Predictors of smoking among male junior secondary school students in Riyadh, Saudi Arabia

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Abstract

***Objective* – To determine the prevalence and determinants of cigarette smoking among intermediate (junior secondary) schoolboys in Riyadh, Saudi Arabia.**

***Participants* – A sample of 1382 students (ages 12–19 years) in 45 classes randomly selected from 15 schools, using a two-stage stratified cluster sampling scheme.**

***Design* – Students in the selected classes were requested to complete an anonymous questionnaire, under the supervision of trained interviewers. Univariate and multivariate statistical analyses of potential risk factors were performed.**

***Setting* – Intermediate schools in Riyadh, Saudi Arabia.**

***Main outcome measures* – Association between current smoking and sociodemographic variables, history of smoking, age of smoking initiation, smoking behaviour among family members, knowledge of the harmful effects of smoking, and whether smoking is allowed in the presence of relatives and acquaintances.**

***Results* – The prevalence of current smokers was 13.2% overall, ranging from 3.2% in those 12–13 years old to 31.1% in those aged 18–19. Some of the variables (nationality, father's education, and smoking allowed in the presence of parents or teachers) found to be associated with current smoking in a univariate analysis were no longer significantly associated with smoking in the multivariate analysis. By multivariate analysis, knowledge of the harmful effects of smoking, age, smoking allowed in the presence of friends or brothers, and previous smoking were statistically significant determinants of current smoking.**

***Conclusions* – Current health education activities against smoking should be continued and extended to the young population to further reduce the prevalence of smoking and its health consequences. Religious antipathy toward smoking should be emphasised in any local anti-smoking campaigns.**

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Introduction

Smoking has long been associated with preventable morbidity and premature deaths in human populations.[1] Several studies have specifically implicated smoking as strongly associated with lung cancer, coronary heart disease, chronic obstructive pulmonary disease, stroke, and polycythaemia.[2–6] Physicians who smoked cigarettes were reported to have a mortality rate of about 10 times that of non-smoking physicians.[3] In addition, the greater the number of cigarettes smoked, the greater the risk of mortality from lung cancer.[4] The extension of the damaging effects of smoking on the health of non-smokers has greatly increased the concern of the health managers and researchers.[5–8]

Research on smoking behaviour in developing countries is less common, and much of this research in these countries (including Saudi Arabia) has focused on providing baseline information that is purely descriptive.[9–16] Some studies have employed univariate analysis[9–11,15] but there has been no attempt at multivariate analysis of potential risk factors for smoking.

Our study attempts to provide information on the prevalence and determinants of cigarette smoking among male secondary school students in Riyadh, Saudi Arabia. The potential risk factors for the uptake of smoking identified in a univariate analysis are analysed using a multivariate technique.

Methods

PROCEDURES

The study was conducted among male junior secondary (intermediate) school students in grades 7–9 in Riyadh, the capital of Saudi Arabia. The sample of students was selected using a two-stage stratified cluster sampling method. A list of secondary schools was obtained from the Directorate of Education in Riyadh, and was used as the sampling frame for the first-stage sampling. There are 103 male junior secondary (intermediate) school in Riyadh. Riyadh was arbitrarily divided into five geographical areas (clusters). The number of schools in each cluster ranged from 19 to 22. From the list of male schools in each cluster, a simple random sample of three schools was selected to give a total of 15 schools.

Each school has three grades, with four arms

or classrooms in each grade. In each selected school, a classroom was randomly selected from each grade, to give a total of 45 classrooms in the 15 schools. The number of students in each class varied from 30 to 35. The students in each selected classroom constituted our study sample.

The permission of the General Directorate of Education was obtained before administering the survey. With the co-operation of the class teachers, the questionnaires were distributed to the selected students for completion. This self-completion questionnaire was anonymous, and confidentiality of the information collected was guaranteed to the students.

SURVEY INSTRUMENT

The World Health Organisation (WHO) questionnaire on smoking was adapted and translated into Arabic.[17] The back translation to English showed no disparity with the Arabic translation. The questionnaire contained items on the demographic characteristics and smoking history of the students, the smoking status of family members (father, brothers, and "others"), and attitudes toward smoking among students' relatives and acquaintances (parents, brothers, friends, and teachers). Subjects' knowledge of the hazards of smoking was also documented.

