Diabetic Patients Who Smoke: Are They Different?

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ABSTRACT

BACKGROUND We wanted to identify differences between diabetic patients who smoke and those who do not smoke to design more effective strategies to improve their diabetes care and encourage smoking cessation.

METHODS A random sample of adult health plan members with diabetes were mailed a survey questionnaire, with telephone follow-up, asking about their attitudes and behaviors regarding diabetes care and smoking. Among the 1,352 respondents (response rate 82.4%), we found 188 current smokers whose answers we compared with those of 1,264 nonsmokers, with statistical adjustment for demographic characteristics and duration of diabetes.

RESULTS Smokers with diabetes were more likely to report fair or poor health (odds ratio [OR] = 1.5, P = .03) and often feeling depressed (OR = 1.7, P = .004). Relative to nonsmokers, smokers had lower rates of checking blood glucose levels, were less physically active, and had fewer diabetes care visits, glycated hemoglobin (A_{1c}) tests, foot examinations, eye examinations, and dental checkups ($P \leq .01$). Smokers also reported receiving and desiring less support from family and friends for specific diabetic self-management activities and had lower readiness to quit smoking than has been observed in other population groups.

CONCLUSIONS Clinicians should be aware that diabetic patients who smoke are more likely to report often feeling depressed and, even after adjusting for depression, are less likely to be active in self-care or to comply with diabetes care recommendations. Diabetic patients who smoke are special clinical challenges and are likely to require more creative and consistent clinical interventions and support.

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INTRODUCTION

Smoking has long been known to worsen the prognosis of patients with diabetes. Mulhauser's literature review in 1990[1] concluded that the frequency of smoking in adults with diabetes was comparable to that in the general population and that smoking is a major risk factor for both macrovascular and microvascular complications. Subsequent systematic reviews have strengthened these conclusions while adding evidence that smoking increases insulin resistance, worsens diabetes control, and may even induce the disease.[2,3] Many cross-sectional and prospective studies of patients who have diabetes also show that cardiovascular and all-cause mortality is higher in those who smoke than in those who do not smoke.[4-7] Thus, the 1 in 5 persons with diabetes who also smoke represent a particularly important target for intervention, both by clinicians and by policy makers in health plans and public health.

Despite this information, and despite strong evidence that clinician support of smoking cessation is effective for smokers among the general population and those with diabetes,[8-10] only 58% of patients with diabetes who smoke reported that a physician had ever advised them to stop or cut down on their smoking.[11] Recently, the American Diabetes Associa-

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tion noted that "smoking cessation has not received the priority it deserves from health care providers" and recommended that identification of smoking status and systematic cessation support "should be incorporated into the routine practice of diabetes care."[12]

In the past, many diabetes care specialists and some professional organizations have concentrated largely on glucose-oriented diabetes care strategies.[13] Recent evidence shows that cardiovascular disease risk management might be more important than tight glycemic control in reducing morbidity and mortality in patients with diabetes.[14-17] These new data, however, have only recently received strong emphasis in the general medical literature.[18,19] Enthusiasm for smoking cessation as an important diabetes care component has also been constrained by the assumption that smokers who have diabetes are less interested in quitting than those who do not have diabetes and that smoking reflects their lack of interest in health promotion, prevention, and self-care strategies.[20] Providers who sense this attitude might avoid addressing smoking, finding it difficult enough to deal with other aspects of diabetes care. Because it has been shown that smokers who have diabetes are much more likely to be in a precontemplation stage for quitting and are also more likely to have depression, such reduced interest in their health seems likely.[21,22]

We report a cross-sectional analysis of adult health plan members with diabetes that compares self-reports of health attitudes and diabetes care behaviors between smokers and nonsmokers. We hypothesized that diabetic respondents who smoked would have worse glycemic control and less interest in self-care or support from others for all aspects of their diabetes care.

METHODS

This study was conducted at HealthPartners, a Minnesota health plan that provided care to about 700,000 members in 1996. All aspects of the study methods were reviewed and approved (after modifications) by the Institutional Review Board. We used a previously validated method with estimated sensitivity of 0.91 and positive predictive value of 0.94 to identify adult health plan members with diabetes.[23] From this pool of about 14,000 adult members with diabetes, we drew a random sample of 1,828 study subjects, one half from those receiving care in the HealthPartners Medical Group and one half from those receiving care from any of 50 contracted private medical groups.

