Dentists' attitudes and practices related to diabetes in the dental setting[1]

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Abstract

Objective: The objective of this study was to determine general dentists' attitudes and practices related to patients with diabetes, a major public health issue with oral complications.
Methods: This study was a cross-sectional survey of 265 randomly selected general dentists who were Delta Dental providers in California, West Virginia, and Pennsylvania.
Results: Sixty-one percent of respondents believed that addressing diabetes was important to their role as a dentist, 86 percent advised patients with diabetes about periodontal risks, 18 percent provided diabetic-related services, 47 percent reported they knew how to assess for diabetes, and 42 percent felt well prepared to intervene with patients with diabetes. Adjusting for number of patients with diabetes and adult patients seen in the past month, dentists' formal training in diabetes assessment and management [odds ratio (OR) = 4.0, $P = 0.000$, confidence interval (CI) = 1.9, 8.5], and belief in the importance of their role as a dentist to intervene with patients with diabetes (OR = 1.6, $P = 0.011$, CI = 1.1, 2.3) were both significant factors in providing services for patients with diabetes. Similarly, dentists' formal training (OR = 3.0, $P = 0.02$, CI = 1.2, 7.3) and belief in the importance of their role (OR = 1.9, $P = 0.00$, CI = 1.3, 2.6) were both significant factors in advising patients with diabetes about periodontal risk associated with diabetes.
Conclusions: Formal training and personal beliefs are important factors related to dentists' behavior toward patients with diabetes in the dental setting.

Introduction

The 2007 prevalence data estimate that nearly 8 percent of the US population has diabetes (1). In 2006, among the 20.8 million individuals with diabetes in the United States, almost one-third (6.2 million) was estimated to be undiagnosed and unaware of their condition (2). Uncontrolled diabetes has many systemic complications, and in the United States, diabetes currently is the sixth leading cause of death. The United States spends about $132 billion annually, which includes $92 billion in diabetes-related direct medical costs and another $40 billion in indirect costs because of missed workdays or other productivity losses (2).

[1] The preliminary results of this project were presented as a poster at the University of California, San Francisco School of Dentistry by the authors in fall of 2006.

Compromised oral health is one of the many complications of poorly controlled or uncontrolled diabetes . Such oral complications include periodontal disease, fungal infections, xerostomia, oral ulcers, and many others (3). Based on the Centers for Disease Control estimates, young adults with diabetes have about twice the risk of periodontal disease than young adults with no diabetes, and almost one-third of people with diabetes have severe periodontal disease (1). Moreover, there is evidence to support a bidirectional relationship between diabetes and periodontal disease. That is to say that poor glycemic control contributes to poor periodontal health, and periodontal infection contributes to poor glycemic control in patients with diabetes (4). A study based on an analysis of Third National Health and Nutrition Examination Survey data shows that the prevalence of diabetes in patients with periodontitis is double than that seen in non-periodontitis patients (12.5 percent versus 6.3 percent) (5).

During recent years, concerns have been raised about the need to address the relationship between general health and oral health in the dental setting (6,7). In 2005, the CDC called for an increase of oral health awareness and oral health care of patients with diabetes at a state and national level (8). One study in the northeastern states found that the majority of general dentists surveyed lacked knowledge about diabetes, and believed that activities related to management of patients with diabetes in the dental setting are peripheral to their role and that their patients and colleagues did not expect them to perform those activities (9). Considering that approximately a third of patients with diabetes are undiagnosed, and that 58–62 percent of US adults (percentage differs based on age group) visit a dentist annually (10), dentists are well positioned to detect undiagnosed patients with diabetes early by recognizing oral manifestation of diabetes and referring suspected undiagnosed patients to a physician for further diagnostic workup. Our study's purpose was to assess among general dentists in California (CA), Pennsylvania (PA), and West Virginia (WV), attitudes and behaviors related to their dental patients who have, or who are suspected of having, diabetes.

Methods

Study design, sample selection, recruitment, and informed consent

This study is a secondary data analysis of findings from a cross-sectional survey of general dentists who were Delta Dental providers from 2004 to 2006 in CA, PA, and WV. This study was approved by the Committees on Human Research at the University of California both at the San Francisco and Berkeley campuses.

Although the overall questionnaire assessed general dentists' self-reported attitudes and practices related to the assessment and management of tobacco use, high caries risk, periodontal disease, and diabetes, the current study analyzed only the diabetes-related responses.

