



# Taibah University

## Journal of Taibah University Medical Sciences

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Original Article

### Factors associated with the willingness to quit smoking among a cohort of university students in the KSA



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Received 20 November 2015; revised 2 January 2016; accepted 16 January 2016; Available online 18 February 2016

#### المخلص

**أهداف البحث:** هدفت هذه الدراسة إلى تحديد العوامل التي يمكن بها التنبؤ بالاستعداد للإقلاع عن التدخين بين مجموعة من الطلبة السعوديين.

**طريقة البحث:** تم في هذه الدراسة المقطعية توزيع استبانة على مجموعة من الطلبة الذكور من ثلاثة مراكز للتعليم العالي. خضعت البيانات المستحصلة للتحليل ثنائي المتغير واختبارات الانحدار اللوجستية لتقييم العوامل المرتبطة بالاستعداد للإقلاع عن التدخين.

**النتائج:** كان ٢٤٪ من بين الـ ٤٦٧ متجاوب للاستبانة مدخنين حاليين، بينما كان ٦٥٪ من بين هؤلاء المدخنين لديهم الرغبة في الإقلاع عن التدخين. تبين من التحليل ثنائي المتغير أن المحاولات السابقة للإقلاع عن التدخين، ورسائل مكافحة التدخين في التلفاز والصحف كان لها علاقة وثيقة بالقبالية للإقلاع عن التدخين. كما بين التحليل الانحداري اللوجستي متعدد المتغيرات أن متغيراً واحداً فقط كان مؤشراً ذا قيمة إحصائية في التنبؤ بقبالية الإقلاع عن التدخين، وهو وجود محاولة سابقة للإقلاع عن التدخين.

**الاستنتاجات:** تبين نتائج هذه الدراسة أن الطلبة السعوديين المدخنين الذكور لديهم الرغبة في الإقلاع عن التدخين، وقد بذلوا محاولة سابقة غير ناجحة في الإقلاع عنه وهم على استعداد لإعادة المحاولة. ينبغي استحداث البرامج الناجحة لهذا الغرض فيما يخص طلبة الجامعة الذكور المدخنين في المملكة العربية السعودية لمساعدتهم على تحقيق رغبتهم في الإقلاع عن التدخين وعدم العودة إليه.

**الكلمات المفتاحية:** المملكة العربية السعودية؛ برامج مكافحة التدخين؛ الطلاب الذكور الجامعة؛ أقلع عن التدخين

#### Abstract

**Objectives:** The aim of this study was to determine the predictors of the willingness to quit smoking among a cohort of male Saudi students.

**Methods:** In this cross-sectional study, a questionnaire was administered to a cohort of male students that were recruited from three institutes of higher education. Using the retrieved data, bivariate analysis and logistic regression tests were performed to assess the factors associated with the willingness to quit smoking.

**Results:** Of 467 participants, 24% of respondents were current smokers, while 65% of these smokers were willing to quit smoking. In the bivariate analysis, past attempts to quit smoking and the anti-smoking messages on TV and in newspapers were significantly associated with the willingness to quit smoking. Only one variable – past attempts to quit smoking – was a significant predictor of the willingness to quit smoking, as shown by the multivariate logistic regression analysis.

**Conclusion:** The findings of this study indicate that Saudi male students who smoke are willing to quit smoking; having unsuccessfully attempted to quit smoking in the past, they are willing to try again. Successful programs should be developed for male university students in KSA to assist them in their quest to quit smoking and maintain cessation.

**Keywords:** Anti-smoking programs; KSA; Quit smoking; University male students

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Peer review under responsibility of Taibah University.



