

Periodontal Disease and Diabetes: Knowledge and Attitudes Assessment Project

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ABSTRACT

There is a growing body of evidence showing that periodontal disease is more prevalent among diabetic patients than among non-diabetic patients. This same evidence also shows that the more poorly controlled the diabetes, the more severe the periodontal disease. However, it is unclear if the increased risk of periodontal disease is known by the diabetes community. Two hundred diabetic patients voluntarily participated in an intervention to increase the diabetic patient's knowledge of and attitudes toward periodontal disease. The study was conducted at the University of Miami-Jackson Memorial Hospital's Diabetes Research Institute (DRI) during the month of May 2005. The purpose of the intervention was to develop an educational brochure designed to increase the diabetic patient's knowledge of and attitude about periodontal disease. The effectiveness of this pamphlet was assessed by administering an anonymous pre-test, immediately followed by the reading of an educational brochure, and then immediate administration of a post-test consisting of the same questions as the pre-test. The data were then analyzed for any changes in knowledge and attitude concerning diabetes and periodontal disease. The results showed that the intervention caused a 33% increase in knowledge ($P < 0.001$); furthermore, although the change in knowledge for subjects with type 1 diabetes was only marginally significant ($P = 0.066$), the change for subjects with type 2 diabetes was very highly significant ($P < 0.001$). Most of the subjects (56%) indicated that they had never been told by their endocrinologist to go see the dentist for a check-up. Therefore, diabetes doctors need to work more closely with their patients and oral health providers to ensure their patients' periodontal health.

Florida Public Health Review, 2007; 4:12-17

Introduction

The Expert Committee of the American Diabetes Association in 2003 defined diabetes mellitus as a group of chronic metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. In 2002, the direct economic costs of diabetes mellitus in the United States were estimated to be \$132 billion. The 2002 estimates of indirect costs due to absenteeism, disability, and mortality from diabetes were in excess of \$40 million (American Diabetes Association, 2003; Fowler, 2007).

There have been various studies which have demonstrated a bidirectional relationship between periodontal disease and diabetes (Matthews, 2002; Nishimura, Iwamoto, Mineshiba, Shimizu, Soga, & Muayama, 2003; Ryan, Carnu, & Kamer, 2003; Salvia, Beck & Offenbacher, 1998; Taylor, Burt, Becker, Genco, & Schlossman, 1998). There is a growing body of evidence showing that periodontal disease is more prevalent among diabetic patients than among non-diabetic patients. This same evidence also shows that the more poorly controlled the diabetes, the more severe the periodontal disease (Lyle, 2001; Nunn, 2000). National Health and Nutrition Examination Survey (NHANES) data collected from 1999 to 2004 demonstrated that moderate and severe chronic periodontitis affects approximately 5% to 17% of the U.S. population (National Center for Health Statistics, 2007).

The relationship between oral diseases and type 2 diabetes has become a recent focus of attention among healthcare professionals because of substantial evidence supporting the role of diabetes and poor glycemic control as important risk factors for periodontal disease (Taylor, Manz, & Borgnakke, 2004; Ship, 2003). Furthermore, it appears that periodontal diseases can contribute to poorer glycemic control in people with diabetes and that treating periodontal infections could have a beneficial effect on glycemic control in either type 1 or type 2 diabetes (Jin, Chiu, & Corbet, 2003; Nishimura, Takahashi, Kurihara, Takashiba, & Muruyama, 1998). The evidence is not unequivocal, but it is sufficient to support investigating the effects of preventing and treating periodontal infections as a way to contribute to glycemic control in people with diabetes (Soskolne, 1998; Levin, 2003).

Additionally, there is growing evidence that clinical practitioners should incorporate education concerning the risk of periodontal disease into the management regimens of their patients with diabetes. It is also important to communicate with physicians and others involved in diabetes care about the importance of referring patients with diabetes for thorough oral health evaluations and necessary oral health care (Robertson, Drexler, & Vernillo, 2003). This study evaluated the knowledge and attitudes of persons with both type 1 and type 2 diabetes concerning their risk of periodontal disease and its prevention.

Methods

This study entailed the creation of an educational pamphlet and a pre-/post-test assessment of the change in knowledge and attitudes concerning the risks of periodontal disease for diabetics in a group of diabetic patients. All subjects were physician-diagnosed diabetics 18 years of age and older. This project was approved as an Exempt Protocol by the University of Miami IRB (Protocol Number 2005-0001) since all data were collected anonymously and the study was conducted at the Diabetes Research Institute's (DRI) Diabetes Clinic waiting room at the University of Miami-Jackson Memorial Hospital campus during May 2005.

