Impact of Chronic Periodontitis on the Quality of Life of Individuals with and without Diabetes

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Abstract

Objective: The aim of the present study was to evaluate the occurrence of chronic periodontitis among individuals with and without diabetes and measure the impact on quality of life in this population.

Methods: A case-control study was conducted at the Endocrinology Clinic of Agamenon Magalhães Hospital and the clinic of the Federal University of Pernambuco (Recife, Brazil). The sample consisted of 116 individuals with type 2 diabetes mellitus and chronic periodontitis, 95 individuals with chronic periodontitis alone (case groups) and 69 healthy individuals without either condition (control group). Data were collected on age, sex, income and schooling and the Oral Health Impact Profile (OHIP-14) was administered in interview format for the evaluation of the impact on quality of life. Clinical examinations were performed and a periogram was filled out for each participant, on which visible plaque, probing depth, bleeding on probing and clinical attachment loss were recorded.

Results: In the group with diabetes, a significant difference in the mean plaque index was found between individuals with and without impact (p=0.023).

Conclusion: In the present study, the impact on quality of life was greater among females, individuals with a higher visible plaque index and those with a fewer number of teeth.

Keywords: Chronic periodontitis; Oral health impact profile; Quality of life; Type 2 diabetes mellitus

Introduction

Periodontitis is an infectious inflammatory disease that affects the periodontium [1] and is caused by an impaired immune response to oral bacteria [2,3]. It is considered to be one of the most common inflammatory diseases throughout the world [4] and causes harm to both the connective tissue and bone [5]. The two main forms are aggressive periodontitis and chronic periodontitis [6], the latter of which occurs due to longstanding exposure to periodontal pathogens [7-9] and is the result of the buildup of dental biofilm, with consequent slow, progressive damage to the supporting structures of the teeth [10]. However, other risk factors, such as smoking, diabetes, stress, medications and poor nutrition, are involved in the onset of gingival inflammation [11].

Diabetes is also considered an important chronic disease throughout the world [12]. It is a metabolic disorder with a multifactor etiology characterized by chronic hyperglycemia [13]. Epidemiological evidence demonstrates a bi-directional relationship between diabetes and periodontitis [14]. The control of periodontitis can contribute to a better blood sugar control, as the oral tissues most commonly affected in diabetes are the periodontal tissues [15].

In the past, quality of life referred to “having a good life” and one’s satisfaction with life. In contrast, quality of life is currently defined as a statistical index based on multiple economic, health-related, environment-related and individual-related variables or the living conditions of a group [16]. Initial reports in this field denominated self-rated results “health status”. This evaluation can be performed on both patients and the general population. When directed mainly at the evaluation of the patient, it became known as health-related quality of life, which is distinguished from the quality of life of the general population, as the latter partially depends on factors not related to health. Health-related quality of life involves multidimensional evaluations that include the
physical, emotional (or psychological) and social domains and can also include other domains, such as cognitive functioning, sexuality and spirituality [17]. Moreover, differences can be found among different ethnic groups [18].

Studies report that periodontal disease exerts a negative impact on quality of life and such effects are greater among individuals with severe periodontitis. Some studies report that periodontitis not only affects the ability to eat, speak and socialize, but also interpersonal relationships and activities of daily living. Curiously, this condition can even affect the smiling pattern of affected individuals and smile-related quality of life [19].

The psychosocial consequences of oral conditions have received little attention, since such conditions are rarely life threatening. Moreover, the oral cavity has historically been dissociated from the rest of the body. However, recent studies have demonstrated that the emotional and psychosocial consequences of oral problems are as serious at those found with other disorders [20].

The Oral Health Impact Profile (OHIP) is among the assessment tools commonly used as a measure of quality of life [21]. The OHIP-14 is derived from the original 49-item OHIP and is used to evaluate seven dimensions of impact: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap [22]. Altered for dentistry by Locker [23], this scale focuses nearly exclusively on negative impacts stemming from oral problems [24]. Each domain is composed of statements, such as “Have you had to interrupt meals because of problems with your teeth, mouth or dentures?” The response options are scored on a five-point scale: never=0; hardly ever=1; occasionally=2; fairly often=3; and very often=4. The frequency of impact is calculated by the sum of the reported negative impacts (responses of “fairly often” and “very often”). This scale has increased the possibility of measuring and “exploring” the social consequences of oral problems patients consider to be important and is considered the most sophisticated oral health measure [25]. OHIP-14 scores among individuals with gingivitis and periodontitis are higher than those among individuals with a healthy periodontal status. Moreover, total OHIP-14 scores are higher among individuals with periodontitis than those with gingivitis [26].

