

Results of the application of the American Diabetes Association guidelines regarding tobacco dependency in subjects with diabetes mellitus

Mercè Albareda*, Lucinda Sánchez, Joana González, Jaume Viguera,
Antonio Mestrón, Angels Vernet, Lluís Vila

Endocrinology Department, Hospital Dos de Maig, Consorci Sanitari Integral, 08025 Barcelona, Spain

Received 6 October 2008; accepted 23 March 2009

Abstract

The objective of the study was to evaluate the stages of change for cessation in smoking after the application of American Diabetes Association recommendations in diabetic patients who smoke. This longitudinal descriptive study involved smokers with diabetes mellitus (DM) who were attended for their DM between September 2003 and December 2006. Intervention used was dependent on the stage of change for cessation (according to Prochaska and Di Clemente). For precontemplation subjects, a brief session was carried out where information regarding the risks of smoking in conjunction with DM was given. Patients at the contemplation stage of smoking cessation were offered the chance to participate in a cessation program. Later evaluation was carried out after a follow-up of more than 6 months. Seven hundred thirty-three subjects with DM were evaluated, including 156 smokers (21.28%): 103 (66.02%) in the precontemplation stage, 25 (16.02%) in the contemplation stage, 12 (7.69%) in the preparation stage, 12 (7.69%) in the action stage, and 4 (2.56%) in the maintenance stage. By the last follow-up, 65 (41.6%) subjects had quit smoking (36 ex-smokers), of whom 20 (30.77%) had subsequently relapsed. The use of the American Diabetes Association recommendations for the treatment of tobacco dependence in diabetes treatment results in an increased change of smoking cessation stages in subjects with DM as well as a higher overall percentage in abstinence.

© 2009 Elsevier Inc. All rights reserved.

1. Introduction

Current evidence shows that tobacco dependence increases the risks of mortality and cardiovascular morbidity in subjects with diabetes mellitus (DM) [1,2]. There are also studies that report an increased progression of microvascular complications like neuropathy [3] and nephropathy [4,5], although there are no clear results regarding retinopathy [4,6]. In addition, some authors have described worsened metabolic control in smokers with DM [5,7].

Current treatment recommendations for DM discuss the importance of taking action regarding tobacco dependency in subjects with DM [6,8]. Apart from the resultant increased macrovascular risk in smokers, the length of time from smoking cessation decreases the risk of mortality in subjects who stop smoking for more than 10 years [1,9]. No doubt that the application of these recommendations is most evident in the higher percentage of DM subjects who admitted to having

received antitobacco counseling; and the most recent studies show numbers greater than 75% [10–13], which are greater than those for the population without DM [12].

Despite this information, the prevalence of tobacco dependency in subjects with DM continues to be high; and numbers have been found to be similar to those of the general population, which have remained consistent in recent years [12].

The main objective of our study was to evaluate the change in smoking cessation stages after the application of the American Diabetes Association (ADA) recommendations regarding tobacco dependence in diabetic subjects [8] who made follow-up visits related to their diabetes. Secondary objectives were to (1) calculate the prevalence of tobacco dependence in DM subjects in our population and (2) learn in which stage of smoking cessation the smokers were.

2. Patients and methods

The program consisted of a descriptive transversal study with subsequent follow-up for smokers. The study was

* Corresponding author. Tel.: +34 935 072 700; fax: +34 935 072 746.
E-mail address: merce.albareda@sanitatintegral.org (M. Albareda).

carried out in one of the physicians' offices of diabetes care on the Endocrinology and Nutrition Department at the Hospital Dos de Maig (a level II hospital) in Barcelona. All patients who visited this physician's office between September 2003 and December 2006 were included in the study. The subjects had previously been attended at the same department, but the first time that they visited this physician's office during the above dates was listed as the inclusion visit. Later visits were considered follow-ups and could be made at any other office of the same department. Follow-up visits were made every 3 months by subjects with poor metabolic control and every 6 months for subjects with acceptable metabolic control. Subjects with a follow-up of less than 6 months were excluded from the longitudinal study.

The first evaluation of tobacco dependence was made by 2 nurses, and the cessation program was explained by a physician and a nurse. Later evaluations were made by all members of the service.

