**MESTRADO EM ODONTOLOGIA**

**ÁREA DE CONCENTRAÇÃO EM PERIODONTIA**

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**RELAÇÃO ENTRE PERIODONTITE E QUALIDADE DE VIDA EM PACIENTES COM DIABETES MELLITUS E NORMOGLICÊMICOS**

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Orientadora: Profª. Drª. Nidia Cristina Castro dos Santos

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# RESUMO

**Contexto**: Periodontite e diabetes são problemas de saúde em todo o mundo que afetam negativamente a qualidade de vida. O objetivo deste estudo foi investigar a relação entre a periodontite e medidas de qualidade de vida relacionadas à saúde bucal (OHRQoL) em pacientes diabéticos e não diabéticos.

**Métodos**: Pacientes diabéticos e não diabéticos com periodontite nos estágios III e IV, graus B e C foram avaliados para OHRQoL por meio do Oral Health Impact Profile (OHIP) -14. Os escores médios do OHIP-14 e a prevalência de respostas foram comparados, e a regressão logística binária foi usada para medir a relação entre os escores do OHIP-14 e as variáveis independentes.

**Resultados:** Foram analisados 77 pacientes diabéticos e 101 não diabéticos. O diabetes foi significativamente associado a escores mais elevados do OHIP-14, indicando redução da percepção da qualidade de vida. Os diabéticos apresentaram OHIP-14 significativamente maior e maior prevalência de limitação funcional, desconforto psicológico, incapacidade física e incapacidade social. A regressão logística revelou que o diabetes aumentou o odds ratio para pontuações mais altas do OHIP-14.

**Conclusão:** A periodontite teve um impacto negativo maior no OHRQoL para pessoas com diabetes do que para pacientes não diabéticos.

**Palavras-chave:** Qualidade de vida relacionada à saúde bucal. Periodontite. Diabetes. Hiperglicemia.

# ABSTRACT

**Background:** Periodontitis and diabetes are worldwide health problems that negatively impact quality of life. The aim of this study was to investigate the relationship between periodontitis and oral health-related quality of life measures (OHRQoL) in diabetic and non-diabetic patients.

**Methods:** Diabetic and non-diabetic  patients with Stages III and IV, Grades B and C periodontitis were assessed for OHRQoL by means of the Oral Health Impact Profile (OHIP)-14. Mean OHIP-14 scores and prevalence of answers were compared, and binary logistic regression was used to measure the relationship between OHIP-14 scores and independent variables.

**Results:** A total of 77 diabetic and 101 non-diabetic patients were analyzed. Diabetes was significantly associated with higher OHIP-14 scores indicating reduced quality of life perception. Diabetics presented significantly higher OHIP-14 and higher prevalence of functional limitation, psychological discomfort, physical inability and social inability. Logistic regression revealed that diabetes increased the odds ratio for higher OHIP-14 scores.

**Conclusion:** Periodontitis had a higher negative impact on OHRQoL for people with diabetes than for non-diabetic patients.

**Keywords**: Oral health-related quality of life. Periodontitis. Diabetes. Hyperglycemia.

# SUMÁRIO

# 1. INTRODUÇÃO

A Organização Mundial da Saúde (OMS) define saúde como "um estado completo de bem-estar físico, mental e social e não meramente a ausência de doença ou enfermidade" (WORLD HEAL ORGAN CONSTITUTION, 1946). Esse conceito social tem sido amplamente aplicado à odontologia e o Brasil como um dos membros da OMS se vale dessa concepção   na avaliação e elaboração das diretrizes e metas que norteiam o planejamento dos programas de prevenção e tratamento odontológico adotados pelo SUS ( Sistema Único de Saúde)  nos âmbitos nacional, estadual e municipal. A Federação Mundial de Odontologia (FDI) estabelece que " a saúde bucal é multifacetada e inclui a habilidade de falar, sorrir, cheirar, provar, tocar, mastigar, engolir e transmitir uma gama de emoções através de expressões faciais com confiança e sem dor, desconforto e doença do complexo craniofacial" (GLICK et al., 2016). Portanto, a avaliação da qualidade de vida relativa à saúde oral (OHRQoL) na perspectiva dos pacientes é uma importante ferramenta para o diagnóstico e caracterização das doenças bucais. A percepção da OHRQoL tem se mostrado significante em relação às diferentes condições bucais como cárie (RAMOS-JORGR et al., 2014), perda dentaria (KATO et al., 2018) e doença periodontal (KATO et al., 2018; MASOOD et al., 2019).

