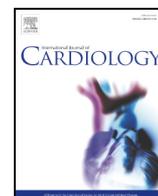




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Letter to the Editor

Smoking cessation and weight gain in patients with cardiovascular disease or risk factor

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Health interventions aimed at smoking cessation can clearly have a significant impact on public health around the globe. Even though the health benefits of quitting smoking are indisputable, research indicates that smoking cessation is associated with an increase in the prevalence of overweight. In this scenario, the present study evaluated the weight gain among patients participating in a smoking cessation intervention in order to find possible predictor variables.

This cohort study utilized the database of PAF (Programa de Assistência ao Fumante/Program of Assistance to Smokers) and retrieved data from patients admitted to a smoking cessation program between 2008 and 2011. The study protocol was approved by the Institutional Ethics Committee. From 1053 patients who consented having their information analyzed, 887 had follow-up of weight status (lost data = 8.4%). Patients were divided into three groups: success (continuous abstinence for 52 weeks), relapse (abstinence interrupted prior to completing the 52 weeks), and failure (no abstinence over the first 8 weeks of treatment). The patients who wished to begin smoke cessation treatment received individual medical approach and prescription of smoking cessation drugs for at

least 12 weeks. Among the medications available, there were nicotine replacement therapies (NRT – patch and gum), bupropion, and varenicline. These drugs were initiated in monotherapy according to nicotine dependence level; previous use of smoking cessation medication; availability of medication and contra-indication. These drugs could be associated to help a patient achieve the smoke free status or decrease abstinence symptoms [1]. The patients were followed for 52 weeks. Variables included in the analysis were age, gender, weight, treatment outcome, smoke cessation drug used, number of medical visits, Fagerstrom score, and self-report of clinical situation. Logistic regression multivariate analyses were carried out to estimate the odds ratio (OR) of weight gain in the successful group.

Table 1 shows the demographic and clinical characteristics of participating patients according to treatment outcome. Both females and males from the successful group had higher weight gain than patients even after adjusting for age, initial weight, ethnicity, from the relapse and failure groups ($p < 0.01$) (Table 2). These values were significant even after adjusting for age, initial weight, ethnicity, education, number of medications prescribed, number of medical visits, and Fagerstrom score. In the successful group, we created models to analyze the odds ratio for weight gain of more than 5% of the original body weight. Higher weight gain odds were associated with being female (OR 2.41, $p < 0.01$) and with a high Fagerstrom score (OR 1.23, $p = 0.01$), education, number of medications prescribed, type of smoking cessation drug used, number of medical visits, and gender or Fagerstrom score depending on the model.

The mechanisms through which weight gain happens after smoking cessation are not yet completely clear, but research indicates that they can be attributed to the absence of nicotine [2]. There is evidence that nicotine works in the hypothalamus neurotransmitters responsible for regulating appetite and satiety. Our result aligns with the most recent evidence that the average weight gain 12 months after smoking cessation is between 4 and 5 kg, or between 8.8 and 11 lb [2]; however, some people gain even more weight [3]. The average weight gain (as a percentage of the initial body weight) observed in the analysis stratified by gender of the successful group was of 6.7 ± 5.2 for females and of 3.8 ± 5.7 for males. In this study, weight gain was significantly higher among women and

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Table 1
Demographic and clinical characteristics of participating patients according to the treatment outcome.

	Failure n = 209	Relapse n = 305	Success n = 373	P value
Gender, male (%)	45.4	45.3	47.6	0.52
Age, years	51.5 ± 10.2	51.4 ± 12.1	52.0 ± 11.1	0.73
Ethnicity, White (%)	75.5	74.3	76.9	0.35
Number of medical visits	1.8 ± 1.2 ^a	3.7 ± 2.6 ^b	4.7 ± 3.1 ^c	<0.01
Hypertension (%)	40.8	41.2	32.6	0.12
Coronary artery disease (%)	9.5	14.8	10.5	0.25
Acute myocardial infarction (%)	12.2	11.5	13.0	0.91
Dyslipidemia (%)	34.0	32.4	26.8	0.26
Obstructive pulmonary chronic disease (%)	11.9	10.0	11.8	0.74
Diabetes mellitus type 2 (%)	6.1	3.3	2.5	0.18
Hypothyroidism (%)	6.8	6.6	7.1	0.98

