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# Predictors of past quit attempts and duration of abstinence among cigarette smokers

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ABSTRACT

*Objective:* Despite the widespread awareness of the harms of smoking, millions continue to smoke around the world partly due to the difficulty it takes to quit smoking. Identifying the factors associated with making quit attempts is an essential pillar to reach successful quitting. The purpose of this study is to assess the factors associated with the past quit attempts and their past length of abstinence in a Lebanese sample of cigarette smokers.

*Methods:* This study was conducted between March 2014 and March 2015, involving 382 patients randomly chosen from 5 outpatient clinics in 5 hospitals in Lebanon. A standardized questionnaire was completed including socio-demographic characteristics, smoking behavior, chronic respiratory symptoms, Fagerstrom scale, Mondor scale, packaging perception, quitting behavior and readiness to quit ladder.

*Results:* Smokers who have chronic allergies (ORa = 2.45, p = 0.03), those who have ever stopped smoking for at least one month due to the warnings implemented on the packages (ORa = 4.6, p < 0.0001) and smokers with an intention to quit in 2 months (ORa = 2.49, p < 0.0001) had significantly more past quit attempts.

*Results:* Furthermore, longer quit attempts duration (more than 1 month) were significantly associated with low-nicotine dependent smokers (ORa = 0.56, p = 0.02), higher-motivated smokers (ORa = 1.85, p = 0.01), people with chronic allergies (ORa = 2.07, p = 0.02), smokers who have ever stopped smoking for at least one month due to the warnings (ORa = 3.72, p < 0.0001) and those with an intention to quit in 2 months (ORa = 1.98, p = 0.05).

*Conclusion:* The promoters of smoking cessation services should consider these factors when designing comprehensive tobacco control initiatives and in service planning.



## 1. Introduction

Tobacco use is the number one cause of preventable mortality. Five million deaths each year are attributable to smoking, with an estimated rise of as much as 10 million deaths per year by the 2030s [1]. Yet, despite the widespread awareness of the harms of smoking, millions continue to smoke around the world partly due to the difficulty it takes to quit smoking. The Centers for Disease Control and Prevention suggests 8–11 attempts before

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quitting permanently [2]. However, a recent study suggests that a current smoker tries to quit on average 30 times or more before successfully quitting for 1 year or longer [3].

Several studies found that being in daily contact with other smokers reduced the likelihood of success in quitting [4,5]. Similarly, Senore et al. [6] and Gourlay et al. [7] found that the likelihood of success in quitting was lower among smokers who lived with other smokers than among those who did not. Furthermore, Farkas et al. [8] found that bans in both the workplace and in the home were significant predictors of successful quitting.

Most past studies of factors affecting quit attempts and their outcomes have been limited to specific populations or have addressed individual demographic or environmental characteristics. Recognizing the dynamic nature of smoking behavior, Horn [9], Prochaska et al. [10–12] and DiClemente et al. [13] found that change in smoking behavior followed a series of stages, with each stage individually influenced by different factors. A previous study showed that smokers who are highly motivated to quit smoking, having one or less smoker at work, who consider shocking pictorial warnings as more effective than textual ones already implemented on cigarettes packages in helping to reduce/stop smoking, who consider the health warnings on packs as very important, having past quit attempt during the last year and real quit attempts duration for 1 month or more, were all factors associated with the stages of readiness to quit [14].

Cigarette packages in almost every jurisdiction in the world carry health warnings to inform consumers about the risks of smoking. Indeed, health warnings on packages are appealing both because of their low cost to regulators and their unparalleled reach among smokers. However, the effectiveness of package warnings depends on their size, position, and design: whereas obscure warnings have been shown to have relatively little impact, more comprehensive warnings, including picture-based warnings, have been associated with a greater recall, an increased motivation to quit smoking, and greater attempts to quit [15–17].

To the best of our knowledge, no study has been conducted in Lebanon to assess factors affecting past quit attempts and their duration. Therefore, our aim was to assess factors associated with the past quit attempts and their past length of abstinence in a Lebanese sample of cigarette smokers.

