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Original Research

Factors associated with smoking cessation success in Lebanon

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Abstract

Objective: The objective is to assess factors associated with the success rate of smoking cessation among Lebanese smokers in a smoking cessation center.

Methods: A cross-sectional data study, conducted between March 2014 and March 2016 in an outpatient smoking cessation center with 156 enrolled patients. The patient's nicotine dependence and motivation to quit smoking were evaluated according to the Fagerstrom Test for Nicotine Dependence and Richmond tests respectively.

Results: The number of packs smoked per year decreased the odds of smoking cessation success ($p=0.004$, ORa=0.982, CI 0.97-0.994), while the compliance with the offered treatment increased the odds of success by 7.68 times ($p<0.001$, ORa=7.68, CI 3.438-17.187). Highly dependent and highly motivated smokers had more success in the quitting process compared to those with a lower dependence and motivation respectively.

Conclusion: Our findings showed that many factors can influence smoking cessation, an experience described as difficult, most significantly the number of packs per year and compliance with the smoking cessation treatment. Moreover, although these outcomes are not representative of the entire Lebanese population, we believe that health authorities could utilize these results when implementing upcoming smoking cessations programs. All attempts at cessation should have a goal of reducing the number of packs smoked per year to improve the chances of ceasing into the future.

Keywords

Smoking Cessation; Tobacco Use Cessation; Tobacco Smoking; Epidemiologic Factors; Cross-Sectional Studies; Multivariate Analysis; Lebanon

INTRODUCTION

Smoking is the single largest preventable cause of disease and premature death worldwide, being a key causal factor in heart disease, stroke, chronic lung disease, and cancers.¹ It has been estimated by the World Health Organization (WHO) that 4.9 million people die per year because of smoking and the death toll is expected to rise to 8 million by 2030.² Of great concern is the lack of success in addressing smoking cessation among young people.³ Smoking rates were highest in the Eastern Mediterranean countries among the population overall, reaching a peak of 53.9 percent in Lebanon.⁴ Alarming, 78.9 percent of Lebanese children are exposed to passive smoking in their dwellings, while 74.9 percent are exposed to it outdoors.⁴ Indeed, 42.9 percent of male adults and 27.5 percent of female adults are cigarette smokers.⁵ Furthermore, the smoking prevalence rates are 14.8 percent and 6.7 percent for male and female youths respectively.⁶

Smoking cessation remains a big problem in Lebanon despite the evolution in socioeconomic standards, quality of life, education and preventive medicine. Lebanon is still lacking the vision to implement smoking cessation policies. The advantages of smoking cessation are indisputable and have been proven in populations of all ages and genders, in healthy populations, and in patients with comorbidities (cardiovascular disease or cancer).⁷ Quitting smoking can be beneficial at any age. It increases treatment response in cases of COPD, coronary artery disease and cancer, and increases the response to chemotherapy.⁸ Some countries in the developing world as of yet do not have the internal impetus to support the development of their own national guidelines to promote smoking prevention and cessation.⁹ Health services, despite internal standards, are influenced by the social, economic and political state of the country. They are influenced by the wars around us, the mass movements of the population and civil conflicts. While much effort is being made to increase awareness about serious diseases and their treatment; it is time to make efforts to prevent them altogether. Our young Lebanese population is leading a sedentary, unhealthy lifestyle, on its way to potentially suffering from future chronic diseases.¹⁰

Many factors have been recognized as predictors of smoking, such as financial considerations, leisure, relief of pressure¹¹, parental smoking^{12,13}, having a sibling that smokes and peer smoking, all significantly associated with an adolescent being a smoker.¹⁴⁻¹⁷ Exposure to cigarette advertisements on television has also been proven influential.¹⁸

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Mobile phone technology has the potential to provide personalized smoking cessation support, with the latter being delivered wherever the person is located, without them having to attend services, and can be interactive, allowing quitters to obtain extra help when needed.¹⁹ In fact, the rate of continuous abstinence at 6 months was significantly increased in the group that received text messages compared to those who did not (10.7% vs 4.9%).²⁰

Smoking addiction is considered a chronic relapsing disease. Commonly, several failed cessation attempts occur before achieving permanent abstinence.²¹ Since only 35 percent of smokers are able to quit smoking by themselves, most smokers need help and assistance to stop.²² The aim of this study is to assess factors associated with the success rate of smoking cessation among Lebanese smokers in a smoking cessation center.

