



Pattern of Tobacco Consumption and Influencing Factors among Male School Children in Riyadh, Saudi Arabia

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Abstract

This study aimed at studying tobacco consumption patterns among male school children in Riyadh.

Methods: A cross-sectional survey was carried out on 5961 male school children, using a modified WHO-GYTS questionnaire.

Results: Smoking data was available for 4693(83%) children, among whom 483(10.3%; 95% CI:9.4-11.2%) reported being "current smokers". Logistic regression reflected independent risk factors for tobacco use to include: educational stage (OR=3.1-4.4 for high school), school type (OR=6.2 for governmental-general compared to private schools), smoking household member (father / mother / brother / friends) (OR=1.5-25.7).

Recommendations: Raising awareness of children is important for saving them from taking up the habit and assisting smokers to quit. The school health team should be playing important dual roles: directly for children and indirectly through empowering their teachers in combating tobacco use campaigns. Male school children are mostly affected by their peers, fathers and brothers. Thus, parents and siblings should be role models for their children / siblings, respectively, by not smoking themselves.

Keywords: Tobacco use; School children; Riyadh; Saudi Arabia

Introduction

Tobacco is the leading cause of mortality and disability worldwide [1]. Globally everyday more than 100,000 youth initiate smoking; most of them are from developing countries [2]. The World Health Organization (WHO) attributes 4.9 million deaths per year to tobacco use, and it is projected to increase more than 10 million by 2030 if the current trend continues [3]. The WHO has reported that the prevalence of smoking among young people in Saudi Arabia (KSA) to be 25% [4]. Even though KSA is not directly involved in the manufacturing process of cigarettes, it currently imports 20,000 million cigarettes per year, which costs about 351.8 million US dollars. [5]. KSA is now ranked eighth in the world in terms of tobacco consumption, with a phenomenal change from fifty-second rank between 1970-1972 to twenty-third position during 1990-1992 [6,7].

Tobacco use has become a global epidemic due to its consumption by both adults and children in different nations / continents. Studies have shown that smoking initiation during childhood increases the likelihood of continued smoking during adulthood and decreases the chance of quitting [8,9]. Tobacco consumption by children leads to poor health and a variety of short-term adverse health effects, such as respiratory system damage, besides addiction to nicotine and other drugs. Long-term health consequences of childhood smoking are due to the fact that most children who smoke regularly continue to smoke

throughout their adulthood [10]. Several studies in KSA have been conducted regarding tobacco consumption among youth. However, most of them were restricted to studying the prevalence and risk factors of smoking in general population and among university students in various provinces of KSA. Few studies addressed prevalence of smoking among school children comparing various stages of education. This school-based study was designed to study the pattern of tobacco consumption and identify its predictors among male school children in Riyadh, KSA.

Methodology

An observational cross-sectional school based survey was carried out during March-June, 2011 in Riyadh city, in which the reference population was male school children, from primary (1st-6th grade), preparatory (7th-9th grade), and high (10th-12th grade) schools. The study subjects were male children of these 3 school levels, of both general and Islamic studies, at government and private sectors, across the 5 regions (south, north, and east, west and central) of Riyadh city (4 strata). The study subjects were randomly selected by using probability proportionate sampling at multiple stages. First the sample size was distributed across the 5 regions (south, north, east, west and central) of Riyadh city using probability proportionate of each region. At the second stage, from each of these 5 regions, the study sample was selected according to 3 levels of schooling (primary, preparatory and high) by using probability proportionate sampling procedure. Later at

the third stage, from each of these 3 levels of schools, the study subjects were selected from the two sectors of governmental and private management schools. At the final stage from each of these two sectors, and at each of the 3 levels of school, the study subjects were selected from general studies, and Islamic studies.

A modified version of the WHO-GYTS questionnaire was used for data collection, using self-administrated method. It was piloted before finally being utilized and distributed. The tool included questions on: (a) **demographic data:** age, gender, nationality, occupation, educational status of parents, smoking status of parents, siblings and friends; (b) **behavioral patterns:** with respect to tobacco use: smoking frequency; age of initiation of smoking; place of smoking; amount spent to purchase tobacco materials; and place of purchase. The questionnaire was randomly distributed to school-children. Anonymity of participants was emphasized and confidentiality strictly maintained on all collected questionnaires.

Statistical analysis

The data was entered, cleaned and analyzed using SPSS pc⁺, version 16.0 statistical software. Descriptive statistics was used to quantify categorical study variables. Chi-square test was used to test associations between categorical study and outcome variables. Odd ratios were used to estimate associations between smoking status and selected study variables. Stepwise multiple logistic regression was used to identify independent risk factors related to the binary outcome variable (smoking status).