DEFINITIONS

A current smoker was defined as anyone who smoked at least one cigarette (or any other type of tobacco such as pipe or *shesha*) per day at the time of survey. Students' knowledge of the health effects of smoking was assessed by asking them if they believed that cigarette smoking is harmful to one's health. The attitudes of the students' relatives and acquaintances toward cigarette smoking were measured indirectly by asking the students if their relatives and acquaintances allow people to smoke freely in their presence.

ANALYSIS

The characteristics of current smokers and non-smokers were compared using χ^2 tests for categorical variables and Student's *t* test for continuous variables at a 5% probability level of statistical significance. Univariate odds ratios (ORs) (which provided estimates of the relative risks) and their 95% confidence intervals (CIs) were calculated by unmatched techniques.[18] The independent effects of subjects' characteristics adjusted for other potential risk factors for smoking were assessed by logistic regression.

In the logistic model, age was treated as a continuous variable while other independent variables were categorical. The dependent variable, smoking, was dichotomised as current smokers and non-smokers. Exponentiating the logistic regression coefficients for each variable gave the odds ratios (estimates of relative risk) associated with smoking.

These statistical analyses were done using the BMDP software package.[19] The variance of the overall estimate of the prevalence of current smokers was adjusted for the design effect produced by the cluster sampling method.[20–22]

Results

Table 1 presents the demographic characteristics of the students and the proportion of current smokers. The students were aged between 12 and 19 years with a median age of 15 years. Only 9.8% of the students were 18 years or older, and a sizable proportion (80.8%) were Saudis. More than 50% of the students' fathers had more than primary education and 18.1% had university education.

Of the 1382 students completing the questionnaire, 362 (26.2%) indicated that they had smoked at one time in their lives; but only 182 (13.2%) were smoking currently. Only three of the students who smoked indicated that they smoked *shesha* in addition to cigarettes. Non-smokers' main reasons for not smoking were religious concerns and health beliefs.

The overall prevalence estimate of current smokers (13.2%), adjusted for the effect of the cluster sampling design, showed a variance that was 2.16 times as large as would be expected if a simple random sample had been selected. This allowance translated to a 95% CI of 10.6% to 15.8% instead of 11.4% to 15.0%, an increase of 44.4% in the width of the confidence interval.

There were statistically significant associations between current smoking status and age, nationality, previous smoking status, and father's education, as table 1 shows. However, the age at which ever smokers started smoking was not significantly related to current smoking status ($p > 0.05$).

Smoking prevalence increased substantially with increasing age (table 1). Compared with students 12–13 years old, those aged 16–17 years had an almost eight-fold chance of being

Table 1 The relationship between students' demographic characteristics and current smoking status

Demographic characteristics	*Sample size (n = 1382)*	*Current smokers (%)*	*Odds ratios*	*95% CI*	*p Value*
Age					
12–13	222	3.2	1.0	NA	NA
14–15	645	8.5	2.9	1.2–7.0	0.005
16–17	368	20.4	7.9	3.4–19.0	0.00001
18–19	135	31.1	13.9	5.7–35.2	0.00001
Nationality					
Non-Saudi	263	6.5	1.0		
Saudi	1107	14.6	2.5	1.4–4.3	0.0001
Father's education					
Illiterate	248	15.7	1.0		
Primary	346	13.0	0.8	0.5–1.3	0.34
Junior secondary (intermediate)	296	16.2	2.8	1.5–5.2	0.0005
Senior secondary	208	13.0	0.8	0.5–1.4	0.40
University	250	8.0	0.5	0.2–0.9	0.05
Smoked in the past					
No	993	1.7	1.0		
Yes	362	43.9	45.0	26.0–78.7	< 0.00001
Age smoking started					
< 10	73	38.3	1.0		
10–12	105	43.8	1.3	0.6–2.4	0.48
13–15	184	49.5	1.6	0.9–2.8	0.11

* Illiterate = no formal education; primary = six years of education (ages 7–12 years; grades 1–6); junior secondary = nine years of education (ages 13–15; grades 7–9); senior secondary = 13 years of education (ages 16–18; grades 10–12).
CI = confidence interval.
NA = not applicable.