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## Introduction

Smoking is responsible for approximately 5.6 million deaths per year worldwide, and that figure is expected to exceed to eight million by 2030.<sup>1</sup> Smoking is known as the leading preventable cause of death around the world.<sup>1,2</sup>

The KSA is known as one of the top 10 cigarette importers worldwide.<sup>3</sup> A study was conducted on 2564 Saudi students in 2010 and found that 8.9% of the participants were current cigarette smokers.<sup>4</sup> In addition, the study found that male students were two times more likely to be current smokers than female students. This discrepancy may be because smoking is considered a shameful habit for females in the KSA.<sup>5</sup> Because there is no strict legal age for purchasing cigarettes in the KSA, most Saudis start smoking at an early age (under 15 years of age).<sup>6</sup> The social, economic, and health costs associated with all tobacco consumption in 2010 was estimated to be approximately \$1.3 billion in the KSA.<sup>7</sup>

Because smoking is a major factor in different health complications (e.g., cancer, heart disease, stroke, and lung diseases), cessation through intervention procedures is vital to improving the health of individuals.<sup>8</sup> However, nicotine is a highly addictive substance, and it is difficult to quit.<sup>9,10</sup> Therefore, behavioural intervention is one of the primary techniques used in smoking cessation programs.<sup>11</sup> According to Treating Tobacco Use and Dependence Guidelines, smoking cessation intervention should start with assessing the smoker's intention to quit.<sup>12</sup> Modification of addictive behaviour is based on stage-based models of behaviour, starting with no desire to quit smoking and followed by willingness to quit smoking (intention to quit), which in turn is followed by preparing and implementing the behaviour modification. Maintaining the behavioural modification is the final step after achieving the change.<sup>13,14</sup>

To date, no study has comprehensively evaluated predictors of the willingness to quit smoking in the KSA. Identifying these factors in specific cultural and socioeconomic settings is vital to developing appropriate intervention programs.<sup>15</sup> Studies conducted in different countries have reported age, marital status, income, addiction level, past attempts to quit, social pressure, number of smoker friends, smoking status of family members, and anti-smoking media messages as significant predictors of the willingness to quit smoking.<sup>13,16–21</sup>

Because the prevalence of smoking in the KSA is skewed more toward men than toward women and there is an exponential rise in smoking behaviour in the youth, the objective of this study was to examine predictors of the willingness to quit smoking among a sample of male college students in the KSA.

## Materials and Methods

### *Study design and data source*

A cross-sectional study was conducted by using a pre-tested, validated, self-administered questionnaire to predict the willingness to quit smoking among a sample of Saudi male college students over 18 years of age.<sup>14,20,23–25</sup> Data

were collected between December 2011 and January 2012. This study was conducted in three higher education institutes in the KSA. Two universities provide unspecialized general higher education and are located in the cities of Buraydah and Al-Hasa. The colleges of pharmacy, dentistry, and applied medical science at Qassim University agreed to participate. At King Faisal University, the only college that agreed to participate was the college of pharmacy. The third institute is a technical college located in Buraydah city. It provides education in engineering and computer science. All of these colleges admit students after secondary school. Approximately 70,000 students attend these three institutions. Students were asked to participate voluntarily by filling out an anonymous questionnaire about their willingness to quit smoking. The students were assured that the collected data would be kept confidential, and no personal identifiers were requested. A convenience sampling technique was used to conduct this study. Participation in this study was voluntary, and a written informed consent letter was provided before commencing the data collection. The questionnaire was distributed in all colleges that agreed to participate. The faculty at each university who agreed to assist distributed the questionnaires to students before their lecture time was completed. Students were provided approximately 15–20 min to complete the questionnaire. Questionnaires were collected immediately by requesting respondents to drop the completed questionnaire in a box that was available in each lecture room. In each institute, one teaching faculty member was in charge of distributing and collecting questionnaires. The study included students with medical and non-medical backgrounds. The questionnaire was approved by the Committee for the Protection of Human Subject at the University of Houston, USA, and the deans within each college where the data were collected.

### *Questionnaire design*

The original questionnaire was developed in English; it was then translated into Arabic using a translation-back-translation technique.<sup>26</sup> The translated Arabic version was validated by three bilingual experts. Further, the questionnaire was tested for face validity and content validity. The reliability of the questionnaire's questions was assessed using the test-retest method by which 10 subjects were provided the questionnaire at two different moments two weeks apart, and the result was greater than 0.7 for all questions.