Results

Of the targeted 6000, completed questionnaires were obtained from 5961 (i.e. 99.3% response rate) children. Two thirds of such children (65.9%) were in the age range of 11-15 years and mostly (83.7%) were Saudis. The distribution of education level of these school children was: primary (34.6%), preparatory (36.9%), high-scientific (22.8%) and high-arts (5.7%). Most school children in our sample (92%) were living with their parents. Only 4.3% of them reported that they had “no pocket money” to spend on purchasing tobacco related items. The distribution of educational level of the children’s fathers indicates that 24.3% of them hold a post-graduate degree, 29.6% completed university education, whereas only 2.7% of them do not read or write. Whereas only 11.3% of the children’s mothers were reported to hold a postgraduate degree, 28.1% completed university education and 6.8% of them do not read or write. The smoking habit of parents and siblings were reported as 21% of children’s fathers, 2.2% of mothers, 36.2% of brothers, and only 1 % of sisters were smokers. On the other hand, the distribution of smoking pattern among friends of children in our sample was found to be: all of them smoke (2.7%), most of them (6.5%), some of them (26.9%) (Table 1).

Characteristics	No (%)
Region (n=5961)	
Central	736 (12.3)
North	1553 (26.0)
South	1687 (28.3)
East	1435 (24.1)
West	550 (9.2)

Age (in years) (n=5775)	
< 10	82 (1.4)
11–15	3805 (65.9)
16–20	1877 (32.5)
> 20	11 (0.2)
Nationality: (n=5776)	
Saudi	4833 (83.7)
Non-Saudi	943 (16.3)
Educational level (n=5882)	
Primary	2034 (34.6)
Preparatory	2171 (36.9)
High – Scientific	1341 (22.8)
High – Arts	336 (5.7)
Living with (n=5842)	
Parents	5375 (92)
Mother only	200 (3.4)
Father only	85 (1.5)
Family (not parents)	72 (1.2)
Others	110 (1.9)
Pocket Money (n=5787)	
No pocket money	250 (4.3)
5 to 9 Saudi Riyals	2054 (35.5)
10 to 50 Saudi Riyals	1454 (25.1)
>50 Saudi Riyals	855 (14.8)
No response	1174 (20.3)
Educational level of (father) (n=5301)	
Does not read or write	114 (2.7)
Reads and write only	351 (6.6)
Completed primary education	314 (5.9)
Completed preparatory education	518 (9.8)
Completed high school education	1118 (21.1)
Completed university education	1569 (29.6)
Holds a postgraduate degree	1287 (24.3)
Educational level of (mother) (n=5374)	
Does not read or write	363 (6.8)
Reads and write only	575 (10.7)
Completed primary education	461 (8.6)
Completed preparatory education	660 (12.3)

Completed high school education	1197 (22.3)
Completed university education	1512 (28.1)
Holds a postgraduate degree	606 (11.3)
Father smoke (n=5643)	
Yes	1185 (21)
No	4458 (79)
Mother Smoke (n=5701)	
Yes	124(2.2)
No	5577(97.8)
Brother Smoke(n=3034)	
Yes	1098(36.2)
No	1936(63.8)
Sister smoke (n=2413)	
Yes	24 (1.0)
No	2389(99)
Friends smoke (n=5727)	
None	3658(63.9)
Some of them	1542(26.9)
Most of them	375(6.5)
All of them	152(2.7)

Table 1: Distribution of socio-demographic characteristics and smoking pattern of school children and their family members.

Out of 5961 participating children in our study, data on smoking status was available for only 4693(i.e. 83%), in which only 483(10.3%; 95% CI: 9.4% to 11.2%) reported being “current smokers” (regular smokers over the past 30 days). About 30.9% of these children starting smoking at the age of 14 to 15 years, followed by 27.8% at ≥ 16 years, and 19.7% at the age of 12-13 years. Concerning consumption of cigarettes during past one month 31.9% of them reported to have smoked 1 to 4 cigarettes per day, whereas 17.7% of them reported to have smoked ≥ 20 cigarettes per day. The pattern of obtaining cigarette was as follows: from a grocery store (57.2%), provided by colleague/friend (21.1%), while only 3.9% reported obtaining them during a social occasion. About 14.8% of smokers have reported to spend 200SR/- or more on purchasing cigarette during the last month, and 61.8% of them reported to use public places as the place of smoking cigarettes. Among smokers, 312(79.2%) tried to smoke water pipe. The place of smoking water pipe was reported to be: in public places (40.9 %), at home (10.3%), or at events and parties (7.2%) (Table 2).

