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Self-efficacy and smoking behavior among high school students in Madinah city, Saudi Arabia

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Abstract--Background: Smoking behavior among adolescents is found to be influenced by many factors. Self-efficacy factors, however, have been of little concern in the Saudi literature. Objectives: to examine the association of smoking behavior with self-efficacy among secondary school students in Madinah City, Saudi Arabia. Methods: A secondary school-based cross-sectional study was conducted in Madinah City, Saudi Arabia during the study year 2019-2020. A cluster multistage random sampling technique was taken from 10 (5 male and 5 female) secondary schools. Smoking related data were collected using a predesigned structured self-administered questionnaire. Self-efficacy data were studied as a dichotomous variable according to its median distribution. The prevalence of current smokers was estimated and its association with self-efficacy levels was examined using logistic regression analysis. Results: The response rate was 91.6% (641/700). The prevalence of current smokers was 26.4% (95%CI = 23–30%). The prevalence showed statistically significant differences among adolescents by their sex, mother's education, and parents' and friends' smoking. The mean self-efficacy was slightly lower in current smokers 27.5 (5.9) vs. 27.8 (5.6). The likelihood to quit smoking was significantly higher among male smokers (adjusted OR = 3.5; 95%CI = 1.23–9.90) with high self-efficacy. The likelihood to start smoking among non-smokers was reduced by 35% among males and 30% among females, although not significantly. Conclusions: Self-efficacy was found to influence smoking behavior among Saudi adolescents. The study suggests the

need to encourage adolescents' self-efficacy in the preventive and smoking cessation program in Madinah City.

Keywords---Self-efficacy; smoking; health behavior; adolescents; Saudi Arabia

Introduction

The use of Tobacco and its health consequences represent a significant public health problem worldwide ¹. In spite of its known negative health effects, smoking has become more prevalent, particularly among youth ^{2,3}, with the majority of smokers starting to smoke at an early stage before the age of 18 years ^{4,5}. In Saudi Arabia, the prevalence was high among secondary school students, particularly males. It was 26.2% in Madinah ⁶, 29% in Riyadh ⁷, and as high as 37% in Jeddah ⁸. Several regional and international studies have reported many factors in association with risk of smoking behavior among adolescents ⁶⁻¹¹. The most important risk factors were friends' and parents' smoking, age, sex ⁶⁻¹⁰, and family structure of adolescents ¹¹.

The period of adolescence is a critical period during which psychological and social constructs, such as personality, self-esteem, and self-efficacy, develop and are believed to be predictive of smoking behavior ¹². Some of these constructs were examined in connection with smoking behavior in the Saudi literature. Addressing beliefs and attitudes toward smoking revealed a significant positive risk of smoking behavior among Saudi adolescents ^{13,14}.

Self-efficacy, as confidence in one's ability to smoke, was found to predict smoking behavior. Previous studies have reported the role of social self efficacy in the risk of smoking behavior ¹⁵⁻¹⁷ among adolescents. Moreover, other studies documented the effect of self-efficacy on intention to quit among smokers and intention to initiate among non-smokers ¹⁸⁻²⁰. The Saudi literature, however, showed a shortage of studies connecting self-efficacy factors with smoking behavior among adolescents. Investigating the role of self-efficacy in adolescents' smoking behavior may help to ameliorate the preventive strategy and smoking cessation programs in the Kingdom.

From these points of view, the aim of the current study was to examine the association of self-efficacy with smoking behavior among a sample of high school students in Madinah City, Kingdom of Saudi Arabia.

Methods

A secondary-school-based cross-sectional study was conducted in Madinah City, Saudi Arabia during the study year 2019-2020, with the aim of examining the association of self-efficacy with smoking behavior among a sample of 641 secondary school students. A cluster multistage random sampling technique was used to select a cohort of 10 (5 male and 5 female) secondary schools in Madinah. The study enrolled 700 students from the 10 schools (70 from each randomly chosen school).

The primary calculated sample was 297 according to the recent reported prevalence of smoking (26.2%) among secondary school students in Madinah ⁶, and to an assumed precision of 5% with a confidence interval of 95% and an acceptable error of 5%. The same level of accuracy in both male and female students was obtained by doubling the calculated sample size. Furthermore, to overcome the problem of non-response and missing data, if any, the final sample size was increased to become 700 students.

Pre-designed self-administered structured questionnaires were distributed to the included 700 students in the selected schools. Of these students, 641 agreed to participate (91.6% response rate). The used questionnaire included data about (i) socio-demographic factors: age (< 16 and ≥ 16 years), pocket money (≤ 300 SR vs. > 300 SR), parents' educational level (University and higher, basically educated and illiterate), ii) smoking-related factors: parents' smoking (both parents smoke, one parent smokes vs. non), smoking habit of best friends (all, most, some vs. non); iii) self-efficacy-related questions, and iv) questions about the intention to quit smoking among current and intention to start among not-current smokers. The content validity of the study questionnaire was discussed with a smoking-control and preventive medicine consultants.

