Assessment of factors related to smokers' adherence to a short-term support group for smoking cessation: a longitudinal study in a developing country

Avaliação dos fatores associados à adesão de fumantes a um grupo de apoio de curta duração para a cessação de tabagismo: um estudo longitudinal em um país em desenvolvimento

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Abstract

Objective: The aim of this study was to determine which individual characteristics of smokers are associated with their adherence to a support group for smoking cessation.

Methods: Smokers from Porto Alegre, Brazil, were invited to participate in a support group for smoking cessation consisting of four weekly sessions. Demographic data, smoking history, presence of tobacco-related diseases, severity of nicotine dependence, stage of motivation, and symptoms of anxiety and depression were evaluated at baseline. Adherence was defined as attendance at group sessions and was measured at the second and fourth sessions of the program.

Results: The study recruited 167 smokers who attended the first meeting and met criteria for admission to the study. One hundred and two of the participants returned to the second session and only 55 of those who attended the first meeting completed the four-week program. For immediate adherence (second session), adult smokers over the age of 35 were more likely to adhere to the treatment (p = 0.004), whereas smoking higher numbers of cigarettes per day was associated with lower adherence to attendance at group meetings (p = 0.031). For final adherence (fourth session), only minimal level symptoms of anxiety were associated with a higher likelihood of adherence (p = 0.02).

Conclusions: Older smokers, those who smoked fewer cigarettes per day, and those with lower levels of anxiety exhibited higher rates of adherence to a smoking cessation support group.

Keywords: Adherence, smoking cessation, motivation, tobacco use disorder, comorbidity.

Resumo

Objetivo: O objetivo deste estudo foi determinar quais características individuais de fumantes estão associadas à sua adesão a um grupo de apoio para a cessação do tabagismo.

Métodos: Fumantes de Porto Alegre, Brasil, foram convidados a participar de um grupo de apoio para a cessação do tabagismo realizado em quatro reuniões semanais. Dados sociodemográficos, história tabagística, presença de doenças relacionadas ao tabaco, severidade da dependência de nicotina, estágio motivacional e sintomas de ansiedade e depressão foram avaliados no início do estudo. Adesão foi definida como estar presente nas reuniões do grupo, e foi medida na segunda e na quarta sessões do programa.

Resultados: O estudo recrutou 167 fumantes que compareceram ao primeiro encontro e preencheram os critérios de inclusão. Desses participantes, 102 retornaram para a segunda sessão, e apenas 55 completaram as quatro semanas do programa. Com relação à adesão imediata (segunda sessão), adultos com idade superior a 35 anos mostraram maior probabilidade de aderir ao tratamento (p = 0.004), enquanto um maior número de cigarros por dia foi associado com menor adesão (p = 0.031). Para a adesão final (quarta sessão), apenas um nível mínimo de ansiedade foi associado com maior probabilidade de adesão (p = 0.02).

Conclusões: Fumantes mais velhos, que fumavam menos cigarros por dia, e com menores níveis de ansiedade exibiram maiores taxas de adesão ao programa de apoio para a cessação do tabagismo.

Descritores: Adesão, cessação do tabagismo, motivação, transtorno por uso de tabaco, comorbidade.

Introduction

There are nearly 22 million smokers in Brazil and 15% of the population aged 15 years or over smokes. Almost 44% of male current smokers and 53% of female current smokers have tried to quit smoking in the past 12 months,[1] but only 15.2% and 6.7% did so, with the help of counseling or pharmacotherapy respectively.[2] Cognitive-behavioral therapy plus medication is the treatment method for smoking cessation. However, pharmacotherapy is overvalued and there is minimal emphasis on unassisted cessation or behavioral treatment.[3] Since pharmacotherapy is prohibitively expensive for low-income populations, it is of interest to be able to predict which smokers would continue attending behavioral treatment alone, in order to initially invest in this approach with those individuals. Moreover, group behavior programs for smoking cessation may be economically more attractive because smokers can be given more counseling time and more people can be treated by a single professional simultaneously.[4] This is particularly important in Brazil, since the available resources are insufficient to provide care for all those who need it, despite increasing efforts to provide smokers with treatment.[2,5] To effectively assist larger numbers of smokers with a group approach would lead to a reduction in costs for public health administrations, allowing application of financial resources to purchase more medications for those smokers who really need them to quit.

