

Parental Smoking and the Risk of Respiratory Symptoms, among School Boys in Al-Khobar City, Saudi Arabia

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Objective: The objective of this study was to measure the prevalence of parental smoking and its association with respiratory symptoms among 6-15 years old school boys in Al-Khobar city, Saudi Arabia.

Methods: This is a cross-sectional study. The methodology included the distribution of a self-administered questionnaire, which was filled by the parents of 1482 school boys who satisfied the selection criteria of the study.

Results: The overall rate of smoking among parents of this sample was 18.2% (32% among fathers and 4% for mothers). There was an increased risk between parental smoking and respiratory symptoms among asthmatic and non-asthmatic children. The magnitude of this risk was variable for different respiratory symptoms. Smoking rate among parents of asthmatic children was significantly higher than in those with normal children although the logistic regression model showed paternal smoking to be significantly associated with bronchial asthma in their children.

Conclusions: There is an increased risk of respiratory symptoms among asthmatic and non-asthmatic children because of parental smoking. The smoking rate and trend among fathers and mothers were comparable to those reported earlier indicating an ongoing problem. School children with smoking parent(s) may better be screened for bronchial asthma. Management of children presenting with respiratory symptoms should include inquiry about exposure to passive smoking. Tobacco smoking should be considered a public health problem with serious implications and its import should be banned.

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Tobacco was first introduced in Saudi Arabia during the Ottoman Empire¹. Although Saudi Arabia has no contribution to the world's production of tobacco, its imports of tobacco have multiplied more than 250 times during the period from 1961 (1,061 tons) to 1987(41,440 tons). The money spent on importing tobacco increased from SR (Saudi Riyal) 7,844,263 to SR 917,165,108,117 folds during the same period. Saudi Arabia ranked 52nd in the world import of tobacco during the period between 1970 and 1972 but it had moved up to the 23rd position by 1990 to 1992^{1,2}.

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Prevalence studies of smoking in Saudi Arabia have shown an alarming trend¹⁻⁶. Various recommendations suggested by these studies have not changed the situation². Up to 37% of university students smoke and 58% of them smoke more than 15 cigarettes per day and 36% started smoking between 10 and 15 years of age⁵.

Parental smoking was documented to have harmful effects in pre-school⁷⁻⁹ and older children^{10,11}. This includes increased prevalence of cough, asthma, wheeze and respiratory diseases. To the best of the investigators' knowledge only one study was carried out in Saudi Arabia to assess this association¹². Al-Frayh and Bener in 1991 have established dose and effect relationship between parental smoking and respiratory symptoms in children between 7 and 12 years of age¹². However, the authors of that study did not control for the socioeconomic class in their sample. This confounder is known to influence their outcome¹³. This methodological shortcoming may have affected the results of their study. Knowledge about how common is the parental smoking in Saudi Arabia and its impact on the health of children is essential for individual patients' management and for public health reasons. The objective of this study was to determine the prevalence of parental smoking and to assess the magnitude of its association with respiratory symptoms among 6-15 years old school boys in Al-Khobar City, Saudi Arabia.

METHODS

Saudi boys in elementary and preparatory schools in Al-Khobar City were the subjects of this cross-sectional study. Al-Khobar City is located on the Arabian Gulf coast in the Eastern province of the Kingdom of Saudi Arabia. A total of 22077 school boys were identified at elementary (15829 (71.7%)) and preparatory (6248 (28.3%)) schools in Al-Khobar City. A sample of 7 % of the total number of school boys was randomly selected. A total sample of 1550 school boys [elementary = 1110 (71.6%) and preparatory = 440 (28.4%)] was drawn from 7% of schools selected by simple random sampling (4 elementary + 2 preparatory schools). The total number of sample students in each school was in accordance with the ratio they represent in relation to the total number of students in all schools (in each level of education). In each school the sample was drawn evenly from different classes. The non- inclusion of schoolgirls in this study was due to difficulties in gaining access, a limitation that faced some other investigators previously^{6,14}.

