Diabetes Mellitus and Periodontal Health: Dentists’ Knowledge

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Objectives: There is a strong body of evidence to support the relationship between periodontal diseases and diabetes mellitus. Unless dental practitioners are aware of this link, they cannot apply the information to their daily practice. The aim of the study was, therefore, to evaluate the knowledge of dental practitioners concerning the effect of diabetes on periodontal health.

Subjects and Methods: This was a cross-sectional survey of randomly selected dental practitioners in Kuwait. Participants were asked about specific periodontal complications which they believed that patients diagnosed with diabetes were more susceptible to. Results: A total of 220 dental practitioners (133 general dental practitioners and 87 dental specialists) participated in the study. Less than 60% of all study participants reported that tooth loss due to periodontal reasons and periodontal abscess were frequent among diabetic patients. Dental specialists, especially periodontists, were significantly more aware of periodontal complications associated with diabetes. Factors significantly associated with having knowledge about the effect of diabetes on periodontal health in logistic regression analysis were dentists who were older and those who were specialists.

Conclusions: The results of this study indicate that knowledge about the effects of diabetes on periodontal health among this sample of dental practitioners is generally low, and dentists may underestimate the outcomes of periodontal diseases in diabetic patients.

Key Words
Diabetes mellitus • Periodontal diseases • Knowledge of dentists

Abstract
Introduction

A bidirectional relationship exists between diabetes mellitus and periodontal diseases [1, 2]. Patients diagnosed with diabetes are considered to be a high-risk group with greater susceptibility to severe forms of periodontal breakdown [3, 4]. Chronic periodontitis is a common periodontal disease among adults, a potentially progressive bacterial infection that may lead to tooth loss due to extensive destruction of periodontal attachment. In addition, inflammatory response plays a major role in the progression of periodontal diseases. Controlled clinical studies have shown that subjects diagnosed with diabetes have a greater prevalence of periodontal complications compared to healthy individuals,
including gingival inflammation [5], bone resorption [6], periodontal abscess [7] and tooth loss [8]. Severe periodontitis may increase the risk of poor glycemic control [9, 10], and current scientific evidence supports the concept that treating periodontal infections can be influential and contribute to glycemic control management [11, 12]. The World Health Organization advised that oral diseases, including periodontal disease, are serious health problems and considered increasing awareness of oral health worldwide should be an important component of general health and quality of life [13]. These findings indicate the importance of clinically relevant preventive and therapeutic measures for the management of both diabetes mellitus and periodontal diseases in both adults and children.

Although there is a growing body of evidence supporting the relationship between periodontal diseases and diabetes mellitus, several studies have indicated a lack of general oral health information among diabetic patients [14–17]. Most of these studies have shown that few patients diagnosed with diabetes visit the dentist on a regular basis and many are not informed of the effect of diabetes on oral health. A study by Allen et al. [15] has reported that awareness of diabetic patients about periodontal diseases is very low compared to their reported awareness of increased risk for heart disease, kidney disease and circulatory problems. Unless dental practitioners are aware of the link between diabetes mellitus and periodontal diseases, they cannot convey this information to the patients in their practice. Few studies have evaluated dentists’ attitude and behavior toward the management of patients diagnosed with diabetes [18–20]. Most of these studies have shown that few dentists monitor blood glucose levels and adjust the frequency of dental visits according to the patient’s diabetic status.

As the prevalence of diabetes in Kuwait has reached almost epidemic proportions [21], it is expected that dentists are seeing and treating a large number of diabetic patients with periodontal problems. For that reason, evaluating dentists’ knowledge regarding this issue will assist in making recommendations regarding the appropriate level of continuing educational programs, updating the undergraduate and postgraduate dental curriculum and initiating interprofessional collaboration between medicine and dentistry. The aim of this study was, therefore, to evaluate the knowledge of dental practitioners concerning the effect of diabetes on periodontal health.