The project consisted of a pre-test with 10 questions, with an educational brochure to be read immediately after the pre-test. A post-test consisting of the same ten questions as the pre-test was administered immediately after reading the educational brochure (see Appendix A). The post-test also had an additional question to elicit information about the frequency of physician referrals to dental practitioners. All three survey instruments were available in English, Spanish, and Creole. The survey instrument was created in English and Spanish by the bilingual investigators, while the Creole instrument was professionally translated.

Each subject was approached individually by the investigators, and asked if he/she would be willing to take part in the project. The subjects chose the pre-test/educational brochure/post-test in their preferred language. The majority of the subjects read the survey instrument themselves, as they waited for their diabetes care appointments in the DRI waiting room. It was observed that seven of the subjects had the pre-/post-test questions and educational brochure read to them by family members either due to illiteracy or blindness.

After the subject answered the questions on the pre-test, he/she would immediately read the educational brochure. Upon completion of reading the brochure, the subject would then answer the questions on the post-test.

The environment in the waiting room was quiet, comfortable and the subjects were able to sit relatively far apart from each other as they read through the survey instrument. Subjects had ample time to complete the survey instrument, and were free to question the investigators as to the survey instrument content, although it is noted that none of the subjects did so.

The pre-test and post-test collected demographic information, including gender, age, diabetes type, race/ethnicity, and educational level, but no personal identifiers. An English-language sample of the pre- and post-test, as well as the educational brochure, is available upon request from the investigators.

Statistics

The data from the pre- and post-tests were entered into an Excel 2003 spreadsheet program and analyzed using SAS program version 9.1. After evaluating the demographics, separate Cronbach's alpha coefficients were computed for the knowledge questions and attitude items. A paired t-test was used to test change between the post-test and the pre-test. Repeated measures of analysis of variance (ANOVA) was used to test for change in knowledge between diabetes mellitus types. The criteria for statistical significance was $\alpha=0.05$.

Results

Out of the 230 people who were approached to participate in the study, thirty (13%) people declined; reasons given ranged from "Too busy" and "Not enough time" to "I'm not diabetic, I'm a friend of the patient" and "I'm not interested." Ultimately, two hundred (87%) patients agreed to participate.

The demographics of the subjects for this study broke down as follows: 124 (62%) females and 76 (38%) males with a mean age of 51 years with a +/- standard deviation of 16.5, and range from 18-93 years. There were 48 (24%) type 1 diabetics, and 152 (76%) type 2 diabetics. Race/ethnic demographics were: White-Non Hispanic 48 (24%), White-Hispanic 108 (54%), African-American 36 (18%), and other 8 (4%). Educational levels were: 4 (2%) elementary school, 4 (2%) middle school, 16 (8%) some high school, 44 (22%) high school graduate, 36 (18%) some college, 60 (30%) bachelor's degree, 20 (10%) master's degree, 8 (4%) doctoral degree, 8 (4%) other (business/trade/vocational school).

The respective knowledge score means +/- standard deviation for the pre- and post-test were 4.95 ± 2.42 and 6.60 ± 0.96 (see Table 1).

The Cronbach's internal consistency and reliability for the knowledge test was excellent (0.88); however, since the attitude items did not have a right or wrong response, they did not form scale with acceptable reliability (0.39), so each item was analyzed separately. For question 6, the recorded items were placed into ordinal categories, from Low to Neutral to High.

Table 1. Knowledge test scores by diabetic type (mean ± standard error)

	Type 1	Type 2	Difference	Statistical Significance (p value)
Pre test	6.29 ± 0.24	4.53 ± 0.20	1.76 ± 0.31	<0.001
Post test	6.75 ± 0.06	6.55 ± 0.09	0.20 ± 0.11	0.066
Change	0.46 ± 0.25	2.02 ± 0.21	-1.56 ± 0.33	<0.001
P	0.066	< 0.001		

The results for question 6 (“If you lost a tooth from periodontal disease, how big of a problem would you consider it to be?”) showed that 84% of the subjects stayed with their original answer on both the pre- and post-test. Fourteen percent of the subjects changed their answer towards the positive for the post-test for question 6, and 2% of the subjects changed their answer towards the negative. The test of symmetry for question 6 showed $P < 0.001$.