METHODS

Study design

A cross-sectional data study was conducted between March 2014 and March 2016 in an outpatient smoking cessation center. The center aims to offer personalized care and follow up, and assists patients in a multidisciplinary approach. The smoking cessation model combines proactive outreach to smokers with systematic counseling, treatment and ongoing support for a period of three months inclusive of medical requisites, medical support and special diets to curb the urge to smoke. Eligible participants were required to be aged >18 years, willing to quit smoking, and smoking at least one cigarette/day. Exclusion criteria included patients who came for only one or two visits, and were not motivated to stop smoking.

The professional team involved with the center is composed of a respiratory physician specialized in smoking cessation. This physician manages the program, assesses patients, provides them with medical treatment to achieve smoking cessation, and deals with relapses if/when these occur. A nurse is also present on board who, in addition to her usual responsibilities, visits and speaks with every smoker hospitalized in medical departments, assists in patients' motivation via phone or text messages and performs a CO test during each visit. A psychologist is also present to provide behavioral support and motivational sessions, as well as a dietician who helps control the risk of weight gain in these patients. The primary objective of the smoking cessation center is to offer specialized and professional help to all smokers and recent ex-smokers, in order to alleviate their nicotine withdrawal symptoms. As very few people can quit smoking on their own initiative, we provided throughout our study an approach that focused on listening, coaching, face-to-face conversations and long term support.

Recruitment and screening

Both, inpatients and outpatients who asked for help to quit smoking, were recruited by a trained nurse. The latter was responsible for educating patients about health-related problems, and performing basic medical tests and procedures. She received a thorough training by the

tobacologists concerning all steps of approaching patients prior to the start of the data collection process.

A total of 156 smokers participated in the baseline interview; during this visit, the study's objectives were explained to each participant, who were informed about the length of the treatment program (three months) at the rate of one visit per week.

Before enrolling the participants in the program, two sessions with a psychologist were offered. They were conducted as follows: the first session included 20 to 30 minutes of motivation by the psychologist and another 15 minutes spent with the nurse to get the information about the program. The psychologist recorded information about the patient; a baseline assessment was completed. The patient's motivation to quit smoking was evaluated according to the Richmond test. The patient was also offered some tips on how to delay his cigarette intake. Fears concerning stopping smoking, the cognitive abilities, the past psychiatric history and related treatments, and other kind of addictions if present were also evaluated and recorded.

During the second session, which lasted for 15-20 minutes, the psychologist worked on motivation by discussing the advantages and disadvantages of smoking and quitting smoking, as well as explaining the principles of cognitive behavioral therapy (CBT). At the end of the second session, a full psychological assessment was completed to determine the ability of the smoker to quit. The patient had one week of reflexion and was reassessed again for his willingness to quit. If the assessment reinforced the intentions of the smoker to quit, and he/she had decided on a date to quit, the smoker was enrolled into the three-month smoking cessation program, with meetings scheduled on a weekly basis for the total duration of the program.

Ethical aspect

Ethical approval was obtained from the Institutional Review Board of the Saint-Joseph University. A written informed consent was obtained from all participants prior to enrolling in the study.

Program components

A three-month smoking cessation program, including behavioral counseling and pharmacological treatment, was given to all smokers. Each weekly, in-person behavioral counseling session had duration of 45 minutes, and involved discussions about aspects of smoking-related morbidity and mortality, the principal factors of nicotine addiction and the build-up of an action plan for quitting smoking that was specific for each patient. Some of the important topics covered were the identification of smoking triggers, functional analysis, handling of lapses, lifestyle balancing and problem solving. The therapy style was active and directive, with role playing used regularly as a training technique.

Each participant received a twelve-week pharmacological treatment course, which consisted of Nicotine Replacement Therapy (NRT), Varenicline (VAR) and Bupropion (BUP), depending on the patient's comorbidities and the level of their smoking dependence. The choice of

pharmacotherapy was based on clinical suitability and patient choice. Patients were asked to schedule follow up check-up and medication control visits at weeks two, four, eight and twelve after the scheduled quit day, and then on a monthly basis up to six months after the quit day. These medication control visits were scheduled on the same day of the weekly behavioral sessions. Smokers who had quit smoking for six months or more were followed up via a telephone call to check if they are still abstinent or not.

Questionnaire

On average, the questionnaire was completed by participants within approximately 10 minutes. The final version of the standardized questionnaire of the American Thoracic Society was administered in Arabic, the native language of Lebanon. Details about the translation process were presented in previous studies.²³⁻³⁰ The Fagerstrom scale was used to assess nicotine dependence, whereas the Richmond scale was used to assess motivation to quit. The Fagerstrom scale included questions about (i) how soon after you wake up to you smoke your first cigarette, (ii) finding difficulty to refrain from smoking in places where it is forbidden, (iii) the cigarette the patient would hate most to give up, (iv) number of cigarettes smoked per day, (v) smoking frequently in the morning and (vi) smoking even if you are sick in bed most of the day. The Richmond scale included 4 questions as follows: "would you like to quit smoking if you could do it easily, how interested are you to quit smoking, will you try to stop smoking in the following 2 weeks and how likely are you to be a non-smoker in the following 6 months".