The dependent variable in this study was the current smoker's behavior, and it was assessed by these questions: "During the past 30 days, how many days did you smoke cigarettes?", "During the past 30 days, on the days you smoke, how many cigarettes did you usually smoke?", and "How old were you when you first tried a cigarette?". In this study, students reported to have had smoked at least one cigarette in the past 30 days were considered as current smokers and those reported never smoking in their lifetime were considered as never smokers ²¹.

The main independent variable in this study consisted of the self-efficacy questions. Self-efficacy was measured by 8 questions adapted from tools used in previous studies ^{22,23}. Questions are based on 6-point scale answers that ranged from very difficult equal to 1 on the scale and very easy equal to 6 on the scale. According to the median distribution among the studied students, self-efficacy was studied in two categories: low self-efficacy (median ≤ 28), and high self-efficacy level (median > 28).

All study data were analyzed by using a statistical analysis system software package ²⁴. Chi-squared tests were used to compare the distribution of the studied categorical variables and a t-test was used to compare the mean scale distribution of self-efficacy between current and not current smokers. The level $P \leq 0.05$ was considered as the cut-off value for significance.

Univariate logistic regression was done in the first step to estimate the odds ratios (OR) and their 95% confidence intervals (95% CI) for the association of smoking behavior and self-efficacy levels. Adjustment of the estimated OR was also done using multivariate logistic regression analysis controlling the confounding effect of age, sex (all students), mother's education, parents' and friends' smoking.

An ethical approval was taken from the Taibah University Ethical Committee. All participants and/or their teachers gave informed consent prior to their inclusion in the study. Confidentiality and privacy of the collected data were assured, and the data were analyzed anonymously and used only for the research purpose.

Results

The response rate was 91.6% (641/700). Smoking prevalence was 26.4% (169/641 [95% CI = 23–30%]) among the studied students. More than 60% of this cohort reported starting smoking before the age of 16 years.

Table 1 presents the distribution of smoking behavior (current vs. not current) among the studied students by their socio-demographic and smoking-related factors. Smoking prevalence was significantly high among males (41.6%), those reporting monthly pocket money > 300 SR (34.9%), and those in the illiterate father (39.1%) and mother (40%) groups. The prevalence of smoking was also significantly higher among students whose both parents (53.3%), and all best friends, smoke (52.9%). The mean (SD) self-efficacy scale showed no significant difference by smoking behavior, although it was slightly lower in current smokers 27.5 (5.9) vs. 27.8 (5.6).

Table 1. Characteristics of the studied high school students by their current smoking behavior in Madinah, Saudi Arabia (n= 641)

Characteristics*	Current smokers		P value
	Yes (n= 169)	No (n= 472)	
Age group in years			
< 16	61 (27.5)	161 (72.5)	.64
≥ 16	108 (25.8)	311 (74.2)	
Sex			
Male	119 (41.6)	167 (58.4)	<.0001**
Female	50 (14.1)	305 (85.9)	
Secondary school grade			
1 st	51 (23.3)	168 (76.7)	.001**
2 nd	36 (19.2)	152 (80.8)	
3 rd	82 (35.0)	152 (65.0)	
Pocket money per month			
≤ 300 SR	146 (25.4)	429 (74.6)	.10
> 300 SR	23 (34.9)	43 (66.1)	
Father education			
Illiterate	18 (39.1)	28 (60.9)	.11
Less than university	76 (25.9)	217 (74.1)	
University and higher	75 (24.8)	302 (75.2)	
Mother education			
Illiterate	22 (40.0)	33 (60.0)	.01**
Less than university	71 (22.1)	250 (77.9)	
University and higher	76 (28.7)	189 (71.3)	
Parents smoking			
No	106 (22.2)	371 (77.8)	

One parent	55 (36.9)	94 (63.1)	.001**
Both	8 (53.3)	7 (46.7)	
Friends smoking			
No	38 (10.9)	311 (89.1)	<.0001**
Some	76 (40.4)	112 (59.6)	
Most or all	55 (52.9)	49 (47.1)	
Self-efficacy scale; Mean (SD) [Range]	27.5 (5.9) [4-43]	27.8 (5.6) [2-44]	.84

*Data are presented by n (%) and mean \pm SD.

**Significant

Table 2 presents the risk of smoking associated with the self-efficacy level among the studied secondary school students. Multivariate logistic regression analyses showed that the risk of smoking was reduced among the high self-efficacy level, particularly among males with an adjusted OR of 0.80 (95% CI = 0.54–1.42). Among female students, however, there was no association between self-efficacy level, and the risk of smoking among them with the estimated OR approached null.