However, even in trials in which smokers have agreed to attend treatment meetings, the non-participation rate is often high. Adherence is patient acceptance of recommended health behaviors, such as taking medication, adopting a proposed diet, or changing lifestyle habits[6] and proves a challenge for health professionals. Generally, higher levels of adherence to medical treatment are associated with better health outcomes and with public health cost reductions.[7-10] However, it is difficult to compare findings on adherence, because the term can have different meanings; ranging from merely participating (sometimes termed retention), to actually following the proposed regimen until the desired outcome is achieved.[11] Higher adherence to smoking treatment is associated with a higher chance of nicotine abstinence and higher latency to relapse.[12,13]

Average rates of adherence to multiple sessions of behavioral smoking cessation treatments range from 30 to 66%.[14-19] In Brazil, the rate of adherence to group intervention for smoking cessation varies from 67 to 95%.[20-23] These high rates do not seem to represent clinical practice.

Some studies show that adherence to smoking treatment may be associated with personal characteristics including the pattern of tobacco use[24] and depression and anxiety symptoms experienced during withdrawal.[14,25-27] In general, depression and anxiety are risk factors for poor adherence to recommended preventative behaviors,[28] including quitting smoking. Furthermore, few studies have specifically examined factors predictive of dropout from smoking cessation programs. In general, studies have long observation periods, but it is important to identify early which smokers are more likely to remain engaged in treatment. We consider that it is important to understand the personal characteristics that favor or negatively impact on adherence to smoking cessation treatment, because this insight should help with development of practices that can promote engagement and, consequently, improve support group effectiveness. The objective of this study was therefore to determine whether people who were adherent to a smoking cessation support group, i.e. those who attended the meetings, had different characteristics to those who were non-adherent, in terms of demographic variables, smoking history, presence of tobacco-related diseases, severity of nicotine dependence, motivation stage, and symptoms of anxiety and depression.

Methods

Participants

The study participants were male and female smokers aged 18 or over and living in Porto Alegre, Brazil. Smokers were recruited from the community by newspaper and radio advertisements publicizing a support group for smoking cessation. People who were interested called a call-center for drug abuse prevention and were given a description of how the group sessions would be conducted and participation in a group was then scheduled if the smoker chose to participate. The people enrolled were current cigarette smokers who presented on the date scheduled. Smokers under 18 years of age or those who reported current illicit drugs use, nicotine replacement therapy, bupropion treatment, or the presence of debilitating conditions that could interfere with group participation were excluded.

Table 1 contains the characteristics of the 166 smokers who participated in the study.

Procedures

Smokers participated in a free of charge program for smoking cessation between July 2007 and November 2009. The program consisted of four weekly group meetings with 8 to 12 participants, which were conducted by health professionals trained in cognitive-behavioral and

Motivational Interviewing techniques.[29] Each session lasted about two hours and was structured according to American Cancer Society and Brazilian National Cancer Institute recommendations.[30,31]

Table 1 - Sociodemographic characteristics, smoking history, presence of tobacco-related illnesses, smoking intensity, motivational stage, and symptoms of anxiety and depression among smokers in a short-term support group for smoking cessation (n = 166)