Study variables	No (%)
Smoking status (n=4693)	
Smoker	483 (10.3)
Non-smoker	4210 (89.7)

Start of smoking first time (n=421)	
7 years or less	24 (5.7)
8 to 9 years	24 (5.7)
10 to 11 years	43 (10.2)
12 to 13 years	83 (19.7)
14to 15 years	130 (30.9)
> 16 years ¹⁶	117 (27.8)
How many cigarettes did you smoke during last 1 month (n=385)	
< 1 cigarette per day	50 (13)
1 to 4 cigarettes per day	123 (31.9)
5 to 9 cigarettes per day	71 (18.4)
10 to 14 cigarettes per day	41 (10.6)
15 to 19 cigarettes per day	32 (8.3)
> 20 cigarettes per day	68 (17.7)
How do you obtain cigarettes (n=484)	
From a grocery store	277 (57.2)
Provided to me by a colleague/friend	102 (21.1)
Provided to me by one of family members	35 (7.2)
Gave money someone else to buy me	33 (6.8)
Obtained by some other way	26 (5.4)
Obtained in a social occasion	19 (3.9)
Estimated amount spent for purchasing cigarettes during the last month (n=393)	
I do not buy cigarettes myself	73 (18.6)
Less than 50 SR	130 (33.1)
50 to 99 SR	90 (22.9)
100 to 199 SR	42 (10.7)
200 SR or more	58 (14.8)
Place of smoke of cigarettes(n=484)	
In public places	299(61.8)
At home	87 (18.0)
In the homes of friends	81 (16.7)
At events/parties	75 (15.5)
In bathrooms	51(10.5)

At school	41 (8.5)
Have you tried smoking water pipe? (n=394)	
Yes	312 (79.2)
No	82 (20.8)
How old, when smoking water pipe? (n=340)	
< 7 years	23 (6.8)
8 to 9 years	9 (2.6)
10 to 11 years	24 (7.1)
12 to 13 years	49 (14.4)
14 to 15 years	107 (31.5)
>= 16 years	128 (37.6)
Place of smoking of water pipe (n=484)	
In public places	198(40.9)
Other places	94(19.4)
In homes of friends	80(16.5)
At home	50 (10.3)
At events and parties	35 (7.2)

Testing the possible association between smoking status (smoker/non-smoker) and various study variables showed that the following variables were highly statistically significantly associated with smoking status, namely: nationality, educational stage, type of school, daily pocket money, educational level of father, educational level of mother, smoking father, smoking mother, smoking brother, smoking sister, and smoking friends. Thus, bivariate analysis indicated that non-Saudi school children were twice at risk of being a smoker, when compared with Saudis in our sample. In addition, an estimated risk (odds ratio) of being a smoker was found to be 11 times greater, if the student was in high-scientific educational stage, as compared with colleagues who are in primary stage. The type of school was also found to be statistically significantly associated with smoking status, as the estimated risk (odds ratio) was found to be 14.5 times higher to be a smoker, when the child is in a government-general school, as compared to a private-Islamic school. Testing the association of parental smoking with smoking status of study subjects, it was found that the odds of a school child in our sample being a smoker is 2.3 times higher, if his father is a smoker, 2.5 times higher if his mother is a smoker, 4.2 times higher when his brother is a smoker, and 2.9 times higher when his sister is a smoker. Nevertheless, testing the association of friends smoking and smoking status of school children in our sample, showed that the odds were 56.3 times higher to be a smoker, when “all” friends smoke, 32.4 times higher when “most” friends smoke, and 9.8 times higher when only “some” friends smoke (Table 3).

Table 2: Prevalence of smoking and the distribution of consumption pattern among school children.

