

## Gender differences in success at quitting smoking: Short- and long-term outcomes

### *Diferencias de género en el éxito al dejar de fumar: resultados a corto y largo plazo*

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#### Abstract

Smoking cessation treatments are effective in men and women. However, possible sex-related differences in the outcome of these treatments remain a controversial topic. This study evaluated whether there were differences between men and women in the success of smoking cessation treatment, including gender-tailored components, in the short and long term (> 1 year). A telephone survey was carried out between September 2008 and June 2009 in smokers attended in a Smoking Cessation Clinic. All patients who have successfully completed treatment (3 months) were surveyed by telephone to determine their long-term abstinence. Those who remained abstinent were requested to attend the Smoking Cessation Clinic for biochemical validation (expired CO  $\leq$  10 ppm). The probability of remaining abstinent in the long-term was calculated using a Kaplan-Meier survival analysis. The treatment success rate at 3-months was 41.3% (538/1302) with no differences by sex 89% (479/538) among those located in the telephonic follow-up study and 47.6% (256/479) were abstinent without differences by sex ( $p = .519$ ); abstinence was validated with CO less than 10 ppm in 191 of the 256 (53.9% men and 46.1% women). In the survival analysis, the probability of men and women remaining abstinent in the long-term was not significant. There are no differences by sex in the outcome of smoking cessation treatment that included gender-tailored components in the short and long term (> 1 year).

**Keywords:** Smoking; smoking cessation; gender and health; women; survival analysis.

#### Resumen

Los tratamientos para dejar de fumar son eficaces en hombres y mujeres. Sin embargo, las posibles diferencias encontradas en los resultados del tratamiento aún son objeto de controversia. Este estudio analiza si existen diferencias entre hombres y mujeres en el éxito al dejar de fumar a corto y largo plazo (> 1 año) con un programa de tratamiento que incluye la perspectiva de género. Se realizó una encuesta telefónica en fumadores atendidos en una unidad de tabaquismo. Los pacientes que completaron con éxito el tratamiento (3 meses), fueron encuestados telefónicamente para determinar su abstinencia a largo plazo; se validó la abstinencia mediante cooximetría (CO espirado  $\leq$  10 ppm) en los que se mantenían abstinentes. La probabilidad de permanecer abstinentes a largo plazo se calculó utilizando un análisis de supervivencia de Kaplan-Meier. La tasa de éxito del tratamiento fue de 41,3% (538/1302), sin diferencias por sexo. El 89% (479/538) fue localizado por teléfono y el 47,6% (256/479) se mantenía abstinentes sin diferencias por sexo ( $p = .519$ ); la abstinencia fue validada en 191 de 256 (53,9% hombres y 46,1% mujeres). En el análisis de supervivencia, la probabilidad de que los hombres y las mujeres mantuvieran la abstinencia a largo plazo no fue significativa. No hay diferencias por sexo en el resultado del tratamiento para dejar de fumar, que incluyan aspectos de género, a corto y largo plazo (> 1 año).

**Palabras clave:** Tabaquismo; cesación tabáquica; género y salud; mujeres; análisis de supervivencia.

Received: June 2015; Accepted: January 2016

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Smoking is the greatest public health problem in developed countries and an emerging problem in developing countries (López, Mathers, Ezzati, Jamison, & Murray, 2006). Worldwide, the prevalence of smoking is higher in men than in women, although the rate for young women is on the rise (Amos, Greaves, Nichter, & Bloch, 2012). As a consequence of these differences in the smoking prevalence by sex, so far the smoking related mortality has been higher among men. However, in some developed countries, the increase in the smoking habit among women has conditioned also a rise in related mortality in women compared with previous years. Thus, in many countries tobacco use is already a major public health concern for women (Croghan et al., 2009; Banegas et al., 2011; US Department of Health and Human Services, 2001).

Helping current smokers to quit is the single most important step to reduce morbidity and mortality associated with cigarette smoking (Peto et al., 2000). Smoking cessation treatments recommended in the main clinical practice guidelines have been found to be equally effective in men and women (Munafo, Bradburn, Bowes, & David, 2004; Perkins & Scott, 2008). However, possible sex-related differences in the outcome of these treatments remain a controversial topic.