A periodontite é uma doença infecto-inflamatória que leva à destruição dos tecidos periodontais e o seu curso pode ser mudado por múltiplos recursos de respostas do hospedeiro em combinação com estilo de vida e fatores ambientais (BARTOLD et al., 2013; PAPAPANOU et al., 2018 ). É considerada um problema de saúde mundial (WHO REPORT, 2003) que por anos exigiu políticas de saúde globais e programas que possam auxiliar na sua prevenção e tratamento (PETERSEN et al., 2005). A periodontite severa é a sexta doença mais prevalente no mundo, e estima-se que 11% da população mundial seja afetada pela doença (KASSEBAUM et al., 2014). As doenças periodontais impactam negativamente a qualidade de vida, com a maior severidade da doença relacionada ao maior impacto (FERREIRA et al., 2017)). Desde que foi sugerido que a doença periodontal poderia diminuir a expectativa de vida (BUSET et al., 2016) , muitos estudos tem focado na influencia  dessa doença na qualidade de vida e na saúde dos indivíduos, favorecendo complicações na doença cardiovascular (DIETRICH, 2008; TONETTI; VAN DYKE, 2008), na gestação (ARMITAGE, 2013), nas doenças neurológicas (HELLVARD et al, 2019) e no  diabetes (TAYLOR, 2001;  CASANOVA et al, 2014).

O diabetes é considerado uma das maiores emergências globais de saúde do século 21. A Federação Internacional de Diabetes (International Diabetes Federation-IDF) estima que "463 milhões de pessoas vivam com a doença e que 374 milhões de adultos tenham intolerância à glicose, colocando-os em risco de desenvolver diabetes" (IDF ATLAS, 2019). O Brasil é atualmente o 5º país em número de pessoas com diabetes, com 16,8 milhões de pessoas diagnosticadas com a doença (IDF ATLAS, 2019). As complicações do diabetes como doenças cardiovasculares, nefropatia, retinopatia e periodontite, são as principais causas de redução da qualidade de vida, incapacidade e perda de produtividade (GUIDELINES; FORCE, 2012). As evidências mostram que o manejo adequado da doença melhora a qualidade de vida das pessoas com diabetes. No entanto, embora a periodontite seja uma das complicações mais frequentes do diabetes, a diretriz global para o manejo do diabetes tipo 2 não inclui cuidados com a saúde bucal (GUIDELINES; FORCE, 2012). Portanto, é necessário avaliar o impacto potencial da ocorrência concomitante de diabetes e periodontite na qualidade de vida dos pacientes.

## 2. OBJETIVO

O objetivo deste estudo foi avaliar o impacto da periodontite na qualidade de vida relativo à saúde oral em indivíduos com diabetes mellitus e normoglicêmicos .

## 2.1 Objetivos específicos

Avaliar o impacto da periodontite por meio do questionário OHIP-14;

Comparar os resultados de pacientes com diabetes mellitus e normoglicêmicos;

Identificar quais fatores influenciaram na piora da qualidade de vida dos pacientes.

# 3. ARTIGO CIENTÍFICO

# Relationship Between Periodontitis and Oral Health-Related Quality of Life for Diabetes Mellitus and Normoglycemic Patients

## ABSTRACT

**Background:** Periodontitis and diabetes are worldwide health problems that negatively impact quality of life. The aim of this study was to investigate the relationship between periodontitis and oral health-related quality of life (OHRQoL) measures in diabetic and normoglycemic patients.

**Methods:** Diabetic and normoglycemic patients with Stages III and IV, Grades B and C periodontitis were assessed for OHRQoL by means of the Oral Health Impact Profile (OHIP)-14. Mean OHIP-14 scores and prevalence of answers were compared, and binary logistic regression was used to measure the relationship between OHIP-14 scores and independent variables.

**Results:** A total of 77 diabetic and 101 normoglycemic patients were analyzed. Diabetes was significantly associated with higher OHIP-14 scores indicating reduced quality of life perception. Diabetics presented significantly higher OHIP-14 and higher prevalence of functional limitation, psychological discomfort, physical inability and social inability. Logistic regression revealed that diabetes increased the odds ratio for higher OHIP-14 scores.