## 2. Methods

### 2.1. Study design and ethics

A cross-sectional survey was conducted between March 2014 and March 2015 in 5 outpatient clinics in 5 hospitals in Lebanon: 2 in Beirut, 1 in Mount Lebanon, 2 in North of Lebanon and included cigarette adult smokers age ≥18 years) and in a smoking cessation center located in one hospital in Beirut. The Lebanese University waived approval of the study since it is an observational non-invasive study that respects participants' autonomy and anonymity; the study followed principles of the Declaration of Helsinki for such types of studies [18].

### 2.2. Study participants

Subjects were invited to complete a standardized questionnaire in the waiting rooms of respiratory outpatient clinics in the hospitals and of the smoking cessation center. The individuals were patients coming to the clinic for an ordinary checkup, for an acute respiratory disease such as pneumonia or acute bronchitis or for a chronic respiratory disease; they had to be exclusive current cigarette smokers. Healthy individuals (with no respiratory disease) were also included, provided they were current cigarette smokers "defined as currently smoking ≥1 cigarette per day". In addition, they could be seeking advice for a smoking cessation program. The interview was carried out by trained pharmacists and nurses. A written consent in Arabic was given by participants in order to be included in the study.

### 2.3. Study tool and variables

The pretested questionnaire from the standardized questionnaire of the American Thoracic Society was given to all participants [19]. It was adapted to local Arabic language (the native language in Lebanon); details about the translation process were presented previous studies in [20–24]. Socio-demographic characteristics, including age categorized into ≤45 years and >45 years, gender, region categorized into Beirut, Mount and North, employment status divided into employed, unemployed and never employed, educational level divided into low education (illiterate, primary, complementary and secondary levels) versus high education (university level) and the marital status categorized into married versus single status (single, divorced or widowed) were assessed.

Concerning the smoking behavior, we asked about the cigarette smoking status, the number of cigarettes smoked per day categorized into 1–9, 10–25 and >25 cigarettes per day [25], the family smoking status categorized into ≤1 person who smoked in the same house versus >1 person, if the patient smoked indoor, the number of smokers at work categorized into ≤1 smokers or >1 person and submission to tobacco smoking at work. The age of cigarette smoking onset was categorized into 10 to 14, 15 to 17 and ≥18 years [26].

The presence of chronic respiratory symptoms was defined as an affirmative answer to the questions "did the doctor tell you that you have a respiratory disease?", "do you have symptoms of chronic wheezing (whistling sounds heard on expiration more than 2 years)? A chronic cough (defined as the presence of a cough for 3 consecutive months in 2 consecutive years)? Chronic phlegm (presence of phlegm for 3 consecutive months in 2 consecutive years)? A chronic cough with phlegm for more than 3 weeks per year? Chronic allergy? Classification into the presence of chronic respiratory symptoms category required a positive answer to one of the previous questions.

The cigarette nicotine dependence status was measured via the Fagerstrom scale. Scores were categorized into 1–4 "low dependency" and ≥5 "high dependency" [25]. The motivation to quit smoking was measured using the Mondor scale; scores were categorized into ≤12 reflecting a low motivation to quit and >12 reflecting a high motivation to quit [27].

In order to assess the packaging perception, we asked patients how much the labels of the cigarette packaging were actually appreciated and their perceived effectiveness for smoking cessation or reduction. Two different types of warnings were shown to the smokers during the interview: Only text (current warning used in Lebanon) versus pictorial "shocking" warnings (i.e., diseased lungs, throat cancer and rotting teeth). To quantify the effect of the warning, two questions were asked: "If your favorite cigarette brand decides to change its look using these pictorial warnings on tobacco packaging, would you think of buying another cigarette brand?" (Yes/No) and "If you could choose the types of warning labels on cigarette packs, which one do you feel as more effective in helping to stop smoking?" (Graphic images/texts/a combination of both).

