INTRODUCTION

The World Health Organization (WHO) attributes 4.9 million deaths a year to tobacco use, a figure expected to rise to >10 million by 2030 if the current trend continues (Peto and Lopez, 2001; Satcher, 2001). Almost 70% of these premature deaths will be in developing countries, one-third (~250 million) of which will be children (WHO, 1999). The morbidity and mortality associated with tobacco use is shifting from the developed world to developing countries, especially low- and middle-income Arab countries (Jha and Chaloupka, 2000). One such country, which has the highest rate of tobacco consumption in the Middle East and North Africa [the MENA region, including Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates (UAE) and Yemen], is Egypt (Corrao et al., 2000; Hassan, 2003). It is estimated that 34% of Egyptians are daily smokers, with males having significantly higher...
daily smoking rates than females (43.4% males, 4.7% females) (ERC Statistics International, 2001).

The rise of tobacco use in Egypt

Egypt's population of 70 million is relatively young, with 60% below the age of 24 years (WHO, 2002). Egypt is a predominantly Muslim patriarchal collective society, governed by traditional cultural and Islamic values (Bernard, 1994).

Over the past 30 years, the number of smokers in Egypt has increased by 8–9% per year, more than twice as fast as the population growth rate (2%) (Hassan, 2003; WHO–EMRO, 2003). From 1970 to 1998, Egypt had a greater per capita consumption of cigarettes compared with the remaining 22 countries of the Eastern Mediterranean Region [Afghanistan, Bahrain, Cyprus, Djibouti, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen, West Bank and Gaza Strip] (Corrao et al., 2000). Cigarette consumption increased from 12.027 million sticks in 1970 to 46,600 million sticks in 1999, or 24% of the total MENA consumption, despite the fact that Egypt only accounted for 21% of MENA's total population (World Bank, 2001). Some studies have noted that Egyptian families spend 5% of their annual income on cigarettes (Dous, 2003; Hassan, 2003), although other sources have quoted a much higher figure of nearly 22% (GLOBALink, 2002), compared with 2–3% on health care (Moyer, 2000). In 2000, ~13 million Egyptians were current smokers, of which 500,000 (4%) were below the age of 15 years and 73,000 (0.6%) were below the age of 10, who consumed a total of 85 million sticks (Dous, 2003). According to the results of the Global Youth Tobacco Survey (GYTS) (2001), 13.8% of Egyptian students surveyed, aged 13–15 years, had ever smoked cigarettes, 19.6% had used any tobacco product, and 4.1% were current smokers (Global Youth Tobacco Survey, 2001). The WHO reports that smoking causes 90% of the lung cancer cases in Egypt, and tobacco-related cancers as a percentage of all cancers are on the rise (Hassan, 2003). The usual long-term delay before smoking-related morbidity occurs, especially in a country with a relatively young population, ensures a heavy future public health burden on Egypt.

One solution to curb the rising smoking epidemic in Egypt is the implementation of effective adolescent smoking prevention programs. Prevention of adolescent smoking is crucial because studies have shown that most adult smokers start smoking during adolescence (Lee et al., 1993; Chassin et al., 1996), and that smokers who initiate smoking at younger ages are more likely to continue smoking, have more severe health consequences and a lower probability of quitting (Chassin et al., 1996; Pierce et al., 1996). Therefore, if children can be guided through their teenage years without becoming addicted to nicotine, the likelihood of becoming a life-long tobacco user would drop dramatically (Kessler et al., 1997).

The majority of effective smoking prevention programs are based on the social influence model, which targets the proximal psychosocial variables believed to promote adolescent smoking, such as peer and family smoking, perceptions of social smoking norms, normative beliefs, knowledge about the consequences of smoking, and refusal self-efficacy skills (Conrad et al., 1992; Flay et al., 1994; Biglan et al., 1995; Greenlund et al., 1997; Charlton et al., 1999; CDC, 2000; Epstein et al., 2000), on the basis that the impact of the intervention on smoking behavior is mediated by the changes it produces on these mediating variables (MacKinnon et al., 1991; Kumpfer, 2000). However, the majority of these studies focused on the smoking behavior of Western youth (Mermelstein, 1998), and as a result, we know much less about the influences of these psychosocial smoking risk factors on adolescents from developing Arab collective cultures, like Egypt.