**Conclusion:** Periodontitis had a higher negative impact on OHRQoL for people with diabetes than for normoglycemic patients.

**Keywords**: Oral health-related quality of life. Periodontitis. Diabetes. Hyperglycemia.

## INTRODUCTION

The World Health Organization defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" ( WHO, 1946). This social concept has been widely applied to dentistry. The FDI World Dental Federation states that "Oral health is multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex." ( GLICK et al., 2016). Thus, assessment of oral health-related quality of life

(OHRQoL) from the patient's perspective is an important tool for diagnosis and characterization of oral diseases. The perception of OHRQoL has been shown to be significant in relation to different oral conditions, such as tooth decay (RAMOS-JORGE et al., 2014), tooth loss ( KATO et al., 2018) and periodontal disease ( KATO et al., 2018; MASOOD et al., 2019).

Periodontitis is an infectious-inflammatory disease that leads to the destruction of periodontal tissues, and its course may be modified by multiple host response features in combination with lifestyle and environmental factors ( BARTOLD et al., 2013; PAPAPANOU et al., 2018). It is considered a worldwide health problem ( WHO REPORT, 2003) that over the years has demanded global health policies and programs that can assist in its prevention and treatment   (PETERSEN et al., 2005). Severe periodontitis is the sixth most prevalent disease in the world, and it is estimated that 11% of the world's population is affected by periodontitis ( KASSEBAUM et al., 2014). Periodontal diseases negatively impact quality of life, with greater severity of disease related to greater impact ( FERREIRA, 2017). Since it was suggested that periodontitis could decrease life expectancy ( BUSET et al., 2016), many studies have focused on the influence of this disease on quality of life and systemic health of individuals, including cardiovascular disease ( DIETRICH, 2008; TONETTI; VAN DYKE, 2008), pregnancy complications( ARMITAGE, 2013), neurological diseases( HELLVARD et al., 2019) and diabetes ( TAYLOR, 2001; CASANOVA et al., 2014).

Diabetes is considered one of the largest global health emergencies of the 21st century. The International Diabetes Federation (IDF) estimates that 463 million people live with diabetes, and that 374 million adults have impaired glucose intolerance, putting them at risk for developing diabetes (IDF ATLAS, 2019). Brazil is currently the 5th country in number of people with diabetes, with 16.8 million people diagnosed with the disease, and the country with the highest annual health expenditure per patient with diabetes (US$ 3,117) (IDF ATLAS, 2019). Complications of diabetes, such as cardiovascular disease, nephropathy, retinopathy and periodontitis, are major causes of reduced quality of life, disability and loss of productivity. Evidence shows that appropriate management of the disease improves quality of life in people with diabetes. However, even though periodontitis is one of the most frequent diabetes complications, the global guideline for the management of type 2 diabetes does not include oral health care( GUIDELINES; FORCE, 2012). In addition, no previous studies have assessed if

the potential impact of the concomitant occurrence of diabetes and periodontitis on patients' quality of life. Thus, the aim of this study was to investigate the relationship between periodontitis and oral health-related quality of life measures (OHRQoL) in diabetic and normoglycemic patients.

## MATERIALS AND METHODS

### Study population, Inclusion and Exclusion Criteria

The present study is a retrospective analysis derived from two independent randomized clinical trials (RCTs) conducted in Brazil ( FERES et al., 2018,; CASTRO DOS SANTOS et al., 2020). Diabetic volunteers were recruited at São Paulo State University (UNESP) (São José dos Campos, SP) and normoglycemic volunteers were recruited at Guarulhos University (Guarulhos, SP). Detailed dental and medical records were obtained. Patients who fulfilled the inclusion criteria were invited to participate in the study. Inclusion criteria for both RCTs were as follows: stages III and IV, grades B and C periodontitis( PAPAPANOU et al., 2018; ARMITAGE, 1999) with at least 6 sites with PD and clinical attachment level (CAL) $\geq$5 mm and bleeding on probing (BoP) ( ANDERE et al., 2017; ARAUJO et al., 2019); $\geq$15 teeth; aged $\geq$35. For diabetic volunteers: diagnosis of type 2 diabetes for $\geq$5 years; under treatment for diabetes, with glycated hemoglobin (HbA1c) levels $\geq$6.5% to $\leq$11%. Exclusion criteria were as follows: need for prophylactic antimicrobial coverage; scaling and root planing (SRP) in the previous 6 months; antimicrobial therapy in the previous 6 months; systemic conditions that could affect the progression of periodontitis; long-term use of medication that could interfere with periodontal response; pregnancy or lactation; smoking. Informed consent was provided by each volunteer after a thorough explanation of the nature, risks, and benefits of the clinical investigations. The study protocols were approved by UNESP Institutional Review Board (CAAE: 51626115.5.0000.0077) and Guarulhos University Institutional Review Board (CAAE: 32.465.714.4.1001.5506). The clinical trials were registered in ClinicalTrials.gov (NCT02800252 and NCT02954393).