In addition, we asked some questions about the influence of the warnings on the patient's decision or intention to quit: have you ever stopped smoking for at least one month during the last year due to the warnings? "no/yes"; Are you or have you been influenced by the health warnings on cigarette packages (in relation to the daily number of cigarettes smoked)? "no/yes"; Have you changed your

smoking habits due to the warnings (e.g., do not smoking after coffee)? No/yes; do you consider it important to report the health warnings about tobacco consumption on cigarette packs? (a lot/enough/ poor/no) [25]; Have the health warnings increased the curiosity or the desire to be better informed or to be helped to give up smoking? (a lot/enough/ poor/no) [25]; If shocking images were used on cigarette boxes, would they have greater effect than simple warning text currently used? "no/yes"; If your favorite cigarette brand/company decide to change the look of its cigarette boxes with shocking images of smoking health damage, would you think of changing it? "no/ yes"; If you could choose the types of warning labels on cigarette packs, which one do you feel as more effective in helping to stop smoking? (Textual health warning/Graphic health warnings/Both shocking images with text/Nothing).

We assessed the motivation to quit smoking by using the readiness to quit ladder. The Ladder is a continuous measure of motivation to change smoking behavior that uses a 10-point scale with responses ranging from 1 = "I have decided to continue smoking" to 10 = "I have already quit smoking." Validity studies have demonstrated that the Ladder is associated with cognitive and behavioral indices of readiness to consider smoking cessation (e.g., intention to quit, nicotine dependence) and performs as well or better than the staging algorithm in predicting smoking rate, quit attempts and cessation [10,28,29]. We divided the scale into 2 subgroups, the low-motivated one including the pre-contemplation (not thinking about quitting) phases and the high-motivated one containing the "contemplation (thinking about quitting but not ready to quit), preparation (getting ready to quit), action (quitting) and maintenance (remaining a non-smoker) phases. Indeed we evaluated the intention to seriously quit cigarette smoking in 2 months "no/yes" in addition to the intention to seriously quit cigarette smoking in 6 months and one year "no/yes" [14].

Quit attempts were assessed by asking smokers, "how many times during the last year have you stopped smoked for 1 day (24 h) or longer?" Responses were categorized into zero quit attempts and ≥1 quit attempt. Real quit attempts durations were assessed by asking smokers: "how long did you stay or have you been staying without smoking any cigarette?" Answers were categorized into <1 month and ≥1 month.

### 2.4. Statistical analysis

Data analysis was performed using the SPSS software (Statistical Package for the Social Sciences), version 23. Categorical data were shown as absolute frequencies and percentages. Continuous data were presented as means ± standard deviation (SD). Two sided statistical tests were used; Chi-2 test or the Fisher's exact test for dichotomous or multinomial categorical variables, and Student's *t* test for quantitative variables of normal distribution and homogeneous variances.

Multivariate analysis logistic regressions were carried out using variables that showed a $p < 0.2$ in the bivariate analysis [30,31]; potential confounders may be eliminated only if $p > 0.2$, in order to protect against residual confounding [32]. Two logistic regressions were performed, taking into account the variables in the bivariate analysis that showed a p-value <0.2. The first regression took the past quit attempt as a dependent variable (zero quit attempts versus ≥1 quit attempt), whereas the second one considered the length of abstinence (<1 month versus ≥1 month) as a dependent variable. The statistical significance was set at a p-value <0.05.

## 3. Results

In total, data was collected from 382 cigarette smokers, with a response rate of 88%. Table 1 summarizes the socio-demographic characteristics of those cigarette smokers. Sixty-one percent of the participants were males; more than half were more than 45 years old. Almost 34% had a single status (single, widowed or divorced), whereas 42% lived in Mount Lebanon. More than half of the participants (51.6%) had more than 1 smoking person in the family and 64.1% smoked indoor. Forty-five percent had more than 1 person smoking at work, whereas 40.6% declared being submissive to smoking at work.