We constructed a 16-page, 116-item questionnaire of attitudes and behaviors related to diabetes care, building it largely from questions in other validated and reliable surveys. We pretested the questionnaire, modified it, and sent to the study sample, using a variation of the Dillman Total Design Method with telephone follow-up.[24] Completed questionnaires were received from 1,565 members for a response rate of 85.6%. Only 1,352 respondents (74.0%), however, answered all of the questions required for this analysis. A comparison of the 213 incomplete questionnaires with the 1,352 completed ones for the questions that allowed comparison showed that the 213 respondents who returned incomplete questionnaires had the same rate of smoking (13.9% vs 13.3%, $P = .81$) and were similar on most other questions. These 213 respondents tended to be somewhat older, less educated, even more likely to report often feeling depressed, and less likely to have had at least 1 diabetes visit and 1 glycated hemoglobin (A_{1c}) test in the past year.

About 12% of all respondents reported onset of diabetes before the age of 30 years and treatment exclusively with insulin. Thus, at least 88% of the respondents were likely to have type-2 diabetes. Patients with type 1 and type 2 diabetes were pooled for analysis because it is difficult to distinguish these groups from their responses to a survey and because key clinical recommendations, such as goals for A_{1c}, low-density lipoprotein cholesterol, and blood pressure treatment, are the same for all patients.[25]

For a subgroup of 602 patients who received care from HealthPartners Medical Group, we were also able to obtain A_{1c} values during the year before and after the survey. These patients had all A_{1c} laboratory tests done at a single accredited clinical chemistry laboratory using a standard liquid chromatographic method with a normal range of 4.5% to 6.1% and a coefficient of variation of 0.58% at an A_{1c} value of 8.8%.[26] Where multiple results were present for 1 patient, the result closest in time to the survey was used.

We first compared 3 groups for the characteristics and behaviors of interest: current smokers, former smokers, and never smokers. Age and age-related measures, such as diabetes duration and comorbidities, were the primary differences between former smokers and never smokers. These 2 groups were similar for most other measures of interest. Because, in a busy practice, clinicians are likely to know only whether a patient is a current smoker, and because our analyses adjusted for age and duration of diabetes, we combined former and never smokers for these analyses and compared the responses of these 2 groups (current smokers vs never or former smokers) on questions and scales relevant to the hypotheses using chi square and the *t* test.

We then constructed multivariate linear regression models and logistic regression models to control for differences between the groups in variables believed likely to affect the responses. These factors were age, sex, race, education, marital status, duration of diabe-

Table 1. Demographic Characteristics of Respondents by Smoking Status (N = 1,352)

Characteristic	Smokers (n = 188)	Nonsmokers (n = 1,164)	*P* Value
Mean age (y)	52.6 ± 12.6	58.4 ± 14.8	<.001
Male, %	48.4	51.2	.48
White, %	90.4	91.0	.81
Education ≥ high school, %	56.9	64.1	.059
Married, %	67.6	71.5	.27
Employed for wages, %	59.0	43.9	<.001

tes, insulin use, type of medical group (owned vs contracted), and method of response to the survey (mail vs telephone). Each survey response item was treated as the dependent variable, and the covariates above were entered in the regression analysis along with smoking status. The adjusted coefficient and odds ratio for smoking status was interpreted for each variable reported in the results tables. Finally, because many of the findings could have been caused by depression, we tested whether the proportion who agreed or strongly agreed with the question, "I often feel sad or depressed," affected the significant differences found between smokers and nonsmokers.

RESULTS

Smokers made up 13.9% of the respondents to this survey of patients with diabetes. Their demographic characteristics are compared with those of the nonsmokers in Table 1. Smokers and nonsmokers were demographically similar except that smokers were significantly younger and more likely to be employed. Table 2 shows that smokers also had diabetes diagnosed at a younger age. Among the subgroup of 602 with A_{1c} values, the proportion with A_{1c} < 7% or > 9.5% was similar for smokers and nonsmokers, although there were only 24 and 18 smokers, respectively, in these groups. The same proportion of each group (55% to 60%) also reported that their diabetes had been well controlled for the past 6 months. When adjusted for other characteristics, smokers were 50% more likely to report being in fair or poor health and were even more likely to report often feeling depressed or having mental health visits in the last year. On the other hand, smokers were somewhat less likely to report being obese or having hypertension.

Only 20.2% of current smokers were in the preparation stage of readiness to quit smoking (considering quitting in the next 30 days), while 28.7% were in the contemplation stage (considering quitting in the next 1 to 6 months) and 51.1% were in precontemplation (no interest in quitting). Readiness stage was not significantly associated with any of the demographic characteristics of smokers except that those with less interest in quitting had diabetes diagnosed with at older ages. Approximately 85% reported that a health professional had cautioned them about the added risk of smoking with diabetes, and the same percentage recalled receiving advice about smoking. Smokers in the preparation stage for quitting were no more likely to report either type of advice than were those in contemplation or precontemplation stages. Overall, 56% of the smokers smoked at least 1 pack a day, and 24% reported smoking their first cigarette within 5 minutes of awakening in the morning. Nevertheless, 77% reported a quit attempt in the past year, and 26% reported a quit attempt that lasted more than a week.