For question 8 (“No matter what you do, some people will get periodontal disease”), pre- and post-test results indicated that 52% of the subjects stayed with their original answer on both the pre- and post-test. Forty percent of the subjects changed their answer toward the positive for the post-test for question 8, and 8% of the subjects changed their answer towards the negative. The test of symmetry for question 8 showed $P < 0.001$.

For question 10 (“How important is it for your teeth/smile to look good?”), pre- and post-test results indicated that 96% of the subjects stayed with their original answer on both the pre- and post-test. Four percent of the subjects changed their answer toward the positive (“Very important”) for the post-test for question 10, and 0% of the subjects changed their answer towards the negative. The test of symmetry for question 10 showed $P = 0.046$.

The results of the paired t-test showed that the difference in means of the post-test and the pre-test was very significant ($P < 0.001$). The mean difference was 1.65 ± 2.51 . The increase in knowledge was approximately 33%.

The results for the repeated measures of ANOVA indicated that there was a significant interaction between diabetes type and change in knowledge, indicating that the change was different between the two groups. The change in knowledge for patients with type 1 diabetes was marginally significant (0.45 ± 0.25 ; $P = 0.066$), however for type

2 diabetics it was very highly significant (2.03 ± 0.21 ; $P < 0.001$).

For question 11 the respondent was asked, “Have you ever been told by your diabetes doctor to see your dentist for a check-up?” and was found only on the post-test. It is significant to note that 56% of the respondents indicated “No,” and 8% indicated “I don’t know,” while 36% indicated “Yes.” The results of these data can be found in Figure 1.

Discussion

An educational brochure was developed to increase the knowledge of a diverse group of diabetic patients (both type 1 and type 2) concerning their risk of periodontal disease; their knowledge and attitudes regarding this issue were evaluated with pre/post testing.

Cronbach’s alpha demonstrated that the pre-test and post-test results displayed internal consistency and reliability. The subjects displayed a nearly 33% increase in knowledge after the intervention. Whereas there was no significant difference in knowledge on the pre-test or post-test between types of diabetes mellitus, both types of diabetes mellitus, did have significant increases in knowledge from the baseline ($P < 0.001$), with type 2 diabetes mellitus subjects having a significantly larger increase in knowledge (2.1 ± 0.3 , $P < 0.001$) than type 1 diabetic mellitus subjects (0.5 ± 0.3 , $P < 0.001$).

The findings also indicated that 56% of the diabetic patients reported that they had never been told by their diabetes doctors to go to their dentist for a check up. This would seem to indicate that there may be lack of knowledge of the risk of periodontal disease and the preventive potential of oral healthcare not only among the diabetic patients, but also among their healthcare providers.