Table 2 Smoking prevalence among students, by their knowledge of the harmful effects of smoking, by smoking status of family members, and by smoking allowed in the presence of relatives and acquaintances

Family characteristics		Sample size	Smokers (%)	Odds ratios	95% CI	p Value
Family smokers						
None		313	19.8	1.0	NA	NA
Father		136	36.0	2.3	1.4–3.7	0.001
⩾ 1 Brother(s)		149	34.2	2.1	1.3–3.3	0.001
Others		30	43.3	3.1	1.3–7.2	0.003
Smoking allowed in the presence of:						
Father	No	352	42.6	1.0		
	Yes	43	60.5	2.1	1.03–4.13	0.03
Mother	No	353	41.6	1.0		
	Yes	41	70.7	3.4	1.6–7.3	0.0004
Brothers	No	306	39.2	1.0		
	Yes	87	64.4	2.8	1.7–4.7	0.0001
Friends	No	144	29.9	1.0		
	Yes	249	53.4	2.7	1.7–4.3	0.0001
Teachers	No	330	40.9	1.0		
	Yes	63	65.1	2.7	1.5–4.9	0.001
Others	No	236	37.7	1.0		
	Yes	156	55.1	2.0	1.2–1.8	0.001
Knowledge of harmful effects						
Yes		1239	12.5	1.00	NA	NA
No		96	28.1	2.7	1.6–4.5	0.0001

CI = confidence interval.
NA = not applicable.

a smoker (OR = 7.9), and those 18–19 years old were almost 14 times more likely to be a smoker (OR = 13.9). Smoking prevalence among Saudis was 16.6%. The risk of smoking was 2.5 times higher in Saudis compared with non-Saudis.

The association between smoking and the father's educational level did not seem to follow a regular pattern (table 1). Children whose fathers had completed only junior secondary school were almost three times more likely to smoke compared with children of illiterate fathers. But thereafter, the risk decreased with increasing levels of education.

The strongest correlate of current smoking status was a history of smoking among students ($p < 0.00001$). Those who had ever smoked were 45 times more likely to be smoking currently (table 1).

The results in table 2 show the influence of family and peers on current smoking status. Children from families in which no member smoked were less likely to smoke, the risk was higher when a brother smoked, and the risk was highest when the father was a smoker.

There was a statistically significant increased likelihood of smoking among students whose family members allowed smoking in their presence. This association was strongest for mothers and brothers who tolerated smoking in their presence (odds ratios = 3.4 and 2.8, respectively).

Those who did not believe that cigarette smoking is harmful to health had a risk of smoking that was three times that of students who did believe that smoking is harmful to health.

MULTIVARIATE ANALYSIS

The stepwise logistic regression analysis showed ignorance of the harmful effects of smoking as a dominant independent contributor to smoking (table 3). The estimated odds of smoking increased significantly by about 150% if the student had no knowledge of the harmful effects of smoking. The odds of smoking increased by 25% for each one-year increase in age and by 135% if one ever smoked. The odds increased by about 100% for students whose friends or brothers do not allow smoking in their presence. Of the three demographic variables that were significantly related to current smoking in the univariate analysis (age, nationality, and father's education), only age entered the regression model at the 10% probability level after adjustment for other variables.

Table 3 Maximum likelihood estimates of logistic parameters relating potential risk factors for smoking

Variables	Regression coefficient	Odds ratio	95% CI
Intercept	−3.3945		
Age*	0.2215	1.25	1.08–1.44
Ever-smokers	0.8557	2.35	1.08–5.14
Brothers**	0.7375	2.09	1.19–3.68
Friends**	0.6649	1.94	1.17–3.23
No knowledge of harmful effects	0.9208	2.51	1.19–5.30

*For each one-year increase in age.
**Allow smoking in their presence.
CI = confidence interval.