The methods used included a self administered pre-tested and pre-coded questionnaire directed to the parents. This questionnaire was previously standardized and validated for the Saudi community¹⁴. The questionnaire used in this work was subjected to a reliability test, which showed a reliability of 95%.

The criteria selected to identify asthmatic children were as follows: Any school boy whose parents responded to all of the following questions with "Yes" was considered to be "Questionnaire Diagnosed Asthmatic" (QDA):

- 1) Has your child ever had an attack of wheezing? (Whistling noise that comes from chest).
- 2) Did your child get attacks of shortness of breath with wheezing?
- 3) Does the breathing of your child become normal in between attacks?

Smoking family was defined as the family with at least one parent who is currently a cigarette smoker. Families were classified into upper, middle and lower socioeconomic class based on an aggregate score of the father's education, occupation and monthly income¹³. The boys and their parents were requested to give details of personal data such as age, area of residence, father's education, occupation and income. Data included the subject or any family member with current or history of bronchial asthma (including dyspnea, dyspnea after exercise, wheeze or whistle), allergic rhinitis, eczema, cough and past doctor diagnosis. History of smoking by any household member and more specifically parental smoking habit, presence of family pets at home (birds, cats.... etc.) were inquired about. Students who were or thought to be smoking were excluded from the study. Data were analyzed using an IBM compatible personal computer. The Statistical Program SPSS/PC was used to calculate Chi-squared differences, odds ratios and to assess the statistical significance of the observed differences in contingency tables. Multiple linear logistic regression was used to analyze the data using the stepwise method.

RESULTS

1. Sample characteristics

A total of 1550 school boys were included in this study. The total returned filled questionnaires were 1482 with a response rate of 95.6%. Twenty-one students (1.4%) were excluded from the study because they did not live in Al-Khobar City. The remaining 47 students (3.0%) declined to participate for other reasons not related to the study subject. The ages of the boys ranged from 6 to 15 years. The mean age of the school boys in the total sample was 10.7 ± 3.1 years. There was no statistical difference in mean age among Questionnaire Diagnosed Asthmatics (QDA) and non-QDA (Table1). Two hundred and twenty three (15.0%) school boys were found to belong to upper socioeconomic class families compared with 756 (51.0%) and 503(34.0%) in the middle and lower socio-economic classes respectively. Similarly, no statistically significant difference was found among QDA and non-QDA, smoking family and non-smoking family regarding their socioeconomic class (Table1). The cumulative prevalence of QDA in the total sample was 9.5%.

Table 1. **Sample Characteristics & prevalence of smoking among QDA and Non-QDA**

Variable	QDA(n=141)	Non-QDA(n=1341)	P-value
Age (mean \pm S.D) year	10.3 \pm 2.1	10.3 \pm 2.2	NS
Smoking Rate			
Father	76(53.9%)	402(30.0%)	< 0.05
Mother	11(7.8%)	51(3.8%)	<0.05
Socio-economic class			
Upper(n=223)	22(15.6%)	201(15.0%)	NS
Middle(n=756)	62(44.0%)	694(51.8%)	
Lower(n=503)	57(40.4%)	446(33.2%)	
Total	141(100%)	1341(100%)	

NS =Not Significant.

QDA= Questionnaire Diagnosed Asthma

2. Prevalence of smoking among sample parents

The overall prevalence of current smoking in the sample was 18.2%. Gender wise the rate was 32% and 4% among fathers and mothers, respectively. More than half of QDA fathers (53.9%) and around one third (30.0%) of non-QDA fathers were smokers (OR=2.5, 95%CI =2.3,2.8). QDA smoking mothers were (7.8%) double that of non-QDA (3.8%)(OR = 1.9, 95%CI =1.5, 2.5). Out of 282 parents in the QDA group 87, were found to be smokers (30.9 %) compared with 453 out of 2682 (16.9%) among non-QDA group (OR =2.0, 95%CI =1.8, 2.2). It was interesting to find that all smoking mothers in the sample were married to smoking husbands (fathers).