Previous research on adolescent smoking in Egypt has focused mainly on providing prevalence data (Souef et al., 1985; Ahmed et al., 1999; Dous, 2003), and information about the determinants of adolescent smoking such as access/availability and price, environmental tobacco smoke exposure (ETS), cessation, media and advertising, and school curriculum (Dous, 2003). There is a scarcity of quantitative studies investigating the influence of the proximal psychosocial factors associated with Arab adolescents' smoking behavior, on which effective adolescent smoking prevention programs may be based.

The current study investigates the influences of the known psychosocial smoking risk factors associated with Western adolescents, on Egyptian adolescents' smoking behavior (ever-smoking, 30-day smoking and susceptibility to smoking),
to shed some light on the psychosocial correlates of smoking behavior among Egyptian youth. Results of this study may help researchers design effective smoking prevention programs targeting Egyptian adolescents, in the hope of curbing the rising smoking epidemic in Egypt.

METHODS

Sample selection and subjects

The study was conducted in the city of Alexandria, Egypt. Alexandria is Egypt's second largest city and main seaport. It has a population of >4 million people, primarily comprising indigenous ethnic Egyptian groups (Ashmawy et al., 2000).

Schools were stratified based on school type (public/private) and student gender. Two schools from within each stratum were randomly selected, for a total of eight schools. Three classes per grade per school were randomly selected to participate in the study. Data were obtained from all actively consenting students in grades 7, 9 and 12.

To assess the different factors being studied, students completed a 112-item written questionnaire during regular classroom hours in May 2003. The survey questionnaire included measures to assess smoking behavior, demographics and a number of known smoking risk factors, including psychosocial, psychological and cultural factors, and pro-tobacco and Western media. This study reports the results of the psychosocial smoking risk factors. The questionnaire was administered by trained data collectors, including the author, who were not otherwise associated with the schools or students. The surveys were identified only by a code number and no identifying information linked students to the survey. Consent forms were sent to parents of all students 2 weeks before questionnaire administration. Only students with parental consent participated in the study. Students were given the option not to participate in the study, if they so chose, even after being granted parental consent. The study was approved by the University of Southern California (USC) Institutional Review Board (IRB), as part of a larger set of studies operating out of the USC Transdisciplinary Tobacco Use Research Center, and by the Rotary International Alexandria IRB.

A total of 2150 students from the eight schools were invited to participate. Of the 2150 students, 65 (3%) did not provide parental consent and 145 (6.7%) were absent from school on the day of data collection. Of the remaining 1940, 10 had missing values for gender. These were excluded from the analysis. This study reports the results of the remaining 1930 students, or ~90% of the population invited to participate.

Measures

Measures of demographics, smoking behavior and psychosocial variables were obtained from existing surveys used by the Pacific Rim Integrated Research Program (PRIRP) (Unger et al., 2001a) and the Wuhan smoking prevention trial (Unger et al., 2001b), two social influence-based tobacco use prevention programs targeting Pacific Rim populations in the US and Chinese adolescents in Wuhan, China, respectively, and currently being conducted at USC. Questions from the existing surveys were translated from English to Arabic and then translated back to English by a group of bilingual professionals, who ensured that the translation was idiomatically appropriate for Egyptian adolescents and that there was no disparity between the back-translated version and the original surveys.

Measures of smoking behavior variables

Smoking-dependent variables include experimentation with cigarettes (ever-smoking), 30-day smoking and susceptibility to smoking. For this study, ever-smokers are defined as adolescents who have tried smoking at least once in their lifetime, even a few puffs, 30-day smokers are adolescents who have smoked at least once in the 30 days prior to the survey administration, and susceptible adolescents are those who do not rule out smoking in the near future. Susceptible adolescents included never smokers, experimenters, 30-day smokers, current smokers and/or ex-smokers, as long as they did not adamantly rule out the possibility of future smoking (Pierce et al., 1998). Longitudinal studies have shown an increased likelihood of future smoking among susceptible adolescents and experimenters (Pierce et al., 1996; Unger et al., 1997; Pierce et al., 1998), and although not all adolescents who experiment with smoking will go on to become addicted, experimentation is a necessary step for the eventual smoking uptake process (Chassin et al., 1996; Choi et al., 1997; Unger et al., 1997).