First, in the beginning of the 1980s, a Surgeon General's report (US Department of Health and Human Services, 1980) concluded that women had greater difficulties in stopping smoking, although subsequent studies suggested that this conclusion was perhaps premature (Whitlock, Vogt, Hollis, & Lichtenstein, 1997). Overall, studies which evaluated possible differences in the results of smoking treatment by sex showed different results. Thus, Whitlock et al. (1997) found no gender differences in a brief clinic-based smoking intervention and Croghan et al. (2009) neither found differences through a clinical treatment program. Likewise, in a meta-analysis of 11 clinical trials using Nicotine Replacement Therapy (NRT) for smoking cessation did not find gender differences between males and females smokers (Munafo et al., 2004). Conversely, Osler, Prescott, Godtfredsen, Hein, & Schnohr (1999) found worse results for women in spontaneous smoking cessation whereas Piper et al. (2010) observed that with pharmacotherapy of smoking cessation, women were less likely to quit smoking successfully than men. On the other hand, Cepeda, Reynoso, & Erath (2004), observed that smoking abstinence between males and females receiving NRT was mediated by intensity of behavioural support, (with higher intensity support for women) with poorer 1-year outcome in women vs. men, a similar result found by Perkins et al., (2008). Finally, Scharf & Shiffman (2004) concluded that women were less successful at quitting than men, regardless of treatment. Related to the follow-up, numerous studies have assessed the success of smoking cessation treatments by sex in the short and medium term (three and six months of abstinence), and even up to one year (Croghan et al., 2009; Puente et al., 2011),

but very few have continued follow-up in the longer term, beyond 12 months (Bjornson et al., 1995; Osler et al., 1999; Wetter et al., 2004) also with contradictory findings.

As we can see, all these studies had many methodological differences which could partially explain the different results: differences in the treatment applied (with or without pharmacotherapy), different methodological criteria for determining abstinence (self-reported or biochemical measures), or a different time length of the follow-up period. All these differences make it difficult to draw reliable comparisons between studies.

The objective of this study was to determine whether there were differences between men and women as regards the success of smoking cessation treatment, in the short and long term, with a smoking cessation program which includes gender-tailored components.

## Methods

### *Participants*

A telephone survey was carried out in smokers attended in a Smoking Cessation Clinic between 2002 and 2007 (inclusive). The participants were smokers who requested treatment and had successfully quit at the end of the treatment. This unit is a public service that treats smokers who request a smoking cessation treatment or are referred by their primary care physician (general practitioner) or specialist. For access to treatment the inclusion criteria were being a smoker older than 18 years and voluntarily agreeing to start treatment and the exclusion criteria included having an uncontrolled psychiatric disorder, other active drug-dependence or, in the case of women, pregnancy. All participating gave their written informed consent to be included in the study.

### *Intervention*

The smoking cessation program uses a group format of 60 minute sessions over the course of 3 months. The follow-up visits were arranged as follows: first session, the day before giving up smoking; second session, the day after giving up smoking; one booster visit every week during the first month; and at six, nine and twelve weeks of abstinence; in summary, nine sessions over three months. All those sessions were in group format (men and women mixed) and the day for giving up smoking was the same for all.

The smoking cessation treatment offered is a multicomponent intervention: cognitive and behavioural treatment in group with pharmacological treatment using the medications recommended in smoking cessation treatment guidelines, such as Nicotine Replacement Therapy (NRT), Bupropion and Varenicline (Fiore et al., 2008); the fulfillment of pharmacological treatment was carried out along the group sessions. It is led by health professionals with extensive experience in group therapy.

In the cognitive behavioural therapy, all participants received cessation counselling focused on preparing to quit, the benefits of cessation, coping with smoking urges and relapse prevention. Also were incorporated specific strategies for women as cognitive therapy to reduce weight/body image concerns, how to break the link between cues and smoking and strategies to cope with the negative affect.