Table 2. Association of self-efficacy with current smoking behavior among high school students by their sex in Madinah, Saudi Arabia

Self-efficacy levels	Current smokers (n= 169)	Not current smokers (n= 472)	OR (95% CI)	OR* (95% CI)
All students (n= 641)				
Low self-efficacy	79	233	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	90	239	0.90 (0.63-1.28)	0.93 (0.65-1.35)
Male students (n= 386)				
Low self-efficacy	54	83	1.00 (Ref.)	1.00
High self-efficacy	65	84	0.84 (0.52-1.35)	0.80 (0.54-1.42)
Female students (n= 355)				
Low self-efficacy	25	150	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	25	155	1.03 (0.57-1.87)	1.01 (0.55-1.93)

*OR adjusted by age, mother education, school grade, parents and friends' smoking

Table 3 shows the multivariate analyses for the association between self-efficacy level and the intention to quit smoking among current smokers (n = 169). The likelihood to quit smoking among the studied smokers was increased among all studied students with an adjusted OR of 1.90 (95% CI = 0.85–4.20). Stratified analyses by students' sex showed a significantly high positive association among male students (adjusted OR = 3.5; 95%CI= 1.23–9.90), and non-significant weak positive association among female students (adjusted OR = 1.30; 95% CI = 0.28–7.14).

Table 3. Association of self-efficacy factors with intention to quit smoking among current smokers students by their sex in Madinah, Saudi Arabia

Self-efficacy levels	Intention to quit (n= 134)	No intention to quit (n= 35)	OR (95% CI)	OR* (95% CI)
All students (n= 169)				
Low self-efficacy	67	23	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	67	12	1.92 (0.90-4.16)	1.90 (0.85-4.20)
Male students (n= 119)				
Low self-efficacy	46	19	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	48	6	3.30 (1.21-9.00)**	3.50 (1.23-9.90)**
Female students (n= 50)				
Low self-efficacy	21	6	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	19	4	1.35 (0.30-6.46)	1.30 (0.28-7.14)

*OR adjusted by age, mother education, school grade, parents and friends' smoking

**Significant

Table 4 shows the multivariate analyses for the association between self-efficacy level and the intention to start smoking among not current smokers (n = 0.472). The likelihood to start smoking among non-smokers was decreased among all studied students with an adjusted OR of 0.90 (95% CI = 0.48–1.69). Although not significant, the likelihood to start smoking was reduced by 35% (adjusted OR = 0.70; 95% CI = 0.16–3.93) among males and 30% among females (adjusted OR = 0.70; 95 CI = 0.33–1.49).

Table 4. Association of self-efficacy factors with intention to start smoking among current smokers students by their sex in Madinah, Saudi Arabia

Self-efficacy levels	Intention to start (n= 45)	No intention to start (n= 427)	OR (95% CI)	OR* (95% CI)
All students (n= 472)				
Low self-efficacy	24	215	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	21	212	0.89 (0.48-1.64)	0.90 (0.48-1.69)
Male students (n= 167)				
Low self-efficacy	7	80	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	4	76	0.60 (0.23-3.50)	0.65 (0.16-3.93)
Female students (n= 305)				
Low self-efficacy	20	135	1.00 (Ref.)	1.00 (Ref.)
High self-efficacy	14	136	0.69 (0.34-1.43)	0.70 (0.33-1.49)

*OR adjusted by age, mother education, school grade, parents and friends' smoking

Discussion

The present study showed the prevalence of smoking among secondary school students in Madinah City, Saudi Arabia, to be 26.4%, and more than 60% of them

have reported to start smoking before the age of 16 years. The prevalence of smoking in this study was nearly similar to other studies conducted among secondary school students in other Saudi regions. A previous study in Madinah City reported a prevalence of 26.2% among the studied students ⁶. In Riyadh City, the prevalence was 29% ⁷. In contrast, however, the prevalence of smoking among secondary school students in Jeddah City was as high as 37% ⁸. The possible reason for this difference may be attributed to a methodological issue and the definition of the smoking variable in the Jeddah study.

The prevalence of smoking among students, however, showed significant variations by the students' characteristics. It was 41.6% among males, 40% among students with an illiterate mother and 39.1% among those with an illiterate father.

The prevalence of smoking was also significantly higher among students with both parents as smokers (53.3%), and all best friends as smokers (52.9%). These findings have appeared consistent with the results of other studies done in different Saudi regions ⁶⁻⁸, as well as with the results of other studies done in Congo²⁵ and Greece ⁹.