Delta Dental, the largest dental insurer in the nation (11), provided researchers with a list of 2,174 randomly selected Delta Dental general dentists in CA, PA, and WV. All of these dentists were recruited for study participation, and 271 (12 percent) agreed to participate. Subsequently, a survey along with an informed consent, cover letter, and a return-addressed stamped envelope were mailed to these dentists, and 265 (98 percent) returned the survey. Among the respondents, 42 percent were from CA, 35 percent were from PA, and 23 percent were from WV. The cover letter explained the study's purpose, methods, risks, potential benefits, alternates, costs, and voluntary nature. It also provided information regarding the confidentiality of the responses. Return of a completed questionnaire indicated informed consent. Data were coded without personal identifiers and entered into password-protected computer files. Questionnaire hard copies were kept securely in a locked file.

Questionnaire development

Prior to finalizing the questionnaire, it was pilot tested among a convenience sample of 20 practicing dentists (11 females, 9 males) in the eastern and South Bay areas of Northern CA. Upon completion of the pilot questionnaire, each practitioner was interviewed to gain feedback on the overall acceptability of the questionnaire in terms of length, language clarity, and time, and on the feasibility of dentists completing and returning it. Based on this feedback, we refined or eliminated some of the questionnaire items.

Description of diabetes-related questionnaire items

Twenty-five items of the survey addressed dentists' attitudes and behaviors related to diabetes assessment and intervention. These items assessed demographics; diabetic status of the dentist; practice characteristics and importance of intervening with patients with diabetes as part of the dentist's role, with five levels of response options ranging from "very unimportant" to "very important"; frequency of performing five specific diabetes-related assessment and intervention behaviors, with four response levels ranging from "almost always" to "almost never"; resources to learn about blood glucose measurement (BGM); potential barriers to providing BGM, with five levels ranging from "not a barrier" to "a strong barrier"; and one item each to assess perceptions about knowing how to assess for diabetes, feeling quite effective to address diabetes, and having sufficient knowledge of related pharmaceutical products, with five response levels ranging from "strongly disagree" to "strongly agree."

The questionnaire also asked questions related to formal training in diabetes assessment and management (i.e., dental school course/lecture or continuing dental education) (Yes/No), and the effect of third-party reimbursement on frequency of performance of a diabetes-related behavior.

Data analyses

Data were first entered into the Epi-Info data management software (Centers for Disease Control, Atlanta, GA, USA). Data were then converted to Excel, and finally to STATA 8.0 format (StataCorp LP, College Station, TX , USA). Most of the response options on the survey were in ordered categories on a 1–5 scale. In STATA 8.0, the ordered categories were re-coded and dichotomized, and the missing data were identified and coded as missing. The process of dichotomization was based on the background information on the subject

Table 1 Dentists' Sociodemographic and Practice Characteristics

Characteristics	% (*n*)
Average years in practice was 15+ years	74 (195)
Full-time practice (≥30 hours/week)	95 (250)
Average number of adult patients seen in the past month was 200+	53 (139)
Average number of adult patients with diabetes seen in the past month was 10+	48 (125)
Demographics	
Gender	Female: 14 (38), Male: 86 (226)
Ethnicity	Hispanic: 3 (7)
	Non-Hispanic: 97 (256)
Race	White/Caucasian: 80 (209)
	Black/African-American: 5 (12)
	American Indian/Alaska Native: 0.8 (2)
	Asian: 10 (26)
	Native Hawaiian/Other Pacific Islander: 0.4 (1)
	Other: 3.8 (11)
Dentists who are diabetic	5 (14)
Dentists who had formal training related to diabetes	43 (109)

matter, and the structure and type of questions. Data analysis included descriptive statistics, and bivariate and multivariate logistic regression. Bivariate analysis examined the association between dentists' perceptions related to diabetes assessment, and intervention and formal training. Two outcomes of "providing services" and "advising patients with diabetes about periodontal risks" were used separately for multivariable logistic regression models. That is to say, the predictors entered into model no. 1 were "formal training," "importance of dentist's role," "number of patients with diabetes in the past month," and "number of adult patients in the past month," and the outcome was "providing services for patients with diabetes." Model no. 2 had the same predictors as model no. 1, but the outcome was "advising patients with diabetes about periodontal risks."

Results

There were no statistically significant differences in findings among the geographic locations and responses. Characteristics of the study sample are shown in Table 1. Most of the dentists were white males practicing full-time for at least 15 years. Only 5 percent of dentists reported that they were diabetic. Interestingly, less than half (43 percent) of respondents reported they had formal training in intervening with dental patients regarding diabetes.