	n (%)
Sociodemographic data	
Gender (n = 166)	
Female	108 (65.1)
Age (n = 164)	
Mean ± SD	49.5±11.3
Marital status (n = 166)	
Married	82 (49.4)
Single, divorced, widowed	84 (50.6)
Education (n = 163)	
≤ 8 years	42 (25.9)
8-11 years	65 (40.2)
> 11 years	55 (33.9)
Occupation (n = 149)	
Unpaid	18 (12.1)
Paid	131 (87.9)
Household income (n = 131)	
≤ US$ 1330/month	76 (58.0)
> US$ 1330/month	55 (42.0)
General characteristics	
Tobacco-related disease (n = 166)	
Yes	117 (70.5)
Medical treatment (n = 165)	
Yes	44 (26.7)
Drinking (n = 163)	
Yes	69 (42.3)
Tobacco consumption	
Age started smoking (n = 166)	
Childhood/adolescence (< 19 years)	133 (80.1)
Adulthood (≥19 years)	33 (19.9)
Daily cigarette consumption (n = 166)	
≤ 20	109 (65.7)
> 20	57 (34.3)
Previous attempt to quit (n = 163)	
Yes	130 (79.8)
Tobacco dependence - NHSDA (n = 129)	
Yes	112 (86.8)
FTND (n = 165)	
≥ 5 (moderate to very heavy)	101 (61.2)
< 5 (very light to light)	64 (38.8)
Motivation	
Contemplation ladder (n = 164)	
Precontemplation/contemplation	29 (17.7)
Preparation/action	135 (82.3)
URICA (n = 164)	
Low motivation	143 (87.2)
High motivation	21 (12.8)
Comorbidities	
Symptoms of depression - BDI (n = 159)	
Mild/moderate/severe (> 11)	82 (51.6)
Minimal (≤ 11)	77 (48.4)
Symptoms of anxiety - BAI (n = 162)	
Mild/moderate/severe (> 10)	87 (53.7)
Minimal (≤ 10)	75 (46.3)

BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; FTND = Fagerström Test for Nicotine Dependence; NHSDA = National Household Survey on Drug Abuse; SD = standard deviation; URICA = University of Rhode Island Change Assessment Scale.

Participants were informed about the study objectives and procedures at the beginning of the first session and informed consent was obtained from all participants. The smokers answered a self-administered questionnaire covering sociodemographic characteristics, their perceived health status, smoking history, nicotine dependence, symptoms of anxiety and depression, and stage of motivation. The second session was devoted to planning the attempt to quit. Information was provided about withdrawal signs and symptoms, risk situations, coping strategies, and relaxation exercises, and the quit date was set. In the third session, difficulties experienced while trying to quit were discussed and strategies for remaining abstinent were reinforced. The fourth session was reserved for feedback on strategies for relapse prevention and for reinforcement of skills and learning for those who had not achieved abstinence. After this initial program, monthly follow-up sessions were scheduled and phone counseling was offered.

The study was approved by the Ethics Committee at the Universidade Federal de Ciências da Saúde de Porto Alegre (no. 219/07).

Sampling

Sampling was by convenience in this study. The sample size was calculated, based on an adherence rate of 55%, observed during the first month of a group intervention for smoking cessation,[17] to find a relative difference between actual and estimated the proportion of no more than 15%, at α = 0.05. After addition of 20% to allow for losses, the sample size calculated corresponded to 162 people.

Study design

Longitudinal study in two periods (second and fourth session).

Measures

Sociodemographic characteristics

The questionnaire included questions on gender, age, marital status, occupation, family income, education level, reported tobacco-related diseases (diabetes, hypertension, cancer, and respiratory and cardiovascular diseases) and use of medication, alcohol, or illicit drugs.

Smoking history

Smoking history was evaluated using a questionnaire covering the age at which respondents started smoking, number of cigarettes smoked per day, years smoking,

number of previous attempts to quit smoking, and the longest previous period of abstinence from smoking.[32]

Nicotine dependence

Dependence was diagnosed on the basis of assessment with the Brazilian National Household Survey on Drug Abuse, a measure which is based on the National Household Survey on Drug Abuse (NHSDA).[33,34] This questionnaire covers six symptoms of the dependence syndrome: tolerance, lack of control over use, significant time spent in activities related to use, continued use of the substance despite the physical risks and personal problems resulting from use, and at least one unsuccessful attempt to stop or to decrease use. Smokers were considered dependent if they endorsed at least two of these criteria.[33] Intensity of nicotine dependence was measured using the Fagerström Test for Nicotine Dependence (FTND), a measure which consists of six questions related to smoking.[35,36] This questionnaire classifies the level of dependence from very low to very high. The total score is calculated by adding the scores obtained for each question, which range from 0 to 10 points.