### Clinical Examination

Periodontal measurements were performed by calibrated examiners in each study. Clinical evaluations were performed. The evaluated parameters were: number of teeth,

PD (mm), CAL (mm), BoP (0/1) and Supragingival biofilm accumulation (0/1) (AINAMO; BAY, 1976). All clinical measures were assessed at six sites per tooth (mesiobuccal, buccal, distobuccal, distolingual/palatal, lingual/palatal and mesiolingual/palatal) on all teeth, excluding third molars, using a manual probe[*]. For diabetic patients, peripheral blood was collected to evaluate HbA1c levels ( $\geq 6.5\%$ to $\leq 11\%$) ; anthropometric measures including weight and height were recorded and body mass index (BMI) was calculated as the weight divided by the square of height (kg/m$^2$).

**Oral Health-Related Quality of Life**

The Oral Health Impact Profile (OHIP)-14 was applied to measure oral health-reported quality of life (OHRQoL) (SLADE,1997). The OHIP-14 comprises a questionnaire with 14 questions that measure 7 domains (2 questions in each domain) namely functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. All patients completed the questionnaire by answering "Never"=0, "Hardly ever"=1, "Occasionally"=2, "Fairly often"=3 or "Very often"=4. Quality of life reduces as the scores increase.

**Data Collection and Statistical Analysis**

Clinical and OHIP data were entered directly onto electronic spreadsheets (Microsoft® Excel 2011®, version 14.4.8, Copyright © 1990, Microsoft, Santa Rosa, California, USA), at the time of clinical examination, by a single investigator in each study. The data were analyzed for all patients. Mean and standard deviations were calculated for each parameter. Normal distribution was tested by Shapiro-Wilk. Demographic and clinical data did not present normal distribution and were assessed using Mann-Whitney U test. Gender differences between groups were assessed using Chi-square test. Mean OHIP-14 and mean OHIP-14 for sub-domains were assessed using Kruskal-Wallis test. The percentage of answers according to sub-domains were compared using Chi-square test. Stepwise binary logistic regression models were used to look at parameters that could possibly have influenced patients' perception of OHRQoL according to OHIP-14 scores. The dependent variables were different cutoffs for OHIP-14 scores: >7, >14, >21, >28, >35, and >42 (binary state). The independent variables (covariates) were quantitative/qualitative parameters (considering quartiles as cutoffs). Multicollinearity was assessed for the variables in the models and no high

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[*] University of North Carolina Probe PCPUNC-BR 15, Hu-Friedy, Chicago, IL, USA

intercorrelations were detected. All data analyses were performed using IBM SPSS Statistics. The significance level applied was 5%.

## RESULTS

### Demographic and Clinical Data

Data of 178 volunteers (77 diabetics and 101 non-dabetics) with periodontitis were assessed. Except for gender (% females), all other parameters differed between both

| Parameters | Diabetes (n=77) | Normoglycemic (n=101) | p value |
|---|---|---|---|
| Female (%) | 61.0 | 64.4 | 0.65 |
| Age (years) | 55.2 ± 9.0 | 48.0 ± 8.2 | 0.00 |
| Number of teeth | 21.2 ± 4.0 | 23.4 ± 2.9 | 0.00 |
| BoP (%) | 48.0 ± 20.5 | 36.9 ± 21.5 | 0.00 |
| PI (%) | 57.0 ± 18.2 | 86.4 ± 14.5 | 0.00 |
| Number of sites with PD ≥5mm | 28.0 ± 2.0 | 38.7 ± 1.7 | 0.00 |

volunteers group (Table 1). Diabetic patients had higher mean age and percentage of sites with BoP. Mean number of teeth, of percentage of sites with biofilm accumulation and with PD ≥5mm were elevated in non-diabetic volunteers (Table 1).