Figure 1. Comparison of answers to question 11 on post-test

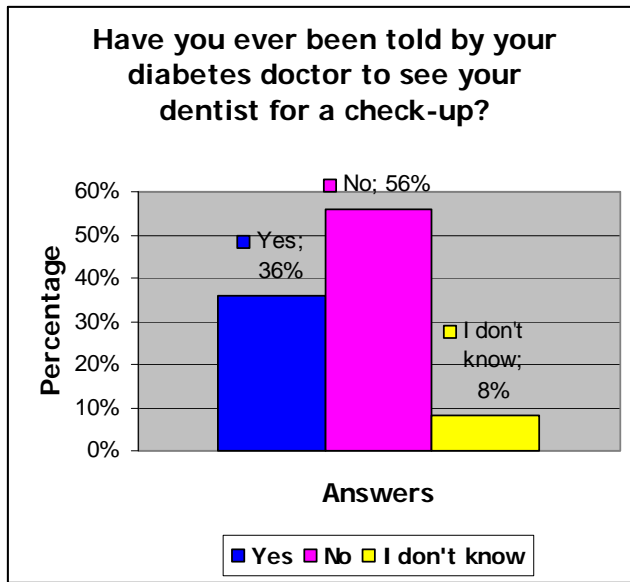
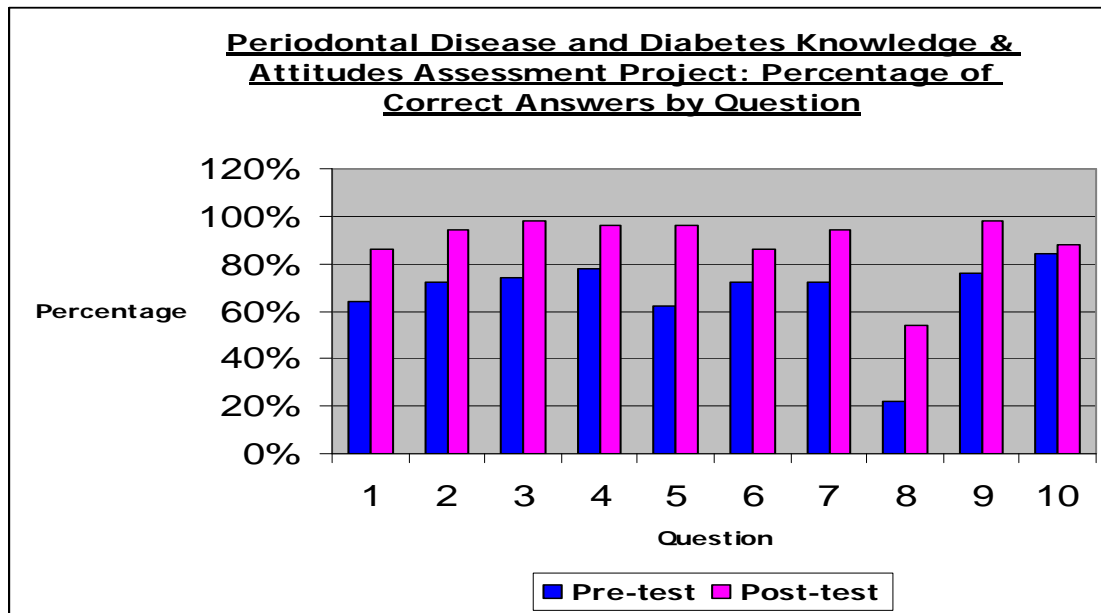


Figure 2. Changes in correct answers from pre-test to post-test.



Limitations

The study was only performed in one clinic with predominantly privately insured patients. In addition, with the relatively small sample size, extrapolation of the results to the general U.S. population cannot be accomplished.

The survey instrument was administered within a short amount of time so it is not possible to know whether the knowledge gain and attitude change accomplished during the study were retained following the study.

The data for the study were self-reported. It is possible that socio-economic status and education could have affected the recall of the self-report. Finally, it is possible that it was the combination of the pre/post-test with the educational brochure, not just the brochure alone, which led to the increased knowledge and change in attitude; without a control group, it is not possible to know.

Conclusions and Recommendations

The results of this study demonstrate that an educational brochure can be effective in increasing the diabetic patient's knowledge and attitude about periodontal disease. Although most (71%) of the diabetic patients knew about the relationship between periodontal disease and diabetes prior to reading the brochure, a substantial proportion (22%) did not.

It behooves the diabetes care practitioner to consistently refer their patients to the dentist (Hein, 2003; Robertson et al., 2003). This should be addressed not just at the initial appointment, but throughout the patient's treatment. Since diabetes care practitioners always refer their diabetic patients to the podiatrist, the eye doctor, and the nutritionist for individualized care, the dentist/periodontist could also be included on this referral list.

Diabetes care teams should include an oral health practitioner in their group. This person does not have to be a dentist but could be a dental hygienist as these professionals are trained to identify signs and symptoms of periodontal disease in every stage of disease progression. Although dental hygienists in the state of Florida cannot legally diagnose periodontal disease, they can screen clients and report their findings to a dentist for dental diagnosis. Dental hygienists are also uniquely qualified to provide oral health education and preventative services to clients with diabetes and/or periodontal disease. Oral healthcare providers need to take a more proactive approach in addressing the oral healthcare needs of their diabetic patients by insisting on being included as members of diabetes care teams. A multidisciplinary approach is important in the treatment of the diabetic client for the prevention of both medical and dental complications.

Acknowledgements

The authors thank Dr. Luigi Meneghini, Medical Director, Diabetes Research Institute, University of Miami/Jackson Memorial Hospital, and Dr. Hermes Florez, Diabetes Research Institute, University of Miami/Jackson Memorial Hospital, without whom this project would not have been accomplished. In addition, we thank the patients, their families, and the physicians, nurses, and staff at the Diabetes Research Institute for their assistance with this project.

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