## 4. Bivariate analysis

The first bivariate analysis was conducted taking the cigarette past quit attempt as the dependent variable. The results showed that smokers having chronic allergies had significantly more quit attempts than those with no allergies (18.6% versus 7.6%, $p = 0.005$), same as people with high motivation as shown by the Mondor scale score (52.9% versus 33.6%, $p < 0.001$). Furthermore, patients with higher readiness to quit had significantly more quit attempts (50.4% vs 25.9%; $p < 0.001$). If the tobacco company decided to include pictorial shocking warnings on the boxes, smokers declared that they significantly made more quit attempts (73.2% versus 59.5%, $p = 0.008$). Indeed smokers revealed changing significantly their smoking habits due to the warnings and taking more quit attempts (14.8% vs 6.9%, $p = 0.03$), while smokers with higher quit attempts acknowledged they would consider changing the brand they smoked if the company decided to change the look of the cigarette box with shocking pictures (54% vs 43.1%, $p = 0.05$). A significantly greater proportion of smokers who had quit attempts (60.8%) as compared to those who had no quit attempts (49.1%) declared that graphical warnings would significantly have more effect on smokers to take quit attempts ($p = 0.03$), while smokers with an intention to quit in 2 months, 6 months and 1 year would significantly have more quit attempts ($p < 0.001$ for all 3 variables). Furthermore, a significantly higher proportion of patients with successful quit attempts had longer duration spent without smoking ($p < 0.0001$) (Table 1).

The results of the bivariate analysis taking the real quit attempt duration as a dependent variable showed that smokers living in Mount Lebanon had a significantly higher quit attempt duration as compared to Beirut and North Lebanon (49.4% vs 36%, $p = 0.03$). Smokers having chronic allergies had significantly more quit attempts than those with no allergies (19.6% versus 11.7%, $p = 0.03$), while patients who smoke 20 or more cigarettes per day and those highly dependent to smoking as shown by the Fagerstrom scale had a significantly lower quit attempt duration (75.7% vs 66.7%, $p = 0.04$ and 74.8% vs 61.9%, $p = 0.007$ respectively). In contrast, smokers with higher motivation as shown by the Mondor scale and more readiness to quit had a significantly longer quit attempt duration (60.1% vs 36.4%, $p < 0.001$ and 55.1% vs 33.2%, $p < 0.001$ respectively). Furthermore, shocking graphic warnings would significantly have more effect than textual warnings on smokers to make longer quit attempts (76.6% vs 63%, $p = 0.005$), while considering the report of health warnings on cigarette packages to be very important was also significantly associated with longer quit attempt duration (25.9% vs 15.4%, $p = 0.01$). In addition, patients who stopped smoking for at least one month due to the warnings had significantly longer quit attempt duration (32.9% vs 13.9%, $p < 0.001$). Moreover, smokers with an intention to quit in 2 months would significantly have a longer duration of quit attempts (42.9% versus 25.2%, $p < 0.001$) (Table 2).

## 5. Multivariable analysis

The multivariable analysis results are shown in Table 3. The first logistic regression taking the ever attempted to quit as dependent