The questionnaire also included sociodemographic characteristics, smoking behavior, i.e., the number of packs smoked per year and the Fagerstrom Test for Nicotine Dependence with a cutoff point of five^{31,32}; a score lower

than 5 indicates low cigarette nicotine dependence, whereas a score more than 5 indicates high dependence. The motivation scale was evaluated using the Richmond test, with a total score ranging between 0 and 10. Scores between 0 and 4 indicate low motivation; 5–6 moderate motivation; and 7–10 high motivation to quit.³³

Medication compliance

Medication compliance was operationalized as taking the prescribed doses per day for each day of the 12 weeks on the full dose of study medication. Prescribed medications are not available on the Lebanese market and are provided to the patient exclusively by the center. Therefore, medication compliance is monitored very closely and precisely. Subjects were coded as non-compliant if they stopped the treatment before the end of the 12 weeks. Thus, each subject received an overall compliance score; zero for non-compliant and one for compliant.

Assessment of abstinence

Abstinence was determined at each clinic visit by self-report of no smoking in the past seven days combined with a CO level of no more than 10 parts per million (ppm).³⁴ An exhaled CO test was performed at each visit. During follow-up, self-reported abstinence during the preceding seven days was verified by a CO analysis. Moreover, tests for cotinine dosage in urine were performed twice during the course of the program, once on the first visit when enrolled in the program (when the patient was still a smoker), and a second time after abstinence or to titrate the NRT. The second cotinine level guided the investigators as to whether the doses of NRT are low or the patient is experiencing craving, and consequently should be increased or if they are high and the patient is experiencing symptoms of intoxication and thus, doses should be decreased or other treatments should be introduced

Table 1. Results of smokers' success or failure to quit by gender, smoking dependence, motivation, compliance to treatment, program messaging and type of cessation therapy.			
Variable	Failure	Success	p-value
Gender			0.789
Male	32 (50%)	48 (52.2%)	
Female	32 (50%)	44 (47.8%)	
Fagerstrom scale			0.379
Low dependence	8 (12.7%)	16 (18%)	
High dependence	55 (87.3%)	73 (82%)	
Motivation			0.027
Low	38 (65.5%)	37 (43%)	
Moderate	13 (22.4%)	29 (33.7%)	
High	7 (12.1%)	20 (23.3%)	
Self-reported compliance to treatment			<0.001
Yes	25 (39.7%)	73 (81.1%)	
Messaging program			0.503
Yes	21 (32.8%)	35 (38%)	
Nicotine gum 4 mg			0.116
Yes	33 (51.6%)	59 (64.1%)	
Magnesium and Vitamin B6			0.442
Yes	36 (56.3%)	46 (50%)	
Vitamin C			0.503
Yes	32 (50%)	41 (44.6%)	
Bupropion 150 mg			0.878
Yes	16 (25%)	24 (26.1%)	
Patch 25 mg			0.93
Yes	22 (34.4%)	31 (33.7%)	
Varenicline 1 mg			0.815
Yes	17 (26.6%)	26 (28.3%)	

Factor	Cotinine-1*	Cotinine-2**	Packs/year	Age	Number of visits
Failure	1939 ± 4280	1387 ± 1034	60.84 ± 42.61	52.12 ± 12.08	6.92 ± 3.80
Success	1314 ± 1018	43787 ± 290026	43.27 ± 29.98	49.05 ± 11.86	7.29 ± 4.34
p-value	0.289	0.327	0.003	0.118	0.57

Values are expressed as a mean ± standard deviation.
 *Cotinine-1= cotinine measured during the first visit (when enrolled in the program)
 **Cotinine-2= cotinine measured during the second measurement after abstinence or to titrate the nicotine replacement therapy.

(bupropion, varenicline). To assess the cotinine levels in the urine, we used high-performance liquid chromatography with UV detection, a simple, sensitive and rapid method.³⁵ Urinary cotinine samples were analyzed by the Faculty of Pharmacy, Saint-Joseph University, Lebanon.

Statistical analysis

Data analysis was performed on SPSS software, version 23. Categorical data was shown as absolute frequencies and percentages. Continuous data was presented as means and standard deviation (SD). Two-sided statistical tests were used; chi-2 test or the Fisher's exact test for dichotomous or multinomial qualitative variables, and Student's t-test for quantitative variables of normal distribution and homogeneous variances. Regarding the multivariate analysis, a backward logistic regression was performed, taking into account the variables in the bivariate analysis that showed a p-value <0.2. The regression took the failure/success to quit smoking as the dependent variable (yes/no). The statistical significance was set at a p-value < 0.05.