Type 2 diabetes mellitus (DM2) is considered a pandemic disease. The causal origin of this accelerated development is related to various interacting factors, such as a sedentary lifestyle, excessive body weight, stress and poor eating habits [27]. The prevalence of periodontitis ranges from 20 to 50% in the general population, but is 60% in the population with diabetes [28]. Epidemiological studies and meta-analyses of studies involving diabetic populations have demonstrated that diabetes increases the risk of developing periodontitis approximately threefold compared to individuals without diabetes [29,30].

The evaluation of the impact of diseases on daily living and quality of life is an important component of modernity. Health and patient-centered outcomes are likely more relevant to individuals than traditional clinical measures of a disease [30]. Thus, the aim of the present study was to determine the occurrence of chronic periodontitis among individuals with and without diabetes and measure the impact on quality of life in the population studied.

**Methods**

**Ethical considerations**

This study received approval from the human research ethics committees of the Center for Health Science of the Universidade Federal de Pernambuco (certificate number: 1310208) and Agamenon Magalhães Hospital (certificate number: 1368830). All participants received clarifications regarding the objectives and procedures of the study and agreed to participate by signing a statement of informed consent.

**Interview**

Prior to the clinical examinations, data were collected on age, sex, income and schooling and the OHIP-14 quality of life measure was administered in interview form.

**Study design and target population**

A case-control study was conducted at the Endocrinology Clinic of Agamenon Magalhães Hospital and the clinic of the Postgraduate Program in Dentistry of the Universidade Federal de Pernambuco.

The study population was composed of 116 individuals with a diagnosis of type 2 diabetes mellitus and chronic periodontitis (DM2+CP), 95 individuals diagnosed with chronic periodontitis (CP) (case groups) and 69 healthy individuals with neither of these two conditions (control group). The participants were recruited from the aforementioned clinics between November 2015 and November 2016. All participants were residents of the state of Pernambuco, Brazil, and were recruited based on the following eligibility criteria:

**Inclusion criteria:** For all groups, the inclusion criteria were a minimum age of 35 years and having at least eight natural teeth (excluding those with an indication for extraction). In the DM2+CP group, the inclusion criteria were DM2 and a clinical diagnosis of CP. In the CP group, the inclusion criterion was a clinical diagnosis of CP. Individuals without DM2 and without a diagnosis of CP were included in the control group.

**Exclusion criteria:** Individuals submitted to antibiotic therapy in the previous six months, those making chronic use of an anti-inflammatory agent, those with conditions that compromise systemic immunity, pregnant or nursing women, individuals having been submitted to periodontal treatment in the previous six months, smokers and individuals wearing an orthodontic appliance were excluded from the study.
Clinical aspects

CP was characterized by the presence of inflammation (bleeding on probing), an increase in probing depth and clinical attachment loss, following the recommendations of the American Academy of Periodontology [6]. The diagnosis is based on clinical and radiographic findings, but not all variables are necessarily present. Based on these variables, CP is classified based on severity (mild, moderate or severe) and extent (localized or generalized).

A periogram was filled out for each individual, on which the following were recorded: visible plaque, probing depth, bleeding on probing, clinical attachment loss, mobility and furcation involvement. Six sites were probed for each tooth: mesio-vestibular, mid-vestibular, disto-vestibular, mesiolingual, mid-lingual and disto-lingual. The examination was performed under artificial light with the aid of an odontoscope and North Carolina millimeter periodontal probe (Trinity®). The examiners wore individual protective equipment. Three examiners and assistants who had undergone training and calibration exercises performed the clinical examinations and recorded the findings on individual charts.

Statistical analysis

The data were expressed as mean (± standard deviation) and frequency distributions. Data on probing depth, clinical attachment level, bleeding on probing and the plaque index were categorized and the likelihood ratio independence test was used to determine associations with genotype, since it was not possible to use Pearson's chi-square test. Associations between the severity/extent of periodontitis and the continuous variables (duration of diabetes, income and age) in individuals with and without diabetes were evaluated using the nonparametric Mann-Whitney test, since the continuous data did not have normal distribution. Associations with discrete variables (sex, smoking habit, schooling and single-nucleotide polymorphisms (alleles and genotypes) were evaluated using the likelihood ratio test.