**Table 1**
Bivariate analysis of factors associated with quit attempts.

| Variable | No (n = 119) | Yes (n = 263) | p-value |
|---|---|---|---|
| **Residence** | | | |
| Beirut | 41 (34.5) | 67 (25.5) | 0.15 |
| Mount Lebanon | 43 (36.1) | 117 (44.5) | |
| North | 35 (29.4) | 79 (30) | |
| **Number of smokers in the family** | | | 0.06 |
| ≤1 person | 66 (55.5) | 119 (45.2) | |
| >1 person | 53 (44.5) | 144 (54.8) | |
| **Chronic allergy** | | | 0.005 |
| No | 110 (92.4) | 214 (81.4) | |
| Yes | 9 (7.6) | 49 (18.6) | |
| **Fagerstrom dependence scale** | | | 0.17 |
| Low dependence | 31 (26.1) | 87 (33.1) | |
| High dependence | 88 (73.9) | 176 (66.9) | |
| **Mondor motivation scale** | | | <0.001 |
| Low motivation | 79 (66.4) | 124 (47.1) | |
| High motivation | 40 (33.6) | 139 (52.9) | |
| **Readiness to quit** | | | <0.001 |
| Low | 86 (74.1) | 124 (49.6) | |
| High | 30 (25.9) | 126 (50.4) | |
| **Longest duration spent without smoking** | | | <0.0001 |
| 0–1 day | 114 (95.8%) | 82 (31.2%) | |
| 2–3 days | 1 (0.8%) | 17 (6.5%) | |
| 1–6 weeks | 3 (2.5%) | 89 (33.8%) | |
| 7–11 weeks | 1 (0.8%) | 18 (6.8%) | |
| 1–3 years | 0 (0%) | 39 (14.8%) | |
| 4–6 years | 0 (0%) | 9 (3.4%) | |
| More than 6 years | 0 (0%) | 9 (3.4%) | |
| **If these shocking images were used on tobacco boxes, would they have a greater effect than simple warning text currently used?** | | | 0.008 |
| No | 47 (40.5) | 67 (26.8) | |
| Yes | 69 (59.5) | 183 (73.2) | |
| **Curiosity to ask help to quit due to the warnings** | | | 0.07 |
| No | 78 (67.2) | 143 (57.2) | |
| Yes a lot | 13 (11.2) | 52 (20.8) | |
| Yes enough | 10 (8.6) | 30 (12) | |
| Yes poorly | 15 (12.9) | 25 (10) | |
| **Have you changed your smoking habits due to the warnings?** | | | 0.03 |
| No | 108 (93.1) | 213 (85.2) | |
| Yes | 8 (6.9) | 37 (14.8) | |
| **If your favorite cigarette brand/company decide to change the look of its cigarette boxes with shocking images of smoking health damage, would you think of changing it?** | | | 0.05 |
| No | 66 (56.9) | 115 (46) | |
| Yes | 50 (43.1) | 135 (54) | |
| **Have you ever stopped smoking due to the warnings?** | | | <0.001 |
| No | 107 (92.2) | 178 (71.2) | |
| Yes | 9 (7.8) | 72 (28.8) | |
| **If you could choose the types of warning labels on cigarette packs, which one do you feel as more effective in helping to stop smoking?** | | | 0.03 |
| None | 28 (24.1) | 32 (12.8) | |
| Textual | 7 (6) | 11 (4.4) | |
| Graphic | 57 (49.1) | 152 (60.8) | |
| Both | 24 (20.7) | 55 (22) | |
| **Do you consider the report of health warnings on cigarette packages to be very important?** | | | 0.06 |
| No | 46 (39.7) | 67 (26.8) | |
| Yes a lot | 43 (37.1) | 125 (50) | |
| Yes enough | 13 (11.2) | 31 (12.4) | |
| Yes poorly | 14 (12.1) | 27 (10.8) | |
| **Intention to quit at 2 months** | | | <0.001 |
| No | 98 (82.4) | 158 (60.1) | |
| Yes | 21 (17.6) | 105 (39.9) | |
| **Intention to quit at 6 months** | | | <0.001 |
| No | 114 (95.8) | 238 (90.5) | |
| Yes | 5 (4.2) | 25 (9.5) | |
| **Intention to quit at 1 year** | | | <0.001 |
| No | 115 (96.6) | 241 (91.6) | |
| Yes | 4 (3.4) | 22 (8.4) | |

*Results are provided as frequencies and the percentages between parentheses.

variable, showed that people who have chronic allergies would significantly have increased quit attempts by 2.45 times (ORa = 2.45, CI 1.11–5.4, p = 0.03), while patients who have ever stopped smoking for at least one month due to the warnings implemented on the packages would significantly have increased ever quit attempts by 4.6 times (ORa = 4.49, CI 2.16–9.83, p < 0.001). In addition, smokers with an intention to quit in 2 months would significantly have more ever past quit attempts by 3.46 times (ORa = 3.46, CI 1.69–3.67, p < 0.001).