Discussion

The overall smoking prevalence estimate of 13.2% found among Saudi male schoolchildren aged 12–19 years in our study agreed with the previously reported estimates in similar populations. Rowland in 1987 reported a prevalence of 12%,[9] which was the same as the rate reported by Felimban and Jarallah in 1994[15] but lower than the range of 17.5% to 34% in other countries.[22–24] To assure the accuracy of information provided by the students, the questionnaires were made anonymous and students were told that the study was strictly confidential and for academic purposes. Despite this, it is still possible that some boys may not have admitted to being current smokers. However, the percentage of students who did admit to smoking cigarettes at one time (26.2%) is similar to the proportion recorded in another recent study,[15] but lower than the 40% reported seven years ago.[9] This could be interpreted either as a decline in smoking or as a result of differences in sampling procedures. An adjustment for the cluster sampling design effect gave an upper 95% confidence limit (15.8%) which is still considered low when compared with results from other countries.

The low smoking prevalence could be attributed to the Islamic culture in Saudi Arabia. The main reasons for not smoking cited by non-smokers were religious concerns and health beliefs. Because Islam considers smoking unlawful and distasteful, religious considerations, if emphasised, could reduce further the current level of smoking.

We observed a lower risk of smoking in male students whose fathers were at the two extremes of the educational scale. On one hand, the highly educated are presumably more knowledgeable about the health consequences of smoking, while on the other, the

illiterates may be more conservative. Both groups may have in common the wisdom that could protect their children from taking up smoking. This parental influence on children's smoking practices was found significant in the univariate analyses but disappeared after adjustment for other variables when the logistic model was fitted to the data. Parents may be role models for their children's smoking behaviour;[25–27] however, the significant association found in previous studies may not have persisted in a multivariate analysis, such as that which we performed.

The use of the logistic regression model in our analysis, which allowed for adjustment of other potential risk factors, implicated friends and brothers rather than parents or teachers as significant influences on smoking behaviour. The personal environment of youths has been reported as a contributing factor to adolescents' smoking behaviour.[28] The importance of peer group pressure on that environment cannot be overemphasised.

It is not surprising that those who ever tried smoking were at greater risk of being current smokers.[29] Given the addictive nature of cigarettes, once smoking becomes an behaviour, it becomes more difficult to stop. This emphasises the need for measures directed at primary prevention of smoking.

Our finding that children lacking knowledge of the harmful effects of smoking had a greater likelihood of smoking seems logical. This supports the hypothesis of an association between health beliefs and behaviour,[26] and calls for improved health education against smoking at an early age.[30–31] In addition, cigarettes are relatively inexpensive in Saudi Arabia, a factor that might encourage adolescents to smoke.

Media messages (through broadcast, electronic, and computer communications) have the potential to change public attitudes and behaviour with respect to smoking.[32] Unfortunately the mass media have not been used adequately in Saudi Arabia to combat smoking. It is time for a national anti-smoking campaign that would guarantee communicating the message to everybody. In addition, rules for banning smoking in schools should be implemented. Special anti-smoking programmes, including religious considerations, should be extended to students in secondary schools. This might take the form of new school health education curricula, or incorporation of anti-smoking messages into existing curricula. Collaboration with school health authorities would be critically important for such a programme to succeed.