The multivariate analysis was composed of binary logistic regression. The models were tested using the Omnibus test to find a good fit. The coefficient of determination of the model was calculated based on Nagelkerke’s R2. The Hosmer-Lemeshow test was used to compare observed values to expected values. Odds ratios (OR) were also calculated. All independent variables with a p-value of 0.20 in the bivariate analysis were incorporated into the model. A 5% significance level (p<0.05) was adopted for the final model. The data were entered into the Microsoft Excel program and the SPSS 20.0 program was used for the data analysis.

Results

Two hundred eighty individuals participated in the present study: 116 (41.5%) in the DM2+ CP group (mean age: 58.2 ± 9.7 years; range: 20 to 80 years), 95 (33.9%) in the CP group (mean age: 51.1 ± 9.6 years; range: 35 to 76 years) and 69 (24.6%) in the control group (mean age: 49.6 ± 10.7; range: 35 to 77 years). The difference in age was statistically significant (p=0.000; nonparametric Kruskal-Wallis test).

The female sex was predominant in all groups: 74.1% of the DM2+CP group, 80.0% in the CP group and 91.3% in the control group. The difference between sexes was statistically significant (p=0.018), but only in the control group (Table 1).

Table 1 Characterization of sample (categorical variables) in the different groups.

| Variable       | Group          | Total | p-value |
|----------------|----------------|-------|---------|
|                | DM2+ CP | CP | Control |            |
|                | n | % | n | % | n | % | n | % |
| Sex            |        |   |   |   |   |   |   |   |
| Male           | 30 | 25.9 | 19 | 20 | 6 | 8.7 | 55 | 19.6 |
| Female         | 86 | 74.1 | 76 | 80 | 63 | 91.3 | 225 | 80.4 |
| Total          | 116 | 100 | 95 | 100 | 69 | 100 | 280 | 100 |
| Marital status |        |   |   |   |   |   |   |   |
| Married        | 75 | 64.7 | 46 | 48.4 | 31 | 44.9 | 152 | 54.3 |
| Single         | 23 | 19.8 | 31 | 32.6 | 19 | 27.5 | 73 | 26.1 |
| Divorced       | 7 | 6 | 8 | 8.4 | 14 | 20.3 | 29 | 10.4 |
| Widowed        | 10 | 8.6 | 10 | 10.5 | 4 | 5.8 | 24 | 8.6 |
Mean duration of diabetes was 16.6 ± 24.1 years. Mean income of the diabetic patients was 1.6 ± 1.2 times the BMMW (range: 0 to 10 times the BMMW). Regarding periodontal status in this group, mean probing depth was 2.4 ± 0.7 mm, with 82.8% of the measurements less than 3 mm. Mean clinical attachment loss (CAL) was 3.9 ± 1.7 mm; 42.6% of patients had CAL between 3.0 and 4.9 mm and 22.6% had CAL greater than 5.0 mm. Mean bleeding on probing was 11.6 ± 14.3%, with 78.4% of the patients exhibiting bleeding. The mean plaque index was 26.0 ± 25.4%, with 84.5% of the patients exhibiting plaque. All these variables differed significantly in comparison to the control group (Table 2).

Table 2: Descriptive measures of quantitative variables.

| Variable         | N    | Mean ± SD | Minimum | Maximum | p-value |
|------------------|------|-----------|---------|---------|---------|
| **Age**          |      |           |         |         |         |
| DM2+CP           | 116  | A         | 58.2 ± 9.7 | 20     | 80      | 0       |
| CP               | 95   | AB        | 53.0 ± 9.6 | 35     | 76      |         |
| Control          | 69   | B         | 49.6 ± 10.7 | 35     | 77      |         |
| Total            | 280  |           | 54.3 ± 10.5 | 20     | 80      |         |
| **Income (x BMMW)** |      |           |         |         |         |
| DM2+CP           | 106  | A         | 1.6 ± 1.2 | 0      | 10      | 0.004   |
| CP               | 89   | A         | 1.6 ± 1.3 | 0      | 7       |         |
In the DM2+CP group, the frequency of moderate and severe CP was the same (40.5%) and generalized periodontitis was found in 80.2% of the group. Considering severity and extent, 34.5% had generalized moderate periodontitis and 39.7% had generalized severe periodontitis. No significant differences were found between the DM2+CP and CP groups (Table 3).