RESULTS

Table 1 summarizes the results of the bivariate analysis taking failure/success to quit smoking as the dependent variable. A significantly higher proportion of the smokers who successfully quit smoking (33.7 percent and 23.3 percent) as compared to those who failed (22.4 percent and 12.1 percent) had a moderate and high motivation to quit smoking respectively (p=0.027). A significantly higher proportion of those who succeeded in quitting (81.1 percent) were compliant with the treatment, compared to those who failed (39.7 percent) (p<0.001). No significant difference was found between both groups in terms of vitamins taken (magnesium & vitamin B6, vitamin C) or the text messaging system used (p>0.05 for all these variables) (Table 1).

In addition, smokers who were successful in quitting smoked a significantly lower number of packs per year compared to those who failed (43.27 versus 60.84 packs per year; p=0.003). The cotinine levels, age and the number of visits to the center did not significantly differ between those who failed and those who succeeded in quitting smoking (p>0.05 for all variables) (Table 2).

A backward logistic regression, taking the failure/success to quit smoking as dependent variable, showed that a higher number of packs per year decreased the odds of success to quit by 1.8 percent (p=0.006, ORa=0.982, CI 0.97-0.99), while the compliance with the treatment would significantly increase the odds of quitting success by 7.6 times more likely if they complied with the treatment (p<0.001, ORa=7.68, CI 3.43-17.18). Highly dependent

smokers as shown by the Fagerstrom scale and highly motivated smokers as shown by the Richmond scale had more success in the quitting process compared to those who had low dependence and low motivation respectively. However, this association was not statistically significant (Table 3).

DISCUSSION

This is the first study conducted in Lebanon that assesses factors associated with the success rate of smoking cessation among Lebanese smokers. Compliance with treatment and the number of packs per year were significantly associated with smoking cessation among our Lebanese smokers. The study had a success rate, which is in line with international standards and which amounted to 37 percent. Our findings are also in agreement with those of Farkas *et al*, who showed that heavy smokers (those who smoked more than 15 cigarettes a day) were less successful at quitting in the preceding 18 months than light smokers.^{36,37} A partial success can be considered achieved only if cigarette consumption is reduced from 60-80 cigarettes to 5-10 cigarettes per day.³⁸ Smoking cessation recommendation is a cornerstone for cardiovascular risk reduction, especially that a recent Lebanese study current cigarettes smoking would significantly increase the LDL levels more in waterpipe smokers as compared to non-waterpipe smokers.³⁹ Spreading awareness by health professionals about the drawbacks of cigarette and waterpipe smoking and their possible deleterious effects, can help educate the patients prevent cardiovascular diseases.

Any pharmacological treatment will be maximally effective if the patient is consistent with the treatment in terms of dose and duration in order to achieve positive therapeutic outcomes.⁴⁰ The importance of medication adherence to smoking abstinence was demonstrated in this study. Thus, increasing the effectiveness of smoking cessation interventions might be achieved by improving treatment adherence.⁴¹

Factor	ORa	95% CI	p-value
Packs per year	0.98	0.97 : 0.99	0.006
Compliance with the treatment	7.32	3.20 : 16.78	<0.001
Fagerstrom: ≥5/<5*	1.88	0.56 : 6.30	0.31
Motivation			
6-8 /0-5*	1.86	0.73 : 4.69	0.16
9-10/0-5*	2.72	0.85 : 8.68	

Variables entered in the model: Number of packs per year, compliance with the treatment, Fagerstrom scale, and Richmond scale. * Reference group
 ORa: adjusted odds ratio; CI: confidence interval

Compliance is the concept to determine whether a patient's behavior is consistent enough with the prescription or advice of a physician.⁴² Therefore, improving adherence to existing treatments is an important avenue to explore in research trials and an essential component to include in behavioral programs designed to increase cessation rates. Similar to smoking cessation interventions⁴³, multidimensional adherence interventions, including behavioral components may be effective.⁴⁴

The adoption of a combination of motivational enhancement, along with cognitive behavioral strategies and adherence counseling, could hypothetically be part of smoking cessation counseling.^{43,44} Our data suggests that good adherence increased the quit rates seven fold compared with poor adherence. Thus, in the absence of newer and more effective treatments for nicotine dependence, it is crucial to better understand the drivers of medication non-adherence and how to maximize treatment utilization in order to maximize abstinence rates.⁴¹

