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Factors Associated with Additional Time Dental Hygienists Spent on Educating Patients with Diabetes

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Abstract

AIMS—To investigate what dental hygienists' practice characteristics and oral health topics are associated with additional time dental hygienists spent on educating patients with diabetes.

METHODS—A one-page survey was mailed to 2,237 registered dental hygienists in South Carolina. Survey questions focused on perceptions of dental hygienists regarding their oral health preventive education for patients with diabetes. After two follow-up mails, we received 995 usable questionnaires.

RESULTS—Multivariable logistic regression modeling showed dental hygienist respondents who spent additional time educating patients with diabetes about oral health felt they had adequately covered the topics on effects of periodontal disease related to diabetes, effects of uncontrolled diabetes on periodontal disease, and nutrition and dietary counseling. In addition, a higher number of patients with diabetes treated per week, and a shorter recall interval for patients were also associated with more likelihood of respondents spending additional time educating patients with diabetes.

CONCLUSION—Results suggest that the additional time that dental hygienist respondents spent on educating patients with diabetes was related to oral health issues associated with diabetes, not just repetition of routine oral hygiene and plaque control instructions.

Keywords

dental education; preventive dentistry; diabetes mellitus

Introduction

Adults with diabetes are at higher risk of developing oral diseases.¹ Those with poorly controlled diabetes had a significantly higher prevalence of periodontitis than those without diabetes.² This is attributed to the bi-directional relationship between diabetes and periodontal disease in which poor glycemic control tends to promote severity of periodontal disease and vice versa, and proper management of either condition may assist treatment of the other in patients with diabetes.^{3–5} However, studies found the majority of adults with

diabetes had poor awareness of and lacked knowledge about oral health risks and complications (e.g., periodontal disease) associated with diabetes, and the need for proper preventive oral care.^{1,6–8} For example, less than 20% of patients with diabetes were aware of the adverse effect of diabetes on oral health.⁹ At the same time, about 70% of adults with diabetes reported that they had never received oral health instruction related to their diabetes from a health professional.¹⁰ Most diabetes care providers do not address oral health care in their diabetes education curriculum.¹¹ This is reflected by nearly 95% of diabetes educator respondents of a survey conducted in South Carolina, who reported that their curriculum did not include an oral health module.¹²

Dental health professionals who treat patients with diabetes have the responsibility not only to educate their patients on good oral health behaviors, but also to explain the bi-directional relationship between diabetes and periodontal disease as part of the comprehensive management of diabetes.^{1,9} Our survey of registered dental hygienists (RDHs) practicing in South Carolina found only 41% of the respondents reported that they covered all essential materials related to oral health when educating patients with diabetes.¹³ Of those responses regarding adequacy of covering different diabetes-related oral health topics, topics that were adequately covered ranged from “having patients demonstrate recommended brushing and flossing techniques” as reported by about 27% of the respondents to “daily brushing and flossing” by 99.5% of the respondents.¹³ The main reason that the RDH respondents were not able to cover all essential materials related to oral health when educating patients with diabetes was because they do not have enough time during scheduled visits.¹³

In our survey, 41% of the RDH respondents reported that they spent more time educating patients with diabetes about oral health when compared to other patients in general.¹³ For RDHs who can offer additional time in providing oral health education to their patients with diabetes, it is unknown upon what oral health topics they spend additional time. Knowing the oral health topics that RDHs spend additional time on educating patients with diabetes may help develop a standardized education module to be more efficient when delivering the instruction. It is noted that insufficient information on oral care and diabetes for RDHs was another major factor contributing to the lack of coverage for all essential materials related to oral health when educating this population.¹³ On the other hand, if topics of diabetic patient education are not specific to the relationship between diabetes and periodontal disease, then the plan would be more on educating the RDHs. The purpose of this study is therefore to investigate what RDHs’ practice characteristics and oral health topics are associated with additional time RDH spent on educating patients with diabetes.

Methods

Design

This descriptive study involved a cross-sectional survey research design. The study was approved by the Institutional Review Board of the Medical University of South Carolina, protocol number of HR 15774. Consent was provided by respondents upon return of the completed survey.

Participants

Participants included for the study were RDHs holding a license to practice in the state of South Carolina.