### Table 3 Distribution of periodontitis severity and extent in DM2+CP and CP groups.

| Chronic periodontitis | Group | Total | p-value |
|-----------------------|-------|-------|---------|
| DM2 + CP              |       |       |         |
| Control               |       |       |         |
| Total                 |       |       |         |
| CP                    |       |       |         |
| Control               |       |       |         |
| Total                 |       |       |         |

1-nonparametric Kruskal-Wallis test, *statistically significant difference (p<0.05)
A significant association (p=0.037) was found between the classification of periodontitis and sex. Generalized severe periodontitis was more frequent among males in the DM2+CP group (56.7%). No significant associations were found between the classification of chronic periodontitis and income, smoking habit or duration of diabetes (p>0.05) (Table 4).

![Table 4](https://www.hsj.gr)
A significant association (p=0.007) was found between the classification of periodontitis and sex in the CP group, with a greater frequency of generalized severe periodontitis among males (78.9%). No significant associations were found between the classification of chronic periodontitis and income or smoking habit (p>0.05) (Table 5).

Table 5 Distribution of classification of chronic periodontitis according to sex, smoking habit and income in CP group.

| Variable | Classification of Chronic Periodontitis | Total | p-value<sup>1</sup> |
|----------|----------------------------------------|-------|---------------------|
|          | Localized mild | Generalized mild | Localized moderate | Generalized moderate | Localized severe | Generalized severe |          |
| Sex      |             |                |                   |                     |                  |                   |          |
|          | N %         | N %            | N %               | N %                 | N %             | N %              |          |
| Male     | 0 0         | 0 0            | 0 0               | 0 0                 | 3 15.8         | 1 5.3            | 15 78.9   |
|          |             |                |                   |                     |                  |                   | 19 100    |
| Female   | 12 15.8     | 5 6.6          | 8 10.5            | 17 22.4             | 4 5.3          | 30 39.5         | 39.5 76   |
|          |             |                |                   |                     |                  |                   | 76 100    |
| Total    | 12 12.6     | 5 8.4          | 8 20.1            | 5 5.3               | 5 45           | 1 45.4          | 45 47.4   |
| Income   |             |                |                   |                     |                  |                   | 95 100    |
| Up to 2 x BMMW | 10 14.9 | 5 7.5 | 6 9 | 14 20.9 | 3 4.5 | 29 43.3 | 43.3 67 |
|          |             |                |                   |                     |                  |                   | 100 0.34  |
| 2 to 4 x BMMW | 0 0 | 0 0 | 2 10.5 | 4 21.1 | 2 10.5 | 11 57.9 | 57.9 19 |
|          |             |                |                   |                     |                  |                   | 100 0    |
| 4 to 10 x BMMW | 0 0 | 0 0 | 0 0 | 0 1 | 33.3 0 | 0 2 | 66.7 3 |
|          |             |                |                   |                     |                  |                   | 100 0    |
| Total    | 10 11.2     | 5 5.6          | 8 9               | 19 21.3             | 5 5.6          | 42 47.2         | 47.2 89   |
| Smoking habit |     |                |                   |                     |                  |                   | 100 0.35  |
| Never smoked | 8 12.7 | 3 4.8 | 6 9.5 | 15 23.8 | 1 1.6 | 30 47.6 | 47.6 63 |
| Ex-smoker | 4 12.5     | 2 6.3          | 2 6.3             | 5 15.6              | 4 12.5         | 15 48.9         | 48.9 32   |
|          |             |                |                   |                     |                  |                   | 100 0     |
| Total    | 12 12.6     | 5 5.3          | 8 8.4             | 20 21.1             | 5 5.3          | 45 47.4         | 47.4 95   |

Table 6 displays the impact on quality of life in the DM2+CP group. The only significant association was with sex (p=0.033), as 52.3% of the females reported impact versus 30.0% of the males. No significant associations were found for the other variables.