Self-efficacy has been theorized in several studies¹⁷⁻²⁰ to be negatively related to the smoking behavior and positively related to the avoidance of smoking. Although not significant, the findings of the present study have also showed that the risk of smoking was reduced among those with a high self-efficacy level (OR = 0.93; 95% CI = 0.65–1.35), particularly among male students with an adjusted OR of 0.80 (95% CI = 0.54–1.42). The same result was also reported by Mee ²⁶, who conducted a correlational study between smoking behavior and smoking resistance self-efficacy (SSE) on 364 college students aged 18–21 years. A significant negative relationship was found in that study between smoking behavior and SSE. Findings indicated that the higher the SSE the lower chance for students to smoke.

On the contrary, however, some studies ^{15,16} have found a positive significant association between smoking behavior and social self-efficacy, in connection with affectivity. The results of these two studies, however, may be attributed to the inclusion of current and ex-smokers as a definition of a dependent variable (smoking behavior). The development of youth smoking is a dynamic process, in which social self-efficacy gained from previous experience is attributed to increasing the likelihood of smoking behavior and regular smoking among adolescents ²⁷. The present study has only addressed the current smokers as a definition of smoking behavior.

The likelihood to quit smoking among the studied smokers who reported high self-efficacy in the current study was increased among all students with an adjusted OR of 1.90 (95% CI = 0.85–4.20), and it was more manifested among male students (adjusted OR = 3.5; 95% CI = 1.23–9.90). Among female students, however, the association was weakly positive and non-significant (adjusted OR = 1.30; 95% CI = 0.28–7.14). This positive association between intention to quit and self-efficacy was also reported in a meta-analytic study conducted by Gwaltney et al. ¹⁹ that included more than 50 prospective studies. The study found a positive

relationship between self-efficacy and future smoking, and the authors concluded that the strength of this association depended primarily upon the population studied and the timing of the self-efficacy assessment. The relationship between self-efficacy and future smoking was modest when self-efficacy was assessed prior to a quitting attempt and stronger when assessed post-quitting ¹⁹.

On the other hand, their studies²⁸ among old people found that retired people have the highest smoking abstinence self-efficacy, significantly higher than the commercial, service personnel and professional technicians. On the one hand, most retired people are older, and the older are more easy to quit smoking, which is consistent with previous studies^{29,30}

The engagement of current non-smokers in a smoking attempt in the present study was found to insignificantly decrease in association with high self-efficacy among all studied students with an adjusted OR of 0.90 (95% CI = 0.48–1.69). The risk reduction to start smoking in association with high self-efficacy among currently nonsmoking students was 35% (adjusted OR = 0.70; 95% CI = 0.16–3.93) among male students and 30% (adjusted OR = 0.70; 95 CI = 0.33–1.49) among female students. A previous study by [Vitoria et al.](#) ³¹, on 3064 Portuguese students at the beginning of their 7th grade, showed the social influence to explain 29% of the variance of the intention to smoke among them. The same study also suggested other factors, such as parental and friends' smoke, to influence the adolescent intention to smoke. Selection of friends and community norms and traditions were also suggested by another study ³² to greatly influence smoking behavior among adolescents in addition to their social efficacy factors. All of these factors were controlled in the present study.

This study has several important strengths: the high response rate, the relative large sample and the school-based design are factors consolidate the study results. According to available knowledge, the study is the first to assess the effects of self-efficacy on smoking behavior among adolescents in Madinah City. Also, the categorization of the independent variable (self-efficacy) may be a unique addition to the literature as most of the other similar studies analyzing self-efficacy as a continuous variable examine only its correlation and variance explanation, without quantification of the risk. Moreover, the used multivariate models have minimized the confounding effects of other factors while estimating the risk of intention to quit or intention to start smoking in association with self-efficacy levels. Finally, the used questionnaire, including self efficacy data, was structured and validated. Using validated tools are known to increase the confidence in obtaining sound and standard information.

The following limitations have also been considered in this study. The use of self-reporting questionnaires in measuring smoking behavior might underestimate smoking prevalence in the studied students.

Self-reporting in such types of studies is the most practical way to obtain information when, as was the case in this study, it is not feasible to validate the self-reporting via biochemical tests due to logistical and cultural constraints. Also, the use of a self-administered anonymous questionnaire has facilitated the confidence in obtaining sound information in a standardized manner.

A second limitation is that the cross-sectional nature of the present study design does not allow decisive conclusions about the direction of relationships. The aim of this study was to explore the influence of self-efficacy on smoking behavior among the studied students. However, reverse association cannot be excluded and students' smoking behavior might influence their social self-efficacy. This clearly necessitates prospective cohort study designs.

In conclusion, the current study suggests a role for self-efficacy in smoking behavior among Saudi adolescents. This finding may add to Saudi literature and contribute to reinforce the current smoking prevention strategies in the country. The study also suggests the need to encourage adolescents' self-efficacy in the preventive and smoking cessation program in Madinah City.

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