The definition of current smokers has varied in different studies. The GYTS (2001) defines
current smokers as students who have smoked on one or more days during the 30 days prior to the survey (GYTS, 2001), which, in this study is defined as 30-day smokers. The Centers for Disease Control and Prevention’s (CDC) Behavioral Risk Factor Surveillance System (BRFSS) questionnaire (CDC, 2002) defines current smokers as those who smoked at least 100 cigarettes (five packs) in their lifetime. This study uses the BRFSS’s definition of current smokers for reporting the different smoking prevalence rates for the population under study. Figure 2 shows the items in the questionnaire assessing the smoking behavior variables.

Measures of psychosocial variables

Peer smoking was assessed by the following two questions: ‘How many of your friends have ever tried smoking?’ and ‘How many of your friends smoke cigarettes at least once a month?’ (standardized $\alpha = 0.85$). Responses were rated on a six-point scale (1 = none, 2 = one, 3 = two, 4 = three, 5 = four and 6 = more than four). Peer smoking was coded as a dichotomous variable: those who indicated ‘none’ for both questions were classified as unexposed to peer smokers and coded as ‘0’, while all other responses were classified as having peers who smoke, and coded as ‘1’.

Parent smoking was assessed by: ‘Do either of your parents smoke cigarettes now?’. Respondents answered ‘Yes’ or ‘No’. Positive responses classified the student as being exposed to parental smoking and coded as ‘1’, and negative responses were coded as ‘0’. The purpose of this measure was to assess the influence of parent smoking on their children’s smoking behavior, regardless of whether the student lived with both birth parents or not. The underlying assumption was that students who did not live with both birth parents would still be exposed to parental smoking during their visits with the other parent, if that parent was the smoker.

Sibling smoking status was similarly assessed by the following question: ‘Do any of your siblings smoke now?’. Respondents answered ‘Yes’ or ‘No’. Positive responses classified the student as having siblings who smoked, regardless of the age of the sibling, and coded as ‘1’, while negative responses were coded as ‘0’.

Figures 3 and 4 show the measures assessing the rest of the psychosocial variables being studied: perceived peer and adult smoking norms, and refusal self-efficacy (Figure 3), positive beliefs about smoking and knowledge of the long- and short-term consequences of smoking, and their corresponding standardized Cronbach’s $\alpha$ values.

Measurement of covariates

Covariates in this study included sex, age and socioeconomic status (SES).

To assess students’ SES, respondents were asked about their parents’ educational level and
their weekly allowance by the following questions: ‘What is your father’s highest educational level?’ and ‘What is your mother’s highest educational level?’ [responses ranged from 1 (‘Illiterate’) to 8 (‘PhD’)]; and ‘How much pocket money do you get each week to spend any way you want?’ [responses ranged from 1 (‘None’) to 8 (‘over 30 Egyptian pounds’), with increments of 5 Egyptian pounds]. The SES index was formed by summing the responses to the above three items. Higher values indicated higher SES.

### Data analysis

Descriptive statistics (frequencies, percentages and means) were used to examine smoking prevalence and age of respondents. Chi-square analyses were used to compare the prevalence of smoking behavior across genders, and t-test analyses were used to compare the mean age across genders.

Dependent variables were naturally dichotomized. Multivariate logistic regression was used to assess the associations between the independent and dependent variables. Each multivariate model included all the independent variables under study and their interaction terms with sex. Interaction terms are used to test for any differential influence of one variable on another. For example, to test if the influence of peer smoking on smoking behaviour was significantly different between genders, an interaction term was created (peer smoking × sex) and included in the model. Whenever there was a significant interaction with sex, the multivariate model was reanalyzed for each gender, controlling for age and SES.

All statistical analysis was completed using the SAS system version 9.0. (SAS Institute, 2002).
RESULTS

Demographic characteristics of the sample
The population sample of 1930 students comprised 51% males and 49% females. The age of the students ranged from 13 to 19 years, with a mean age of 15.2 [standard deviation (SD) = 1.4] years. $t$-test analysis revealed no significant difference in the mean age between the sexes ($t = 1.78$, degrees of freedom (df) = 1928, $p = 0.08$). Table 1 presents the demographic characteristics of the study sample.