Variables were selected based on previous studies and included age, income, marital status, number of smoking friends, social pressure to quit, number of past attempts to quit, addiction level (using the Fagerstrom Test for Nicotine Dependence), smoking status of family members, and anti-smoking media campaigns.<sup>27</sup> There is no cutoff between nicotine dependence and non-nicotine dependence. However, the higher the FTND score is, the higher is the level of nicotine dependence, and vice versa. In 1990, Fagerstrom suggested classifying the FTND score into five categories based on a study that was performed with 1447 Canadian smokers.<sup>28</sup> Most of the FTND scores were between 3 and 7, with a mean of 5.15 and a standard deviation of 2.23. Scores

were divided as follows: 1 – 2 was considered to be a very low dependence, 3 – 4 was considered to be a low dependence, 5 was considered to be a medium dependence, 6 – 7 was considered to be a high dependence, and 8 – 10 was considered to be a very high dependence. Those variables were part of a four-page questionnaire. Willingness to quit smoking status was the primary outcome variable. The participants were asked if they were seriously thinking about quitting smoking, and responses were recorded using a dichotomous yes/no scale.

### Statistical analysis

Descriptive statistics were performed to evaluate the sample characteristics. Because the willingness to quit smoking was defined as a dichotomous variable, chi-square and multiple logistic regression analyses were used to identify the predictors of the willingness to quit smoking. Chi-square analyses were used to determine the associations and frequencies of sample characteristics with the willingness to quit smoking among smokers. No fixed model was planned in advance for the final multiple logistic regression. Any variables with a probability of 0.2 or less were retained for the final multiple logistic regression. A multiple logistic regression model was used to determine the predictors of the willingness to quit among smoking students, with a prior level of significance of 0.05. The results of the analyses were presented as an adjusted odds ratio and at a 95% confidence interval. Data coding and entry was performed using Microsoft Excel 2010, and data analysis was conducted using SAS 9.3.

### Results

Of 920 surveys distributed, 467 were returned. One hundred thirty surveys were excluded from the final analysis because of missing data, leading to a final response rate of 36.6%. The majority (37%) of the respondents were from the Al-Hassa province, followed by Al-Qassim students (32%). The technical college response rate was approximately 31%. Approximately 24% ( $n = 82$ ) of the participants were smokers, and their surveys were retained for further analysis. Approximately 65% ( $n = 53$ ) of the smokers reported that they were thinking about quitting (willing to quit smoking). The average smoker's age was  $22.1 \pm 2.2$  years. The average age at which the participants started smoking was  $15 \pm 4.7$  years.

The results of the bivariate analysis are provided in [Table 1](#). Three variables indicated a significant impact on the willingness to quit smoking. Approximately 96% of the smokers with one or more attempts to quit smoking were willing to quit smoking ( $P < 0.0001$ ). Those who were significantly more willing to quit smoking than those unwilling to quit smoking reported that they had seen anti-smoking messages on TV (77.4% versus 53.6%) ( $P < 0.0275$ ) and in the newspaper (72.5% versus 40.7%) ( $P < 0.006$ ).

The results of the multivariate logistic regression model are reported in [Table 2](#). After controlling for income; current or former smokers among fathers; other smokers in the family; and media messages against smoking on TV, in

schools, and in newspapers, previous quitting attempts had a significant positive association with the willingness to quit smoking (OR = 17.24, 95% CI: 2.79–106.69).

### Discussion

The results of this study indicate that male college students in the KSA are willing to quit smoking, have tried unsuccessfully to quit in the past, and yet are willing to try again. This result indicates that the strategy for improving smoking cessation in the KSA may be limited and that providing opportunities for the KSA's youth to quit smoking would be beneficial. Further understanding of which interventions or strategies have been tried unsuccessfully by these students would help the KSA to develop better interventions in the future.

Approximately 24% of the participants in our study were smokers. This finding was relatively less than previously published research conducted in the same geographical locations. A study conducted in Al-Hassa among 1652 male secondary school students found that approximately one-third of the respondents were current smokers.<sup>29</sup> A second study conducted in the Al-Qassim province with 2203 male secondary school students reported that 29.8% of the respondents were cigarette smokers.<sup>30</sup>

Approximately 64% of the student smokers in our study were willing to quit smoking, which was higher than the results reported in other countries. A study conducted with 260 adults in Jordan found that approximately 60% of smokers considered quitting smoking in the following year.<sup>20</sup> Another study conducted with 351 adult Chinese smokers found that approximately 45% intended to quit smoking in the following year.<sup>14</sup> Only one study had results that were higher than those in our study: of a group of 587 Syrian students, the authors found that approximately 75% of the students were willing to quit smoking.<sup>16</sup> Clearly the youth of the KSA are looking at opportunities to quit and may understand the benefits associated with cessation.