Table 3 compares diabetes self-care behaviors reported by smokers and nonsmokers. Smokers were

Table 2. Health Characteristics of Respondents by Smoking Status

Characteristic	Smokers (n = 188)	Nonsmokers (n = 1,164)	*P* value	Adjusted OR* (95% CI)	Adjusted *P* Value*
Mean age at diagnosis (y)	42.8 ± 15.9	47.6 ± 17.8	<.001		
Duration of diabetes (y)	9.7 ± 9.7	10.8 ± 9.9	.18		
Use insulin, %	49.5	46.1	.40		
Latest A_{1c} (n = 602)	8.3 (8.7*)	8.3 (8.9*)	.92		<.001
Fair or poor health, %	30.3	26.2		1.47 (1.03-2.10)	.033
Obese by BMI, %	38.0	41.5		0.68 (0.47-0.97)	.047
Diagnosed heart trouble, %	15.4	26.8		0.68 (0.44-1.07)	.093
Diagnosed hypertension, %	42.0	53.7		0.68 (0.49-0.95)	.024
Diagnosed high cholesterol, %	36.7	37.7		0.94 (0.68-1.31)	.72
Often feels depressed, %	27.7	17.2		1.72 (1.18-2.47)	.004
Mental health visit(s) in last year, %	19.2	10.5		1.72 (0.94-3.15)	.078

OR = odds ratio, CI = confidence interval, BMI = body mass index.

*Adjusted for age, sex, race, education, marital status, duration of diabetes, and type of survey, diabetes, and clinic.

Table 3. Reported Self-management by Smoking Status (N = 1,352)

Self-Management	Smokers	Nonsmokers	*P* Value	Adjusted OR* (95% CI)	Adjusted *P* Value*
Check blood glucose 2+/wk, %	59.0	67.2	.03	0.66 (0.47-0.91)	.013
Check feet ≥1/wk, %	67.0	67.4	.93	1.02 (0.73-1.43)	.92
Follow special diet, %	47.3	54.0	.09	0.82 (0.59-1.12)	.21
Cheat on diet weekly, %	65.2	71.5	.22	0.63 (0.38-1.03)	.066
Will start special diet in next month, %	15.2	15.3	.96	0.79 (0.42-1.49)	.47
Take ASA ≥ 3/wk, %	27.7	30.2	.47	1.28 (0.89-1.86)	.19
Always/usually takes diabetes medication as directed, %	76.6	81.8	.09	0.77 (0.52-1.15)	.20
Physical activity (d/wk)	4.6 ± 2.4 (4.4*)	4.9 ± 2.4 (4.9*)	.07		<.001
Will increase physical activity in next month, %	42.6	44.1	.70	0.88 (0.64-1.22)	.44
Strongly feels able to do the things needed for control, %	20.8	23.8	.37	0.85 (0.57-1.26)	.41
Doctor often asks take some responsibility for treatment, %	35.6	27.2	.02	1.36 (0.97-1.92)	.076

OR = odds ratio, CI = confidence interval, ASA = aminosalicylic acid.

* Adjusted for age, sex, race, education, marital status, duration of diabetes, and type of survey, diabetes, and clinic.

significantly less likely to check their blood glucose levels more than once a week or to engage in daily physical activity, but were similar to nonsmokers on other measures of diabetes self-care. Table 4 evaluates use of services. Smokers with diabetes reported fewer medical visits, foot checks, eye examinations, and dental checkups. They also were significantly less likely to report having a regular diabetes care provider.

Table 5 shows that smokers were generally less likely to report strong support from their family and friends for specific aspects of diabetes self-care, although they also appeared to be less interested in that support. Smokers, however, were just as likely to report having an emotional bond with at least 1 other person, having someone they can talk to about important decisions or count on in an emergency, or someone who depends on them for help (data not shown). Despite being more likely to report often feeling sad or depressed, current smokers were no more likely than nonsmokers to blame diabetes for feeling life is difficult (18.6% vs 16.8%), for feeling unhappy or depressed (11.7% vs 8.3%), for feeling dissatisfied with life (9.6% vs 7.1%), or for feeling not as good as others (6.4% vs 7.9%). Also, controlling for reported frequent sad or depressed feelings had no effect on any of the above significant differences between smokers and nonsmokers.