Furthermore, our results showed that the higher the number of packs smoked per year correlated with an increase in the odds of smoking cessation failure, in line with the findings of Hays *et al.*⁴⁵ Most of the earlier literature reported nicotine dependence as a predictor for smoking cessation.⁴⁶⁻⁴⁸ In particular, a decrease in levels of nicotine dependence among recent cohorts of smokers could partly explain higher rates of successful quitting among adults. Less-dependent smokers are more likely to successfully quit, presumably because of less-intense withdrawal symptoms.^{36,49,50}

Recent findings from Lebanon showed that the motivation to quit was significantly associated with higher stages of readiness to quit²⁸ and would significantly increase the odds of having a real quit attempt duration of more than one month.²⁹ Our findings indicated that motivation did not have significant impact on the success of quitting, though this was likely, due to the small sample size. Current smokers with extrinsic motivations (i.e., social influences) were less likely to quit successfully than intrinsic motivations (i.e., health related influences).⁵¹

The influence of smoking cost on cessation was not addressed in our study, however, it is plausible that smokers react to price increases without consciously identifying them as a motivation to quit; this could be explained by underestimating the cost of the smoking by more than half.⁵² Therefore, we are hopeful that the

increase in taxes that was applied in March 2017 by the Lebanese government on tobacco products will encourage smokers to quit.

Limitations

Our study has several limitations. This is a cross-sectional design and therefore, we are unable to draw causal associations with such a design. The total sample size is small and however cannot be extrapolated to the whole population. The replication of this study in different settings and geographic locations would provide better generalizability of the results. A selection bias is still however possible because of the refusal rate. The use of a questionnaire in patients may not always be accurate: problems in question understanding, recall deficiency and over or under evaluating symptoms, which can lead to a possible information bias. In addition, we relied on each subject's self-reported data, which might contain some potential sources of bias. Other study limitation could be the cost of providing this quality of service to all smokers in Lebanon. The program complexity makes it less replicable by others and consequently, may not be generalizable to other populations. Further studies are warranted in more diverse populations. The self-report recall might be another source of bias as well.

CONCLUSIONS

Our findings showed that many factors can influence smoking cessation, an experience described as difficult, most significantly the number of packs per year and compliance with the smoking cessation treatment. All attempts at cessation should have a goal of reducing the number of packs smoked per year to improve the chances of ceasing into the future. Moreover, although these outcomes are not representative of the entire Lebanese population, we believe that health authorities could utilize these results when implementing upcoming smoking cessations programs. Further studies are needed in different populations and settings.

CONFLICT OF INTEREST

The authors have nothing to disclose.

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References

1. Hollands GJ, McDermott MS, Lindson-Hawley N, Vogt F, Farley A, Aveyard P. Interventions to increase adherence to medications for tobacco dependence. *Cochrane Database Syst Rev.* 2015;(2):CD009164. doi: [10.1002/14651858.CD009164.pub2](https://doi.org/10.1002/14651858.CD009164.pub2)
2. Aires CC, Ruiter JP, Luís PB, ten Brink HJ, Ijst L, de Almeida IT, Duran M, Wanders RJ, Silva MF. Studies on the extra-mitochondrial CoA-ester formation of valproic and Delta(4)-valproic acids. *Biochim Biophys Acta.* 2007 Apr;1771(4):533-543. doi: [10.1016/j.bbali.2007.01.010](https://doi.org/10.1016/j.bbali.2007.01.010)
3. Barroso M, Kao D, Blom HJ, Tavares de Almeida I, Castro R, Loscalzo J, Handy DE. S-adenosylhomocysteine induces inflammation through NFkB: A possible role for EZH2 in endothelial cell activation. *Biochim Biophys Acta.* 2016;1862(1):82-92. doi: [10.1016/j.bbadi.2015.10.019](https://doi.org/10.1016/j.bbadi.2015.10.019)
4. Khattab A, Javaid A, Iraqi G, Alzaabi A, Ben Kheder A, Koniski ML, Shahrour N, Taright S, Idrees M, Polatli M, Rashid N, El Hasnaoui A; BREATHE Study Group. Smoking habits in the Middle East and North Africa: results of the BREATHE study. *Respir Med.* 2012;106(Suppl 2):S16-S24. doi: [10.1016/S0954-6111\(12\)70011-2](https://doi.org/10.1016/S0954-6111(12)70011-2)