Attitudes

Figure 1 shows dentists' perceptions about their "knowing how to assess patients for diabetes"; "feeling prepared to

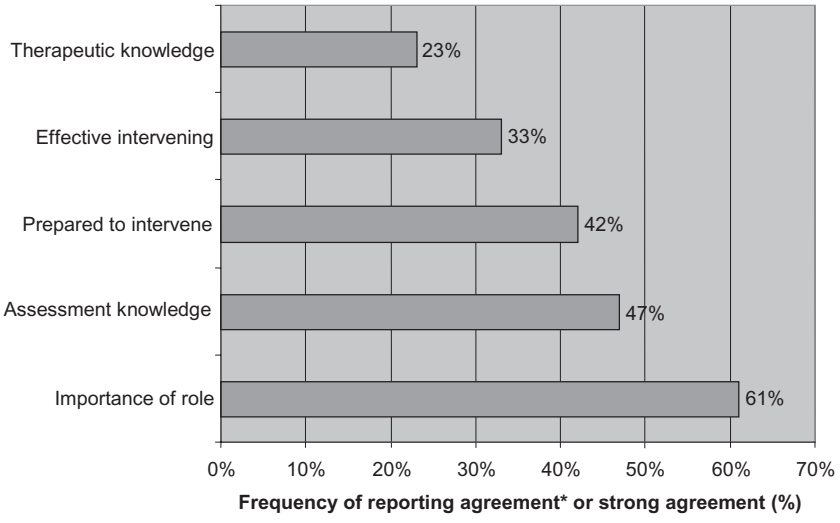

Figure 1 Frequency of dentists' self-reported attitudes related to diabetes assessment and intervention. *Agreement or strong agreement was scored as 4 or 5 on a 1-5 scale.

Table 2 Bivariate Logistic Regression Results Showing Formal Training as a Significant Predictor of Dentists' Perceptions Related to Diabetes Assessment of Intervention

Outcome variables	Predictor variables	*n**	Odds ratio	Confidence interval	*P*-value
Perception of knowing how to assess diabetes	Formal training	254	2.3	(1.26, 4.11)	0.007
Feeling well prepared to intervene with patients to address diabetes	Formal training	256	3.21	(1.91, 5.39)	0.000
Perception of having appropriate knowledge of pharmaceutical products	Formal training	256	2.57	(1.54, 4.27)	0.000
Feeling effective to intervene with patients to address diabetes	Formal training	257	3.86	(2.23, 6.69)	0.000

* *n* varies because of missing variables.

intervene" and "feeling effective to intervene" with patients to address their diabetes; "feeling knowledgeable about therapeutic products"; and feeling that intervening with patients to address diabetes was important to their role as a dentist. Less than half of responders felt they knew how to assess patients for diabetes, and felt prepared and effective to intervene with patients on this issue. Less than a quarter felt they had sufficient knowledge of the appropriate pharmaceutical products related to patients with diabetes. More than half of respondents believed that intervening with patients with diabetes was an important or very important part of their role as a dentist.

Table 2 shows the association between dentists' perceptions related to diabetes assessment and intervention, and formal training. We found that compared with those that did not have formal training, those who had formal training were more likely to feel that they knew how to assess for diabetes, to feel well prepared and effective to intervene, and to feel that they had appropriate knowledge about related pharmaceutical products.

Table 3 shows that dentists who had formal training were four times more likely to provide services to address diabetes than those who did not have formal training. In addition, those who believed their role was important in addressing diabetes were almost twice as likely to provide services than those who did not believe their role was important. Table 4 shows that dentists who had formal training in intervening with patients with diabetes were almost three times more likely to advise a patient with diabetes about diabetes and periodontal risks than dentists who did not have formal training. In addition, those who believed in the importance of their role to address diabetes were almost twice as likely to advise a patient with diabetes about diabetes and periodontal risks.

Figure 2 summarizes the factors perceived by dentists as strong barriers to providing BGM services. Over half (53 percent) reported reimbursement as a strong barrier to performing BGM. Of note, 66 percent reported they would be likely or very likely to perform BGM more often if it was included as a benefit in patients' dental insurance (data not shown in figure).

About (51 percent) of the dentists reported not being exposed to any information about BGM within the past 12 months. Among those who were exposed, the most frequent source of exposure was journal articles (data not shown in figure).