### Measures

During the first visit, and before smoking cessation treatment commenced, sociodemographics (sex, age, marital status, educational level, employment activity) and smoking-related variables, including number of cigarettes smoked per day, years as a smoker, number of previous quit attempts to stop smoking (0, 1 or 2, and 3 or more) and degree of nicotine dependence (Fagerström Test) (Fagerström & Schneider, 1989) were collected from all participants. The baseline CO level was measured using a Mini Smokerlyzer cooximeter (Bedfont Scientific Ltd., Rochester, UK) (Jarvis, Russell, & Saloojee, 1980). Finally, a medical history (hypertension, cholesterol levels, cardiovascular disease, hyper- or hypothyroidism and cancer) was completed. Subjects were also asked about their previous history of anxiety and/or depression requiring pharmacological treatment. This information was collected using two variables: history of depression before the smoking cessation treatment, or during treatment. In this first visit the pharmacological treatment was prescribed according to individual profile of each smoker.

Continuous abstinence, in other words not smoking from the quit day until the end of the treatment (3 months), as validated by CO values of  $\leq 10$  ppm, was considered to indicate successful treatment. Expired-air CO was assessed at each of the follow-up visits. As the intention-to-treat criterion was used to assess the success percentage, the success rate was taken to be the proportion of abstinent subjects (continuous and CO validated abstinence) with respect to the total number of subjects who started treatment. Both these criteria (success and success rate) were established on the basis of the recommendations to communicate the outcome of smoking cessation treatment (Hughes et al., 2003). All subjects who failed to attend the final group treatment session (week 12) were considered to be smokers.

### Follow-up

To analyze long-term abstinence (>1 year), a telephone survey of all subjects who were abstinent at the end of treatment (3 months) was carried out between September 2008 and June 2009. Trained interviewers called each subject a maximum of five times in two different time periods. As follow-up was phone-based, those subjects who reported not to have smoked again since receiving treatment were asked to attend the unit for biochemical validation of their abstinence.

### Statistical analysis

A descriptive analysis was performed of the sample as a whole, with qualitative variables expressed as absolute frequencies and the equivalent proportion of each category and quantitative variables as means and standard deviations. The characteristics were compared using the two sample t-test for continuous variables and the chi-square test for categorical variables; the test used to compare short-term outcomes was the chi-square test. Two-sided p-values  $\leq 0.05$  were used to denote statistical significance in all cases.

In the phone-based follow-up study, the abstinence time was calculated as the number of months from the end of the treatment to the date of the interview. A survival analysis was performed using the Kaplan-Meier method to analyse the probability of remaining abstinent in the long term, with the Tarone-Ware test being used to study the possible differences in survival time between men and women (Hughes et al., 2003; Tarone & Ware, 1977). We employed the Tarone-Ware test to assess Kaplan-Meier plots of different groups because this test is designed to have good power across a wide range of survival functions. Data were analysed using SPSS© version 15.0.

## Results

A total of 1472 people, 768 men (52.2%) and 704 women (47.8%), completed a medical history. The mean age was 43.2 (SD = 10.3) years. Of these, 170 (11.5%) decided not to commence smoking cessation treatment, 90 (52.9%) men and 80 (47.1%) women. All subjects who decided not to start smoking cessation treatment (170) were excluded from the study and were therefore not included in the subsequent analyses.

The sample studied included 1302 people of whom 678 (52.1%) were male and 624 (47.9%) female. The mean age was 43.4 (SD = 10.2) years. The characteristics of the sample as a whole, and the male and female subgroups, can be found in Table 1. On average, male subjects were older than females (44.2 vs. 42.5 years) and were more likely to be married (73.6% vs. 58.8%), be working (87.9% vs. 77.6%), and to have a secondary education (47.3% vs. 38.9%), whereas women were more likely to have completed higher education (41.7% vs. 27.3% for men). As far as the smoking-related variables are concerned, men smoked more cigarettes per day than women (26.7 vs. 23.7), had been smoking for longer (27.9 vs. 24.9 years), had higher levels of CO (29.3 vs. 24.9) and 56.6% had attempted to stop smoking once or twice compared with 49.1% of women. All these differences were statistically significant ( $p < 0.05$ ).

