-1.810
No	334 (70.6)	333 (76.4)	1	
Increased of the cigarette price can prevent smoking				
Yes	285 (61.0)	210 (48.1)	1.693	1.300-2.205
No	182 (39.0)	227 (51.9)	1	
Knowing that having cigarette among adolescent is an offence that can be punished.				
Yes	416 (87.4)	410 (93.2)	0.507	0.321-0.803
No	60 (12.6)	30 (6.8)	1	
Has read health information on the cigarette box.				
Yes	407 (85.0)	312 (72.1)	2.192	1.581-3.040
No	72 (15.0)	121 (27.9)	1	
Knows that cigarette cannot be sold to adolescents less than 18 years old.				
Yes	454 (94.2)	396 (89.6)	1.883	1.155-3.071
No	28 (5.8)	46 (10.4)	1	
Has heard of No Smoking Campaign				
Yes	419 (87.7)	361 (82.2)	1.534	1.064-2.213
No	59 (12.3)	78 (17.8)	1	

DISCUSSION

The present study investigated the family and environmental factors as predictors of adolescents' smoking. Smoking mothers was one of the important predictors, a finding also reported by others. [19,23] In Malaysia, there was a study reported that mother was significantly involved in intellectual development, developing competence, mentoring or teaching and giving advice to their adolescents as

compared to fathers. [24] This may help in explaining why mother who smokes showed the highest odds to adolescent smoking. With regards to the second highest predictor contributing to smoking in this study which was being offered cigarettes by friends. Other studies also revealed the same finding. [15,25] Adolescents may be more prone to engage in risky behaviors if they have limited degree of self-reliance and have disability to act independently against the

influence of their peers. [19] Another important contributor to adolescent smoking is having friends who smoke. [25] This study also showed the same finding with the above studies. Furthermore respondents who were forced by friends to smoke and having best friend who smokes were also risk factors for smoking in this study. Having felt wanted and being accepted by surrounding friends may make them tend to pick up the cigarettes. [26]

Respondents who received offerings with a label of cigarette brand were prone to be involved in smoking. This study is in accordance to previous findings which supported adolescents being offered with cigarette brand label were smoking as compared to never being offered. [27,28] Our findings also suggested that respondent who has read health information on the cigarette box is one of the predictor of smoking. Health information given by the cigarette company may not help to reduce the prevalence of smoking as reported in a study conducted by Henriksen et al. [29]

In this country, there are mass campaigns for anti-smoking and one of them is 'No Smoking Campaign' launched in 2004. However in this study, respondents who have heard about the campaigns were more likely to smoke. Christophi et al also reported a similar finding. [26] This may be due to unclear messages in the campaign received by the respondents that were not exposed to the campaign thoroughly, thus made them smoke. Adolescent phase is a phase whereby the adolescence starts to develop their identity, eager to investigate things those are not being allowed especially which are not clearly being understood by them. [30] Nonetheless further research needs to be done in order to have a clearer explanation of the above matters.

The Control of Tobacco Products Regulation 2004 in Malaysia, was issued under the Food Act 1983. In this regulation, selling a cigarette to a person below the age

of 18 years old is prohibited. Being aware about the prohibition on selling it was one of the significant protective predictor for an adolescent from involved in the smoking behavior in this study. Additionally, having regulations on smoking in the family will help an adolescent for not smoking. Regulations are important in protecting the adolescents from involving in the smoking behavior in their lives.

Some limitations of this study need to be addressed. The respondents in this study could have under-reported their smoking behavior since this study was conducted in the school despite anonymity being preserved. The findings of this study cannot be generalized to all adolescents since it focused on a school-based sample. Therefore, community based study is recommended in order to get the actual smoking behavior of this group of adolescents. No biochemical markers were being used to confirm their smoking status since the definition of smoking used was ever smoker which the markers were unable to detect if they smoke outside certain time range. Hence recall bias may be present in this study whereby the information on smoking were only based on the questionnaire.

In conclusion, among the family and environmental factors, only mother smokes, being offered cigarette by friends, friends who smoked, smoking forced by friends, best friend smokes, has received offerings with cigarette brand label, has read health information on the cigarette box, and had heard about 'No Smoking' campaign, knows that cigarette cannot be sold to adolescents less than 18 years old and has regulations on smoking in the family are among the important predictors contributing to adolescents' status of smoking in this study. These results have implications for public health fields who need to take considerations on these factors in order to develop

prevention and control on smoking among rural school adolescents.

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