A second logistic regression was conducted taking the length of abstinence as the dependent variable. The results showed that low-nicotine dependent and higher-motivated smokers would significantly have quit attempts duration longer than 1 month by 44% and 1.85 times respectively (ORa = 0.56, CI 0.34–0.93, p = 0.02 and ORa = 1.85, CI 1.15–3, p = 0.01) respectively. Indeed, people who have chronic allergies would significantly have quit attempts duration longer than 1 month by more than 2 times (ORa = 2.07, CI 1.1–3.92, p = 0.02), whereas smokers who have ever stopped

**Table 2**
Bivariate analysis of factors associated with real quit attempts duration.

| Variable | <1 month (n = 214) | ≥1 month (n = 168) | p-value |
|---|---|---|---|
| **Residence** | | | 0.03 |
| Beirut | 67 (31.3) | 41 (24.4) | |
| Mount Lebanon | 77 (36) | 83 (49.4) | |
| North | 70 (32.7) | 44 (26.2) | |
| **Persons smoking inside the house** | | | 0.04 |
| No | 67 (31.3) | 70 (41.7) | |
| Yes | 147 (68.7) | 98 (58.3) | |
| **Employment status** | | | 0.03 |
| Employed | 152 (71) | 128 (76.2) | |
| Unemployed | 18 (8.4) | 21 (12.5) | |
| Never employed | 44 (20.6) | 19 (11.3) | |
| **Chronic allergy (yes)** | | | 0.03 |
| No | 189 (88.3) | 135 (80.4) | |
| Yes | 25 (11.7) | 33 (19.6) | |
| **Number of cigarettes per day** | | | 0.04 |
| 1–5 cigarettes | 12 (5.6) | 15 (8.9) | |
| 6–10 cigarettes | 22 (10.3) | 13 (7.7) | |
| 11–19 cigarettes | 18 (8.4) | 28 (16.7) | |
| ≥20 cigarettes | 162 (75.7) | 112 (66.7) | |
| **Age of smoking onset** | | | 0.06 |
| 10–14 years | 38 (17.8) | 17 (10.1) | |
| 15–17 years | 51 (23.8) | 51 (30.4) | |
| ≥18 years | 125 (58.4) | 100 (59.5) | |
| **Fagerstrom dependence scale** | | | 0.007 |
| Low dependence | 54 (25.2) | 64 (38.1) | |
| High dependence | 160 (74.8) | 104 (61.9) | |
| **Mondor motivation scale** | | | <0.001 |
| Low motivation | 136 (63.6) | 67 (39.9) | |
| High motivation | 78 (36.4) | 101 (60.1) | |
| **Readiness to quit** | | | <0.001 |
| Low | 139 (66.8) | 71 (44.9) | |
| High | 69 (33.2) | 87 (55.1) | |
| **If these shocking images were used on tobacco boxes, would they have a greater effect than simple warning text currently used?** | | | 0.005 |
| No | 77 (37) | 37 (23.4) | |
| Yes | 131 (63) | 121 (76.6) | |
| **Are you or have you been influenced by the health warnings on cigarette packages (in relation to the daily number of cigarette smoked)?** | | | 0.01 |
| No | 176 (84.6) | 117 (74.1) | |
| Yes | 32 (15.4) | 41 (25.9) | |
| **Have you changed your smoking habits due to the warnings (do not smoke in the morning after waking up)?** | | | 0.07 |
| No | 188 (90.4) | 133 (84.2) | |
| Yes | 20 (9.6) | 25 (15.8) | |
| **If your favorite cigarette brand/company decide to change the look of its cigarette boxes with shocking images of smoking health damage, would you think of changing it?** | | | 0.08 |
| No | 111 (53.4) | 70 (44.3) | |
| Yes | 97 (46.6) | 88 (55.7) | |
| **Have you ever stopped smoking due to the warnings?** | | | <0.001 |
| No | 179 (86.1) | 106 (67.1) | |
| Yes | 29 (13.9) | 52 (32.9) | |
| **Intention to quit 2 months** | | | <0.001 |
| No | 160 (74.8) | 96 (57.1) | |
| Yes | 54 (25.2) | 72 (42.9) | |
| **Intention to quit 6 months** | | | 0.14 |
| No | 201 (93.9) | 151 (89.9) | |
| Yes | 13 (6.1) | 17 (10.1) | |
| **Intention to quit 1 year** | | | 0.52 |
| No | 201 (93.9) | 155 (92.3) | |
| Yes | 13 (6.1) | 13 (7.7) | |