Table 6 Distribution of variables according to impact on quality of life (OHIP-14) in DM2+CP group.

| Variable | OHIP | Total | p-value<sup>1</sup> |
|----------|------|-------|---------------------|
|          | Without impact | With impact |          |
|          | n %         | n %       | n %              |          |
| Sex      |             |            |                   |          |
| Male     | 21 70 | 9 30 | 30 100 | 0.033* |
| Female   | 41 47.7 | 45 52.3 | 86 100 | 100 0.382 |
| Total    | 62 53.4 | 54 46.6 | 116 100 | 100 0     |

Marital status

| Marital status | Without impact | With impact | Total | p-value<sup>1</sup> |
|----------------|----------------|-------------|-------|---------------------|
| Married        | 39 52 | 36 48 | 75 100 | 100 0.382 |
| Single         | 10 43.5 | 13 56.5 | 23 100 | 100 0     |
| Divorced       | 5 71.4 | 2 28.6 | 7 100 | 100 0     |
| Widowed        | 7 70 | 3 30 | 10 100 | 100 0     |
| Total          | 61 53 | 54 47 | 115 100 | 100 0     |

Income

| Income | Without impact | With impact | Total | p-value<sup>1</sup> |
|--------|----------------|-------------|-------|---------------------|
|        | n %            | n %         | n %   |          |
| BMMW   | Brazilian monthly minimum wage; 1- likelihood ratio test, * statistically significant difference (p<0.05)
None of the variables analyzed was associated with an impact on quality of life in the CP group (Table 7).

None of the variables analyzed was associated with an impact on quality of life in the control group (Table 8).

The mean plaque index in the DM2+CP group differed significantly (p=0.023) between those with no impact on quality of life (32.00 ± 29.60) and those with impact on quality of life (19.21 ± 17.40). No significant differences in the plaque index were found in the CP and control groups. Significant associations were found between the number of teeth and impact on quality of life in the DM2+CP (p=0.005) and CP (p=0.010) groups, with a higher mean number of teeth among those with no impact on quality of life (Table 9).

### Table 7 Distribution of variables according to impact on quality of life (OHIP-14) in CP group.

| Variable       | OHIP | p-value |
|----------------|------|---------|
|                | Without impact | With impact | Total |       |
|                | n     | %      | n     | %      | n     | %      |
| Sex            |       |        |       |        |       |        |
| Male           | 9     | 47.4   | 10    | 52.6   | 19    | 100    |
| Female         | 36    | 47.4   | 40    | 52.6   | 76    | 100    |
| Total          | 45    | 47.4   | 50    | 52.6   | 95    | 100    |

### Table 8 Distribution of variables according to impact on quality of life (OHIP-14) in control group.

| Variable       | OHIP | p-value |
|----------------|------|---------|
|                | Without impact | With impact | Total |       |
|                | n     | %      | n     | %      | n     | %      |
| Sex            |       |        |       |        |       |        |
| Male           | 4     | 66.7   | 2     | 33.3   | 6     | 100    |
| Female         | 30    | 47.6   | 33    | 52.4   | 63    | 100    |
| Total          | 34    | 49.3   | 35    | 50.7   | 69    | 100    |

### Table 9 Distribution of variables according to impact on quality of life in CP group.

| Variable       | OHIP | p-value |
|----------------|------|---------|
|                | Without impact | With impact | Total |       |
|                | n     | %      | n     | %      | n     | %      |
| Sex            |       |        |       |        |       |        |
| Male           | 23    | 50     | 23    | 50     | 46    | 100    |
| Female         | 13    | 41.9   | 18    | 58.1   | 31    | 100    |
| Divorced       | 4     | 50     | 4     | 50     | 8     | 100    |
| Widowed        | 5     | 50     | 5     | 50     | 10    | 100    |
| Total          | 45    | 47.4   | 50    | 52.6   | 95    | 100    |
Table 9 Descriptive measures of variables according to impact on quality of life (OHIP-14) in each group.