Values for the number of medical visits marked with different letters are significantly different (Tukey *post hoc* test).

those who had higher Fagerstrom scores, and therefore smoked more cigarettes. This last finding is interesting because, while many smoking cessation studies do measure Fagerstrom score, it has not often been mentioned as a predictor of increased weight gain. Linking a high Fagerstrom score and therefore, high levels of cigarette consumption to weight gain offers additional insight into the role that nicotine dependency plays in controlling body weight. Evidence suggests that female smokers may be more dissatisfied with their bodies than women in general [4]; therefore, a prospective study found that weight gain during smoking cessation adversely influences female body image and creates an increased risk for relapse [5].

In this context, some possible health behavior interventions may be able to reduce weight gain after quitting smoking. Smoking cessation interventions, particularly those aimed at female smokers have to address at some point the issue of weight gain. Some approaches have been suggested, including convincing women to focus first on quitting, recommending caloric intake reduction while quitting, and using cognitive-behavioral strategies to reduce the weight concerns themselves [4]. The two first approaches have not been entirely successful in preventing weight gain or found that these concerns could be successfully addressed without harming quit rates [5]. This particular intervention led to reduced weight concerns and reduced weight gain, and participants more likely to report 30-day abstinence [2,4].

Several studies indicate that weight management education only is not effective in preventing post-cessation weight gain and may have the effect of reducing abstinence [2,5,6]. In addition, while personalized weight management support seems to be effective without affecting abstinence rates, the evidence is not definitive [6]. Smoking cessation interventions with an exercise component, while not necessarily improving abstinence [7], reduced weight gain in the long term [2]. So far, the findings from randomized controlled trials of smoking cessation interventions that address weight gain show that adding an appropriate

Table 2
Initial weight, final weight, and weight gain by gender and treatment outcome.

	Failure	Relapse	Success	P value
<i>Female (n = 483)</i>				
Initial weight (kg)	66.3 ± 12.3	66.3 ± 13.7	66.6 ± 14.5	0.95
Final weight (kg)	66.9 ± 12.1 ^a	67.3 ± 13.9 ^a	71.3 ± 15.1 ^b	<0.01
Weight gain (%)	0.6 ± 3.2 ^a	1.0 ± 3.8 ^a	6.7 ± 5.2 ^b	<0.001
<i>Male (n = 404)</i>				
Initial weight (kg)	82.2 ± 17.2	80.3 ± 16.7	83.2 ± 15.9	0.30
Final weight (kg)	82.4 ± 16.7 ^a	81.4 ± 16.7 ^a	87.0 ± 17.0 ^b	<0.01
Weight gain (%)	0.3 ± 3.0 ^a	1.1 ± 5.0 ^a	3.8 ± 5.7 ^b	<0.001

Weight gain (expressed as a percentage) was calculated by dividing (final weight minus initial weight) by initial weight (kg). Values marked with different letters are significantly different (Tukey *post hoc* test).

weight control component may not harm abstinence rates [8]. On the other hand, concerned about weight gain could be a reason to demotivate smokers to try to stop smoking. Further studies are needed to identify the most effective strategy to achieve smoking cessation and a healthy weight, especially try to understand the biological changes, nutritional intake, and physical activity levels in this scenario. This knowledge could motivate more people to quit smoking without this concern.

The present study has some limitations. The design did not include other useful anthropometric measures, such as evaluations of body fat percentages, body composition analyses, and waist-to-hip ratios. However, it is conclusive to indicate that smokers with cardiovascular disease or high risk factor get more weight when stopping smoke if they are female and/or smoke many cigarettes a day.

Declaration of interests

J.S. Issa is the principal site investigator in Varenicline Trials promoted by Pfizer.

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