Procedures

An invitation letter explaining the purpose of the survey study with the one-page questionnaire printed on both sides was sent to all RDHs in South Carolina through regular mail. Mailing address labels of the RDHs were purchased from the South Carolina Board of Dentistry. Two follow-up mailings with a complete survey package were sent about 3 months apart to those RDHs who did not respond. Of the original 2,237 mails sent to the RDHs, 8 RDHs were temporarily away, and 110 had moved and left with no forwarding address. After the second follow-up, 1,042 questionnaires were returned. Based on the 2,119 delivered mails, the response rate was 49.2%. Of the 1042 respondents, 46 reported that they no longer practiced as a dental hygienist, and one returned survey did not have the back side of the questionnaire completed; thus, these 47 respondents were excluded from data analysis. The final analytic sample consisted of 995 respondents with no missing data, therefore, 44.5% of target population results were used for this study.

Survey Instrument

The questionnaire survey was developed based on the input from four practicing RDHs who routinely treat adults dental patients with diabetes and questions drawn from a review of relevant literature on oral health education.^{14–17} There were 13 questions on the survey which focused on perceptions of RDHs regarding their diabetes-related oral health preventive education. The survey collected background information of the respondents' practice that included type of dentistry they practiced, years of clinical practice, number of working hours per week, number of patients with diabetes treated in a typical week, average length of a treatment session for patients with diabetes, and frequency of recall for patients with diabetes.

Questions related to diabetic education included whether the respondents spend more time educating patients with diabetes about oral health when compared to other patients in general, frequencies of respondents recommending different oral health products to patients with diabetes, and perception of respondents on the adequacy of educating this population regarding oral health. There were 19 topics of oral hygiene instruction and healthy lifestyle related to oral health included in the survey. Respondents rated each of the 19 oral health topics on a 3-point scale (with the verbiage of “not covered”, “not adequate”, or “adequate”) regarding their practice of educating patients with diabetes. The 19 topics were as follows: control of blood sugar level, importance of good oral hygiene (plaque control), causes and results of dental plaque, calculus, gingivitis and periodontal disease, benefits of fluoride, use of bleeding to monitor gum health, effect of periodontal disease on diabetes, effect of uncontrolled diabetes on periodontal disease, frequent prophylactic dental visits, daily brushing and flossing, demonstration of proper toothbrushing technique, demonstration of proper flossing technique, patient demonstration of recommended brushing technique, patient demonstration of recommended flossing technique, managing dry mouth, tobacco/

smoking cessation, avoiding alcohol, nutrition and dietary counseling, care of removable prosthetic appliances, and physical activity/exercise.

Additional questions focused on which oral health topic the respondents spent the most time when educating patients with diabetes, whether the respondents felt they covered all essential materials related to oral health, and reasons for not covering the materials in depth. A final open-ended question addressed what further information the respondents can share to help improve oral health for people with diabetes. Qualitative analysis of the findings of the open-ended question will be reported elsewhere.

Statistical Analysis

In addition to performing descriptive statistical analysis on the responses, we conducted univariable and multivariable logistic regression modeling to determine what respondents' practice characteristics, and oral health topics are associated with additional time spent on providing oral health education to patients with diabetes (refer to Table 2). For the univariable analysis related to the multivariable logistic regression modeling, explanatory variables were initially screened for consideration in the model using bivariate association between each explanatory variable and the response variable. The response variable was whether the respondents spend more time educating patients with diabetes about oral health when compared to other patients in general (no = 0 vs. yes = 1).

Potential explanatory variables included numbers of patients with diabetes treated per week, duration of treatment sessions (in minutes), frequencies of recommended recall interval for patients with diabetes (< 6 months vs. ≥ 6 months), years of clinical working experience of the respondents, hours of work per week of the respondents (< 25 hours vs. ≥ 25 hours), frequencies of the respondents recommending different oral health products to patients with diabetes (a four-point Likert-type scale), whether the respondents felt they covered all essential materials related to oral health (no = 0 vs. yes = 1), and adequacy of educating patients with diabetes regarding the 19 oral health topics. For the responses to the 19 topics, we recoded the response of "not covered" to "not adequate" = 0, with "adequate" = 1. Explanatory variables were considered as candidates for inclusion in the multivariable logistic regression analysis if their p-value was < 0.25 in the univariable model.¹⁸ Forward stepwise selection procedure was used to obtain the most parsimonious sets of explanatory variables. Explanatory variables whose regression coefficients had p-values less than .05 were retained in the multivariable logistic regression model. All data analysis was conducted using the IBM Statistics Package for Social Sciences (SPSS) for Windows, version 23 (www.spss.com).