3. Association between smoking of a parent and children diseases

Table 2 shows QDA and non-QDA boys to be at significantly higher risk of developing most of the respiratory symptoms and/or allergic diseases if at least one parent was a smoker. The strength of this significant association ranged between 1.9 and 9.3 folds among QDA boys compared with 1.3 to 4.5 for non-QDA boys. "Dyspnea" and "dyspnea after exercise" scored the highest odds ratio among QDA and non-QDA groups, respectively. Respiratory variables that were not found to be statistically significant among QDA group were those with low frequencies (with subsequent large random error). Since only 11 QDA and 51 non-QDA families had both smoking parents, it was difficult (due to small numbers) to analyze the association between smoking and the respiratory symptoms and/or diseases in each group.

Table 2. Prevalence rate of respiratory symptoms when at least one parent is smoking in the family among school boys

Variable	Smoking Family	Non-Smoking Family	OR	95% CI	P
	No (%)	No (%)			
A. Among QDA(n=141)					
1. Dyspnea (n=51)	43 (56.6)	8 (12.3)	9.3	(4.9,17.6)	<0.05
2. Dyspnea after exercise(n=45)	29 (38.2)	16 (24.6)	1.9	(1.1,3.4)	<0.05
3. Cough (n=39)	28 (36.8)	11 (16.9)	2.9	(1.5,5.4)	<0.05
4. Rhinitis (n=11)	8 (10.5)	3 (4.6)	2.4	(0.6,9.8)	NS
5. Other sibling with asthma (n=11)	7 (9.2)	4 (6.2)	1.5	(0.4,5.5)	NS
6. Other sibling with rhinitis(n=9)	6 (7.9)	3 (4.6)	1.8	(0.4,8.2)	NS
a. Among non- QDA(n=1341)					
1. Dyspnea (n=172)	43 (23.1)	79 (8.41)	1.3	(1.0,1.8)	<0.05
2. Dyspnea after exercise(n=150)	92 (22.9)	58 (6.2)	4.5	(3.5,5.8)	<0.05
3. Cough (n=113)	52 (13.0)	61 (6.5)	2.1	(1.5,2.9)	<0.05
4. Rhinitis (n=45)	20 (4.98)	25 (2.7)	1.9	(1.1,3.2)	<0.05
5. Other sibling with asthma (n=41)	15 (3.7)	26 (2.8)	1.4	(0.7,2.5)	NS
6. Other sibling with rhinitis (n=94)	36(9.0)	58 (6.2)	1.5	(1.1,2.2)	<0.05

QDA - Questionnaire Diagnosed Asthma NS - Not Significant

4. Logistic Linear Regression Model for QDA

Table 3 shows the linear logistic regression model for QDA. Variables in the equation included: dyspnea, cough, eczema, pets at home, smoking by father, asthmatic father and mother. The variability of these variables can explain up to 42% of the variability of QDA in this model.

Table 3. **Logistic linear regression coefficients and Equation for QDA in Al-Khobar School Boys 6-15 years**

Independent variable		Coefficient value	P-value
Constant	(b0)	-0.55	
Dyspnea	(b1)	0.38	< 0.05
Cough	(b2)	0.33	< 0.05
Eczema	(b3)	0.49	< 0.05
Pets at home	(b4)	0.20	< 0.001
Smoking by father	(b5)	0.18	< 0.01
Father with asthma	(b6)	0.42	< 0.001
Mother with Asthma	(b7)	0.28	< 0.01

Equation: $\ln(\text{odds QDA}) = -0.55 + 0.38 (\text{Dyspnea}) + 0.33 (\text{Cough}) + 0.49 (\text{eczema}) + 0.20 (\text{Pets at home}) + 0.18 (\text{smoking by father}) + 0.42 (\text{father with asthma}) + 0.28 (\text{mother with asthma}).$