*Results are provided as frequencies and the percentages between parentheses

**Table 3**
Multivariable logistic models.

| Regression 1: ever attempted to quit as dependent variable. | | | |
|---|---|---|---|
| Independent variables | ORa | CI 95% | p-value |
| Number of smokers in the family: ≤1* vs >1 person | 1.54 | 0.95–2.50 | 0.08 |
| Chronic allergy: no*/yes | 2.45 | 1.11–5.40 | 0.03 |
| Have you ever stopped smoking due to the warnings? (yes) | 4.6 | 2.16–9.83 | <0.0001 |
| Intention to quit in 2 months (yes/no*) | 2.49 | 1.69–3.67 | <0.0001 |

| Regression 2: Real quit attempt duration for more than 1 month as the dependent variable. | | | | |
|---|---|---|---|---|
| Independent variables | | ORa | CI 95% | p-value |
| Smokers inside the house: no*/yes | | 0.65 | 0.4–1.05 | 0.08 |
| Fagerstrom dependence scale: low* vs high | | 0.56 | 0.34–0.93 | 0.02 |
| Mondor motivation scale: low* vs high | | 1.85 | 1.15–3 | 0.01 |
| Chronic allergy: no*/yes | | 2.07 | 1.1–3.92 | 0.02 |
| Age of onset of first cigarette (in years) | 15–17/8–14* | 2.33 | 1.08–5.02 | 0.09 |
| | ≥18/8–14* | 1.66 | 0.81–3.38 | |
| Readiness to quit (low* vs high) | | 1.63 | 0.98–2.71 | 0.06 |
| Have you ever stopped smoking due to the warnings? (yes/no*) | | 3.72 | 1.85–7.46 | <0.0001 |
| Intention to quit in 2 months | yes/no* | 1.98 | 1.14–3.46 | 0.05 |

*Reference group.

smoking for at least one month due to the warnings had a significantly quit attempts duration longer than 1 month by 3.7 times (ORa = 3.72, CI 1.85–7.46, p < 0.0001). In addition, smokers with an intention to quit in 2 months would significantly have quit attempts duration longer than 1 month by 98% (ORa = 1.98, CI 1.14–3.46, p = 0.05).

## 6. Discussion

This study assessed the factors associated with any previous quit attempt and their length of abstinence among the Lebanese adult cigarette smokers. On one hand, our results showed that people who have chronic allergies, those who have ever stopped smoking for at least one month due to the warnings implemented on the packages and smokers with an intention to quit in 2 months would significantly have more ever past quit attempts. On another hand, low-nicotine dependent and higher-motivated smokers, people with chronic allergies, smokers who have ever stopped smoking for at least one month due to the warnings, smokers who changed their smoking habits due to the warnings and those with an intention to quit in 2 months were significantly associated with quit attempts duration longer than 1 month. Previous research [33,34] has identified factors associated with smoking cessation, including low nicotine dependence, male gender, higher educational attainment, being married, being older, consuming fewer cigarettes per day, and not having other smokers in the household.

A previous study [35] conducted in four developed countries (Australia, Canada, the UK, and the US) found that intention to quit, making a quit attempt in the previous year, longer duration of past quit attempts, less nicotine dependence, more negative attitudes about smoking, and younger age are predictive of making a quit attempt; thus there is a need to raise awareness and set up smoking cessation programs, especially in young adolescents, concerning the benefits of smoking cessation.

Quitting smoking is a difficult process and usually involves multiple attempts [36], with a high relapse occurring, not just in the early days of an attempt, but also months after quitting [37].