2.1. Description of the transversal study

Subjects provided the following data on the first visit: age, sex, type of DM, length of illness, DM treatment, the presence of micro- and macrovascular complications, and smoking history (if any). The following additional information was obtained from smokers:

- Current tobacco consumption to classify the patient as an active smoker (tobacco consumption ≥ 100 cigarettes per year in the past year), ex-smoker (previous tobacco consumption ≥ 100 cigarettes per year excluding the past year), and nonsmoker (no previous consumption).
- Years as a smoker
- Current consumption
- Current stage of tobacco dependence, following the model of Prochaska and Di Clemente [14]:
 - Precontemplation: the period in which smokers were not considering quitting smoking (at least not within the next 6 months).
 - Contemplation: the period in which smokers were seriously thinking about quitting smoking within the next 6 months.
 - Preparation: the period in which smokers were seriously thinking about quitting smoking in the next month.
 - Action: the period consisting of 0 to 6 months after having initiated cessation.
 - Maintenance: the period beginning 6 months after action had started.
 - Relapse: when a smoker who had tried to stop smoking begins smoking again.

2.2. Description of longitudinal study

American Diabetes Association recommendations were followed [8].

- First visit:

- Assessment of current smoking status and stage of change for cessation
- Advice and assistance
 - Precontemplation stage: Subjects were given a short intervention (3-5 minutes) informing them of the risks of tobacco use in relation to DM and the importance of quitting. Those patients who wished were given additional written material to reinforce the visit.
 - Contemplation/preparation stage: Subjects were given the chance to participate in a smoking cessation program, consisting of choosing a date to stop smoking, strategies to avoid smoking, and nicotine replacement therapy when deemed necessary.
 - Action/maintenance stage: Subjects were provided with reinforcement and strategies to avoid relapse.
- Follow-up for these patients was every 3 months for subjects with poor metabolic control and every 6 months for subjects with adequate metabolic control.
- Precontemplation or contemplation stage: Subjects who were not interested in the assistance programs were evaluated regarding their smoking habits and again counseled on the importance of quitting smoking on subsequent visits.
- Preparation and contemplation stage: Subjects who participated in the cessation program received telephone follow-ups (on quitting day, 7 days, and 6 months after cessation) and visits at 3 months and 1 year after cessation.
- Action and maintenance stage: Subjects were evaluated on their cessation situation during their subsequent follow-up visits.

2.3. Statistical analysis

First, a descriptive analysis of the information was made. Percentages were used for qualitative variables; and the corresponding confidence intervals (CIs) were 95% for the quantitative variables, the mean, typical deviation, or the average and maximum and minimum values.

The comparison of the variables between the different groups of tobacco use was analyzed through a bivariate form applying χ^2 tests for the qualitative and Student *t* tests for the quantitative variables. If the latter did not fulfill the normality distribution, Mann-Whitney *U* tests were used. A significance level of 5% was used in all of the analyses.

The statistical analysis was performed with the statistics packet SPSS, version 11.0 (Chicago, IL).

N calculation: Taking into account that previous studies have seen that the proportion of diabetic smokers in our country is between 12% and 21.3%, the minimum number of subjects necessary to estimate the number of smokers in diabetic patients, with a precision level of 3% and a CI of 95%, is 716 patients.

3. Results

3.1. Description of the population and history of tobacco use

Between September 2003 and December 2006, 733 subjects visited the diabetes follow-up section: 50.06% were women, with a mean age of 62.5 ± 15.9 years.

Of all subjects studied, 156 were smokers (tobacco use prevalence, 21.28%; CI 95%, 18.47–24.39), 207 (28.24%) were ex-smokers, and 370 (50.47%) were nonsmokers. Prevalence of smokers in the study was 21.28% (CI 95%, 18.47%–24.39%). Smokers had an average consumption of 15 cigarettes per day (1–100) and a length of smoking history of 25 years (1–63). Only 1 subject was an occasional smoker. Eighty-two point sixty-nine percent of the smoker subjects (129/156) had been identified in previous visits, but only 44.23% (69/156) showed as having smoking cessation counseling in their clinical histories. The subject characteristics and the results of the univariant study are described in Table 1.

Regarding tobacco use stages, 103 (66.02%) were at the precontemplation stage; 25 (16.02%), the contemplation stage; 12 (7.69%), the preparation stage; 12 (7.69%), the action stage; and 4 (2.56%), the maintenance stage. Previous smoking cessation recommendations (or lack thereof) did not appear to affect stages.

3.2. Evolution of smoking habit after intervention

Table 2 reflects the evolution subsequent to an average follow-up period of 35.9 months from the date of the initial smoking phase. In the latest evaluation, 10 patients were lost to follow-up; and 5 had been in follow-up for less than 6 months. Of the 141 remaining subjects, 59 (41.84%) were in the precontemplation stage, 17 (12.05%) were in the contemplation stage, and 65 (46.1%) had stopped smoking, 36 of whom were ex-smokers (≥ 1 year without smoking), 9

had not completed 1 year without smoking, and 20 had quit and then later relapsed. Nineteen subjects chose to participate in the smoking cessation program, 11 of whom quit smoking (most recent follow-up: 9 ex-smokers and 2 relapses).