| Variable                        | DM2+CP | CP | Control |
|---------------------------------|--------|----|---------|
|                                 | N      | Mean ± SD | p-value | N      | Mean ± SD | p-value | N      | Mean ± SD | p-value |
| Mean probing depth              |        |           |         |        |           |         |        |           |         |
| Without Impact                  | 62     | 2.43 ± 0.66 | 0.778   | 45     | 2.29 ± 0.52 | 0.958   | 34     | 1.89 ± 0.34 | 0.316   |
| With Impact                     | 54     | 2.46 ± 0.68 |          | 50     | 2.30 ± 0.61 |          | 35     | 1.84 ± 0.27 |          |
| Mean clinical attachment loss   |        |           |         |        |           |         |        |           |         |
| Without Impact                  | 62     | 3.74 ± 1.61 | 0.389   | 45     | 3.18 ± 0.96 | 0.495   | 34     | 2.16 ± 0.45 | 0.54    |
| With Impact                     | 54     | 4.06 ± 1.74 |          | 50     | 3.83 ± 2.12 |          | 35     | 2.12 ± 0.44 |          |
| Bleeding index                  |        |           |         |        |           |         |        |           |         |
| Without Impact                  | 62     | 13.25 ± 16.47 | 0.31   | 45     | 14.81 ± 12.54 | 0.985   | 34     | 4.70 ± 5.81 | 0.955   |
| With Impact                     | 54     | 9.71 ± 11.26 |          | 50     | 15.94 ± 15.39 |          | 35     | 5.48 ± 7.58 |          |
| Plaque index (%)                |        |           |         |        |           |         |        |           |         |
| Without Impact                  | 62     | 32.00 ± 29.60 | 0.023  | 45     | 22.50 ± 20.24 | 0.416   | 34     | 15.38 ± 19.79 | 0.642   |
| With Impact                     | 54     | 19.21 ± 17.40 |          | 50     | 27.24 ± 25.02 |          | 35     | 17.32 ± 20.08 |          |
| Number of teeth                 |        |           |         |        |           |         |        |           |         |
| Without Impact                  | 62     | 17.19 ± 5.88 | 0.005   | 45     | 19.20 ± 5.60 | 0.01    | 34     | 21.03 ± 5.42 | 0.33    |
| With Impact                     | 54     | 14.13 ± 4.84 |          | 50     | 16.38 ± 5.38 |          | 35     | 19.37 ± 6.13 |          |

1- likelihood ratio test, *statistically significant difference (p<0.05)

Discussion

Type 2 diabetes mellitus (DM2) is considered a pandemic. The causal origin of its accelerated development is related to several interacting factors, such as a sedentary lifestyle, excessive body weight, stress and poor eating habits [27]. The prevalence of periodontitis ranges from 20 to 50% in the general population, but is 60% in the population with diabetes [28]. Epidemiological studies and meta-analyses of studies involving diabetic populations demonstrate that diabetes increases the risk of developing periodontitis approximately threefold in comparison to individuals without diabetes [29,30].

Periodontal diseases consist of inflammatory processes of infectious origin that affect the gingival tissues (gingivitis) and/or the supporting tissues of the teeth (periodontitis) [1]. They occur as a consequence of the inflammatory and immunological reactions in the periodontal tissues induced by the microorganisms of the dental biofilm (bacterial plaque), damaging the connective tissue and the alveolar bone [2,3]. The bacterial biofilm plays an important role in the pathogenic process. Strategies to avoid accumulation through good oral hygiene and scaling and root planing should be employed.
While bacteria are essential for triggering the disease, the evolution and extent of periodontal damage are also related to host susceptibility [2]. Chronic periodontitis is a silent disease with a slow evolution that causes tooth loss in the final stage [31]. Moreover, its occurrence has recently been demonstrated to have a substantial social-behavioral component. This condition is therefore considered not only a threat to the dentition, but also affects oral health-related quality of life [32], which is defined as a multidimensional concept that reflects comfort when eating, sleeping and engaging in social relationships, affecting one's self-esteem and contentment with regard to oral health [33].

Although there is no consensus on the concept of quality of life, three fundamental aspects referring to this construct have been determined by a group of experts from different cultures: 1) subjectivity, 2) multidimensionality and 3) positive (i.e., mobility) and negative (i.e., pain) dimensions. The consideration of these elements has led to a definition of quality of life as “individuals’ perceptions of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations and standards and concerns” [34].

A large number of indices have been developed in an attempt to evaluate how oral problems affect quality of life. One of the most described and widely used of which is the Oral Health Impact Profile (OHIP), which was developed to obtain information on the nature and extent of functional, social and psychological impacts in dental studies, procedures and clinical evaluations. The subscales of the OHIP are functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap [23,35-39]. The OHIP is one of the most widely used questionnaires and its reliability has been confirmed. It was created and developed in Australia [40] and has been translated and adapted to several languages and cultures [41]. The 49-item questionnaire was subsequently reduced to 14 items that have proven to be effective and useful for assessing the impact of oral problems on quality of life [36].