Smoking prevalence
The overall prevalence of ever-smoking, 30-day smoking, current smoking and susceptibility to smoking was 25%, 12%, 6% and 38%, respectively, with males having significantly higher ever-smoking ($\chi^2 = 82.93$, df = 1, $p < 0.0001$), 30-day smoking ($\chi^2 = 40.8$, df = 1, $p < 0.0001$), current smoking ($\chi^2 = 12.64$, df = 1, $p < 0.0001$) and susceptibility to smoking ($\chi^2 = 127.13$, df = 1, $p < 0.0001$) rates than females. Of the susceptible adolescents, 47% had never smoked even a few puffs. Figure 1 presents the prevalence of smoking rates by gender.
Main effects associated with ever-smoking and 30-day smoking

There was no significant interaction between any of the independent variables and ever-smoking or 30-day smoking, therefore logistic regression analysis was performed for the whole sample, adjusting for sex, age and SES. Tables 2 and 3 present the psychosocial smoking risk factors significantly associated with Egyptian adolescents’ ever and 30-day smoking behavior, respectively. Controlling for all other variables in the study, sibling smoking had the highest odds for ever-smoking [odds ratio (OR) = 3.5, 95% confidence interval (CI) = 2.3–5.2] and 30-day smoking (OR = 3.9, 95% CI = 2.6–6.1). Adolescents whose parents smoked were at a slightly higher odds for ever-smoking (OR = 2.3, 95% CI = 1.6–3.2) than those whose peers smoked (OR = 2.1, 95% CI = 1.4–2.9) (Table 2). However, peer smoking appears to increase the odds of adolescents’ 30-day smoking behavior (OR = 2.6, 95% CI = 1.4–4.6) more than parent smoking (OR = 2.1, 95% CI = 1.4–3.1) (Table 3).

High levels of perceived adult smoking norms increased the odds of adolescent’s ever-smoking behavior (OR = 1.7, 95% CI = 1.6–1.9) more than high levels of perceived peer smoking norms (OR = 1.3, 95% CI = 1.2–1.4) (Table 2). There was almost no difference in the odds of perceived adult smoking norms (OR = 1.2, 95% CI = 1.1–1.4) and perceived peer smoking norms (OR = 1.3, 95% CI = 1.2–1.5) on the risk of 30-day smoking behavior (Table 3).

Having positive beliefs about smoking was significantly associated with both ever-smoking (OR = 1.2, 95% CI = 1.2–1.2) and 30-day smoking (OR = 1.3, 95% CI = 1.2–1.3). While high levels of refusal self-efficacy were protective against ever-smoking (OR = 0.9, 95% CI = 0.8–0.9), they were not against 30-day smoking behavior. Knowledge of the consequences of smoking, both long- and short-term, was not significantly associated with either ever-smoking or 30-day smoking behavior.

Main effects associated with susceptibility to smoking

There was a significant interaction between gender and knowledge of the short-term negative consequences of smoking, therefore multivariate logistic regression analysis was performed for each gender. Table 4 presents the psychosocial risk factors significantly associated with susceptibility to smoking by gender.

Knowledge of the short-term negative consequences of smoking was protective against susceptibility to smoking for females only (OR = 0.8, 95% CI = 0.7–0.9). High levels of perceived adult smoking norms, not perceived

### Table 2: Psychosocial smoking risk factors significantly associated with ever-smoking among Egyptian adolescents, adjusted for sex, age and SES

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR</th>
<th>(95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sibling smoking</td>
<td>3.5</td>
<td>2.3–5.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Parent smoking</td>
<td>2.3</td>
<td>1.6–3.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Peer smoking</td>
<td>2.1</td>
<td>1.4–2.9</td>
<td>0.0002</td>
</tr>
<tr>
<td>Perceived adult smoking</td>
<td>1.7</td>
<td>1.6–1.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Perceived peer smoking</td>
<td>1.3</td>
<td>1.2–1.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Positive beliefs about smoking</td>
<td>1.2</td>
<td>1.1–1.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Refusal self-efficacy</td>
<td>0.9</td>
<td>0.8–0.9</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

### Table 3: Psychosocial smoking risk factors significantly associated with 30-day smoking behavior among Egyptian adolescents, adjusted for sex, age and SES