5. Sibai A, Hwalla N. Non-communicable disease and behavioral risk factor survey. Final report submitted to the World Health Organization-Lebanon office. 2010.
6. Uzaslan E, Mahboub B, Beji M, Nejari C, Tageldin MA, Khan JA, Nafti S, Obeidat NM, Sayiner A, Wali S, Rashid N, El Hasnaoui A; BREATHE Study Group. The burden of chronic obstructive pulmonary disease in the Middle East and North Africa: results of the BREATHE study. *Respir Med*. 2012;106(Suppl 2):S45-S59. doi: [10.1016/S0954-6111\(12\)70014-8](https://doi.org/10.1016/S0954-6111(12)70014-8)
7. Frank E. Benefits of stopping smoking. *West J Med*. 1993;159(1):83-86.
8. Warren GW, Sobus S, Gritz ER. The biological and clinical effects of smoking by patients with cancer and strategies to implement evidence-based tobacco cessation support. *Lancet Oncol*. 2014;15(12):e568-e580. doi: [10.1016/S1470-2045\(14\)70266-9](https://doi.org/10.1016/S1470-2045(14)70266-9)
9. Maziak W, Eissenberg T, Klesges RC, Keil U, Ward KD. Adapting smoking cessation interventions for developing countries: a model for the Middle East. *Int J Tuberc Lung Dis*. 2004;8(4):403-413.
10. Skinner H, Pinho-Campos K, Bader R. Smoking prevention in Middle East: Why tobacco is a critical issue in the region. *Pan Arab Med J*. 2004;1:52-57.
11. Al-Kaabba AF, Saeed AA, Abdalla AM, Hassan HA, Mustafa AA. Prevalence and associated factors of cigarette smoking among medical students at King Fahad Medical City in Riyadh of Saudi Arabia. *J Family Community Med*. 2011;18(1):8-12. doi: [10.4103/1319-1683.78631](https://doi.org/10.4103/1319-1683.78631)
12. Dappen A, Schwartz RH, O'Donnell R. A survey of adolescent smoking patterns. *J Am Board Fam Pract*. 1996;9(1):7-13.
13. Distefan JM, Gilpin EA, Choi WS, Pierce JP. Parental influences predict adolescent smoking in the United States, 1989-1993. *J Adolesc Health*. 1998;22(6):466-474. doi: [10.1016/S1054-139X\(98\)00013-5](https://doi.org/10.1016/S1054-139X(98)00013-5)
14. Evans N, Farkas A, Gilpin E, Berry C, Pierce JP. Influence of tobacco marketing and exposure to smokers on adolescent susceptibility to smoking. *J Natl Cancer Inst*. 1995;87(20):1538-1545.
15. Gilpin EA, Pierce JP, Rosbrook B. Are adolescents receptive to current sales promotion practices of the tobacco industry? *Prev Med*. 1997;26(1):14-21. doi: [10.1006/pmed.1996.9980](https://doi.org/10.1006/pmed.1996.9980)
16. Gilpin EA, Pierce JP. Trends in adolescent smoking initiation in the United States: is tobacco marketing an influence? *Tob Control*. 1997;6(2):122-127.
17. Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Berry CC. Tobacco industry promotion of cigarettes and adolescent smoking. *JAMA*. 1998;279(7):511-515. doi: [10.1001/jama.279.7.511](https://doi.org/10.1001/jama.279.7.511)
18. DiFranza JR, Wellman RJ, Sargent JD, Weitzman M, Hipple BJ, Winickoff JP; Tobacco Consortium, Center for Child Health Research of the American Academy of Pediatrics. Tobacco promotion and the initiation of tobacco use: assessing the evidence for causality. *Pediatrics*. 2006;117(6):e1237-e1248. doi: [10.1542/peds.2005-1817](https://doi.org/10.1542/peds.2005-1817)
19. Free C, Whittaker R, Knight R, Abramsky T, Rodgers A, Roberts IG. Txt2stop: a pilot randomised controlled trial of mobile phone-based smoking cessation support. *Tob Control*. 2009;18(2):88-91. doi: [10.1136/tc.2008.026146](https://doi.org/10.1136/tc.2008.026146)
20. Free C, Knight R, Robertson S, Whittaker R, Edwards P, Zhou W, Rodgers A, Cairns J, Kenward MG, Roberts I. Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomised trial. *Lancet*. 2011;378(9785):49-55. doi: [10.1016/S0140-6736\(11\)60701-0](https://doi.org/10.1016/S0140-6736(11)60701-0)