$R^2 = 0.42, P\text{-value} < 0.001.$ QDA - Questionnaire Diagnosed Asthma

DISCUSSION

The response rate of 95.6% in this study was probably due to the ease of the method used (being non-invasive) and to the cooperation of school teachers and families. The overall prevalence rate of smoking in this study was 18.2%. This rate was diluted by the relatively low rate of smoking among mothers. This rate was close to the 21.8% reported earlier from the region¹. However, this rate was generally less than 30% and 29.2% which were reported in community based studies from Eastern and Southern Saudi Arabia, respectively^{3,4} and was much less than rates reported from Asian and Arab countries¹. Smoking rate among fathers (32.0%) was comparable to 34.4% and 35% reported in two studies conducted in the region^{1,12}. This rate was however less than what was reported from Eastern³ and Southern⁴ Saudi Arabia and was less than the rate of 41% but was more than the rate of 29% reported from Jeddah and Riyadh, respectively¹². This variation may be explained by the nature of the populations under study. Fortunately, in this study prevalence of smoking among mothers was comparatively low (4.0%). This rate compares well with 6.3% found earlier in the region¹ and to the low prevalence of smoking among females in the Eastern countries in general⁴. Saudi community due to its religious and socio-cultural reasons which forbid smoking and considers it distasteful¹².

The rate of smoking in this study was significantly higher among parents of QDA compared to non-QDA children. Reports have shown that children with asthma and their parents are at significantly higher risk of allergenic diseases (rhinitis, eczema and asthma) than normal children¹⁵. Moreover, knowledge about the ill effects of smoking in general and of passive smoking on children in particular was found to be satisfactory among smokers and non-smokers in Saudi Arabia including Al-Khobar City¹⁻⁶. However, this finding may be explained by the discrepancy between knowledge and practice of smoking which was documented in Saudi Arabia^{1,3,4-6}. Moreover, this mismatch between knowledge and practice of smoking may prove to be of multiplicative effect on health (of smokers' and others). This is because, Saudi smokers are known to start smoking in early adolescent life, heavily and for long period of time¹⁻⁶. This is especially so when the prevalence of QDA is not low like in this study (9.5 %) compared to rates reported from Saudi Arabia and elsewhere¹⁵.

Smoking in this study was not found to be associated with specific socio- economic class, indicating that all community social strata are at risk. It also means that the association between smoking by a parent and the respiratory symptoms in children is real and not because of the variation in the socioeconomic class.

This study is consistent with previous reports that change in life style and environmental factors (ie. passive smoking) are significantly associated with respiratory symptoms among children^{12,15}. However, this study has shown for the first time in Saudi Arabia, that the strength of this association was relatively large among both asthmatic and normal children. This finding supports the hypothesis that change in life style influences the environment to express the allergic disease¹⁶. This has its important practical implications for decision-makers as to consider smoking a public health problem that should be prevented. Meanwhile clinicians should consider this fact when managing children presenting with these symptoms. In this study paternal smoking among other factors was found to be significantly associated with QDA. This has its practical implication as children with smoking fathers may be better screened for asthma. Similarly, the association between QDA and the variables included in the logistic regression model (Table 3) may prove to be suitable to form basis for any screening program for asthma among school children.

CONCLUSION

In conclusion, the smoking rate and trend among parents in this study were comparable to those reported earlier indicating an on-going problem. Surprisingly, the rate of smoking was significantly higher among parents of asthmatic children. It is shown in this study that there is an increased risk of respiratory symptoms among asthmatic and non-asthmatic children exposed to parental smoking.

Based on the results of this study, school children with smoking parent(s) may be considered at higher risk of developing bronchial asthma and respiratory diseases and they are better screened for bronchial asthma. Management of children presenting with respiratory symptoms should include inquiry about exposure to passive smoking. Smoking parents should be educated and persuaded to give up smoking at least indoors. This study may be considered as a baseline for further and larger studies in Saudi Arabia in the future including wider age group and female children. Smoking should be considered a public health problem with dangerous impacts. Despite methods proposed

to prevent smoking in Saudi Arabia, it appears that the only sure way is to ban the import of this poison.

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