4. Discussion

The prevalence of smoking in the group of subjects with DM was 21.28% (CI 95%, 18.47%–24.39%), which is among the highest rates described in our country for subjects with DM (12%–21.3%) [15,16]. These numbers are lower than the average found in the general population (Catalonia, 29.4%) [17]. According to these data, it appears that the population in Catalonia with DM, unlike the study carried out in the United States, smokes less than the population without DM, although it must be added that the median age is probably greater in the study of those with DM (>60 years) compared with the studies of the general population. When only subjects younger than 65 years are examined, the percentage of smoking becomes 38%, compared with 37.9% in the Catalan population [17]. Thus, we could coincide with the study of Ford and colleagues [12] to a possible similar prevalence of smoking in the population with DM.

On the other hand, the high percentage of subjects not previously identified as smokers in their clinical histories must be recognized. Initially, it was thought that the tobacco consumption of these patients was low and, as such, was not identified as habitual or that these were younger subjects who developed the habit afterward. No relation to either consumption or age to explain this was found (data not shown).

Smoking cessation advice figured infrequently in clinical histories; and the lack of relationship to the smoking dependence stage made one suppose that the advice,

Table 1
Study subject characteristics

	Smokers (n = 156)	Ex-smokers (n = 207)	Nonsmokers (n = 370)	P1	P2	P3
Age	52 (18–86)	68 (15–86)	70 (15–94)	<.001	<.01	NS
Women (%)	47 (30.1%)	27 (13%)	293 (79.2%)	<.001	<.01	<.001
Type of DM				<.001	<.01	NS
Type 1	54 (34.61%)	31 (14.97%)	56 (15.13%)			
Type 2	99 (63.46%)	176 (85.02%)	314 (84.86%)			
Other	3 (1.92)	0 (0%)	0 (0%)			
Evolution time of DM (y)	7 (0.1–44)	11.5 (0.5–66)	12 (0.1–61)	<.001	<.01	NS
Treatment				NS	NS	NS
Diet	6 (3.84%)	4 (1.93%)	14 (3.78%)			
HA	45 (28.84%)	67 (32.36%)	81 (21.89%)			
Insulin + HA	17 (10.89%)	26 (12.56)	49 (13.24%)			
Insulin	88 (56.41%)	110 (53.14%)	226 (61.08%)			
DM complications						
Macro	47 (30%)	107 (51.7%)	126 (34%)	NS	<.01	<.001
Micro	50 (32%)	87 (42%)	146 (39.4%)	NS	NS	NS

P1: comparison of smokers with nonsmokers. P2: comparison of smokers with ex-smokers. P3: comparison of nonsmokers with ex-smokers. HA indicates hypoglycemic agent; NS, not significant.

Table 2

Situation of tobacco habit at the last follow-up according to smoking cessation stage before the intervention

Previous smoking stage	Smoking habit at last follow-up		
	Precontemplation	Contemplation	Maintenance relapse
Precontemplation (n = 95)	46 (48.42%)	16 (16.84%)	33 (34.73%) 8/33 (24.24%)
Contemplation (n = 22)	12 (54.54%)	0 (0%)	10 (45.45%) 4/10 (40%)
Preparation (n = 11)	1 (9.09%)	1 (9.09%)	9 (81.81%) 5/9 (55.55%)
Action (n = 11)	0 (0%)	0 (0%)	11 (100%) 2/11 (18.18%)
Maintenance (n = 2)	0 (0%)	0 (0%)	2 (100%) 1/2 (50%)

although no doubt given, was not reflected in the treatment plan. This reinforces the need to treat the problem of tobacco dependence as one of the elements of control for DM, just like blood pressure level or lipid profile evaluation and the need for routine testing.

The percentage of patients with DM in the precontemplation stage of smoking cessation is, as in the above study, higher than that described in the general population [11,18]. This holds true despite the fact that there is a higher percentage of antismoking counseling in this population [10–13] and more subjects found in the contemplation stage after receiving smoking cessation counsel have been described (52.7% vs 85.4%) [10]. In addition, Solberg et al [13] observed that the subjects with DM who smoke are less active in the care of their DM and are less interested in stopping smoking than smokers without DM. Some authors argue that subjects with DM who smoke are resistant to the idea of giving up smoking because of the fear that they will either gain weight or develop a related lack of appetite control and, later, a worsening of the metabolic control because tobacco helps them to control their weight [6,19,20]. Other authors comment that these patients, unlike other groups, feel that they are already so restricted by the need to maintain appropriate metabolic levels that they are unwilling to relinquish their smoking habit as well and do not see themselves as vulnerable or at risk of death [11,21].