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1 Fielding JF. Smoking: health effects and control. *N Engl J Med* 1985; **313**: 491–8.
2 Doll R, Hill AB. Smoking and carcinoma of the lung: Preliminary report. *BMJ* 1950; **2**: 739–48.
3 Doll R, Peto R. Mortality in relation to smoking: 20 years' observations on male British doctors. *BMJ* 1976; **2**: 1525–36.
4 Hammond EC. Smoking in relation to the death rates of one million men and women. In: *Epidemiological studies of cancer and other chronic diseases. Monograph 19*. Bethesda, Maryland: National Cancer Institute, 1966: 127–204.
5 Shah PK, Helfant RH [editorial]. Smoking and coronary artery disease. *Chest* 1988; **94**: 449–52.
6 Atchison R, Russel N. Smoking: a major cause of polycythemia. *J R Soc Med* 1988; **81**: 89–91.
7 Fielding JF, Phenon KJ. Health effects of involuntary smoking. *N Engl J Med* 1988; **319**: 1452–60.
8 Byrd JC, Shapino RS, Schiedermayer DL. Passive smoking: a review of medical and legal issues. *Am J Public Health* 1989; **79**: 209–15.
9 Rowland DF, Shipster PJ. Cigarette smoking amongst Saudi school boys. *Saudi Med J* 1987; **8**: 613–8.
10 Al Faris EA. Smoking habits of secondary school boys in rural Riyadh. *Public Health* 1995; **109**: 47–56.
11 Jarallah JS. Smoking habits of medical students at King Saud University, Riyadh. *Saudi Med J* 1992; **13**: 510–3.
12 Taha A, Bener A, Nouh MS, Saeed A, Al-Harthy S. Smoking habits of King Saud University students in Riyadh. *Ann Saudi Med* 1991; **1**: 141–3.
13 Felimban F, Jarallah JS. The smoking practices and attitude towards smoking of female university students in Riyadh. *Saudi Med J* 1993; **14**: 220–4.
14 Saeed AW. Smoking habits of students in College of Allied Medical Sciences, Riyadh. *J R Soc Health* 1987; **5**: 187–8.
15 Felimban FM, Jarallah JS. Smoking habits of secondary school boys in Riyadh, Saudi Arabia. *Saudi Med J* 1994; **15**: 438–42.
16 Kwabata T, Maruya N, Nakamura M, *et al*. Smoking and alcohol drinking behavior among Japanese adolescents results from "Japan Know Your Body Study" *Nippon Koshu Eisei Zasshi* 1991; **38**: 885–99.
17 World Health Organisation. Guidelines for the conduct of tobacco smoking among health professionals. *WHO/SMO 84*. Geneva: World Health Organisation, 1984.
18 Schlesselman JI. *Case control studies. Design, conduct and analysis*. New York: Oxford University Press, 1982.
19 Dixon WJ, Brown MB, Engelman L, Jennrich. BMDP statistical software. Los Angeles: University of California Press, 1990.
20 Bennett S, Wounds T, Liyanage WM, Smith DL. A simplified general method for cluster – sample surveys of health in developing countries. *World Health Stat Q* 1991; **44**: 98–106.
21 Sullivan K, Kalsbeek W, Chen M, Frerichs R. C sample: analyzing data from complex survey samples. *Epi Info*, version 6; 1994: 157–84.
22 Levy PS, Lemeshow S. *Sampling for health professionals*. California: Lifetime Learning Publications, 1980: 217–25.
23 Elegbeleye OO, Pearce D. Incidence and variables contributing to the onset of cigarette smoking among secondary school children and medical students in Lagos, Nigeria. *Br J Soc Prev Med* 1976; **30**: 66–70.
24 O'Rourke OH, O'Byrne Wilson-Davis. Smoking among school children. *J R Coll Gen Pract* 1983; **33**: 569–72.
25 Wang SQ, YU JJ, Zhu BP, *et al*. Cigarette smoking and its risk factors among senior high schools in Beijing, China, 1988. *Tobacco Control* 1994; **3**: 107–14.
26 Eiser JR, Morgan M, Gammage P, Gray E. Adolescent smoking: attitudes, norms and parental influence. *J Sch Health* 1989; **59**: 150–2.
27 Paine PA, Amanal JA, Pereira MG. Association between parental and student smoking behavior in a Brazilian Medical School. *Int J Epidemiol* 1985; **14**: 330–2.
28 Auba J, Villalbi JR. Tobacco and adolescents: Influence of personal environment. *Med Clin (Barc)* 1993; **100**: 506–9.
29 Jacobson B. Smoking and health: a new generation of campaigners. *BMJ* 1983; **287**: 483–4.
30 Royal College of Physicians. *Smoking and the young*. London: Royal College of Physicians, 1992.
31 Taha A, Ball K. Smoking and Africa: the coming epidemic. *BMJ* 1980; **1**: 991–3.
32 Burns D. Use of media in tobacco control programs. *Am J Prev Med* 1994; **10**(suppl 1): 3–7.