Motivational stage

Motivational stage was measured using the University of Rhode Island Change Assessment Scale (URICA) and the Contemplation Ladder.[37-39] The URICA assesses to what degree participants are willing to change their smoking behavior by indicating whether they agree or disagree with certain statements. Responses are distributed along a Likert scale. Based on the answers, the scores can be equated to stages of precontemplation, contemplation, action, and maintenance,[40] and a total score can be calculated by adding the averages for the subscales of contemplation, action, and maintenance, and subtracting the mean for the precontemplation subscale. Motivation was defined as high when the total score was above 70% of the maximum possible score. On the Contemplation Ladder, used in modified form, participants chose one statement from a group of five that best represented their thinking in relation to smoking at the time. The stage of readiness was classified as precontemplation, contemplation, preparation or action.

Symptoms of anxiety

The Beck Anxiety Inventory (BAI), a measure consisting of 21 items that describe various symptoms of anxiety, was used to assess the levels of symptoms of anxiety. Subjects mark the level of intensity at which they experience each symptom within a range of 0 to 3. The final score is obtained by summing all the items

and matching that sum to a standardized severity level: minimal (0 to 11 points), mild (12 to 19), moderate (20 to 35), or severe (36 to 63).[41,42]

Symptoms of depression

Symptoms of depression were assessed using the Beck Depression Inventory (BDI), a measure which consists of 21 items with four response choices ranging from 0 to 3 for each item, corresponding to increasing degrees of intensity of depression. The total score is the result of the sum of the scores of the individual items, and this sum is used to classify levels of depression as minimal (0 to 10 points), mild (11 to 19), moderate (20 to 30), or severe (31 to 63).[42,43]

Adherence

A smoker was considered adherent when he/she was present at the second session (immediate adherence) or at all four sessions of the support group (final adherence), regardless of whether they had quit smoking or had made any changes in their behavior. This period of four weeks was chosen for analysis because a shorter treatment program may attract more smokers. Moreover, this initial period represents a moment of great importance in the process of smoking cessation, since it has been shown that smokers are most likely to relapse in the first weeks of treatment.[44]

Data analyses

Statistical analysis was performed to determine whether sociodemographic characteristics, smoking history, knowledge of smoking-related diseases, motivational stage, and symptoms of depression and anxiety were associated with adherence to a program for smoking cessation. Associations between variables and outcomes were identified using the chi-square test. Odds ratios and 95% confidence intervals were also used. Missing data were excluded analysis by analysis. Variables which yielded significance or exhibited trends in associations (p < 0.2) were entered into a multivariate model to control for possible confounding variables. Tests were performed using PASW Statistics 18. Associations were considered significant for p < 0.05.

Results

In total, 183 smokers attended the first meeting. Seventeen smokers were excluded from the study on the basis of inclusion and exclusion criteria. Only 102 (61%) smokers returned for the second session and 55 (33%) completed the four-week program (Figure 1).

Few associations were found between the above variables and smokers' adherence to the program (Table 2). For immediate adherence, adult smokers over the age of 35 were more likely than younger smokers to adhere to treatment (p = 0.017). Gender, medical treatment for clinical conditions, and daily cigarette consumption yielded a trend towards associations (p < 0.2), and therefore these predictors were included in a multivariate logistic regression analysis. Logistic regression analysis confirmed the association between age and immediate adherence (p = 0.004) and also indicated that smokers with consumption higher than 20 cigarettes a day dropped out more frequently in the initial group meetings (p = 0.031). There was a trend towards association between male sex and non-adherence at this time (p = 0.076).