Despite the different consumption patterns, no statistically significant differences were found between the sexes in terms of nicotine dependence (6.3 vs. 6.2 points;  $p = .431$ ). Analysis of the different diseases studied showed that men were more likely to present cardiovascular risk factors such

Table 1. Characteristics of the patients who initiated smoking cessation treatment (2002-2007) (N=1302)

	Total % (N)	Men % (N)	Women % (N)	p
<b>Sociodemographic</b>				
Age (SD)	43.4 (10.2)	44.2 (10.4)	42.5 (9.9)	.002
Marital status % (N)				< .0001
Single	23.5 (306)	20.1 (136)	27.3 (170)	
Divorced or widowed	10.0 (130)	6.3 (43)	13.9 (87)	
Married	66.5 (866)	73.6 (499)	58.8 (367)	
Educational level % (N)				< .0001
Basic	22.5 (293)	25.4 (172)	19.4 (121)	
Secondary	43.3 (564)	47.3 (321)	38.9 (243)	
Higher	34.2 (445)	27.3 (185)	41.7 (260)	
Employment % (N)				< .0001
Not active	17.1 (222)	12.1 (82)	22.4 (140)	
Working	82.9 (1080)	87.9 (596)	77.6 (484)	
<b>Consumption pattern</b>				
No. cigarettes/day (SD)	25.3 (10.4)	26.7 (11.5)	23.7 (8.9)	< .0001
Years smoking (SD)	26.4 (10.1)	27.9 (10.7)	24.9 (14.8)	.003
Previous attempts % (N)				.019
0	26.5 (345)	23.9 (162)	29.3 (183)	
1-2	53 (690)	56.6 (384)	49.1 (306)	
3 or more	20.5 (267)	19.5 (132)	21.6 (135)	
Fagerström Test (SD)	6.2 (2.2)	6.3 (2.2)	6.2 (2.2)	.431
Baseline CO (SD)	27.2 (15.8)	29.3 (16.4)	24.9 (14.8)	.003
<b>Medication prescribed % (N)</b>				
None	0.2 (2)	0.1 (1)	0.2 (1)	
Nicotine replacement therapy	64.8 (844)	69.0 (468)	60.3 (376)	
Bupropion	31.1 (405)	27.9 (189)	34.6 (216)	
Varenicline	3.9 (51)	2.9 (20)	5.0 (31)	
<b>Diseases % (N)</b>				
Hypertension	10.2 (133)	12.1 (82)	8.2 (51)	.020
Cholesterol	9.8 (127)	12.7 (86)	6.6 (41)	< .0001
Cardiovascular	8.4 (109)	11.2 (76)	5.3 (33)	< .0001
Diabetes	3.5 (46)	4.9 (33)	2.1 (13)	.007
Hypo/Hyperthyroidism	3.1 (41)	0.7 (5)	5.8 (36)	< .0001
Cancer	1.5 (19)	0.9 (6)	2.1 (13)	.072
<b>Anxiety or depression before treatment % (N)</b>				
	35.7 (465)	24.5 (166)	47.9 (299)	< .0001
<b>Anxiety or depression during treatment % (N)</b>				
	10.4 (136)	5.9 (40)	15.4 (96)	< .0001

p ≤ .05

as hypertension, cholesterol and diabetes. In contrast, women were more likely to present a psychiatric-type disorder such as anxiety and/or depression requiring pharmacological treatment, either at the beginning of treatment or previously.

The three-month treatment success rate using the intention-to-treat criterion was 41.3% (538/1302). There were no statistically significant differences in success rate by sex, although the percentage of abstainers was higher for men than for women [43.8% (297/678) vs. 38.6% (241/624) respectively;  $p=.058$ ].