Study Variables	Smoking Status		X2-value	OR (95% CI)	P-value
	Smoker	Non-smoker			
Nationality					
Saudi	344 (9)	3459 (91)	38.8	1	< 0.0001
Non-Saudi	127 (16.5)	641 (83.5)		2.0 (1.6,2.5)	
Educational stage					
Primary	47 (2.7)	1685 (97.3)	327.1	1	< 0.0001
Preparatory	143 (8.7)	1496 (91.3)		3.4 (2.4, 4.9)	
High -Scientific	242 (23.6)	783 (76.4)		11.1 (7.9, 15.5)	
High –Literacy	47 (18.4)	208 (81.6)		8.1 (5.2,12.7)	
Type of School					
Government – General	323 (12)	2359 (88)	50.2	14.5 (3.5, 42.9)	< 0.0001
Government – Islamic	18 (3.9)	449 (96.1)		4.2 (0.9, 9.7)	
Private – General	131 (10.6)	1100 (89.4)		12.6 (3.0, 39.0)	
Private – Islamic	2 (0.9)	212 (99.1)		1	
Living with					

Parents	435 (10.2)	3813 (89.8)	7.4	-	0.12
Father only	10 (15.4)	55 (24.6)			
Mother only	17 (10.9)	139 (89.1)			
Family (not parents)	12 (18.8)	52 (81.2)			
Others	7 (7.7)	84 (92.3)			
Daily Pocket Money					
No pocket money	24 (11.4)	187 (88.6)	45.7	1	< 0.0001
5 to 9 SR	127 (7.8)	1510 (92.2)		0.65(0.40,1.1)	
10 to <50 SR	152 (13.4)	985 (86.6)		1.2 (0.74, 1.95)	
> 50 SR	97 (14.9)	556 (85.1)		1.3 (0.82, 2.25)	
Others	72 (7.6)	879 (92.4)		0.64 (0.38, 1.1)	
Education level of father					
Does not read and write	19 (15.6)	103 (84.4)	35.7	1.7 (0.94, 2.9)	< 0.0001
Reads and write only	37 (13.1)	246 (86.9)		1.3 (0.89, 2.1)	
Completed primary education	40 (16.7)	200 (83.3)		1.8 (1.2,2.7)	
Completed preparatory education	60 (14.9)	343 (85.1)		1.6 (1.1, 2.2)	
Complete high school education	114 (13.5)	732 (86.5)		1.4(1.04,1.9)	
Completed undergraduate education	97 (7.8)	1140 (92.2)		0.80 (0.57, 1.03)	
Holds a postgraduate degree	101 (10.0)	911 (90)		1	
Education level of Mother					
Does not read and write	45 (15.3)	249 (84.7)	31.21	1.3 (0.9, 2.1)	< 0.0001
Reads and write only	42 (9.2)	415 (90.8)		0.76 (0.49, 1.2)	
Completed primary education	57 (16.6)	286 (83.4)		1.5 (1.0, 2.3)	
Completed preparatory education	62 (12.3)	444 (87.7)		1.05 (0.70, 1.6)	
Complete high school education	113 (12.2)	813 (87.8)		1.04 (0.74,1.5)	
Completed undergraduate education	93 (7.9)	1080 (92.1)		0.65 (0.45, 0.93)	
Holds a postgraduate degree	58 (11.7)	436 (88.2)		1	
Father Smoke					
Yes	172 (17.3)	824 (82.7)	65.04	2.3 (1.8, 2.8)	< 0.0001
No	293 (8.4)	3185 (91.6)		1	
Mother Smoke					
Yes	25 (21.9)	89 (78.1)	17.3	2.5 (1.6, 4.1)	< 0.0001
No	439 (10.0)	3966 (910)		1	
Brother Smoke					
Yes	225 (25.2)	668 (74.8)	169.9	4.2 (3.3, 5.3)	<0.0001
No	142 (7.4)	1776 (92.6)		1	

Sister Smoke					
Yes	5 (25)	15 (75)	4.5	2.9 (0.9, 8.5)	0.035
No	247 (10.4)	2121 (89.6)		1	
Friends Smoke					
None	59 (2.1)	2813 (97.9)	864	1	< 0.0001
Some of them	207 (17)	1009 (83)		9.8 (7.2, 13.3)	
Most of them	130 (40.5)	191 (59.5)		32.4 (22.7, 46.3)	
All of them	72 (54.1)	61 (45.9)		56.3 (35.9, 88.3)	

Table 3: Risk Factors of Smoking among school children (Univariate analysis).

The step-wise multiple logistic regression analysis has brought out independently statistically significantly associated risk factors of smoking among school children in our sample. Such independent risk factors were found to be: educational stage of study subject, type of school in which study subject enrolled, smoking father, smoking mother, smoking brother and smoking friends (Table 4).

