Impact of well-controlled type 2 diabetes mellitus on quality of life of chronic periodontitis patients

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Abstract:

Background: The purpose of the study is to examine the quality of life (QoL) in chronic periodontitis (CP) patients associated with or not with well-controlled type 2 diabetes mellitus (DM2). Materials and Methods: Five hundred CP patients, 250 with DM2 (GDM2 group) and 250 age- and gender-matched controls without DM2 (GND), were enrolled in this cross-sectional case-controlled study from January to September 2015. They were interviewed by a QoL questionnaire (Functional Assessment of Chronic Illness Therapy-Fatigue) validated to Portuguese. Periodontal examinations were also performed to confirm CP: probing pocket depth and clinical attachment level must be >3 mm. Results: An association between the presence of DM2 and a high negative impact on QoL was observed. All domains in GDM2 patients presented mean values above 19. On the other hand, three functional domains in GND (physical, social/family, and emotional) showed values below 19 (medium negative impact). Comparisons between GND and GDM2 revealed the statistical difference between them for all domains (P < 0.05). Conclusions: This study shows that DM2 associated with CP negatively affect QoL, even considering well-controlled diabetic patients.

Key words: Observational study, periodontal disease, quality of life, questionnaires, type 2 diabetes mellitus

INTRODUCTION

Chronic periodontitis (CP) is a common disease of the oral cavity consisting of inflammation and destruction of the underlying supporting tissues of the teeth that is mediated by host response. The activation of the host immune system, mainly for protection, ultimately results in the destruction of tissues, triggering the synthesis, and release of cytokines, pro-inflammatory mediators, and matrix metalloproteinases.

Diabetes mellitus (DM) is a group of metabolic diseases characterized by increased level of glucose in the blood, resulting from defects in insulin secretion and/or action. Hyperglycemia can cause tissue damage without showing clinical symptoms for many years before diagnosis; however, severe cases of hyperglycemia may result in numerous symptoms. Individuals affected by DM have a higher expression of matrix metalloproteinases-8 in the periodontium, contributing to exacerbation of periodontal destruction. Therefore, patients with diabetes are more likely to develop periodontal disease.

In fact, some studies have suggested a bidirectional relationship between glyemic control and periodontal disease. Thus, CP has been identified as a risk factor for glyemic control, especially in chronically stressed patients, which triggers an imbalance of the immune system.

Quality of life (QoL) is related to personal well-being and covers a number of aspects such as functional capacity, physical wellness, emotional stability, and social-familial interactions. Several QoL instruments have often been used for assessing health in populations with chronic diseases, allowing to determine the impact on health care.

Although research evidence began to emerge that CP is related with low QoL and are able to influence the occurrence and severity of certain conditions and systemic diseases, the effect of DM2 on QoL has not yet been explored.

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type 2 diabetes on QoL is still controversial.\cite{5} Thus, the purpose of this study is to examine the impact of well-controlled Type 2 DM (DM2) on QoL of CP patients. The hypothesis is that the negative impact on QoL in patients suffering from CP may be aggravated by DM2. The merit of this research is to study a large CP population with well-controlled diabetes and to measure the QoL using a questionnaire (Functional Assessment of Chronic Illness Therapy-Fatigue [FACIT-F]), which, differently from other instruments, evaluates physical, social/familial, emotional, and functional dimensions.\cite{12}

**MATERIALS AND METHODS**

Patients of both genders attending the endocrinology clinic from January to September 2015 were invited to take part in this cross-sectional research.

**Inclusion criteria**

All participants must present at least two sites with clinical attachment loss and probing pocket depth (PPD) >3 mm in two nonadjacent teeth, based on the criteria of the American Academy of Periodontology.\cite{13} Half of them must also have the diagnosis of type 2 DM obtained from the medical records of the endocrinology clinic. Only patients with complete records containing type of DM, duration, treatment evolution, and control of disease were included in the study.

**Exclusion criteria**

Patients unable to understand and answer the questionnaire (FACIT-F) or submitted to periodontal treatment for at least a year, or affected by any condition that could interfere with the research evaluation such as cirrhosis, pulmonary disorders (chronic obstructive pulmonary disease), HIV, smoking, pregnancy, or cardiovascular disease were excluded from the study.

All patients signed a term of consent. This research was conducted with the approval and in accordance with the guidelines of Research Ethics Committee (Protocol No. 185/11).

QoL was evaluated using the (FACIT-F) questionnaire, validated, and culturally adapted to Brazilian Portuguese, with permission of the Facit Licensing Agreement.\cite{12}

FACIT-F global questions were divided into four domains: physical, family-social, emotional and functional, containing seven questions per domain, with the following scores (negative impact) for each item: 0 - not at all, 1 - a little, 2 - more or less, 3 - very much, and 4 - a lot. For each domain, the scores 0–10 were considered low negative impact, 11–18 medium negative impact, and 19–28 high negative impact.

**Statistical analysis**

Two hundred and fifty participants were required to detect the difference between groups, with a power of 90%, a confidence interval of 0.20, and significance level of 0.05.