Table 2 - Associations between non-adherence of smokers to group treatment for smoking cessation and sociodemographic characteristics, smoking history, presence of tobacco-related illnesses, smoking intensity, motivational stage, and symptoms of anxiety and depression (n = 166)

	Immediate adherence				Final adherence			
	Non-adherents (n = 65) n (%)	χ2	OR (95%CI) unadjusted	OR (95%CI) adjusted	Non-adherents (n = 112) n (%)	χ2	OR (95%CI) unadjusted	OR (95%CI) adjusted
Gender								
Male	28 (48.3)	3.56	1.82 (0.95-3.48)	1.89 (0.95-3.76)	40 (69.0)	0.18	1.16 (0.59-2.29)	
Female	36 (33.3)		1.0	1.0	71 (65.7)		1.0	
Age (2 missing)								
< 35 years	13 (61.9)	5.62	3.02 (1.17-7.78)*	3.85 (1.43-10.41)*	20 (95.5)	8.65	11.78 (1.54-90.29)*	7.71 (0.88-67.79)
≥ 35 years	50 (35.0)		1.0	1.0	90 (62.9)		1.0	1.0
Marital status								
Married	31 (37.8)	0.04	0.94 (0.50-1.76)		52 (63.4)	0.87	0.73 (0.38-1.41)	
Single, divorced, widowed	33 (39.3)		1.0		59 (70.2)		1.0	
Education (4 missing)								
≤ 8 years	16 (40.5)	0.05	0.92 (0.45-1.90)		27 (64.3)	0.47	0.77 (0.37-1.62)	
> 8 years	48 (38.1)		1.0		84 (70.0)		1.0	
Occupation (17 missing)								
Unpaid	7 (38.9)	0.0	1.03 (0.38-2.83)		13 (72.2)	0.13	1.23 (0.41-3.67)	
Paid	50 (38.2)		1.0		89 (67.9)		1.0	
Household income (35 missing)								
≤ US$ 1330/month	37 (48.7)	0.33	1.23 (0.61-2.46)		59 (77.6)	2.37	1.83 (0.84-3.97)	1.65 (0.67-4.01)
> US$ 1330/month	24 (43.6)		1.0		36 (65.5)		1.0	1.0
Tobacco-related disease								
Yes	48 (41.0)	1.02	1.44 (0.71-2.89)		76 (65.0)	0.65	0.74 (0.36-1.53)	
No	16 (32.7)		1.0		35 (71.4)		1.0	
Medical treatment (1 missing)								
Yes	12 (27.3)	3.35	0.50 (0.23-1.06)	0.47 (0.21 - 1.05)	23 (52.3)	6.13	0.41 (0.20-0.84)*	0.39 (0.14-1.07)
No	52 (43.0)		1.0	1.0	88 (72.7)		1.0	1.0
Drinking (3 missing)								
Yes	27 (39.1)	0.00	0.99 (0.52-1.87)		45 (65.2)	0.15	0.88 (0.46-1.70)	
No	37 (39.4)		1.0		64 (68.1)		1.0	
Age started smoking								
Childhood / adolescence (< 19 years)	54 (40.6)	1.18	1.57 (0.69-3.57)		90 (67.7)	0.19	1.20 (0.54-2.65)	
Adulthood (≥ 19 years)	10 (30.3)		1.0		21 (63.6)		1.0	