	Adjusted Odds Ratios (95% C.I's)
Education Stage:	
Primary	1
Preparatory	2.28(1.2,4.3)
High – Scientific	4.14 (2.15, 8.0)
High – Literacy	3.1 (1.1, 8.3)
Type of School:	
Islamic (Govt. & Private)	1
Government General	6.24 (1.4, 27.8)
Private General	4.24 (0.93, 19.26)
Father smoke (Yes)	1.47 (1.1, 1.84)
Mother smoke (Yes)	3.1 (2.2, 3.9)
Brother smoke (Yes)	1.74 (1.4, 2.1)
Friends Smoke:	
None	1
Some of them	4.01 (2.5, 6.5)
Most of them	11.50 (6.7, 19.8)
All of them	25.71 (13.2, 50.0)

Table 4: Risk Factors of Smoking among school children (By Multiple Logistic Regression Analysis).

Discussion

Our premise is that factors associated with tobacco use among Saudi school children, in different levels and types of schools, have not been fully explored. This is probably one of the largest population

based surveys of tobacco use among Saudi school children, which involved about 6000 children, representing the five districts of Riyadh. In fact, sample sizes of prior studies [11-19] ranged from 290 up to 2203 children; predominantly involved high schools, except the WHO-GYTS studies [20] which involved intermediate school students.

Consumption Pattern

The overall smoking prevalence estimate of 10.3% found among male school children aged 7-20 years in our study was above the figure reported by GYTS 2001 among Saudi school children, aged 13-15 years (4.7%), yet below most other studies including a recent compendium of tobacco consumption surveys in Saudi Arabia [21] during the past decade (1999–2009) which reported that the prevalence of tobacco use among school students ranged from 12%–29.8% [11-20], and the latest GYTS 2010 (21.2%). Our estimate was also low in comparison to other Arab states, Kuwait (50.0%), Bahrain (25.8%), Yemen (21.9%), Syria (15.9%), Oman (6.5%) [22-26]. Whereas worldwide the recorded prevalence was almost near to our estimate, according to GYTS applied to students which showed that 9.5% of them were smokers [27,28], while the Eastern Mediterranean Region estimated range was 10-19.9% (GYTS survey 1999-2008) [29].

Relating tobacco use in our sample to their educational stage obviously reveal a cohort effect as 18.4-23.6 % were in their high school, 8.7% preparatory and 2.7 % primary school, that's agreed with previous studies [17,18]. Furthermore, bivariate analysis indicated that the estimated risk (odds ratio) of being a smoker was found to be 11 times greater, if the student was in "high-scientific educational stage", as compared with colleagues who are in "primary" stage, which indicates a cohort effect, as children grew older in Riyadh schools. Moreover, it was found that the child in a "government-general" school was 14 times more liable to take up the habit of smoking, as compared to a "private-Islamic school", a finding which is in favor of the potentially protective effect Islamic studies provided to school children. Such finding was reported in many studies in KSA as well as Brazil and China [18,27,28,30].

About one third of male school children in our survey reported to first initiate smoking at age of 15 or less .The age of starting regular smoking in Riyadh seemed to have decreased from the reported 18-24 years back in 1994, as in a study on smoking habits of high school boys [17], to 12-15 years reported in the current study as well as a recent similar study in KSA [13] where the onset of smoking for 66.5% of

their sample was below 16 years [30,31]. Similar results have been reported from Yemen, as well as China, where smoking began during 10-14 years and increased exponentially with age [25,28]. Such a trend is in agreement with others who have documented that smoking prevalence increase throughout adolescence [20]. The earlier a person starts smoking, the less likely he will quit [32], and the greater the risk of lung cancer [33] or death from coronary heart disease [34]. The chances of success in quitting decrease as age increases [35]. Such observation raises an urgent red flag to establish effective health education and advocacy campaigns targeting primary school children (or even earlier, if possible).

About one fifth of smokers in our study (17.7%) reported to have smoked more or equal to 20 cigarettes per day, which is considered "heavy" smoking among a young age range, predominantly 10-19 years (98%). Moreover, more than half of such smokers (57%) reported obtaining their cigarettes from a grocery store, which calls for a ban of selling cigarettes for children less than 18 years of age.