Age was considered to be a significant predictor of the willingness to quit smoking in two previous studies conducted among adult American populations.<sup>17,18</sup> However, there was no association between age and willingness to quit among Saudi male college students. This may be because the age range was limited due to our sample consideration; most of the previous studies had a wider age range. Further, most respondents in our study were single and had similar income distributions, and thus, the effect of marital status and income could not be evaluated adequately.

Addiction level, an important factor, was found to be associated with a lower willingness to quit smoking.<sup>19</sup> Smokers with a higher addiction level have difficulties in quitting smoking. A study conducted among Jordanian smokers in 2009 found that less addicted smokers were associated with a greater intention to quit smoking, which was not found in our study.<sup>20</sup> Although the effect of addiction was not associated with the willingness to quit, we did find that those who were more addicted were less willing to quit compared to less addicted smokers.

In general, the presence of a smoking family member has been reported to decrease the willingness to quit smoking, while an increase in social pressure has been reported to

**Table 1: Characteristics by smoking status and willingness to quit smoking (WTQ) among Saudi male college students.<sup>a</sup>**

Variable	Characteristic	Total (n = 337)	Non-smokers (n = 255)	Smokers (n = 82)	WTQ (n = 53)	Non-WTQ (n = 29)	P-value
Age group:	18–20	50 (15.7%)	41 (16.7)	9 (12.3%)	4 (8.9%)	5 (17.9%)	0.292
	21–23	212 (66.5%)	165 (67.1%)	47 (64.4%)	27 (60%)	20 (71.4%)	
	24–26	48 (15%)	34 (13.8%)	14 (19.2%)	11 (24.4%)	3 (10.7%)	
	>26	9 (2.8%)	6 (2.4%)	3 (4.1%)	3 (6.7%)	0 (0%)	
Marital status:	Married	12 (3.7%)	8 (3.2%)	4 (5%)	2 (3.9%)	2 (7.1%)	0.438
	Non-married	316 (96.3%)	240 (96.8%)	76 (95%)	50 (96.1%)	26 (92.9%)	
Income Dollar/year:	>3200	76 (22.6%)	49 (19.2%)	27 (32.9%)	14 (26.4%)	13 (44.8%)	0.089
	≤3200	261 (77.4%)	206 (80.8%)	55 (67.1%)	39 (73.6%)	16 (55.2%)	
Addiction level (using The Fagerstrom test for nicotine dependence):	Very low dependence	12 (20.0%)	NA	12 (20.0%)	8 (22.2%)	4 (22.2%)	0.5913
	Low dependence	25 (41.7%)	NA	25 (41.7%)	13 (36.1%)	9 (50.0%)	
	Medium dependence	10 (16.7%)	NA	10 (16.7%)	6 (16.7%)	1 (5.6%)	
	High dependence	8 (13.3%)	NA	8 (13.3%)	7 (19.4%)	1 (5.6%)	
	Very high dependence	5 (8.3%)	NA	5 (8.3%)	2 (5.6%)	3 (16.7%)	
Family smoking status All:	Yes	189 (62%)	135 (58.7%)	54 (72%)	37 (78.7%)	17 (60.7%)	0.973
	No	116 (38%)	95 (41.3%)	21 (28%)	10 (21.3%)	11 (39.3%)	
Mother:	Yes	60 (19.9%)	43 (18.9%)	17 (22.7%)	12 (25.5%)	5 (17.9%)	0.443
	No	242 (80.1%)	184 (81.1%)	58 (77.3%)	35 (74.5%)	23 (82.1%)	
Father:	Yes	119 (39.4%)	84 (36.7%)	35 (47.9%)	26 (55.3%)	9 (34.6%)	0.09
	No	183 (60.6%)	145 (63.3%)	38 (52.1%)	21 (44.7%)	17 (65.4%)	
Brother:	Yes	101 (33.4%)	71 (31.3%)	30 (40%)	21 (44.7%)	9 (32.1%)	0.284
	No	201 (66.6%)	156 (68.7)	45 (60%)	26 (55.3%)	19 (67.9%)	
Any other smokers in the family:	Yes	99 (34%)	62 (28.2%)	37 (52.1%)	23 (52.3%)	14 (51.8%)	0.093
	No	192 (66%)	158 (71.8%)	34 (47.9%)	21 (47.7%)	13 (48.2%)	
Having friends who smoke:	Yes	234 (78.3%)	171 (75%)	63 (88.7%)	40 (88.9%)	23 (88.5%)	0.678
	No	65 (21.7%)	57 (25%)	8 (11.3%)	5 (11.1%)	3 (11.5%)	
Social pressure to quit:	Yes	81 (98.8%)	NA	81 (98.8%)	53 (100%)	28 (96.5%)	0.354
	No	1 (1.2%)	NA	1 (1.2%)	0 (0%)	1 (3.5%)	
≥1 attempts to quit:	Yes	68 (83.9%)	NA	68 (83.9%)	50 (96.2%)	18 (62.1%)	<0.0001*
	No	13 (16.1%)	NA	13 (16.1%)	2 (3.8%)	11 (37.9%)	
Media anti-smoking messages: TV	Yes	220 (66.1%)	164 (65.1%)	56 (69.1%)	41 (77.4%)	15 (53.6%)	0.028
	No	113 (33.9%)	88 (34.9%)	25 (30.9%)	12 (22.6%)	13 (46.4%)	
Radio	Yes	199 (66.1%)	169 (68.1%)	54 (69.2%)	38 (73.1%)	16 (61.5%)	0.298
	No	102 (33.9%)	79 (31.9%)	24 (30.8%)	14 (26.9%)	10 (38.5%)	
Posters	Yes	263 (81.4%)	202 (82.4%)	61 (78.2%)	43 (84.3%)	18 (66.7%)	0.073
	No	60 (18.6%)	43 (17.6%)	17 (21.8%)	8 (15.7%)	9 (33.3%)	
Newspaper	Yes	203 (62.6%)	155 (63%)	48 (61.5%)	37 (72.5%)	11 (40.7%)	0.006
	No	121 (37.4%)	91 (37%)	30 (38.5%)	14 (27.5%)	16 (59.3%)	
School	Yes	237 (72.7%)	181 (73.6%)	56 (70%)	40 (76.9%)	16 (57.1%)	0.066
	No	89 (27.3%)	65 (26.4%)	24 (30%)	12 (23.1%)	12 (42.9%)	