	n (%)		OR (95%CI)	OR (95%CI)	n (%)		OR (95%CI)	OR (95%CI)
Daily cigarette consumption								
≤ 20	37 (33.9)	2.85	0.57 (0.30-1.10)	0,46 (0,22 - 0,92)*	68 (62.4)	2.88	0.54 (0.26-1.11)	0.57 (0.20-1.63)
> 20	27 (47.4)		1.0	1.0	43 (75.4)		1.0	1.0
Previous attempt to quit (3 missing)								
No	10 (30.3)	1.22	0.63 (0.28-1.44)		19 (57.6)	1.85	0.58 (0.27-1.28)	
Yes	53 (40.8)		1.0		91 (70.0)		1.0	
Tobacco dependence - NHSDA (37 missing)								
Yes	50 (44.6)	0.41	0.72 (0.26-1.99)		80 (71.4)	0.89	0.54 (0.14-1.99)	
No	9 (52.9)		1.0		14 (82.4)		1.0	
FTND (1 missing)								
≥ 5 (moderate to very heavy)	37 (36.6)	0.26	0.85 (0.44-1.61)		72 (71.3)	2.50	1.70 (0.88-3.28)	0.97 (0.34-2.78)
< 5 (very light to light)	26 (40.6)		1.0		38 (59.4)		1.0	1.0
Contemplation ladder (2 missing)								
Precontemplation/contemplation	10 (34.5)	0.17	0.84 (0.36-1.95)		21 (72.4)	0.56	1.40 (0.58-3.41)	
Preparation/action	52 (38.5)		1.0		88 (65.2)		1.0	
URICA (2 missing)								
Low motivation	35 (40.7)	0.40	1.23 (0.65-2.31)		58 (67.4)	0.08	1.10 (0.57-2.10)	
High motivation	28 (35.9)		1.0		51 (65.4)		1.0	
Symptoms of depression - BDI (7 missing)								
Mild/moderate/severe (> 11)	30 (36.6)	0.02	0.96 (0.50-1.82)		57 (69.5)	1.26	1.46 (0.76-2.81)	
Minimal (≤ 11)	29 (37.7)		1.0		47 (61.0)		1.0	
Symptoms of anxiety - BAI (4 missing)								
Mild/moderate/severe (> 10)	35 (40.2)	0.14	1.13 (0.60-2.13)		65 (74.7)	5.47	2.20 (1.13-4.28)*	3.07 (1.25-7.56)*
Minimal (≤ 10)	28 (37.3)		1.0		43 (57.3)		1.0	1.0

95%CI = 95% confidence interval; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; FTND = Fagerström Test for Nicotine Dependence; NHSDA = National Household Survey on Drug Abuse; URICA = University of Rhode Island Change Assessment Scale.
Multivariate analysis: adjusted for gender, age, household income, medical treatment, number of cigarettes, FTND, and BAI.
* $p < 0.05$.

For final adherence, older age was associated with higher adherence ($p = 0.001$) and not being on medical treatment for hypertension, diabetes, or other chronic diseases decreased the likelihood of adherence ($p = 0.015$). Moreover, minimal anxiety symptoms increased the likelihood that smokers would attend the meetings ($p = 0.02$). Household income, daily cigarette consumption and FTND score yielded a trend in associations ($p < 0.2$) and therefore these predictors were included in a multivariate logistic regression analysis. The association between adherence and anxiety symptoms was confirmed after adjusting the results for attendance at the fourth session by logistic regression ($p = 0.014$) (Table 2).

Regardless of the session, smokers who were on medical treatment for clinical conditions tended to attend more group sessions ($p = 0.061$ for immediate and $p = 0.067$ for final adherence).

Discussion

This study sought to distinguish characteristics that interfere with participation in a smoking cessation program at two different times: the first return (second session) and the end of the support program for smoking cessation (fourth session). The results indicated that older adult smokers, those smoking fewer cigarettes per day, and those with a minimal level of anxiety symptoms were more likely to adhere to treatment, at different points during the program. Smokers who were on medical treatment for clinical conditions likely to be associated with smoking tended to attend more group sessions.

The profile of the smokers who participated in the support group suggested that adherence to treatment may be most common among older people who have smoked for longer periods. This finding is consistent

with prior studies about smoking cessation.[23,45-47] Further research is needed to develop strategies and approaches that attract younger adult smokers and increase their adherence to treatment. The demand for specialized treatment as well as managing to reach the stage of attempting to quit smoking among younger people[48,49] should be valued because stopping smoking before the onset of smoking-related illness represents a gain in health for both the individual and for society.

