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)
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 years16	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)

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)

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)

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

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).

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					

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

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

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