NA = Not applicable.

\*Fisher test  $P \leq 0.05$ .<sup>a</sup> The total number does not add up because of missing values.

increase the willingness to quit.<sup>16,21,22</sup> This finding was not consistent with our study. There was neither a significant effect of smoking family members on our respondents' willingness to quit smoking nor a significant effect of social pressure on their willingness to quit smoking. However, more than 75% of respondents who were willing to quit had a family member or a friend who smoked.

Consistent with the reported literature regarding adult smokers in China, Jordan, and the Netherlands, our study found that past attempts at quitting had a significantly high association with the willingness to quit.<sup>13,21,22</sup> It has been

demonstrated that past attempts to quit increased the willingness to quit smoking by approximately 17-fold, which is significant. The KSA male college students who had tried to quit in the past were likely to consider quitting, in spite of the fact that they had someone in their family who smoked, were not married, and did not have an income issue. This implies that male college students in the KSA may be aware of the beneficial effects of smoking cessation and are waiting to receive adequate intervention strategies to help them. This result is similar to that of a study conducted with 8556 American youth aged 6 – 12,

**Table 2: Multiple logistic regression results of willingness to quit smoking among Saudi male college students.**

Variable*	Odds ratio	CI	P-value
Income Dollar/year (>3200):			
Yes	0.37	0.09–1.49	0.161
No	1		
Current or former smokers among fathers:			
Yes	2.74	0.50–114.9	0.244
No	1		
Any other smokers in the family:			
Yes	1.21	0.2–7.47	0.835
No	1		
Having $\geq 1$ attempt to quit:			
Yes	17.24	2.79–106.69	0.002
No	1		
Media anti-smoking messages on TV:			
Yes	1.95	0.29–13.1	0.493
No	1		
Media anti-smoking messages on poster:			
Yes	1.09	0.13–9.22	0.936
No	1		
Media anti-smoking messages in newspaper:			
Yes	2.25	0.44–11.63	0.333
No	1		
Media anti-smoking messages in schools:			
Yes	1.52	0.31–7.46	0.607
No	1		

CI = Confidence interval.