A unique feature of tobacco use of alternate forms of tobacco such as the water-pipe (narghile or hookah). This is evident in current smoking prevalence for any type of tobacco, which in most cases is greater than for cigarettes alone. The GYTS results indicated that in all studied countries, use of tobacco products other than cigarettes (most likely water-pipe) was more common than use of cigarettes [36]. In Lebanon, 61% of students reported currently using tobacco product, although only 10% currently smoked cigarettes [36-41]. Water-pipe smoking was reported by 312 school children in our study; most of whom started such habit as ≥ 16 years (37.6%) and 14 to 15 years (31.5%), which is considered a very young age for a growing habit in our part of the world, across social classes and genders. Our finding agrees with those reported from a student survey at King Faisal University where 76.1% of such sample reported smoking both cigarettes and water-pipe at age of 16 years [31]. A recent national survey in Egypt carried out by the Egyptian Smoking Prevention Research Institute (ESPRI) in 2005, in 25 governorates revealed that, among males 18 years and older, show water-pipe use among 18 years and older 10.5% in urban areas 13.6% in rural area. These figures translate to approximately two million current water-pipe smokers in Egypt at the present time. Consequently, water-pipe smoking has been observed among Egyptian schoolchildren in a clear desire to imitate adults [42].

Risk factors

Result of bivariate analyses showed that the most important risk factors for taking up the habit of tobacco use in our sample were: smoking friends (OR:9.8-56.3), type of school (OR:4.2-14.5), educational stage (OR:3.4-11.1), brother smoking (OR:4.2), paternal smoking (OR:2.3), maternal smoking (OR:2.5). This was further confirmed by multiple logistic regressions, which showed that the top three risk factors were: peer pressure, type of school and educational stage. Numerous studies have shown that the single most direct influence on smoking among children is peer pressure. [13,14,18,30,31].

Smoking among school children started early in life, It came out that this is due to the smoking habit of their parents and siblings at home, in our study showed that 21% of fathers and 36.2% of brothers were current smokers, a finding that may suggest "same gender" influence on smoking habits of our study population, which included male school children in Riyadh city. Testing the association of parental

smoking with smoking status of sampled school children, it was found that the OR of a school child being a smoker is 2.3 times higher, if his father is a smoker, 4.2 times higher when his brother is a smoker. Same finding was reported by previous studies on the effect of same gender as significant predictors of smoking. Bauman et al. [43] found that 12-14-year-olds whose parents currently smoked were almost twice as likely to smoke as those whose parents had never smoked. Kandel and Wu [44] found that both maternal smoking and the quality of parent-child interaction influenced the current smoking status among adolescents. These findings are consistent with our study as current smokers had twice the risk when relatives, especially parents and siblings, were smokers. Furthermore, our finding confirms another study's finding that smoking habit of adolescents is correlated with smoking status of their families [30,31].

Nevertheless, testing the association of friends smoking and smoking status of school children in our sample, showed that the OR were 56.3 times higher to be a smoker, when "all" the friends smoke, 32.4 times higher when "most" friends smoke, and 9.8 times higher when only "some" friends smoke. This supports "peer pressure" as an important predictor of tobacco use among different sectors of the population, especially the younger ones, who spend hours together, often without teacher or parental supervision. This was further confirmed by reported risk factors for smoking among this group, which included reported factors as: "accompanying smoking friends" (69%); masculinity (42%) and killing free time (39%). These results were consistent with findings reported from previous studies. [13,14,18,21,29-31].

One of the main limitations of this study is only covering male school children. It is to be noted that local circumstances at the time of its conduction made studying female school children not feasible, while recognizing the epidemiological significance of covering both genders, and comparing results accordingly.

Recommendations

There is an urgent need to promote multi-disciplinary health education activities at different age groups in order to prevent adolescent and younger age from smoking, and to help smokers to quit. Qualitative approaches in studying the phenomenon of tobacco use among our school children should be encouraged, in addition to the quantitative research methodologies applied in our study. Such social and behavioral approaches help better understand such social phenomena, as tobacco use, which need closer deeper approaches, which would help us understand how to better control such national, regional and global epidemic of tobacco use.

Smoking is prevalent among male school children in Riyadh, with increasing values when moving from primary to high school basic education, especially government general schools, as compared to Islamic schools and private schools. Raising awareness among this group of children is important to save them from taking up the habit and assist those who are already smokers to quit smoking, as soon as possible. Moreover, there is great need for strict implementation of the law which prohibits sale of cigarettes to youngsters less than 18 years of age (50% of smoking children in this study purchased their own tobacco). Evidence of an influential role played by parents is significant, as role models and effective communicator during the school age. It is therefore concluded that parents are well placed to influencing antismoking campaign messages by not smoking themselves. This action would help in reducing both active and passive

smoking at school as well as at home thus reducing the risk of smoking related health hazards. The school health team should be playing important roles, both directly for children and indirectly through empowering their teachers in combating tobacco use at schools male school children are mostly affected by their peers, their fathers and brothers, as indicated by results of our study. Thus, parents and siblings should be role models for their children / siblings, respectively. Parental smoking history is associated with smoking initiation in early adolescence. Parental cessation at an early age of their offspring reduces the likelihood of adolescent smoking initiation. Preventive efforts, therefore, should focus on the benefits of parental cessation as early as possible [45]. Parents carry an additional burden of gentle supervision of their children, trying to protect them from taking up the habit of tobacco use, whether as cigarettes or more often nowadays water pipe. Physicians and health professionals should appreciate the magnitude of youth smoking and its effects on health and endeavor to influence policy makers to reduce the burden of ill health that is a consequence of smoking habit particularly among children.