Practices

Ninety-six percent of dentists reported that their health history asks about patients' diabetic condition. Table 5 shows dentists' self-reported practices with regard to managing patients with diabetes. Most of the respondents documented diabetic conditions and advised known patients with diabetes about periodontal risks. However, less than 30 percent

Table 3 Multivariable Regression Model No. 1 Results Showing Significant Predictors of Providing Services for Patients with Diabetes in Dental Settings

Outcome variables*	Predictor variables	Odds ratio	Confidence interval	*P*-value
Providing services for patients with diabetes	Formal training	4.0	(1.9, 8.5)	0.000
Providing services for patients with diabetes	Importance of dentists' role	1.6	(1.1, 2.3)	0.011

* Models were adjusted for the number of patients with diabetes and number of adult patients seen in the past month.

Table 4 Multivariable Regression Model No. 2 Results Showing Significant Predictors of Advising Patients with Diabetes about Periodontal Disease in Dental Settings

Outcome variables*	Predictor variables	Odds ratio	Confidence interval	*P*-value
Advising patients with diabetes about periodontal disease	Formal training	3.0	(1.2, 7.3)	0.02
Advising patients with diabetes about periodontal disease	Importance of dentists' role	1.9	(1.3, 2.6)	0.00

* Models were adjusted for the number of patients with diabetes and number of adult patients seen in the past month.

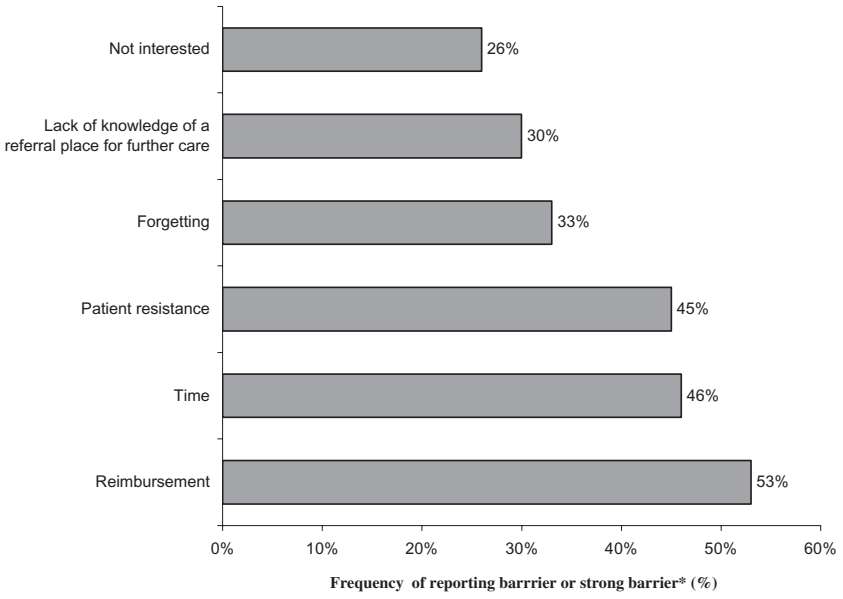

Figure 2 Dentists' perceived barriers to providing services for blood glucose measurement. *Barrier or strong barrier was ranked as 4 or 5 on a 1-5 scale.

provided written educational materials about diabetes and periodontitis, and less than 2 percent performed in-office BGM on patients with diabetes.

Discussion

Over half of the dentists in this study reported that intervening with patients with diabetes was important to their role as a dentist. This finding is encouraging in that the will to participate in addressing this important health issue in the dental setting appears to exist. We also found that belief about importance of diabetes management to the dentist's role was an independent predictor of providing diabetes-related advice about periodontal risks and of providing diabetes-related services. Our finding related to dentists' perceptions of the importance of diabetes management to their role as dentists differs from that reported in 2005 for northeastern states by Kunzel *et al.* (9). Kunzel *et al.* reported that the majority of general dentists surveyed believed that activities related to management of patients with diabetes in the dental setting were peripheral to their role. This apparent inconsistency may be because of the increasing translation of evidence related to the connection between oral health and general health, and specifically, with regard to diabetes and periodontal disease. In 2008, however, Kunzel *et al.* reported that low socioeconomic status (SES) general practice dentists took a more proactive role in managing their patients with diabetes than middle/higher SES general practice dentists. Moreover, they concluded that this finding was important as lower SES general practice dentists see more patients with undiagnosed diabetes in their practice settings (12).

Only a third of dentists, however, felt effective in addressing diabetes with their patients, and less than half believed that they had enough knowledge to assess and intervene with patients with diabetes in the dental setting. These findings may be explained by the fact that our sample of dentists had been out of school for at least 15 years, and less than half of them (43 percent) reported having had formal training in diabetes management in the dental setting.