Although smoking was found not to alter nasal symptoms in patients with allergic rhinitis [38], our study showed that smokers with chronic allergies had more quit attempts than those who did not, these individuals could associate their allergy symptoms to smoking. This could be true since cigarette smoking was shown to be associated with a greater risk of incident asthma in allergic rhinitis patients [39].

This study provided the first evidence from an observational study that pictorial warnings on cigarette packs are effective in promoting quit attempts and helping smokers to quit smoking [40]. Health warnings in general, and pictorial ones in particular play an important role in the intention to quit smoking and quit attempts [41]. Pictorial warnings effectively increased intentions to quit, forgoing cigarettes, quit attempts, and successfully quitting smoking over 4 weeks [40]. Results of a previous study suggested [34] that smokers whose cigarette packs had pictorial warnings were more likely to try to quit during the four week trial, with 40 percent of smokers in the pictorial warning group making a quit attempt compared with 34 percent in the text-only warning group (a relative increase of 18 percent). Therefore, authorized parties should implement new laws to request the use of pictorial warnings and images on all cigarette boxes by manufacturing companies, a method that showed its effectiveness on smokers to quit smoking.

Our results showed a positive and significant correlation between the intention to quit and quit attempts, consistent with prior researches [42,43]. It is plausible that certain smoking attitudes facilitate smokers to think about quitting and thus promote quit intention especially among those who had not attempted to quit ever or recently. Most of the earlier literature reported nicotine dependence as a predictor for smoking cessation [44–46]. In particular, a decrease in levels of nicotine dependence among recent cohorts of smokers could partly explain higher rates of successful quitting among younger adults. Less-dependent smokers are more likely to successfully quit, presumably because of less-intense withdrawal symptoms [47–49]. Similarly, in our study, we found that low-nicotine dependent smokers would significantly have longer quit attempt duration.

During the 1990s, an increasing proportion of smokers, particularly parents, banned smoking in the home [50]. There is a strong association between smoke-free homes and successful quitting [51], perhaps in part because of a lapse, for example after a meal, is less likely.

On the other hand, being highly motivated to quit smoking was positively associated with the quit attempt duration in our study. In fact, both psychological theory and public preconceptions hold that motivation to quit smoking is a critical factor for quit success. Balmford and Borland [52] found that most smokers believe that wanting to quit is both a necessary and a sufficient condition for successful cessation. All theories of health behavior change have a role for motivation, although in most cases it is implicit in the concept of motivation is not directly addressed, being substituted by constructs, such as attitudes to the behavior. Thus, to suggest that all one needs to quit is to be motivated to do so is wrong. The reality is that one needs to be motivated to prompt action to

stop smoking, but this is not sufficient by itself to ensure that one will stop smoking for any length of time.

Although in previous studies home [53] or workplace [8] smoking restrictions had a significant effect on quitting attempts or quitting, the effect of these variables was not significant in the current study. This difference in our findings may have been due to the wide acceptance of smoking in Lebanese families or due to the small sample size.

The intention to quit was significantly associated with the quit attempt and its duration. This suggests the need to encourage smokers to make frequent quit attempts that should also reinforce their confidence to quitting, regardless of perceived likelihood of success on that quit attempt. In a study by Borland et al. [54] study, motivational factors predicted quit attempts but not maintenance of smoking cessation.

### 6.1. Limitations

Our study has several limitations. This is a cross-sectional design and therefore, we are unable to infer causation with such a design. The total sample size is acceptable, withdrawn from 3 governorates in Lebanon, 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, such as selective memory (to remember or not remember experiences or events that occurred at some point in the past) or social desirability bias as a result of the tendency of smokers to base their answers on what they think is theoretically right not what they usually do. Other study limitations include not knowing what effects pictorial warnings may have over a longer period of time, and participant self-selection possibly resulting in a study population with a greater interest in quitting smoking than the general population.

## 7. Conclusion

In conclusion, the present study identified several predictors of quitting attempts and successful quitting amongst adult Lebanese cigarette smokers. The promoters of smoking cessation services should consider these factors when designing comprehensive tobacco control initiatives and in service planning.

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