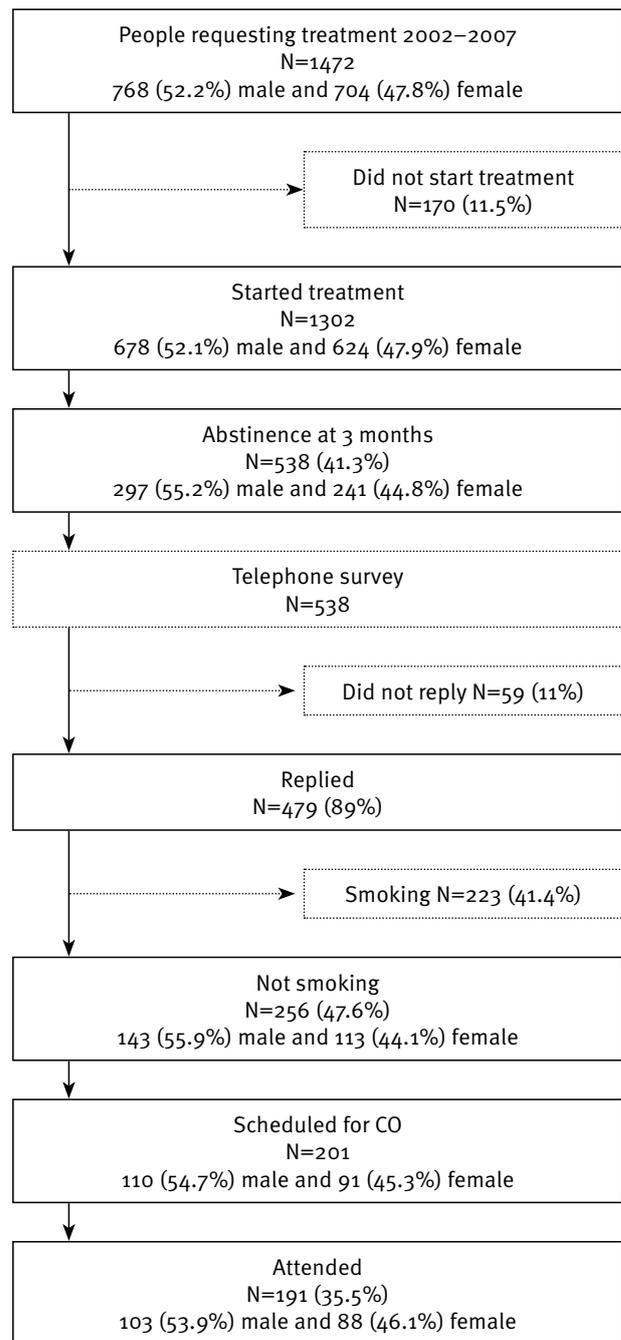
A total of 479 of the 538 subjects who successfully completed the treatment were located during the phone-based follow-up study. Of the 59 who did not reply, 24 had changed phone number, 21 could not be located in the stipulated number of attempts, eight refused to respond to the questionnaire and six had died. Phone-based follow-up was therefore performed with 89% (479/538) of those subjects who successfully completed treatment, 47.6% (256) of whom had remained abstinent since the day they stopped smoking (the quit day); therefore it was 19.6% with respect to the total number of subjects who started treatment (256/1302). There were no statistically significant differences by sex ( $p=.519$ ). Abstinance was validated in 191 (53.9% men and 46.1% women) of the 256 subjects who claimed to have stopped smoking, with CO values of less than 10 ppm; abstinance could not be validated in the remainder (65) as they failed to keep their appointment (see Figure 1).

When compared using the Tarone-Ware test, the differences detected in the survival analysis used to determine the probability of men and women remaining abstinent in the long-term were not significant (see Figure 2).

### Discussion

Our results show that there are no gender differences in the short- and long-term success of smoking cessation treatment which includes gender-tailored components, with men and women having the same probability of remaining abstinent. However, we found sex-based differences in the sociodemographic variables of those people who commenced treatment in our unit. Thus, women tended to be younger, but were less likely to be married than men; these differences are similar to those described by other authors (Croghan et al., 2009; Ramon, Bruguera, Fernández, Sanz de Burgoa, & Ramírez, 2009). The higher percentage of working males reflects the general situation in Spain, where the employment rate for men is higher. Our study also highlights the predominance of women with higher educational qualifications with respect to the greater proportion of men with a secondary education, also found by Iliceto, Fino, Pasquariello, D'Angelo Di Paola, & Enea (2013) in Italy recently. This aspect corresponds, for women, with phase III of the epidemiological model proposed by López, Collishow