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR</th>
<th>(95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sibling smoking</td>
<td>3.9</td>
<td>2.6–6.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Peer smoking</td>
<td>2.6</td>
<td>1.4–4.6</td>
<td>0.001</td>
</tr>
<tr>
<td>Parent smoking</td>
<td>2.1</td>
<td>1.4–3.1</td>
<td>0.0007</td>
</tr>
<tr>
<td>Perceived peer smoking</td>
<td>1.3</td>
<td>1.2–1.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Positive beliefs about smoking</td>
<td>1.3</td>
<td>1.2–1.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Perceived adult smoking</td>
<td>1.2</td>
<td>1.1–1.4</td>
<td>0.0002</td>
</tr>
</tbody>
</table>
peer smoking norms, increased the risk for susceptibility to smoking among both genders. Sibling, parent and peer smoking, and high levels of positive beliefs about smoking had the same influence on increasing the odds of susceptibility to smoking as they did on ever-smoking behavior, while high levels of refusal self-efficacy was protective against susceptibility to future smoking (Table 4).

**DISCUSSION**

Consistent with previous studies from Egypt and other Arab cultures, males were at a much higher risk for smoking behavior than females (Gadalla et al., 1992; Ahmed et al., 1999; ERC Statistics International, 2001; Dous, 2003; Hassan, 2003; WHO–EMRO, 2003). This may be due to cultural factors associated with patriarchal societies, such that smoking may be viewed as an acceptable male social behavior, while being considered a cultural taboo for females (Hassan, 2003; Islam and Johnson, 2003). Accordingly, the relatively low smoking rates among females may simply be a reflection of a cultural taboo, and may be an underestimate of the true female prevalence, since many young females may be reluctant to admit to smoking (Hassan, 2003).

The interesting factor that emerges from this study is that unlike Western adolescents, Egyptian adolescents seem to be more influenced by their sibling smoking and perceived adult smoking norms, compared with peer smoking and perceived peer smoking norms. Although Western studies have shown that family smoking increases the risk of smoking among adolescents, peer smoking and perceived peer smoking norms are consistently stronger smoking risk factors than family smoking and perceived adult smoking norms among Western adolescents (Conrad et al., 1992; Landrine et al., 1994; Biglan et al., 1995; CDC, 1998; Mermelstein, 1998; Gilpin and Pierce, 2001). This is not surprising since Egypt is a traditional collective society where the family unit is more important than an individual or his/her peers (Abd Al Hameed and Al Seikh, 1978). Egyptian adolescents usually look up to family members and adults in their community and try to emulate their behavior. If family members and/or adults in their environment smoke, the adolescent may perceive that smoking is a normative and acceptable social behavior, and that some benefit must accrue from it if those he/she loves and respects engage in it (Gilpin and Pierce, 2001). This difference is emphasized further by the positive significant influence of perceived adult smoking norms, and lack of influence of perceived peer smoking norms, on susceptibility to future smoking (Table 4). Perceived peer smoking norms appears to be a smoking risk factor only among ever-smokers and 30-day smokers (Tables 2 and 3). One explanation may be that adolescents who have already experimented with smoking and/or are 30-day smokers may feel the need to overestimate the prevalence of their peer smoking in an effort to rationalize their own smoking behavior (Islam and Johnson, 2003).

Like Western adolescents, Egyptian adolescents who had greater positive beliefs about smoking were at a higher risk of engaging in any smoking behavior. Interestingly, refusal self-efficacy appears to be protective against

### Table 4: Psychosocial smoking risk factors significantly associated with susceptibility to smoking by gender among Egyptian adolescents, adjusted for age and SES

<table>
<thead>
<tr>
<th></th>
<th>Susceptibility to smoking</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Sibling smoking</td>
<td>3.5 (2.2–5.6)</td>
<td>&lt;0.0001</td>
<td>2.9 (1.7–4.8)</td>
</tr>
<tr>
<td>Parent smoking</td>
<td>2.3 (1.7–3.1)</td>
<td>&lt;0.0001</td>
<td>2.8 (1.9–4.0)</td>
</tr>
<tr>
<td>Peer smoking</td>
<td>2.1 (1.5–2.9)</td>
<td>&lt;0.0001</td>
<td>1.7 (1.1–2.5)</td>
</tr>
<tr>
<td>Positive beliefs</td>
<td>1.2 (1.1–1.3)</td>
<td>0.002</td>
<td>1.2 (1.1–1.3)</td>
</tr>
<tr>
<td>Perceived adult smoking</td>
<td>1.1 (1.1–1.2)</td>
<td>0.002</td>
<td>1.1 (1.1–1.3)</td>
</tr>
<tr>
<td>Refusal self-efficacy</td>
<td>0.8 (0.7–0.9)</td>
<td>0.0001</td>
<td>0.8 (0.8–0.9)</td>
</tr>
<tr>
<td>Short-term negative consequences</td>
<td>0.9 (0.9–1.1)</td>
<td>0.6</td>
<td>0.7 (0.6–0.8)</td>
</tr>
</tbody>
</table>