DISCUSSION

These findings support the hypothesis that smokers with diabetes tend to be less actively involved in their diabetes care than are nonsmokers. After adjusting for demographic factors, diabetes patients who smoke were less likely to check their blood glucose levels frequently, exercise regularly, or receive a variety of medical services designed to improve diabetes care and prevent complications. Smokers appear to feel less support from family and friends, but they also have less interest in such support. In addition, they are less likely to report a regular diabetes care provider. In previous studies,[27] having a regular provider of care has been a predictor of better diabetes care.

Compared with smokers without diabetes in the same population of patients, these smokers with diabetes were less interested in quitting. For example, a recent survey of smokers in the health plan used for this study found 26% of all adult smokers to be in preparation and only 30% in precontemplation (unpublished observations). This picture is also compatible with the relatively lower levels of readiness to quit smoking among these smokers with diabetes. Even so, the smokers with diabetes in this study were more ready to change than those in the study reported by Ruggiero et al[21]: 20% vs 7% in preparation and 51% vs 58% in precontemplation.

Smokers with diabetes in this study were 60% more likely to report that they "often feel sad or depressed" compared with nonsmokers with diabetes, even after adjustment for relevant variables. Thus, it may be tempting to ascribe most of the differences noted above to depression, because it is well documented that both those with diabetes and smokers in general are more likely to report depression, and that smokers who are depressed have more difficulty quitting.[28-32] Our question, however, is not a validated way to identify clinical depression. Unlike Ciechanowski et al,[33] who found depression severity was associated with poorer adherence to diabetic regimens, we could find no clear relationship between these reports of often feeling depressed and either diabetes self-care practices or

Table 4. Reported Medical Care by Smoking Status (N = 1352)

Self-Management	Smokers	Nonsmokers	*P* Value	Adjusted OR* (95% CI)	Adjusted *P* Value*
Visits per year for diabetes care, No.	2.5 ± 1.7 (2.7*)	2.8 ± 1.6 (3.0*)	.02		<.001
At least 1 diabetes visit in 1 y, %	87.2%	91.9%	.035	0.51 (0.31-0.83)	.008
HbA_{1c} tests in past year, No.	2.0 ± 1.5 (2.0*)	2.2 ± 1.6 (2.3*)	.09		.004
At least 1 HbA_{1c} test in 1 y, %	80.8%	83.8%	.32	0.66 (0.44-1.01)	.053
At least 1 foot check in 1 y, %	54.8%	65.0%	.007	0.69 (0.50-0.96)	.03
Dilated eye examination in 1 y, %	51.6%	63.8%	.001	0.66 (0.48-0.91)	.01
Routine check-up in 1 y, %	79.8%	85.3%	.05	0.75 (0.50-1.12)	.16
Cholesterol check in 1 y, %	72.3%	76.5%	.22	0.78 (0.55-1.11)	.17
Influenza shot in 1 y, %	57.4%	65.2%	.04	0.95 (0.67-1.32)	.74
Pneumonia shot ever, %	14.9%	22.8%	.014	0.79 (0.51-1.24)	.31
Dental check-up in 1 y, %	59.0%	70.5%	.002	0.59 (0.43-0.83)	.002
1 physician or nurse who takes care of diabetes, %	82.5%	89.8%	.003	0.58 (0.38-0.90)	.015

OR = odds ratio, CI = confidence interval.

* Adjusted for age, sex, race, education, marital status, duration of diabetes, and type of survey, diabetes, and clinic.

Table 5. Social Support by Smoking Status (N = 1,352)

Help and Support	Smokers (%)	Nonsmokers (%)	*P* Value	Adjusted OR* (95% CI)	Adjusted *P* Value*
Excellent care from health professionals	32.5	36.4	.29	0.90 (0.64-1.26)	.54
Family, friends support me					
Following diet	32.5	41.3	.021	0.68 (0.48-0.96)	.028
Taking medicine	31.9	40.0	.034	0.67 (1.06-2.10)	.022
Caring for feet	22.3	27.3	.152	0.87 (0.59-1.27)	.046
Physical activity	25.5	36.9	.003	0.58 (0.40-0.83)	.003
Testing blood sugar	28.2	33.7	.138	0.76 (0.54-1.08)	.130
Feelings about diabetes	30.3	37.4	.062	0.68 (0.48-0.96)	.027
I want family and friend support for					
Following diet	27.1	34.0	.062	0.63 (0.44-0.90)	.012
Taking medicine	16.5	23.0	.045	0.62 (0.41-0.95)	.029
Caring for feet	16.5	19.6	.320	0.82 (0.54-1.26)	.37
Physical activity	26.1	36.3	.006	0.53 (0.37-0.75)	<.001
Testing blood sugar	20.7	24.0	.330	0.74 (0.50-1.09)	.13
Feelings about diabetes	27.7	33.2	.130	0.62 (0.43-0.88)	.008
I feel an emotional bond with at least 1 person (agree/strongly agree)	85.1	82.7	.40	1.12 (0.71-1.76)	.63

OR = odds ratio, CI = confidence interval.