Results

Table 1 shows the background information and practice characteristics of the RDH respondents, and their responses to questions related to educating patients with diabetes. Detailed descriptive information of responses to the survey questions were reported elsewhere.¹³ Relevant to this report, 41% of the RDH respondents stated that they spent more time educating patients with diabetes about oral health when compared to other patients in general. The oral health topic that respondents reported spending the most time

on educating their patients with diabetes was control of dental plaque (53%), followed by relationship between diabetes and periodontal disease (32%).

Factors associated with additional time of RDH respondents spent on educating patients with diabetes

Results of the bivariate analyses indicated that additional time of RDH respondents spent on educating patients with diabetes was shown to be related to the following variables: numbers of patients with diabetes treated per week, duration of treatment session, frequencies of recall interval for patients with diabetes, covered all essential materials related to oral health, and adequacy of educating patients with diabetes on the 12 oral health topics as shown in Table 2.

After adjusting for other explanatory variables, only numbers of patients with diabetes treated per week, frequencies of recall intervals for patients with diabetes, and adequacy of educating patients with diabetes on the following three oral health topics (effect of periodontal disease on diabetes, effect of uncontrolled diabetes on periodontal disease, and nutrition and dietary counseling) were included in the final multivariable logistic regression model for additional time of RDH respondents spent on educating patients with diabetes (see Table 2).

For every additional patient with diabetes treated in a week, it was 3% more likely that the RDH respondents would spend extra time educating these patients about oral health (adjusted OR = 1.03, 95% CI = 1.00–1.06, $P < 0.048$). Recommending recall interval of less than 6 months was associated with an 86% increase in the odds for RDH respondents to spend additional time educating patients with diabetes about oral health (adjusted OR = 1.86, 95% CI = 1.38 – 2.52, $P < 0.0001$). RDH respondents who reported spending additional time on educating patients with diabetes about oral health were associated with adequate coverage of the effect of periodontal disease on diabetes (adjusted OR = 1.80, 95% CI = 1.16 – 2.79, $P < 0.008$), effect of uncontrolled diabetes on periodontal disease (adjusted OR = 1.56, 95% CI = 1.05 – 2.32, $P < 0.029$), and nutrition and dietary counseling (adjusted OR = 1.55, 95% CI = 1.18 – 2.04, $P < 0.002$).

Discussion

The findings suggested that RDH respondents who spent additional time educating patients with diabetes about oral health felt they had adequately covered the topics on Effect of periodontal disease on diabetes, Effects of uncontrolled diabetes on periodontal disease, and Nutrition and dietary counseling. Results were congruent with the Standards for Clinical Dental Hygiene Practice¹⁹ that RDH respondents adequately covered oral health topics associated with diabetes. Also, RDH respondents were likely to spend more time on educating patients with diabetes compared to other patients in general when they treated more patients with diabetes in a week. When treating more patients with diabetes, it is expected that RDH respondents would proportionally be more likely to encounter patients who had periodontitis and other oral diseases. As a result, RDH respondents would need to spend additional time educating these patients on oral health topics that are relevant to diabetes. Similarly, a shorter recall interval serves as an indicator of more severe periodontal

and dental problems; as a result, additional time would be needed to educate these patients on the relationship between periodontal disease and diabetes, and nutrition and diet.

The model also suggested that the additional time that RDH respondents spent on educating patients with diabetes was related to oral health issues associated with diabetes, not just repetition of routine oral hygiene and plaque control instructions, even though about half of the RDH respondents reported that they spent most of the time on plaque control when educating patients with diabetes. It seems when under time constraints, the standard patient education protocol for RDHs was plaque control regardless of the type of patients. However, when RDHs have additional time to educate patients with diabetes, they were more likely to cover topics on the effect of periodontal disease on diabetes, effect of uncontrolled diabetes on periodontal disease, and nutrition and diet related to oral health. These pieces of information are important as other professionals such as diabetes educators and physicians are less likely to discuss such topics.^{12,20} Without awareness of and knowledge about oral health risks and complications associated with diabetes, and the need for proper preventive oral care, patients with diabetes are less likely to change their lifestyle related to oral health and general health improvement.

Knowing the oral health topics that RDH respondents spend additional time on educating patients with diabetes, the next step will be to develop a standardized education module to improve efficiency when delivering oral health instruction. It is noted that insufficient information on oral care and diabetes was another major barrier for RDHs who did not cover all essential materials related to oral health when educating patients with diabetes.¹³

Limitations

We acknowledge that the response rate of this survey study was relatively low compared to the mean response rate of 74% in dental health professionals survey reported in the literature.²¹ This suggests that the sample in this study may or may not represent fully all the elements related to the study outcome measure of the RDH practicing in South Carolina; therefore, caution should be exercised regarding generalization of study results to the target population. Due to potential selection and nonresponse biases, our study may have drawn more respondents who were interested in diabetes and periodontal disease with more experience or knowledge in working with these patients. Findings may overestimate the additional time the RDH respondents spent on educating patients with diabetes. In addition, data collection through self-report are subjective and potentially limited by recall and socially desirable biases such as over-reporting the amount of time in educating patients with diabetes and adequacy in covering oral health topics associated with diabetes. It is suggested that objective behavioral measure of the outcomes of interest through direct observation would be more reliable.