The literature reports that individuals with periodontal problems experience negative impacts on quality of life [42-44]. However, there are no previous studies regarding this perception among individuals with diabetes.

Each individual has the capacity for perceptions regarding his/her health and its effect on his/her daily life [35]. In diabetic individuals, the perception of oral health may be altered, especially in the occurrence of chronic periodontitis, which is one of the complications of diabetes and can also be associated with emotional disorders in affected individuals.

In the present study, the female sex predominated, which may be due to the fact that more women seek healthcare services and the impact on quality of life in individuals of this gender is more important.

It is necessary to develop specific strategies to minimize the negative effects of chronic periodontitis. A different philosophical approach, with the participation of the patient in the therapeutic process, could be the best way to increase awareness regarding the responsibility for seeking care as well as changing the perspective of patients with regard to health in all its domains (physical, social, familial, emotional and functional) [44]. In the present study, the visible plaque index exerted an impact on quality of life and the number of teeth in individuals with impact on quality of life was lower in the group with diabetes.

Conclusion

In the present study, individuals with chronic periodontitis reported a negative impact on quality of life. Moreover, the impact on quality of life was greater among females, individuals with a higher visible plaque index and those with a fewer number of teeth.

References
1. Di Benedetto A, Gigante I, Colucci S, Grano M (2013) Periodontal disease: linking the primary inflammation to bone loss. Clin Dev Immunol 2013: 1-7.
2. Agrali OB, Kuru BE (2015) Periodontal treatment in a generalized severe chronic periodontitis patient: A case report with 7-year follow-up. Eur J Dent 9: 288-292.
3. Zupin L, Navarra CO, Robino A, Bevilacqua L, Di Lenarda R, et al. (2017) NLRC5 polymorphism is associated with susceptibility to chronic periodontitis. Immunobiol 222: 704-708.
4. Albandar JM, Rams TE (2002) Global epidemiology of periodontal diseases: an overview. Periodontol 2000 29: 7-10.
5. Chen D, Zhang TL, Wang X (2016) Association between polymorphisms in interleukins 4 and 13 genes and chronic periodontitis in a HAN Chinese population. Biomed Res Int 2016: 8389020.
6. Armitage GC (1999) Development of a classification system for periodontal diseases and conditions. Ann Periodontol 4: 1-6.
7. Alnaeeli M, Penninger JM, Teng YTA (2006) Immune interactions with CD4+ T cells promote the development of functional osteoclasts from murine CD11c+ dendritic cells. J Immunol 177: 3314-3326.
8. Laine ML, Crielaard W, Loos BG (2012) Genetic susceptibility to periodontitis. Periodontol 2000 58: 37-68.
9. Laine ML, Loos BG, Crielaard W (2010) Gene polymorphisms in chronic periodontitis. Int J Dent 2010: 324719.
10. Elangovan S, Hertzman-Miller R, Karimbux N, Giddon D (2014) A framework for physician-dentist collaboration in diabetes and periodontitis. Clin Diabetes 32: 188-192.
11. Van Dyke TE, Shlelesh D (2005) Risk factors for periodontitis. J Int Acad Periodontol 7: 3-7.
12. Smyth S, Heron A (2006) Diabetes and obesity: the twin epidemics. Nat Med 12: 75-80.
13. Negrato C, Tarzia O (2010) Buccal alterations in diabetes mellitus. Diabetol Metab Syndr 2: 3.
14. Paraschiv C, Covalea C, Miron E, Ghiuru R, Esanu I, et al. (2014) Clinical forms of periodontal disease in patients with type 2 diabetes mellitus. Rom J Oral Rehabil 18: 6.
15. Gandara BK, Morton TH (2011) Non-periodontal oral manifestations of diabetes: a framework for medical care providers. Diabetes Spectr 24: 199-205.
16. Sosnowski R, Kulpa M, Ziętalewicz U, Wolski JK, Nowakowski R, et al. (2017) Basic issues concerning health-related quality of life. Cent Eur J Urol 206 Cent Eur J Urol 70: 206-211.
17. Osoba D (2011) Health-related quality of life and cancer clinical trials. Therap Adv Med Oncol 3: 57-71.