Table 1 - OHIP-14, demographic and clinical data (mean±SD) at baseline for the diabetic and non-diabetic groups.

BoP, bleeding on probing; PD, probing depth; PI, plaque index.
Gender distribution was assessed using Chi-square Test; $p<0.05$. Differences in age, number of teeth, BoP, supragingival plaque accumulation, and sites with PD ≥5mm were assessed using Mann-Whitney U Test; $p<0.05$. The number of sites was adjusted for number of teeth.

### OHIP-14

The overall mean score of OHIP-14 was significantly higher in the and percentage of answers according to each sub-domain were compared between the diabetic and the non-diabetic groups (Figure 1). The overall OHIP-14 score was significantly increased in

the diabetic compared to the non-diabetic group. For the percentage of answers, four sub-domains were increased in diabetic volunteers, including functional limitation, psychological discomfort, physical inability and social inability (Figure 1).
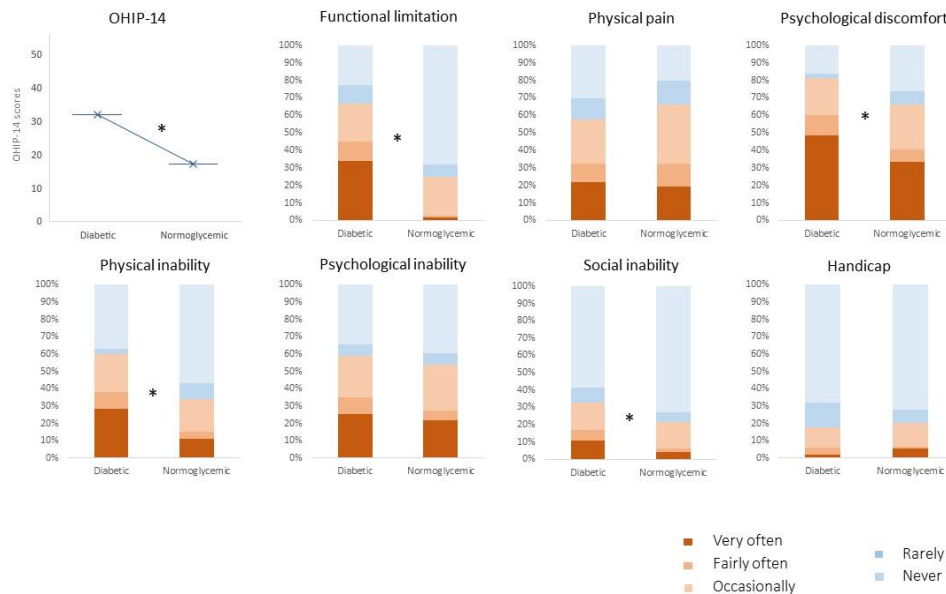


Figure 1 – OHIP-14 and percentage of answers according to OHIP-14 domains for the diabetic and normoglycemic groups.

A stepwise binary logistic regression was performed to determine if demographic and clinical variables were predictors of OHIP-14. Dichotomous variables were assessed. Diabetes was a significant predictor when OHIP >7, >14, >21, >28, >35, and >42 were dependent outcome variables (OR 3.65, 2.77, 3.84, 2.71, 4.64, and 11.59, respectively). Gender was a significant predictor for OHIP >7, >14, >21, and >35 (OR 2.35, 2.71, 2.78, and 5.45, respectively). Age was a predictor for OHIP >7, >14, and >21 (OR 2.98, 4.11, and 2.90, respectively) (Figure 2).
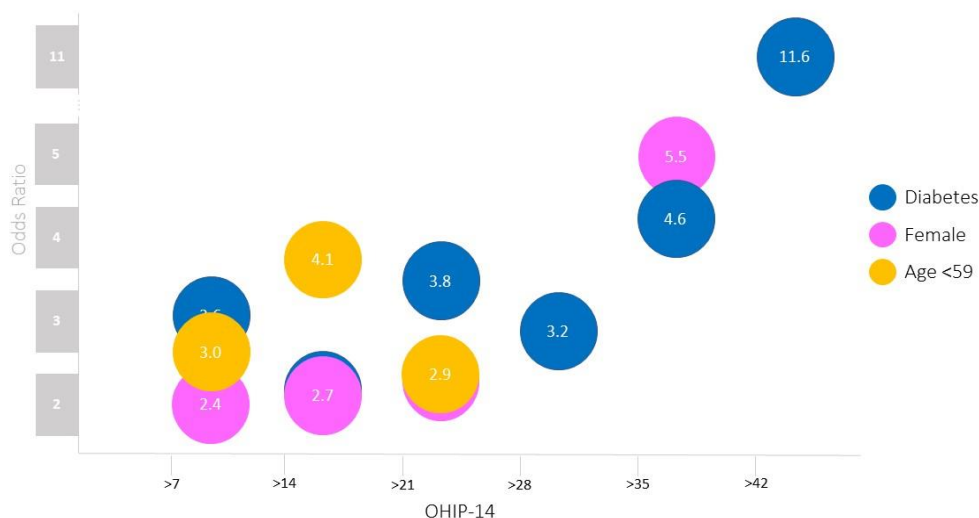
Figure 2 – Binary logistic regression assessing which demographic and clinical variables were predictors of OHIP-14.