Recommendations

Further studies should investigate the level of understanding of patients with diabetes who received oral health instructions from RDHs and, most importantly, whether these patients who understood the instructions will likely take appropriate lifestyle action to manage or control their periodontal disease and diabetes, and reduce the oral risks and complications of

diabetes. For patients who are not willing to take lifestyle action to control their periodontal disease and diabetes, it is important to explore the barriers to making changes. It is also important to investigate what type of instructional strategies that RDHs used to deliver oral health instruction which will help develop a standardized efficient and effective oral health instruction module for patients with diabetes.

Conclusion

This study investigated what RDHs' practice characteristics and oral health topics are associated with additional time RDHs spent on providing oral health education to patients with diabetes. Results of this survey study indicated that RDHs who spent additional time educating patients with diabetes about oral health felt they had adequately covered oral health topics associated with diabetes, not just repetition of routine oral hygiene and plaque control instructions. In addition, a higher number of patients with diabetes treated per week, and a shorter recall interval were also associated with more likelihood of respondents spending additional time educating patients with diabetes.

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Table 1

Background information and practice characteristics of the dental hygienist respondents (N = 995)

Characteristics	Mean $\pm$ SD (Range) or n (%)
Numbers of patients with diabetes treated a week	5.2 $\pm$ 4.6 (range: 0 – 40)
Duration of treatment session (minutes)	54.6 $\pm$ 11.6 (range: 20 – 180)
Practice experience (years)	14.8 $\pm$ 10.6 (range: 1 – 54)
Worked in general dentistry setting	902 (90.7%)
Worked at least 25 hours per week	723 (72.7%)
Recommended recall interval of less than 6 months	659 (66.5%)
Spent more time educating patients with diabetes	406 (40.8%)
Covered all essential materials related to oral health when educating patients with diabetes	408 (41.0%)

Univariate and multivariable analyses examining factors associated with additional time dental hygienist respondents spent on educating patients with diabetes

Table 2

Explanatory Variable	Referent group	Comparison group	OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Number of patients with diabetes treated per week	0	1 person increment	1.03 (1.00, 1.06)	.028	1.03 (1.00, 1.06)	.048
Duration of treatment session (min)	0	1 min increment	1.01 (1.00, 1.02)	.067		
Frequency of recommended patient recall (months)	6 months	<6 months	2.38 (1.79, 3.16)	.0001	1.86 (1.38, 2.52)	.0001
Covered all essential materials related to oral health	No	Yes	1.40 (1.08, 1.81)	.01		
Control blood sugar level	Not adequate	Adequate	1.78 (1.38, 2.30)	.0001		
Causes and results of plaque, calculus, gingivitis and periodontal disease	Not adequate	Adequate	1.80 (.89, 3.66)	.105		
Benefits of fluoride	Not adequate	Adequate	1.32 (1.02, 1.71)	.038		
Use bleeding to monitor the health of gums	Not adequate	Adequate	1.98 (1.10, 3.55)	.023		
Effect of periodontal disease on diabetes	Not adequate	Adequate	3.17 (2.23, 4.50)	.0001	1.80 (1.16, 2.79)	.008
Effect of uncontrolled diabetes on periodontal disease	Not adequate	Adequate	2.79 (2.03, 3.84)	.0001	1.56 (1.05, 2.32)	.029
Have patients demonstrate recommended flossing technique in their mouth	Not adequate	Adequate	1.46 (1.10, 1.95)	.008		
Managing dry mouth	Not adequate	Adequate	1.37 (1.04, 1.82)	.028		
Tobacco/smoking cessation	Not adequate	Adequate	1.33 (1.00, 1.76)	.046		
Avoiding alcohol	Not adequate	Adequate	1.79 (1.35, 2.36)	.0001		
Nutrition and dietary counseling	Not adequate	Adequate	1.93 (1.49, 2.51)	.0001	1.55 (1.18, 2.04)	.002
Physical exercise	Not adequate	Adequate	1.38 (.99, 1.92)	.059		

Note. Statistical significance when the p-value < .05.