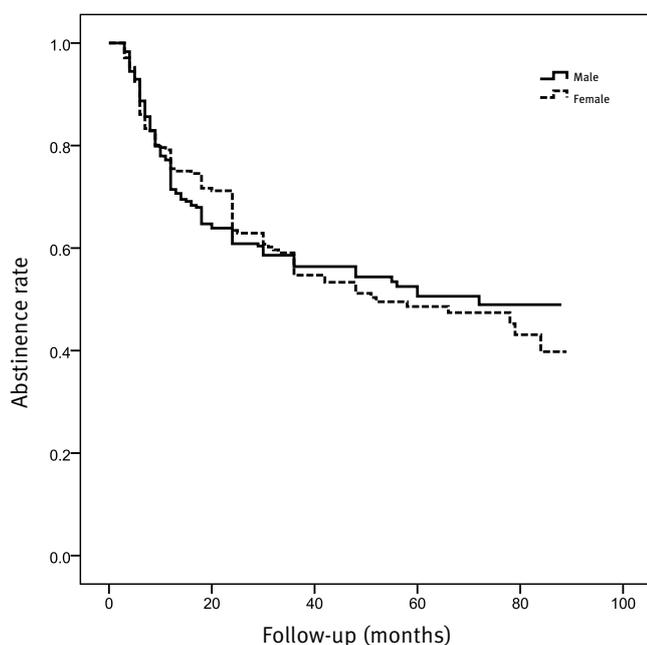
Figure 1. Study scheme



& Piha (1994) and recently review by Thun, Peto, Boreham & Lopez (2012) in which countries like Spain or Italy are currently placed, whereby women with more educational qualifications tend to start smoking first but also decide to stop smoking first. Concerning the high number of women who requested treatment, other studies carried out in a similar setting (Smoking cessation Units) also showed high number of women, most of them with high educational level (Croghan et al., 2009; Fernández et al., 2006; Fidler, Ferguson, Brown, Stapleton & West, 2013)

In accordance with previous findings from our group (Marqueta, Nerín, Jiménez-Muro, Gargallo & Beamonte,

Figure 2. Long-term abstinence by sex



2013) and from other authors in recent studies (Chatkin et al. 2006; Iliceto et al. 2013), no statistically significant differences between men and women were found in terms of the degree of nicotine dependence measured by Fagerström Test. This “equality” reflects the increased consumption in women over the past few years and is in contrast to literature reports from the 1990s, which found a lower dependence in women (Bjornson et al., 1995; Ward, Klesges, Zbikowski, Bliss, & Garvey, 1997). Furthermore, this study was undertaken in a specialised Smoking Cessation Clinic where the men and women who request treatment are usually smokers with a moderate to severe dependence.

Our analysis of reported diseases shows that, in accordance with previous studies (Killen, Fortmann, Varady, & Kraemer, 2002; Marqueta, Jiménez-Muro, Beamonte, Gargallo, & Nerín 2010), anxiety disorders and/or depression are more common in women, whereas a larger proportion of men present cardiovascular risk factors. Both these aspects have been reported in the general non-smoking population and may be due to gender differences arising from both psychosocial and hormonal effects (Borrell, García-Calvente, & Martí-Boscà, 2004; National Institute of Mental Health, 2009).

Concerning the success of the treatment of smoking cessation, although the success rate was higher in men than women we have found no short-term gender differences in the same way as other studies (Croghan et al., 2009; Killen et al., 2002; Puente et al., 2011; Raich et al., 2015; Whitlock et al., 1997;), whereas other authors, such as Bohadana, Nilsson, Rasmussen & Martinet, (2003), Wetter et al., (2004) and Bjornson et al., (1995), have found higher success rates in men and a higher probability of relapse in women (Ili-