**Subjects and Methods**

This was a cross-sectional survey study of randomly selected dentists practicing in the Public Health Service in Kuwait in two types of clinical settings: primary health centers and specialized dental centers. The study protocol was approved by the Ethical Review Committee of Kuwait University, Faculty of Dentistry prior to commencement of the project. Data were collected during 2008. Informed verbal consent from all participants was obtained prior to contribution. A randomized scheme was used to provide a sample size of dentists from all six districts in Kuwait. A total of 300 dentists were approached and invited to participate in the study. In addition to the major dental center serving each district, three primary polyclinics were randomly selected from each district to participate in the study. The sample was stratified to provide a representative number of general dentists and specialists practicing in the public health service in Kuwait. Participants were requested to complete an anonymous, self-administered, structured questionnaire in their clinics and return it at the end of their working hours to assure privacy. The first part of the questionnaire recorded demographic characteristics including age, gender, and years since graduation (from the last dental degree). All participants were asked to report whether they believed that diabetes affected periodontal health, and if poorly controlled diabetic patients should have more frequent dental checkups. For the above-mentioned questions participants were given the choice of ‘yes’, ‘no’, or ‘I don’t know’. Participants were then asked which of the following periodontal complications they believed patients diagnosed with diabetes were more susceptible to: gingival inflammation, gingival bleeding, alveolar bone resorption, tooth loss or periodontal abscess. They were asked to indicate next to each complication the one they believed to be more common among patients with diabetes than among healthy individuals.

**Statistical Analysis**

Data was entered and analyzed using the Statistical Package for Social Science software (SPSS, Chicago, Ill., USA), version 18. Frequency distributions and descriptive statistics were generated for all the study variables; $\chi^2$ test was performed to detect significant association between categorical variables. Knowledge score of 0 or 1 was used to assess knowledge level, with 1 representing adequate knowledge of possible periodontal complications associated with diabetes mellitus, and knowledge score of 0 representing inadequate knowledge of the effect of diabetes on periodontal health. The ‘knowledge score’ was calculated in the following manner: a score of 1 was given if the participant correctly responded to all effects of diabetes on periodontal health (gingival inflammation, gingival bleeding, tooth mobility, periodontal abscess, alveolar bone resorption and tooth loss), and the participant reported that he or she was aware that diabetes affects periodontal health and poorly controlled diabetic patients should have more frequent dental checkups; a score of 0 was given if any of these variables was not correctly answered. Binary logistic regression analysis was performed to examine which factors were significant in predicting knowledge about the effect of diabetes on periodontal health. The regression model used the dependent variable ‘knowledge score’. Independent variables entered in the model were age, gender, years since graduation and dental specialty (general dentist vs. dental specialist). Statistical significance was set at p < 0.05.
Results

A total of 220 dentists (133 general dental practitioners and 87 dental specialists) completed the questionnaire. Dental specialists consist of 14 periodontists, 13 orthodontists, 15 prosthodontists, 8 oral surgeons, 24 endodontists and 13 pedodontists. The response rate was 73.3% (with no significant difference in response between districts). According to the annual report of the Dental Administration of the Ministry of Health in Kuwait in 2009, the total number of dentists working in Kuwait in both public health and private sector during 2008 was 1,474. The public health service consisted of 478 general dental practitioners and 243 dental specialists. Therefore our sample size represents around 28% of the general dental practitioners and 36% of the dental specialists working in the public dental health service in Kuwait.

Table 1 presents the sociodemographic characteristics of the participants. The mean age and standard deviation of general dental practitioners were 33.7 and 9.2, respectively. The mean age and standard deviation of dental specialists were 40.3 and 7.0, respectively. A significant difference was detected regarding the mean age between the two groups \( p < 0.001 \). Statistical differences were found between general dental practitioners and dental specialists in gender distribution, and in years since graduation. The above-mentioned significant difference was expected, especially since the majority of dental specialists in Kuwait are males.