Regarding the cessation of smoking, studies undertaken within the population with DM vary: some studies do not find differences after applying a smoking cessation program to the control group [21–23], and others show such hopeful results as a 40% abstinence rate during the study year compared with 7% in the control group [24]. Canga et al [11] indicate a 17% abstinence rate at 6 months of follow-up compared with 2.3% in the control population in our country. It should be mentioned that these data are from intervention studies where smokers with DM voluntarily participated; in other words, these are persons most likely in the contemplation stage because the majority in the precontemplation stage was not interested in participating. This is evident in the low percentage (0%–21%) of subjects who normally agree to join smoking cessation programs [22,24,25]. Furthermore, more time and resources than are usually available in a DM consultation were probably invested in these studies [11]. The percentage of tobacco abstinence in the last follow-up of our study at 1 year was 31% (29% of the total) and 25%

(23% of the total), but all smokers with DM (in precontemplation and contemplation stages) participated; and this was carried out during regular visits, allocating only 3 to 5 minutes to smoking cessation advice.

On the other hand, the number of subjects in the precontemplation stage fell to 41% of the smokers, a significant change because the move from the precontemplation stage to the contemplation stage doubles the percentage of cessation in the succeeding 6 months [26].

We would like to remark that there is a stage effect for quit rates at the last follow-up (Table 2). The lowest percentage of smoking cessation is in the precontemplative group, and the highest percentage is in the action group (precontemplation < contemplation < preparation < action). This indicates that, probably, the intervention in the precontemplation group should be more intensive. It was observed that including a smoking cessation program in that of diabetes education does not negatively affect the metabolic control of DM, suggesting that antismoking counseling can be incorporated into educational programs without affecting the program's effectiveness [23]. According to this, Jones et al [27] described a 24.3% rate of diabetic subjects smokers who quit smoking at 1-year follow-up after treating multiple behaviors (self-monitoring for blood glucose, diet, and smoking).

One limitation of this study was the lack of biochemical abstinence testing (exhaled CO or cotinine levels) in those subjects who did not participate in the cessation program, given the described differences in other studies through the use of CO measurement [28].

Finally, a meta-analysis of men with and without DM, while describing smoking cessation as the best way of prolonging the lives of subjects with DM [29], also noted that smoking cessation has not been prioritized as a treatment for smokers with DM. This is confirmed when noting that ex-smokers with DM present macroangiopathy more frequently than nonsmokers, reinforcing the importance of abandoning the habit before the first cardiovascular event, rather than after.

In short, providing ADA recommendations for the treatment of smoking dependence in diabetes consultation results in an elevated change in stages in subjects with DM who are smokers, in addition to a high percentage of smoking cessation and resultant abstinence in a follow-up superior to 6 months. The number of participants in this study may not be enough to derive a firm conclusion; as a result, more studies will be necessary.