\*Only those with  $\leq 0.2$  significance in the bivariate analysis were considered in this model.

which reported a significant association between valuing a healthy lifestyle (being healthy) and attempts to quit. This would mean that smokers who attempt to quit smoking may be aware of the harmful effect of cigarettes.<sup>31</sup>

Adequate patient counselling and education could impact the future health of the KSA's youth.<sup>32</sup> Although the effects of smoking on health have been confirmed, smokers must have enough information about the effects of smoking on health in both the short and long term. Another study found that media messages against smoking were effective in reducing smoking in the United States.<sup>33</sup> Thus, continuing educational and anti-smoking media messages should be required as part of smoking control efforts from a public health perspective. This idea is consistent with a study conducted among Jordanian adults in 2009 that found an association between an intention to quit smoking and anti-smoking media campaigns.<sup>20</sup>

Several limitations should be considered regarding this study. The generalizability of the findings is limited given the similarity of the respondents' demographics. Cross-sectional studies lack causality, but they can establish associations between dependent and independent variables. Convenience sampling was used for this study; thus, the potential impact on our results of non-participants cannot be detected. A small sample size due to a low response rate might be a possible explanation for the wide confidence interval and for the lack of significant results. Our low response rate may be due to the Islamic cultural unacceptability of smoking. Smoking is considered to be a distasteful and unlawful practice.<sup>34</sup> Although it was mentioned in our questionnaire

that the identity of respondents would be protected and that participation would remain anonymous, smokers may still have thought that they were vulnerable and that their identity could still be known. Another possible explanation is the time and place in which the questionnaires were distributed. Questionnaires were distributed at the end of the fall semester, and students may have had exams; this busy time period might have affected the willingness of students to participate. In addition, the sample size was small and had some variables skewed in one direction, making it difficult to evaluate those factors. The number of missing values also hinders adequate interpretation. Moreover, the low sample size may be caused by the length of the survey and the lack of incentives. Future studies with larger sample sizes might help to better understand certain predictors.

Most of our findings were unexpectedly insignificant and were not consistent with the literature. Only past attempt to quit was a significant predictor of the willingness to quit smoking. Identifying the reasons for the past attempts at quitting might help to develop future intervention programs. Focussing on smokers with past attempts to quit may provide an effective smoking cessation strategy. Understanding past strategies used to quit smoking and developing better smoking cessation programs would help the youth of the KSA.

## Conclusion

We found that male college students from the KSA in our study were willing to quit smoking, have tried to quit in the past unsuccessfully, and yet were willing to try again. We found that previous attempts to quit were the only variable that was significantly associated with the willingness to quit smoking. These findings suggest the necessity of identifying past unsuccessful strategies, re-evaluating smoking prevention programs, and focussing on smokers with past attempts to quit to develop better smoking cessation outcomes.

## Ethical approval

The study was approved by the Institutional Review Board (IRB) at the University of Houston. Additionally, informed consent was obtained prior to data collection.

## Funding

This article was not funded.

## Competing interests

All authors declared that they do not have any competing interest.

## Authors' contribution

YA and SS conceived and conducted the study. YA collected data and was responsible for data entry, and analyses. SA assisted with survey development and analyses.

AA assisted with data collection and analyses. SS was involved with all aspects of the study. All authors have critically reviewed and approved the final draft and are responsible for the content of the manuscript.

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**How to cite this article:** Almogbel YS, Abughosh SM, Almeman AA, Sansgiry SS. Factors associated with the willingness to quit smoking among a cohort of university students in the KSA. *Journal of Taibah University Medical Sciences* 2016;11:128–133.