Table 2 presents the reported knowledge of specific periodontal complications associated with diabetes mellitus. Around 80% of the study participants were aware that gingival inflammation, gingival bleeding and alveolar bone resorption were manifestations associated with diabetes. Only 59.1% of all study participants reported that tooth loss due to periodontal disease is frequent among diabetic patients and 51.8% of all study participants reported that periodontal abscesses were associated with diabetes. Dental specialists were significantly more aware of the association between diabetes and peri-
Table 3. Awareness of the effects of diabetes on periodontal health

<table>
<thead>
<tr>
<th></th>
<th>General dental practitioners, n (%)</th>
<th>Dental specialists, n (%)</th>
<th>All participants, n (%)</th>
<th>p valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes affects periodontal health</td>
<td>129 (97.0)</td>
<td>84 (96.6)</td>
<td>213 (96.8)</td>
<td>0.855</td>
</tr>
<tr>
<td>Poorly controlled diabetic patients should have more frequent dental checkups</td>
<td>129 (97.0)</td>
<td>83 (95.4)</td>
<td>212 (96.4)</td>
<td>0.715</td>
</tr>
<tr>
<td>Knowledge scoreb</td>
<td>1</td>
<td>40 (30.1)</td>
<td>40 (46.0)</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>93 (69.9)</td>
<td>47 (54.0)</td>
<td></td>
</tr>
</tbody>
</table>

a \(\chi^2 (p < 0.05)\).

b Knowledge score: 1; if correctly identified gingival inflammation, gingival bleeding, periodontal abscess, alveolar bone resorption and tooth loss to be influenced by diabetes and the participant had reported that he or she was aware that diabetes affects periodontal health and poorly controlled diabetic patients should have more frequent dental checkups; a score of 0 was given if any of these variables was not correctly answered.

Table 4. Knowledge score by different dental specialty

<table>
<thead>
<tr>
<th>Knowledge scorea</th>
<th>Periodontists, n (%)</th>
<th>Orthodontists, n (%)</th>
<th>Prosthodontists, n (%)</th>
<th>Oral surgeons, n (%)</th>
<th>Endodontists, n (%)</th>
<th>Pedodontists, n (%)</th>
<th>GDPs, n (%)</th>
<th>p valueb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13 (92.9)</td>
<td>6 (46.2)</td>
<td>6 (40.0)</td>
<td>3 (37.5)</td>
<td>8 (33.3)</td>
<td>4 (30.8)</td>
<td>40 (30.1)</td>
<td>0.001</td>
</tr>
<tr>
<td>0</td>
<td>1 (7.1)</td>
<td>7 (53.8)</td>
<td>9 (60.0)</td>
<td>5 (62.5)</td>
<td>16 (66.7)</td>
<td>9 (69.2)</td>
<td>93 (69.9)</td>
<td></td>
</tr>
</tbody>
</table>

GDPs = General dental practitioners.

a Knowledge score: 1; if correctly identified gingival inflammation, gingival bleeding, periodontal abscess, alveolar bone resorption and tooth loss to be influenced by diabetes and the participant had reported that he or she was aware that diabetes affects periodontal health and poorly controlled diabetic patients should have more frequent dental checkups; a score of 0 was given if any of these variables was not correctly answered.

b \(\chi^2 (p < 0.05)\).

Periodontal abscesses (63.4 vs. 44.4%), and alveolar bone resorption (95.4 vs. 80.5%), with high recorded significant differences between the two groups (\(p < 0.008\) and \(p < 0.001\), respectively). Awareness of the effect of diabetes mellitus on periodontal health is presented in table 3. The majority of the study participants (>95%) agreed that diabetes affects periodontal health and poorly controlled diabetic patients should have more frequent dental follow-ups. A significant difference was detected regarding the knowledge score between the two groups (\(p < 0.022\)), where 46.0% of the dental specialists versus 36.0% of the general dental practitioners scored 1 on the knowledge score. Table 4 represents knowledge score by different dental specialty.