It is generally assumed that heavy smokers would be more likely to seek expert care and to engage with it,[25,45,46,50] because they recognize the level of difficulty they would face if they attempted to achieve abstinence by their own efforts.[47,51] However, in the current study, the less the participants smoked the more likely they were to attend group sessions. Similarly, Asfar et al.[18] reported a trend towards an association between lower numbers of cigarettes smoked and greater adherence to face-to-face treatment. The lack of autonomy over smoking, that even smokers with low-rate consumption may develop,[52] may explain why cessation is difficult in this group and why they also seek and engage with specialized treatment.

Anxiety is a symptom that is commonly observed in tobacco withdrawal syndrome[53] and is considered a predictor of relapse.[54-56] The association between anxiety and adherence to treatment for smoking cessation has not been studied extensively, and our report has demonstrated that smokers with lower levels of anxiety showed higher final adherence to the program. Likewise, Kuhl et al.[57] concluded that anxiety was a predictor of poor adherence to smoking treatment in post-myocardial infarction patients. It may be the case that anxious smokers do not benefit fully from the group sessions because they may request special attention from the professional who leads the groups during the discussions. Furthermore, quitting smoking represents the loss of a control or of a coping mechanism for their anxiety and, for this reason, smokers with high levels of anxiety feel less able to stop due to increased symptoms of withdrawal.[54,58] However, symptoms of anxiety did not influence the probability of maintaining abstinence among smokers attending individualized pharmacological therapy.[59] In another study, anxiety was only a predictor of failure to achieve abstinence among women.[60]

Interestingly, different characteristics were associated with adherence at the two points during the program that were studied. From a theoretical point of view, adherence can be intentional or unintentional[11,24] and it seems that age and number of cigarettes are associated with the intention and decision to abandon the treatment, while the symptoms of anxiety are negative and unintentionally discourage smokers from trying to quit smoking until they eventually drop out of treatment.[61]

Reporting a tobacco-related disease did not alter the probability of compliance with the treatment program at either point in the program. This result is in contrast to findings reported by Klesges et al.,[14] who observed that smokers with high perceived vulnerability to tobacco-related diseases were more likely to enter a treatment program. Smokers who were not receiving medical treatment for a chronic disease tended to adhere less to the support group, suggesting that adherence to one medical treatment may influence adherence to subsequent health care. This finding supports the idea that adherence may be understood as a unitary pattern in which events related to health would motivate a person to adopt spontaneous care for other behaviors.[62,63]

These results might indicate that women tend to worry more about health and are more likely to seek and retain expert care.[23,47,64,65] Adherence was not associated with the sociodemographic characteristics marital status, educational level, occupation, or household income, confirming some studies of the relationship between these characteristics and seeking or adhering to treatment[18,46] but contrasting with others.[25,66] In other studies, women,[23,46,66] older individuals,[23,25,46] people who were not employed,[23,66] and those with higher educational levels[23] were more likely to adhere to treatment.

The prevalence of depression is higher among smokers[67,68] and studies concerning the relationship between depression and adherence to a cognitive-behavioral therapy group for smoking cessation have shown contradictory results.[16,25,26] Our results revealed no association between level of depressive symptoms and adherence to treatment. However, other studies have shown that depressive symptoms serve as predictors of achievement of abstinence and relapse,[67,69,70] likely because smokers who are more depressed may have fewer coping skills and greater dependence on the mood-enhancing effects of nicotine than smokers who are not depressed.[71]

Adherence to treatment reflects an individual's level of motivation and may be influenced by their beliefs about and attitudes toward treatment and the level of their desire to quit smoking.[13,72,73] Commonly, a strong intention to quit smoking is seen as a state of high motivation and is considered to be a powerful predictor of adherence to treatment.[45,51,50] Moreover, low motivation may be an individual-level barrier leading to treatment default.[74] Unlike what might be expected based on previous literature, smokers in this study equally attended the program in the two periods investigated regardless of their degree of motivation to quit smoking. Further studies should be planned to

investigate the influence of smokers' expectations on the efficacy of their attempts to quit.