ceto et al., 2013; Swan, Ward, Carmelli, & Jack, 1993). The reasons used to justify the worse outcome of smoking cessation treatments in women include the suggestion that women perceive the act of smoking as a strategy to reduce negative affects (for example stress) and/or increase positive ones (Xu et al., 2008). It is well known that women smoke for different reasons than men, for example to reduce negative states (sadness, anxiety, etc.), and that they have different worries when stopping smoking, such as weight control and the appearance of depressive symptoms (Croghan et al., 2009; US Department of Health and Human Services, 2001; WHO, 2001); Therefore, it has been suggested that in women smoking behaviour might be more influenced by behavioural components and less by the nicotine dependence than in men, and accordingly the treatment should be appropriately tailored to women to increase their chances of abstinence (Bohadana et al., 2003). Some studies observed that the result in women of smoking cessation program was mediated by intensity of behavioural support, with higher intensity support for women, but they did not include any specific recommendation for women (Cepeda et al., 2004). In our study, we included strategies to prevent relapses that are specific to women, such as weight aspects, facing up to negative situations and how to handle stress, which could explain the lack of a difference between men and women as regards the outcome of smoking cessation treatment.

Moreover, Croghan et al. (2009), adjusting for the baseline characteristics of smokers, observed that the likelihood of abstinence did not differ by sex and suggested that observed differences in tobacco abstinence outcomes between female and male smokers may be explained by other characteristics (e.g., baseline smoking rate, history of depression etc.), which are different for women and men. In the same way, our group, using a similar methodology, found no differences in the outcome of smoking cessation programs by sex suggesting that the predictors of successful abstinence are different for females and males (Marqueta et al., 2013). In other words and as others authors have suggested previously the rate of success in smoking cessation is similar for both sexes, but the process for men and women is different (Whitlock et al., 1997). These findings support the importance of individualizing the treatment for smokers, depending on being a smoker woman or a smoker man.

In our study the long term success can be seen in Figure 1, and in agreement with the findings of Chatkin et al. (2006), men and women have the same probability of remaining abstinent in the long term. Knowing long term results highlights that men and women have the same success after undergoing a smoking cessation program, including gender-tailored components, and is consistent with the short term findings.

As limitations of our study, it should be noted that the study population is not representative of the general smoker

population as it only includes smokers who requested treatment in a specialised Smoking Cessation Clinic. Despite this, the sample of smokers is sufficiently large to allow the differences between men and women in terms of treatment success to be analysed and is therefore appropriate for the proposed objective. Besides, the studies carried out in Smoking Cessation Units usually analyze all patients treated and they do not use samples (Fernandez et al., 2006). Another limitation of our study could be the number of patients who said at the telephone survey that they were not smoker and did not attend to the biochemical validation (see figure 1). However, this situation is very common in studies which evaluate long term abstinence, where these patients are considered as smokers (Álvarez et al., 2015); this criterion was also applied in our study.

On the other hand, one of the strengths of the study is the large and clinical sample and the long-term follow-up assessment, unlike most other studies which tend to be clinical trials with shorter follow-up periods. Furthermore, we use continuous abstinence which is the most rigorous measure and considered by many to be the gold standard, since it requires a longer period of abstinence than other measures and thus is more likely to represent long-term abstinence; and we validated abstinence with CO. Also, according to the intention-to-treat criterion applied to assess the success percentage, all subjects who failed to attend were considered as smokers. Similarly, and as is recommended by the SRNT (2002) (Hughes et al., 2003), we used a survival analysis using the Kaplan-Meier method to analyse the probability of remaining abstinent in the long term. This method provides more detailed information than a simple cut-off point rate as it reflects the evolution in time and provides probability information, thereby more accurately reflecting the patient's actual situation. Since smoking is not a static process in time (Prochaska & DiClemente, 1983), it appears more appropriate to use dynamic techniques, such as survival analysis, to assess such outcomes. In contrast, many studies evaluate the abstinence only with self-declaration in a sample cut-off point.

In summary, our study shows that there are no differences by sex in terms of the outcome of smoking cessation treatment when following the treatment recommended in clinical practice guidelines. These recommendations include tailoring the treatment on the basis of each smoker's characteristics. This means that is necessary to adapt smoking cessation treatment taking into account the different worries and needs for women and men.

### Acknowledgements

This work has been financed by Grupo de Investigación en Tabaquismo B86, del Gobierno de Aragón, (Spain) and by Ministerio de Ciencia e Innovación. Subprograma de Acciones Complementarias, (Ref: PSI2008-05177-E) (Spain).

### Conflicts of interests

The authors declare that there are no conflicts of interests.

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