21. Cosci F, Pistelli F, Lazzarini N, Carrozzi L. Nicotine dependence and psychological distress: outcomes and clinical implications in smoking cessation. *Psychol Res Behav Manag*. 2011;4:119-128. doi: [10.2147/PRBM.S14243](https://doi.org/10.2147/PRBM.S14243)
22. Fiore M. Treating tobacco use and dependence: 2008 update: Clinical practice guideline: Diane Publishing; 2008.
23. Waked M, Salameh P, Aoun Z. Water-pipe (narguile) smokers in Lebanon: a pilot study. *East Mediterr Health J*. 2009;15(2):432-442.
24. Hallit S, Assi TB, Hallit R, Salameh P. Allergic diseases, smoking, and environmental exposure among university students in Lebanon. *J Asthma*. 2018;55(1):35-42. doi: [10.1080/02770903.2017.1306075](https://doi.org/10.1080/02770903.2017.1306075)
25. Hallit S, Raherison C, Abou Abdallah R, Hallit R, Salameh P. Correlation of types of food and asthma diagnosis in childhood: A case-control study. *J Asthma*. 2017 Sep 19 [Epub ahead of print]. doi: [10.1080/02770903.2017.1379535](https://doi.org/10.1080/02770903.2017.1379535)
26. Hallit S, Raherison C, Waked M, Salameh P. Validation of asthma control questionnaire and risk factors affecting uncontrolled asthma among the Lebanese children's population. *Respir Med*. 2017;122:51-57. doi: [10.1016/j.rmed.2016.11.018](https://doi.org/10.1016/j.rmed.2016.11.018)
27. Hallit S, Salameh P. Exposure to toxics during pregnancy and childhood and asthma in children: A pilot study. *J Epidemiol Glob Health*. 2017;7(3):147-154. doi: [10.1016/j.jegh.2017.04.004](https://doi.org/10.1016/j.jegh.2017.04.004)
28. Layoun N, Hallit S, Waked M, Aoun Bacha Z, Godin I, Dramaix M, Salameh P. Predictors of Readiness to Quit Stages and Intention to Quit Cigarette Smoking in 2 and 6 Months in Lebanon. *J Res Health Sci*. 2017;17(2):e00379.
29. Layoun N, Hallit S, Waked M, Aoun Bacha Z, Godin I, Leveque A, Dramaix M, Salameh P. Predictors of past quit attempts and duration of abstinence among cigarette smokers. *J Epidemiol Glob Health*. 2017;7(3):199-206. doi: [10.1016/j.jegh.2017.06.003](https://doi.org/10.1016/j.jegh.2017.06.003)
30. Hallit S, Raherison C, Waked M, Hallit R, Layoun N, Salameh P. Validation of the mini pediatric asthma quality of life questionnaire and identification of risk factors affecting quality of life among Lebanese children. *J Asthma*. 2018 Mar 7 [Epub ahead of print]. doi: [10.1080/02770903.2018.1441417](https://doi.org/10.1080/02770903.2018.1441417)
31. Mannocci A, Colamesta V, Conti V, Cattaruzza MS, Paone G, Cafolla M, Saulle R, Bulzoni V, Antici D, Cuccurullo P, Boccia A, La Torre G, Terzano C. Demographic characteristics, nicotine dependence, and motivation to quit as possible determinants of smoking behaviors and acceptability of shocking warnings in Italy. *Biomed Res Int*. 2014;2014:723035. doi: [10.1155/2014/723035](https://doi.org/10.1155/2014/723035)
32. Korte KJ, Capron DW, Zvolensky M, Schmidt NB. The Fagerstrom test for nicotine dependence: do revisions in the item scoring enhance the psychometric properties? *Addict Behav*. 2013;38(3):1757-1763. doi: [10.1016/j.addbeh.2012.10.013](https://doi.org/10.1016/j.addbeh.2012.10.013)
33. Richmond RL, Kehoe LA, Webster IW. Multivariate models for predicting abstinence following intervention to stop smoking by general practitioners. *Addiction*. 1993;88(8):1127-1135. doi: [10.1111/j.1360-0443.1993.tb02132.x](https://doi.org/10.1111/j.1360-0443.1993.tb02132.x)