Table 5 represents binary logistic regression analysis with knowledge score as the dependent variable. Dental specialty was the most significant variable associated with knowledge level. Dental specialists (OR = 1.969; CI: 1.043–3.720; \(p = 0.037\)) were significantly more likely to have adequate knowledge about the effect of diabetes on periodontal health.

Discussion

The World Dental Federation with the International Diabetes Federation have urged the need to improve the knowledge about the reciprocal link between diabetes and oral health among health professionals [22]. Increasing the knowledge of health care providers will probably improve their attitude and behavior towards the management of diabetic patients. Therefore, this study was designed to assess dentists’ knowledge about periodontal health of diabetic patients.
signed as one part of a cross-sectional survey that aimed
to assess the knowledge of health care professionals in
Kuwait about the relationship between diabetes and peri-
odontal diseases [23]. To the best of our knowledge, this
is the first study that documents dentists’ knowledge of
specific periodontal complications associated with dia-
abetes mellitus in Kuwait.

The majority of respondents believed that diabetes
may affect periodontal health by causing some degree of
gingival inflammation and that frequent dental checkups
are very important for poorly controlled diabetic pa-
tients. As we move toward more specific periodontal
complications, the level of awareness decreased dramati-
cally: only 52% of the respondents were aware that peri-
donotal abscesses are a common manifestation of dia-
abetes, and surprisingly, only 59% of respondents were aware
that tooth loss is a common dental complication among
patients diagnosed with diabetes although recent studies
have documented that periodontal disease is considered
to be one of the main reasons for tooth loss in diabetic
individuals [8, 24, 25]. In our study, participants were un-
aware that severe alveolar bone resorption could take
place and lead to partial or complete edentulousness. The
consequences of periodontal disease and subsequent
tooth loss are not only important considerations for the
quality of life of patients with diabetes, but they may sig-
nificantly affect general health by compromising pa-
tients’ ability to continue a healthy diet and maintain
good glycemic control.

Our data showed that dental specialists were signifi-
cantly more aware of specific periodontal complications
associated with diabetes such as gingival inflammation,
alveolar bone resorption and periodontal abscess than
general dental practitioners. Also, a significantly higher
number of dental specialists, especially periodontists,
had a knowledge score of 1 (adequate knowledge) than
general dental practitioners. Because periodontists are
referral-based practitioners, they are more likely to see
diabetic patients with advanced periodontal disease and
engage in more invasive procedures. Frequent exposure
to diabetic patients with periodontal complications will
prompt periodontists to communicate and interact with
other health care providers, update their knowledge and
maintain continuing education. A previous study has re-
ported that only 15 of 105 general dentists (14%) in North-
eastern United States communicate often with the dia-
abetic patients’ physician and are less likely to take an ac-
tive role in the management and control of diabetes [19].
General dental practitioners may feel that their role is to
focus on general dental problems only and that they do
not have the authority to extend the realm of their care to
the management of systemic health issues.

Binary regression analysis revealed that dental spe-
cialty is the most significant predictor for having ade-
quate knowledge about the effect of diabetes on peri-
donital health. After adjustment for the other predictors
in the model, the estimated odds that dental specialists
had knowledge of the effect of diabetes on periodontal
health was 1.969 times the odds for general dental prac-
titioners (table 5). Because older age (OR = 1.055; CI:1.011–
1.101; p = 0.015) participants may have more experience
and exposure to diabetic patients, they may have more
knowledge about the effect of diabetes on periodontal
health. In addition, years since graduation were not a sig-
nificant predictor for knowledge level; for former gradu-
ates (>5 years), the odds of having knowledge decreased
by a factor of 0.530. Our results agree with data from
Kunzel et al. [18], a study contrasting general dentists
with specialists (periodontists), which reported that 70% of
periodontists in the Northeastern United States com-
pared to 49% of general dentists were good performers in
terms of discussion with the patient about the association
diabetes with oral health, the importance of blood glu-
cose control and the association of dental treatment with