It is known that group-based behavioral interventions are more effective than self-help materials, advice, or no intervention.[4,75,76] Furthermore, group treatments have similar efficacy and effectiveness to individual interventions for smoking cessation treatment.[4,17] However, despite the recognized efficacy of this approach, adherence to group programs remains a barrier to tobacco control; no more than 40 to 60% of the smokers who begin these treatments attend the meetings consistently, 23% of the participants leave treatment within the first month, and around 45% leave it within two months.[16,17] In our study, adherence to the support group was even lower, with only one-third of the individuals attending all the meetings in one month. Poor adherence is also a problem in group treatment of other addictions; for example, only around 20% of alcoholics in Brazil are still attending Alcoholics Anonymous meetings at six-month follow-up.[77]

Comparing the approach used here with studies from other countries may prove disappointing, mainly due to intrinsic characteristics of the support groups in Brazil. Usually these treatments are provided by public health services[5] and recruitment is carried out reactively. Moreover, patients' participation is not accompanied by any kind of incentive, principally financial incentives. Therefore, the adherence rate to treatment solely reflects the individual patient's commitment to and engagement with the proposed scheme per se and, not surprisingly, is lower than rates found in international studies.

Despite the objective contained in Brazil's National Tobacco Control Plan to increase smokers' access to effective methods of smoking cessation, efforts are still insufficient: only 6.7% of smokers have tried to quit using pharmacotherapy, for example.[2] Since support groups are a central approach to smoking cessation in Brazil, it is important to know the predictors of adherence to support groups to be able to plan this treatment better. Health professionals who deliver these interventions should be able to identify smokers at higher risk of non-engagement, even if they show interest in following the activities proposed in a first contact. Even smokers who adhere poorly to the support group may benefit from other strategies to increase their engagement with this treatment before referring them to drug treatment.

These people should receive special attention – phone calls, mobile phone messages, letters, and e-mails to remind them of upcoming meetings could help to improve attendance rates. It may also be possible to increase adherence to support groups by using initial sessions to administer motivational interventions designed to increase smokers' engagement with the group therapy.[21] These individual sessions could also serve as screening interviews to avoid prescribing group treatment for people who will not adapt to this approach. Biofeedback can also be an interesting strategy. Adding a clinical or biological marker of the consequences of tobacco use to group discussions could more strongly motivate smokers to seek to change this situation. This would add a measurable index to the subjective benefits of following the treatment.

Practitioners interested in maximizing adherence could consider providing this treatment to specific groups of smokers. It is probable that adaptations to interventions are needed for less adherent smokers and possibly a proposal for group therapy with only these smokers should be considered. Moreover, it is also possible that these smokers need different approaches simultaneously.

The current study should be interpreted with some degree of caution. The sample was non-probabilistic and the subjects were enrolled in a clinical setting and therefore may not be representative of all smokers. The sample size was calculated based on an adherence rate that was higher than the rate actually observed in this study and so some of the results may not have been significant because of small sample size. Moreover, some participants who were lost to follow up may have stopped smoking and so not have perceived any utility in attending subsequent support group meetings. To the extent that this occurred, the findings may be biased toward understanding factors related to adherence among program participants who experience a negative program outcome (i.e., failure to achieve abstinence). The lack of contact with dropouts is one limitation to this study. More conclusive results would be possible with a larger group of participants and a systematic investigation of the reasons individuals did not continue to attend the meetings.

Conclusion

Determination of predictors of adherence to programs for smoking cessation might provide scientific knowledge that could then be used to develop treatments tailored to improve the adherence of smokers and, consequently, the outcomes of interventions. Our results showed that older smokers and smokers who smoked fewer cigarettes per day had higher immediate adherence to the treatment and that smokers with lower levels of anxiety had higher final adherence to the treatment. One would imagine that these smokers have fewer complicating factors and so could achieve success with support groups alone. Since there is a lack of access to pharmacotherapy in low

resource situations, studying the performance of these smokers is a subject for further research.

Acknowledgements

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