18. Abdelrahim R, Delgado-Angulo EK, Gallagher JE, Bernabé E (2017) Ethnic disparities in oral health related quality of life among adults in London, England. Community Dent Health 34: 122-127.
19. Al Habashneh R, Khader YS, Salameh S (2012) Use of the arabic version of oral health impact profile-14 to evaluate the impact of periodontal disease on oral health-related quality of life among Jordanian adults. J Oral Sci 54: 113-120.
20. Allen FP (2003) Assessment of oral health related quality of life. Health Quality Life 1: 1-8.
21. LuHX, Xu W, Wong MCM, Wei TY, Feng XP (2015) Impact of periodontal conditions on the quality of life of pregnant women: A cross-sectional study. Health Qual Life Outcomes 13: 67.
22. Hongxing L, List T, Nilsson IM, Johansson A, Aström AN (2014) Validity and reliability of OIDP and OHIP-14: a survey of Chinese high school students. BMC Oral Health 14: 158.
23. Locker D (1988) Measuring oral health: a conceptual framework. Community Dent Health Mar 5: 3-18.
24. Niesten D, Van Mourik K, Van Der Sanden W (2012) The impact of having natural teeth on the QoL of frail dentulous older people. A qualitative study. BMC Public Health 12: 839
25. Locker D (1998) Issues in measuring change in self-perceived oral health status. Community Dent Oral Epidemiol 26: 41-47.
26. Eltas A, Uslu MO, Eltas SD (2016) Association of oral health-related quality of life with periodontal status and treatment needs. Oral Health Prev Dent 14: 339-347.
27. Kolb H, Eizirik DL (2011) Resistance to type 2 diabetes mellitus: a matter of hormesis? Nat Rev Endocrinol 8: 183-192.
28. D’Auito F, Sabbah W, Netuveli G, Donos N, Hingorani AD, et al. (2011) Association of the metabolic syndrome with severe periodontitis in a Large U.S. population-based survey. J Clin Endocrinol Metab 93: 3989-3994.
29. Mealey BL, Ocampo GL (2007) Diabetes mellitus and periodontal disease. Periodontol 2000 44: 127-153.
30. Iriani FC, Wassall RR, Preshaw PM (2015) Impact of periodontal status on oral health-related quality of life in patients with and without type 2 diabetes. J Dent 43: 506-511.
31. Buset SL, Walter C, Friedmann A, Weiger R, Borgnaakke WS, et al. (2016) Are periodontal diseases really silent? A systematic review of their effect on quality of life. J Clin Periodontol 43: 333-344.
32. Thomson WM, Sheiham A, Spencer AI (2012) Sociobehavioral aspects of periodontal disease. Periodontol 2000 60: 54-63.
33. https://www.nidcr.nih.gov/research/data-statistics/surgeon-general
34. Bellini M, Maltoni O, Gatto MR, Pelliccioni G, Cecchi V, et al. (2008) Dental phobia in dentistry patients. Minerva Stomatol 57: 485-495.
35. Locker D, Slade G (1993) Oral health and the quality of life among older adults: the oral health impact profile. J Can Dent Assoc 59: 830-833.
36. Slade GD (1997) Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 25: 284-290.
37. Locker D, Jokovic A (1996) Using subjective oral health status indicators to screen for dental care needs in older adults. Community Dent Oral Epidemiol 24: 398-402.
38. Allen PF, McMillan AS, Walshaw D, Locker D (1999) A comparison of the validity of generic- and disease-specific measures in the assessment of oral health-related quality of life. Community Dent Oral Epidemiol 27: 344-352.
39. Allen PF, McMillan AS, Locker D (2001) An assessment of sensitivity to change of the Oral Health Impact Profile in a clinical trial. Community Dent Oral Epidemiol 29: 175-182.
40. Slade GD, Spencer AJ (1994) Development and evaluation of the Oral Health Impact Profile. Community Dent Health 11: 3-11.
41. Locker D (2004) Oral health and quality of life. Oral Health Prev Dent 1: 247-253.
42. Araújo AC da S, Gusmão ES, Batista JEM, Cimões R (2010) Impact of periodontal disease on quality of life. Quintessence Int 41: e111-118.
43. Lopes MWF, Gusmão ES, Alves RV, Cimões R (2009) The impact of chronic periodontitis on quality of life in brazilian subjects. Acta stomatologica Croatica 43: 89-98.
44. Mourão LC, Cataldo D de M, Moutinho H, Canabarao A (2015) Impact of chronic periodontitis on quality-of-life and on the level of blood metabolic markers. J Indian Soc Periodontol 19: 155-158.