Table 5 Dentists' Practices with Respect to Diabetes

Practices	% (*n*)
Documenting the diabetic condition*	93 (246)
Performing in-office blood glucose measurement on patients with diabetes*	1.5 (4)
Consulting with a physician for evaluation prior to treatment*	22 (57)
Advising patients with diabetes about periodontal risks*	86 (226)
Providing written educational material about diabetes and periodontitis to patients with diabetes*	27 (70)
Providing services for diabetes†	18 (46)

* Responses were dichotomized. There were four categories of response: "almost never" and "sometimes" were put in one category, while "often" and "almost always" were put in the other category.

† Response: Yes/No.

Indeed, dentists' report of formal training related to diabetes assessment and management was associated with feeling effective to intervene with patients with diabetes (odds ratio = 3.86). Having had formal training also was a significant predictor of both providing services for patients with diabetes and advising patients about diabetes and its periodontal implications. These findings support the premise that formal training helps in developing confidence and feelings of effectiveness.

It is encouraging that the majority of dentists (86 percent) reported that they "often" or "almost always" advise their patients with diabetes about the interrelationship between diabetes and periodontitis. Nevertheless, only 27 percent of responders provided diabetes-related patient educational material in their dental office. Studies have shown that patients with diabetes may be unaware of the oral health complication of diabetes (13). It may be useful for patients to receive written educational material as well as hear the dentist's advice, especially if the dentist spends a limited time discussing the issue.

Use of in-office BGM has been recommended by some for pre-procedural and emergency adjunct monitoring in the dental office (14). The American Diabetes Association, however, recommends fasting blood glucose (FPG) or oral glucose tolerance test (OGTT) as the suitable screening test. In addition, FPG is less costly than OGTT. As dental patients visit their dentists at different times of the day, they are most likely to be in a non-fasting state. Thus, even though 66 percent of dentists reported interest in performing BGM if it was reimbursed, we do not recommend the use of chairside finger-stick devices as a tool for routine screening of suspected diabetic cases. Instead, our recommendation would be to order an FPG for screening purposes and to refer patients who test positive to their physicians for further interpretation of the results and for follow-up medical care.

A limitation of this study is the low participation rate (12 percent) and the failure to include more recent graduates from dental school. Nevertheless, the demographic and practice characteristics of our sample are comparable with those of dentists' samples reported in national surveys (15,16). As our study was based on a larger survey evaluating various aspects of preventive oral health care, the overall low participation rate may not relate to specific lack of interest in diabetes. Moreover, the inclusion of only Delta Dental insurance subscribers may have created selection bias. As almost three quarters of dentists nationally subscribe to Delta Dental (11), however, the affect on generalizability may not be substantial.

Another limitation of our study may be the interpretation of some of the words in the questionnaire. Words such as "intervene" or "assessment" might have been unclear and interpreted slightly different by different dentists. Although we selected the word "intervening" to capture the broad interpretation of behavior ranging from educating patients to referring them to a physician for further medical evaluation, the lack of specificity may have contributed to lack of clarity. Consequently, use of these general terms may have created potential for information bias.

Based on our findings, most dentists in our overall study sample did not feel confident in dealing with patients with diabetes in the dental setting. Formal training, however, made a significant difference in feelings of confidence and dentists' reported behavior. As diabetes is such an important US public health issue, it is very important for both private practice and public health dentists to have the knowledge and skills to identify potentially undiagnosed patients among their dental patients, and refer them for further medical evaluation. Valuable resources for acquiring diabetes-related information for dentists have been published by the American Dental Association (17). The American Diabetic Association Web site also provides information on oral health and diabetes, periodontal disease for patients with diabetes, and information that can be useful to both patients and health-care professionals (18). In addition, an article published in the *Journal of the American Dental Association* in 2009 describes an obesity intervention that targets a pediatric dental population for prevention of obesity-related systemic diseases, such as diabetes, to enhance oral and systemic health (19). These resources help dentists acquire more information about the following: diabetes diagnosis, management, and oral health implications; effects of periodontal disease on glycemic control; importance of early recognition of symptoms in undiagnosed patients with diabetes by dentists; and the importance of patient education, laboratory assessment, and physician referral when indicated.

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Conclusion

Our study showed that dentists' beliefs and training are important factors in their behavior with regard to addressing diabetes, an important public health issue, in the dental setting. Formal training of dentists may result in increasing dentists' involvement in addressing diabetes in the dental setting. Such training may also change the belief system of those dentists who initially do not see their role as important in addressing this issue in a dental setting.

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