References

- [1] Al-Delaimy WK, Willett WC, Manson JE, Speizer FE, Hu FB. Smoking and mortality among women with type 2 diabetes: the Nurses' Health Study Cohort. *Diabetes Care* 2001;24:2043-8.
- [2] Stamler J, Vaccaro O, Neaton J, Wentworth D. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. *Diabetes Care* 1993;16:434-44.
- [3] Sands M, Shetterly S, Franklin G, Hamman R. Incidence of distal symmetric (sensory) neuropathy in NIDDM: the San Luis Diabetes Study. *Diabetes Care* 1997;20:322-9.
- [4] Muhlhauser I, Bender R, Bott U, Jorgens V, Grusser M, Wagener W, et al. Cigarette smoking and progression of retinopathy and nephropathy in type 1 diabetes. *Diabet Med* 1996;13:536-43.
- [5] Nilsson PM, Gudbjörnsdóttir S, Eliasson B, Cederholm J. Smoking is associated with increased HbA1c values and microalbuminuria in patients with diabetes: data from the National Diabetes Register in Sweden. *Diabetes Metab* 2004;30:261-8.
- [6] Haire-Joshu D, Glasgow RE, Tibbs TL. Smoking and diabetes. *Diabetes Care* 1999;22:1987-98.
- [7] Bott U, Jorgens V, Grusser M, Bender R, Muhlhauser I, Berger M. Predictors of glycaemic control in type 1 diabetic patients after participation in an intensified treatment and teaching programme. *Diabet Med* 1994;14:362-71.
- [8] Smoking and diabetes. American Diabetes Association: clinical practice recommendations 2004. *Diabetes Care* 2004;27(suppl 1):S74-5.
- [9] Chaturvedi N, Stevens L, Fuller J. Which features of smoking determine mortality risk in former cigarette smokers with diabetes? The World Health Organisation Multinational Study Group. *Diabetes Care* 1997;20:1266-72.
- [10] Ruggiero L, Rossi JS, Prochaska JO, Glasgow RE, de Groot M, Dryfoos JM, et al. Smoking and diabetes: readiness for change and provider advice. *Addict Behav* 1999;24:573-8.
- [11] Canga N, De Irala J, Vara E, Duaso MJ, Ferrer A, Martínez-González MA. Intervention study for smoking cessation in diabetic patients. *Diabetes Care* 2000;23:1455-60.
- [12] Ford ES, Mokdad AH, Gregg EW. Trends in cigarette smoking among US adults with diabetes: findings from the Behavioral Risk Factor Surveillance System. *Prev Med* 2004;39:1238-42.
- [13] Solberg LI, Desai JR, O'Connor PJ, Bishop DB, Devlin HM. Diabetic patients who smoke: are they different? *Ann Fam Med* 2004;2:26-32.
- [14] Prochaska JO, Di Clemente CC. Stages and processes of self-change of smoking: toward and integrative model of change. *J Consult Clin Psychol* 1983;51:390-5.
- [15] Fernández de Mendiola Espino J, Iza Padilla A, Lasa Beitia I, Ibáñez Pérez F, Aguirrezabala Jara JR, Aizpuru Barandiaran M, et al. Evaluación de la población diabética tipo II atendida en un equipo de atención primaria. *Aten Primaria* 1996;17:432-6.
- [16] García Mayor R, Benito López P, Faure E, Pallardo LF, Puig-Domingo M, Ravella R, et al. Cardiovascular risk factors in type 2 diabetic patients in Spain. *Av Diabetol* 2003;19:161-5.
- [17] Dades de consum de tabac a Catalunya. ESCA 2006. Població general. Available from <http://www.gencat.net/salut/depsan/units/sanitat/pdf/dadestabac07.pdf> [Access 23/08/07].
- [18] Velicer WF, Fava JL, Prochaska JO, Abrams DB, Emmons KM, Pierce JP. Distribution of smokers by stage in three representative samples. *Prev Med* 1995;24:401-11.
- [19] Wakefield M, Roberts L, Rosenfeld E. Prospects for smoking cessation among people with insulin-dependent diabetes. *Patient Educ Couns* 1998;34:257-66.
- [20] Iino K, Iwase M, Tsutsu N, Iida M. Smoking cessation and glycemic control in type 2 diabetic patients. *Diabetes Obes Metab* 2004;6:181-6.
- [21] Ardrin M, MacFarlane IA, Robinson C, van Heyningen C, Calverley PM. Anti-smoking advice for young diabetic smokers: is it a waste of breath? *Diabet Med* 1988;5:667-70.
- [22] Sawicki PT, Didjurgeit U, Muhlhauser I, Berger M. Behaviour therapy versus doctor's anti-smoking advice in diabetic patients. *J Intern Med* 1993;306:407-9.
- [23] Hokanson JM, Anderson RL, Hennrikus DJ, Lando HA, Kendall DM. Integrated tobacco cessation counselling in a diabetes self-management training program. *Diabetes Educ* 2006;32:562-70.
- [24] Persson LG, Hjalmarson A. Smoking cessation in patients with diabetes mellitus: results from a controlled study of an intervention programme in primary healthcare in Sweden. *Scand J Prim Health Care* 2006;24:75-80.
- [25] Gill GV, Morgan C, MacFarlane IA. Awareness and use of smoking cessation treatments among diabetic patients. *Diabet Med* 2005;22:658-60.
- [26] Prochaska JO. Why do we behave the way we do? *Can J Cardiol* 1996;11:20A-5A.
- [27] Jones H, Edwards L, Vallis TM, Ruggiero L, Rossi SR, Rossi JS, et al. Changes in diabetes self-care behaviors make a difference in glycemic control. *Diabetes Care* 2003;26:732-7.
- [28] Kirkman MS, Weinberger M, Landsman PB, Samsa GP, Shortliffe EA, Simel DL, Feussner JR. A telephone-delivered intervention for patients with NIDDM. Effect on coronary risk factors. *Diabetes Care* 1994;17:840-6.
- [29] Yudkin JS. How can we best prolong life? Benefits of coronary factor reduction in non-diabetic and diabetic subjects. *BMJ* 1993;306:1313-8.