<table>
<thead>
<tr>
<th>Factor</th>
<th>B (SE)</th>
<th>OR (CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.053 (0.022)</td>
<td>1.055 (1.011–1.101)</td>
<td>0.015</td>
</tr>
<tr>
<td>Gender</td>
<td>0.522 (0.316)</td>
<td>1.685 (0.907–3.132)</td>
<td>0.099</td>
</tr>
<tr>
<td>Years since graduation</td>
<td>–0.634 (0.444)</td>
<td>0.530 (0.222–1.267)</td>
<td>0.153</td>
</tr>
<tr>
<td>Dental specialty</td>
<td>0.678 (0.324)</td>
<td>1.969 (1.043–3.720)</td>
<td>0.037</td>
</tr>
</tbody>
</table>

OR = Adjusted odds ratio; CI = 95% confidence interval.
blood glucose control. The level of discussion and active management was significantly associated with the number of consultations with other dental and medical specialists. We speculate that there is a lack of interaction between general dentists and dental specialists. General dental practitioners may underestimate the need for referral to dental specialists. In a 2003 study, Bader et al. investigated the ability of general dental practitioners to assess the risk factor of periodontal disease, and their results suggested a need for heightened improvement among general dentists, particularly their ability to recognize diabetes as an indicator for high risk of periodontal disease. Another survey of 160 members of the Michigan Dental Association has shown a negative attitude towards periodontal referrals among general dentists and that the more positively dentists evaluated their dental education in periodontics, the more conservative they were when considering percentage of bone loss as a basis for referral and the more frequently they used systemic antibiotics in their treatment of periodontal disease [27]. The above-mentioned results demonstrate the importance of exchanging updated scientific-based dental information among dental practitioners. General dentists are considered to be the primary referral source for patients with advanced periodontal conditions, therefore, periodontists should play a major role in educating general practitioners about the relationship between oral disease and systemic conditions.

A population-based study in the United States showed that many people were not aware that they have diabetes [28]. Their results indicate that individuals with self-reported family history of diabetes, hypertension, high cholesterol levels and clinical evidence of periodontal disease bear a probability of 27–53% of having undiagnosed diabetes. Therefore, the dental office can be the first line of defense, actively involved in screening for unidentified diabetic cases. Increasing the knowledge of dental practitioners is a very important element of early diagnosis, prevention, management and control of diabetes and periodontal disease. In our study, most dental specialists other than periodontists had inadequate knowledge about the effect of diabetes on periodontal health. Surprisingly, only 30.8% of pedodontists had an adequate knowledge about the effect of diabetes on periodontal health. This percentage is considered to be very low compared to the prevalence of diabetes among children in Kuwait [21, 29]. Recent studies have shown that accelerated periodontal destruction in children with diabetes is related to poor metabolic control since periodontal destruction can start very early in life and becomes more prominent as diabetic children become adolescents [5]. Consequently, it is vital that pedodontists and other dental specialists be aware of the effect of diabetes on periodontal health to identify diabetic children with poor metabolic control, aid in screening of undiagnosed diabetic cases, and provide the appropriate dental treatment.

Professional attention should be given to the importance of the relationship between oral health and systemic health. It is very essential for both general dental practitioners and dental specialists to understand the relationship between diabetes mellitus and periodontal diseases. Conducting educational programs and encouraging exchange of knowledge between dental practitioners, dental specialists and medical profession are extremely important to effectively prevent, manage and control both diabetes and periodontal diseases. Periodontists should play a major role in educating general dental practitioners about the risk of developing periodontal disease in patients diagnosed with diabetes and the potential for patients with existing severe periodontal disease of being diabetic. In addition, the undergraduate and postgraduate dental curriculum should put great emphasis on the interprofessional education between medicine and dentistry.

**Conclusion**

Within the limitations of the present study, which relies upon self-reported data, knowledge of specific periodontal complications associated with diabetes among this sample was generally low. There may be an underestimation of the extent, severity and the outcomes of periodontal diseases in patients diagnosed with diabetes by dental practitioners.

**Acknowledgment**

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References