*aNot significant (p > 0.05).*
smoking behavior only in the early stages of the smoking uptake process. One explanation may be that as the adolescent becomes a more frequent 30-day smoker, the influence of sibling and peer smoking become stronger (Table 3), and the positive beliefs about smoking may have been reinforced by perceptions of social smoking norms, such that the adolescent doubts his/her capability to refuse cigarette offers from friends and siblings.

The differential protective influence of knowledge of the short-term negative consequences of smoking against susceptibility to future smoking among females may be due to underlying cultural factors. Egyptian adolescent females may place higher importance on their appearance than their male counterparts, and therefore be less susceptible to a behavior that may negatively impact upon their physical appearance and attractiveness to the opposite sex, whereas physical appearance may not be very important to the Egyptian adolescent male, since culturally it is presumed that a man’s affluence and masculinity, not his physical appearance, is what attracts the opposite sex.

The results of this study point to the notion that some of the known smoking risk factors associated with western adolescents’ smoking behavior, such as positive beliefs about smoking and refusal self-efficacy skills, are consistent smoking risk factors across both cultures and genders, while the strength of the influence of family smoking versus peer smoking, perceived adult smoking norms versus perceived peer smoking norms, may depend on the type of society being studied (collective versus individualistic).

Implications

The results of this study provide important new information about the universality of some of the known psychosocial smoking risk factors. Correcting perceived positive beliefs about smoking and increasing adolescents’ refusal self-efficacy skills in the early stages of the smoking uptake process should be incorporated into any smoking prevention program aimed at adolescents from any culture. Smoking prevention programs aimed at adolescents from collective cultures, like Egypt, should be multicomponent programs that include schools, family, community members and the media. Families, especially siblings, and community adult members should be made aware of the detrimental influence their smoking behavior has on their youth. Therefore, smoking prevention programs aimed at Egyptian adolescents should go hand in hand with smoking cessation interventions aimed at Egyptian adults.

Limitations

Results of this study are based on cross-sectional data, so causal influences cannot be determined. The reverse direction of causality is plausible. Adolescents who have already experimented with cigarettes might choose to befriend others who have also experimented with cigarettes, so as not to feel different, and not vice versa. To develop a better understanding of the conditions under which these variables operate as causal factors, more longitudinal study designs are required. However, the influences of family smoking on adolescent smoking behavior cannot be explained by this reversal of causality and remains an important smoking risk factor that needs to be addressed for this population.

Another limitation of this study is the lack of follow-up information on the smoking behavior of the absentees (6.7%) and their parents. It is possible that absentees and their parents had higher smoking prevalence than those surveyed. This may have caused an underestimation of the smoking prevalence rates in this study. Longitudinal Western studies have shown a higher smoking prevalence among absentees and their parents (Charlton and Blair, 1989; Charlton et al., 1997); whether this is true among Egyptian adolescents cannot be determined by this study.

The results of smoking behavior are based on students’ self-reports. Although respondents were assured of their anonymity, Egyptian students may have been suspicious and fearful of entrapment, especially the females, because of the cultural taboo of smoking among females (Hassan, 2003), and therefore may have underreported their smoking behavior in an attempt to appear socially correct. Although adolescents’ self-reports of smoking obtained under similar conditions in the USA have been shown to be quite accurate across ethnic groups (Wills and Cleary, 1997), it is not known whether this is also true for Egyptian adolescents.

This study is based on random sampling of schools and students in the city of Alexandria, Egypt, therefore the results can only be generalized to Egyptian adolescents living in
Alexandria, and cannot be generalized to the rest of the adolescents living in other Egyptian cities. Risk factors associated with Alexandrian adolescents’ smoking behavior may differ for Egyptian adolescents living in the more Westernized capital city of Cairo, or in the more traditional Egyptian suburban cities.

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