Statistical evaluation was performed using SPSS Statistics version 17 (IBM, Armonk, NY, USA). Initially, the normal distribution of data was checked by Kolmogorov–Smirnov test. Subsequently, numerical and percentage data were analyzed by Paired t-test and Qui-Square test, respectively. Paired nonparametric Wilcoxon signed-rank test was used to compare the QoL ordinal data of both groups. Statistical significance was determined at the 0.05 level.

**RESULTS**

Five hundred and forty-seven individuals were initially invited to participate in the study. Forty-seven patients were excluded from the study because they refused to sign the consent (n = 18) or because of they would not be subjected to periodontal examination (n = 9) or even because they did not meet the criteria of inclusion (n = 20).

Thus, 500 individuals with CP, of both genders and aged between 30 and 76 years old, were enrolled in this cross-sectional case-controlled study: 250 with well-controlled Type 2 DM (GDM2 Group) and 250 age- and gender-matched controls without DM2 (GND Group). The characteristics of individuals included in the study are shown in Table 1. No statistical differences between groups were found in age (P = 0.542), gender (P = 0.857), and number of teeth (P = 0.053). However, GM2 presented higher levels of fasting blood glucose (P < 0.001), CAL (P = 0.001), and PPD (P < 0.001) [Table 1], and more sites affected by CP [generalized disease, Table 1].

A correlation between the presence of DM2 and high negative impact on QoL was observed. All domains in GDM2 presented mean values above 19. On the other hand, three functional domains in GND (physical, social/family, and emotional) showed mean values below 19. Comparisons between GND and GDM2 revealed the statistical difference between them for all domains [Table 2].

**DISCUSSION**

Diabetes is a major public health problem\cite{14} and has been associated with different oral diseases including CP.\cite{15} On the
other hand, CP is a chronic infection that produces local and systemic inflammatory responses. Longitudinal studies have demonstrated a two-way relationship between diabetes and periodontitis. The prevalence of diabetes was 12.5% among periodontal patients but only 6.3% in participants without periodontitis. In Brazil, it was observed an increase in the prevalence of diabetes over time, with a progressive increase in the last 35 years. Unfortunately, despite high prevalence of DM and CP among patients, there are very few studies aiming at verifying the participation of both diseases on QoL. Thus, the objective of this cross-sectional case-controlled study was to examine the influence or not of well-controlled DM2 on QoL in CP patients. Cases and controls were matched by age and gender, to limit the influence of confounding factors for DM2.

Two hundred and fifty DM2 patients participated in this study. All of them presented mean fasting blood levels below 130 mg/dL and can be considered well-controlled patients according to American Diabetes Association that recommends a premeal blood glucose target of 80–130 mg/dL. FACIT-F was used to measure the impacts of DM and CP on QoL. This instrument is currently considered a good instrument to investigate perceptions and feelings of individuals about their own health and expectations of dental services. Furthermore, self-report fatigue questionnaires have rarely been used in dentistry, despite the systemic response to oral diseases. In fact, patient-oriented outcomes that measure changes in end points that really matter to patients, such as esthetics, QoL, and pain relief, provide better evidence than disease-oriented outcomes such as probing depth reduction. As CP and DM2 clearly affect the general health of individuals, the use of such questionnaires seems to be of interest to study the consequences of both diseases in terms of well-being and QoL.

Previous studies on the impact of oral diseases on well-being demonstrated that changes in oral health negatively affect the QoL of people. This study has confirmed these observations. Regarding the presence or absence of diabetes, our research showed that 100% of patients with diabetes presented high negative impact on all QoL domains. These results are similar to previous reports that related poor QoL with a high prevalence of symptoms in patients with type 2 diabetes including depression. In fact, CP has been associated with reduced oral health-related QoL (OHRQoL) compared to periodontally healthy nondiabetic patients but with improvement after treatment of periodontitis. However, no impact of type 2 diabetes on OHRQoL was noted by Irani et al. corroborating with Sadeghi et al., who showed that OHRQoL was not negatively affected by diabetes mellitus in the assessed patients. These results may be related to the QoL instrument used by those authors that do not focus on systemic aspects of disease.

This study not only confirms the effects of CP on individuals’ QoL but also emphasizes the influence of DM2 on well-being, especially because of pain, fear, anxiety, and functional limitations observed in DM2 patients with CP. This bidirectional relationship between diabetes and periodontal disease highlights the need for an interdisciplinary approach including diabetic care, periodontal treatment, and education programs.

Low glycemic levels reduce the morbidity associated with type 2 diabetes, which reinforces the importance of keeping patients at controlled glucose levels. However, the present study showed that diabetes control alone is not sufficient to improve people’s QoL. The treatment of periodontitis is also important, to reduce the consequences of periodontal disease and enhance patients’ well-being, especially in countries like Brazil with a high prevalence of diabetes and CP. Hence, it is important to inform patients and health professionals to observe the possible negative impact on QoL in DM2/CP individuals. Dental and medical professionals should develop specific programs with strategies to minimize negative effects of those two comorbidities on well-being.

To conclude, this study showed that DM2 associated with CP negatively affected QoL, even considering well-controlled diabetic patients.

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**Conflicts of interest**

There are no conflicts of interest.

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