34. SRNT Subcommittee on Biochemical Verification. Biochemical verification of tobacco use and cessation. *Nicotine Tob Res.* 2002;4(2):149-159. doi: [10.1080/14622200210123581](https://doi.org/10.1080/14622200210123581)
35. Rabbaa-Khabbaz L, Daoud RA, Karam-Sarkis D. A simple, sensitive, and rapid method for the determination of cotinine in urine by high-performance liquid chromatography with UV detection. *J Chromatogr Sci.* 2006;44(9):535-538.
36. Farkas AJ, Pierce JP, Zhu SH, Rosbrook B, Gilpin EA, Berry C, Kaplan RM. Addiction versus stages of change models in predicting smoking cessation. *Addiction.* 1996;91(9):1271-1280. doi: [10.1046/j.1360-0443.1996.91912713.x](https://doi.org/10.1046/j.1360-0443.1996.91912713.x)
37. Cinciripini PM, Lapitsky L, Seay S, Wallfisch A, Kitchens K, Van Vunakis H. The effects of smoking schedules on cessation outcome: can we improve on common methods of gradual and abrupt nicotine withdrawal? *J Consult Clin Psychol.* 1995;63(3):388-399. doi: [10.1037/0022-006X.63.3.388](https://doi.org/10.1037/0022-006X.63.3.388)
38. Le Houezec J, Säwe U. [Smoking reduction and temporary abstinence: new approaches for smoking cessation]. *J Mal Vasc.* 2003;28(5):293-300.
39. Hallit S, Zoghbi M, Hallit R, Youssef L, Costantine R, Kheir N, Salameh P. Effect of exclusive cigarette smoking and in combination with waterpipe smoking on lipoproteins. *J Epidemiol Glob Health.* 2017;7(4):269-275. doi: [10.1016/j.jegh.2017.08.006](https://doi.org/10.1016/j.jegh.2017.08.006)
40. World Health Organization. Adherence to long-term therapies. Available at: http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf (accessed Sep 11, 2017).
41. Catz SL, Jack LM, McClure JB, Javitz HS, Deprey M, Zbikowski SM, McAfee T, Richards J, Swan GE. Adherence to varenicline in the COMPASS smoking cessation intervention trial. *Nicotine Tob Res.* 2011;13(5):361-368. doi: [10.1093/ntr/ntr003](https://doi.org/10.1093/ntr/ntr003)
42. Stewart RB, Caranasos GJ. Medication compliance in the elderly. *Med Clin North Am.* 1989;73(6):1551-1563. doi: [10.1016/S0025-7125\(16\)30616-2](https://doi.org/10.1016/S0025-7125(16)30616-2)
43. 2008 PHS Guideline Update Panel, Liaisons, and Staff. Treating tobacco use and dependence: 2008 update US Public Health Service Clinical Practice Guideline executive summary. *Respir Care.* 2008;53(9):1217-1222.
44. Haynes RB, Ackloo E, Sahota N, McDonald HP, Yao X. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev.* 2008;(2):CD000011. doi: [10.1002/14651858.CD000011.pub3](https://doi.org/10.1002/14651858.CD000011.pub3)
45. Hays JT, Leischow SJ, Lawrence D, Lee TC. Adherence to treatment for tobacco dependence: association with smoking abstinence and predictors of adherence. *Nicotine Tob Res.* 2010;12(6):574-581. doi: [10.1093/ntr/ntq047](https://doi.org/10.1093/ntr/ntq047)
46. Yang T, Abdullah AS, Mustafa J, Chen B, Yang X, Feng X. Factors associated with smoking cessation among Chinese adults in rural China. *Am J Health Behav.* 2009;33(2):125-134. doi: [10.5993/AJHB.33.2.2](https://doi.org/10.5993/AJHB.33.2.2)
47. Fong GT, Cummings KM, Borland R, Hastings G, Hyland A, Giovino GA, Hammond D, Thompson ME. The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tob Control.* 2006;15(Suppl 3):iii3-11. doi: [10.1136/tc.2005.015438](https://doi.org/10.1136/tc.2005.015438)
48. Abdullah AS, Ho LM, Kwan YH, Cheung WL, McGhee SM, Chan WH. Promoting smoking cessation among the elderly: what are the predictors of intention to quit and successful quitting? *J Aging Health.* 2006;18(4):552-564. doi: [10.1177/0898264305281104](https://doi.org/10.1177/0898264305281104)
49. Kozlowski LT, Porter CQ, Orleans CT, Pope MA, Heatherton T. Predicting smoking cessation with self-reported measures of nicotine dependence: FTQ, FTND, and HSI. *Drug Alcohol Depend.* 1994;34(3):211-216.
50. Pierce JP, Farkas AJ, Gilpin EA. Beyond stages of change: the quitting continuum measures progress towards successful smoking cessation. *Addiction.* 1998;93(2):277-286. doi: [10.1046/j.1360-0443.1998.93227711.x](https://doi.org/10.1046/j.1360-0443.1998.93227711.x)
51. Curry S, Wagner EH, Grothaus LC. Intrinsic and extrinsic motivation for smoking cessation. *J Consult Clin Psychol.* 1990;58(3):310-316. doi: [10.1037/0022-006X.58.3.310](https://doi.org/10.1037/0022-006X.58.3.310)
52. Holden J. Effect on the pocket or fear of the grave? The reaction of smokers to information. *Practitioner.* 1988;232(1450):660-664.