* Adjusted for age, sex, race, education, marital status, duration of diabetes, and type of survey, diabetes, and clinic.

physical activity levels. Even the greater than usual proportion of smokers in precontemplation was not related to self-reported depression, suggesting that other characteristics of smokers might make them more resistant to managing both smoking and diabetes.

These findings are limited in that they are based on a relatively small group of smokers who responded to the survey and who are also health plan members in Minnesota. As such, they are primarily white, middle class, and already subject to a variety of tobacco reduction efforts from multiple sources. In addition, these findings are based almost entirely on self-report with its potential for bias. Although the response rate of completed questionnaires was fairly high (74%), questions might be raised about whether nonresponders or the 213 who responded but did not complete the questionnaire were different from those analyzed. There are some data about nonresponders in these same clinic settings to suggest that they are more likely to be smokers but are otherwise similar to responders in most characteristics and in all measures of physician care for a variety of cardiovascular risk factors.[34] The smoking rate among the 213 incomplete responders was identical to that of the complete responders, as were most

of the frequencies that could be compared. Finally, the questionnaire did not include questions about the frequency and details of physician support for smoking cessation that would have clarified the extent to which the tobacco guideline was being followed.

Despite those limitations, these results suggest several clinical strategies that may help diabetes patients who smoke reduce serious risks of morbidity and mortality. First, clinicians can expect to find depression frequently in smokers and should be prepared to treat depression aggressively when it is identified. Preliminary studies suggest that antidepressant treatment of diabetes patients with depression might improve their glycemic control along with their depression.[35]

Second, regardless of whether depression is present, clinicians can expect a greater likelihood that smokers will be nonadherent to management and prevention, so creativity and close follow-up will be especially important for these patients. For example, these patients might need care management by nurses working in conjunction with their physicians, active follow-up if they do not appear for recommended visits or tests, and more aggressive efforts to manage all cardiovascular risk factors.

Finally, both clinicians and patients should realize that smoking cessation is 1 of the 2 most important ways to reduce macrovascular complications in patients with diabetes, the other being hypertension control. It is especially important that clinicians apply the recommendations of the US Public Health Service clinical guideline for treating tobacco use by consistently using the 5 As: ask, assess, advise, assist, and arrange.[8] Strong evidence supports a strategy that includes a brief nonconfrontational discussion of smoking cessation at nearly every clinical encounter and, because so many of these smokers are not ready to quit, applying a brief, stage-matched intervention designed to move the smoker to the next readiness stage.[36,37]

Although 85% of smoking respondents did report receiving advice about smoking from a health professional at some time in their lives, it is unlikely that many received recommended assistance and follow-up arrangements unless their experience is quite different from that of smokers reported in the literature.[38-40] The guideline also implies that before providing advice to quit, it is very important to assess the patient's readiness to quit, and a lack of plans to do so within the next 6 months defines the precontemplator. Such smokers tend to overestimate the problems of quitting and underestimate the benefits, so the clinician should help them to think about what will be better if they quit and how there are now many aids to quitting. Moving such a smoker to the contemplation stage (readiness to quit within the next 6 months) should be seen as a success, because it doubles the chance of quitting in that time frame.[41] In addition to such clinical cessation support, it is likely that extra support is needed from health plans and medical groups, and the high costs of caring for the cardiovascular complications of diabetes suggest that such cessation support will be particularly cost-effective for those organizations bearing any financial risk.[19]

It is time to take smoking more seriously in our approach to patients with diabetes. Although it is important to improve glycemic control and to screen for microvascular complications, it may be even more important to identify major macrovascular risk factors and work with the patient and family to control them. Because of low readiness to change, smoking cessation may be difficult to achieve, but use of stage-based approaches, consistent and frequent support and follow-up, and liberal use of medications should increase success rates. The key is to make smoking cessation one of the highest priorities in diabetes control.

These data suggest that diabetes patients who smoke are more likely to report often feeling sad or depressed; but even after adjusting for this factor, they are less likely to be active in self-management or to comply with diabetes care recommendations. Thus, diabetic patients who smoke are special clinical challenges and are likely to require more creative and consistent interventions and support.

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