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References:

1. World Health Organization (WHO) (1995) WHO program on tobacco on health. Geneva.
2. Jha P, Chaloupka FJ (1999) Curbing the Epidemic. Governments and the Economics of tobacco Control. Washington D.C. The World Bank.
3. <http://www.who.int/tobacco>
4. Economics of Tobacco for the Middle East and North Africa (MENA) Region. Regional Report: Middle East and North Africa (MENA).
5. Centers for Disease Control and Prevention (CDC) (2005) State-specific prevalence of cigarette smoking and quitting among adults--United States, 2004. *MMWR Morb Mortal Wkly Rep* 54: 1124-1127.
6. Khan SA, Khan LA (1999) Cigarette smoking-a dangerous trend in Saudi Arabia [Editorial]. *The Practitioner East Med Edition*10: 399.
7. Centers for Disease Control and Prevention (CDC) (1997) Progress toward global measles control and elimination, 1990-1996. *MMWR Morb Mortal Wkly Rep* 46: 893-897.
8. Ershler J, Leventhal H, Fleming R, Glynn K (1989) The quitting experience for smokers in sixth through twelfth grades. *Addict Behav* 14: 365-378.
9. Chassin L, Presson CC, Sherman SJ, Edwards DA (1990) The natural history of cigarette smoking: predicting young-adult smoking outcomes from adolescent smoking patterns. *Health Psychol* 9: 701-716.
10. Centers for Disease Control and Prevention (CDC) (1994) Cigarette smoking among adults--United States, 1992, and changes in the definition of current cigarette smoking. *MMWR Morb Mortal Wkly Rep* 43: 342-346.
11. Abdalla AM, Al-Kaabba AF, Saeed AA, Abdulrahman BM, Raat H (2007) Gender differences in smoking behavior among adolescents in Saudi Arabia. *Saudi Med J* 28: 1102-1108.
12. Abolfotouh MA, Abdel Aziz M, Badawi IA, Alkija W (1997) Smoking intervention program for male secondary school students in southwestern Saudi Arabia. *East Mediterr Health J* 3: 90-100.
13. Al-Damegh SA, Saleh MA, Al-Alfi MA, Al-Hoqail IA (2004) Cigarette smoking behavior among male secondary school students in the Central region of Saudi Arabia. *Saudi Med J* 25: 215-219.
14. al-Faris EA (1995) Smoking habits of secondary school boys in rural Riyadh. *Public Health* 109: 47-55.
15. Almas K, Maroof F, McAllister C, Freeman R (2002) Smoking behaviour and knowledge in high school students in Riyadh and Belfast. *Odontostomatol Trop* 25: 40-44.
16. Al-Yousaf MA, Karim A (2001) Prevalence of smoking among high school students. *Saudi Med J* 22: 872-874.
17. Felimban F, Jarallah J (1994) Smoking habits of secondary school boys in Riyadh, Saudi Arabia. *Saudi Med J* 15: 438-442.
18. Jarallah JS, Bamgboye EA, al-Ansary LA, Kalantan KA (1996) Predictors of smoking among male junior secondary school students in Riyadh, Saudi Arabia. *Tob Control* 5: 26-29.
19. Rowlands DF, Shipster PJ (1987) Cigarette smoking among Saudi schoolboys. *Saudi Med J* 8: 613-618.
20. Al-Bedah AM, Qureshi NA (2011) The Global Youth Tobacco Survey: 2001-2002 in Riyadh region, the Kingdom of Saudi Arabia. *Subst Abuse Rehabil* 2: 197-204.
21. Bassiony MM (2009) Smoking in Saudi Arabia. *Saudi Med J* 30: 876-881.
22. Centers for Disease Control and Prevention (CDC) (1997) Progress toward global measles control and elimination, 1990-1996. *MMWR Morb Mortal Wkly Rep* 46: 893-897.
23. Al-Haddad N, Hamadeh RR (2003) Smoking among secondary-school boys in Bahrain: prevalence and risk factors. *East Mediterr Health J* 9: 78-86.
24. Hamadeh RR (1998) Smoking in the Gulf Cooperation Council (GCC) countries. *Bahrain Med Bull* 20: 91-94.
25. Bawazeer AA, Hattab AS, Morales E (1999) First cigarette smoking experience among secondary-school students in Aden, Republic of Yemen. *East Mediterr Health J* 5: 440-449.
26. Jarallah JS, Bamgboye EA, al-Ansary LA, Kalantan KA (1996) Predictors of smoking among male junior secondary school students in Riyadh, Saudi Arabia. *Tob Control* 5: 26-29.
27. Hallal AL, Gotlieb SL, Almeida LM, Casado L (2009) Prevalence and risk factors associated with smoking among school children, Southern Brazil. *Rev Saude Publica* 43: 779-788.
28. Zhang L, Wang W, Zhao Q, Vartiainen E (2000) Psychosocial predictors of smoking among secondary school students in Henan, China. *Health Educ Res* 15: 415-422.
29. Warren CW, Jones NR, Peruga A, Chauvin J, Baptiste JP, et al. (2008) Global youth tobacco surveillance, 2000-2007. *MMWR Surveill Summ* 57: 1-28.
30. Mandil A, BinSaeed A, Dabbagh R, Shaikh SA, AlSaadi M, et al. (2011) Smoking among Saudi university students: consumption patterns and risk factors. *East Mediterr Health J* 17: 309-316.
31. Al-Mohamed HI, Amin TT (2010) Pattern and prevalence of smoking among students at King Faisal University, Al Hassa, Saudi Arabia. *East Mediterr Health J* 16: 56-64.
32. Flay BR, Koepke D, Thomson SJ, Santi S, Best JA, et al. (1989) Six year follow-up of the first Waterloo school smoking prevention trial. *Am J Public Health* 79: 1371-1376.
33. Charlton A (1984) Children's opinions about smoking. *J R Coll Gen Pract* 34: 483-487.
34. Fielding JE (1985) Smoking: health effects and control (1). *N Engl J Med* 313: 491-498.
35. Lennox AS (1992) Determinants of outcome in smoking cessation. *Br J Gen Pract* 42: 247-252.
36. Afifi R, DeJong J, Bose K, Salem T, Awad A, Benkirane M (2012) *The Health of Young People: Challenges and Opportunities*. Cambridge University Press: 242-248.
37. Afifi RA, Yeretjian JS, Rouhana A, Nehlawi MT, Mack A (2010) Neighbourhood influences on narghile smoking among youth in Beirut. *Eur J Public Health* 20: 456-462.
38. El-Roueiheb Z, Tamim H, Kanj M, Jabbour S, Alayan I, et al. (2008) Cigarette and Waterpipe Smoking Among Lebanese Adolescents, a Cross-Sectional Study, 2003-2004. *Nicotine Tob Re* 10: 309-314.

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39. Mandil A, Hussein A, Omer H, Turki G, Gaber I (2007) Characteristics and risk factors of tobacco consumption among University of Sharjah students, 2005. *East Mediterr Health J* 13: 1449-1458.
 40. Maziak W, Eissenberg T, Rastam S, Hammal F, Asfar T, et al. (2004) Beliefs and attitudes related to narghile (waterpipe) smoking among university students in Syria. *Ann Epidemiol* 14: 646-654.
 41. Tamim H, Al-Sahab B, Akkary G, Ghanem M, Tamim N, et al. (2007) Cigarette and nargileh smoking practices among school students in Beirut, Lebanon. *Am J Health Behav* 31: 56-63.
 42. Gadalla S, Aboul-Fotouh A, El-Setouhy M, Mikhail N, Abdel-Aziz F, et al. (2003) Prevalence of smoking among rural secondary school students in Qalyobia governorate. *J Egypt Soc Parasitol* 33: 1031-1050.
 43. Bauman KE, Foshee VA, Linzer MA, Koch GG (1990) Effect of parental smoking classification on the association between parental and adolescent smoking. *Addict Behav* 15: 413-422.
 44. Kandel D, Wu P (1995) The contributions of mothers and fathers to the intergenerational transmission of cigarette smoking in adolescence. *J Res Adolesc* 5: 225-252.
 45. den Exter Blokland EA, Engels RC, Hale WW 3rd, Meeus W, Willemssen MC (2004) Lifetime parental smoking history and cessation and early adolescent smoking behavior. *Prev Med* 38: 359-368.