## DISCUSSION

This study compared the impact of periodontitis on OHRQoL of diabetic and normoglycemic individuals. People with diabetes reported higher negative impact of periodontitis on OHRQoL compared to normoglycemic patients when OHIP-14 was compared between the study groups. Additionally, having diabetes significantly increased the risk of reporting higher OHIP-14 according to stepwise binary logistic regression. These findings suggest that periodontitis has a higher negative impact on OHRQoL for diabetic than for non-diabetic individuals.

OHIP-14 comprises 14 questions to assess 7 different sub-domains. Diabetic individuals reported higher negative impact for the following sub-domains: functional limitation, psychological discomfort, physical inability and social inability. These sub-domains were assessed through questions related to mastication, aesthetics, pronunciation and social interaction. Psychological factors, such as depression and social support, are believed to be both cause and consequence of how an individual manages diabetes (RUBIN; PEYROT, 1992; WALKER RJ et al., 2014; ), with social support being robustly more associated with diabetes control than stressful events or stress-prone personality (CHIDA; HAMER, 2008). Thus, periodontitis negative impact on psychological factors that are related to self-perception and social interaction may indirectly interfere with

diabetes control. Interestingly, answers related to pain and financial loss did not differ between groups. Periodontitis is commonly regarded as a silent disease, since patients often live with no or few symptoms for years before seeking professional care ( BUSET et al., 2016). Although individuals with periodontitis do not report severe pain, other symptoms, such as bleeding, swelling, tooth mobility and halitosis, are frequently reported. However, the OHIP-14 questionnaire does not directly approach these specific characteristics of periodontitis.

We performed a stepwise binary logistic regression to assess demographic and clinical variables that could predict OHIP-14 scores. We assessed the dependent variables as different cutoffs for OHIP-14 scores, and the independent variables were a variety of quantitative/qualitative parameters (considering quartiles as cutoffs). Data adjustment was based on the modelling of several logistic regressions. The covariates initially included in the stepwise logistic regression were systemic condition (diabetic or normoglycemic), hypertension, obesity, gender, age, number of teeth, percentage of sites with BoP, percentage of sites with supragingival biofilm accumulation, mean PD, mean CAL, and the number of sites with PD >5mm. Diabetes significantly increased the risk of chances for reporting higher OHIP-14 scores for all the cutoffs that were tested. Besides diabetes, two other covariates were determined as predictors for increased OHIP-14: gender (female) and age (<59 years old). These characteristics may reflect social and psychological aspects related to OHRQoL. The demand for facial and body aesthetic beauty is higher among females than males (PASTOREK, 2017), which can also be influenced by cultural aspects (FINGER, 2003). According to the American Society for Aesthetic Plastic Surgery, 89.7% of all surgical cosmetic procedures were performed in female patients in 2015 (COSMETIC SURGERY NATIONAL DATA BANK STATISTICS, 2016). Besides the OHIP-14 sub-domains' direct questions regarding the aesthetic self-perception of individuals, aesthetics may affect socialization and well-being. Altogether, these factors could have contributed to the increased chances of female patients to report a higher negative impact of periodontitis on OHRQoL. Some hypothesis could be raised in order to explain why periodontitis seemed to have a more negative impact in the quality of life of younger than (<59 years old) older patients. In the last decades, advances in dental research, mainly in the prevention of caries and periodontal diseases, and access to information and oral hygiene products, have improved oral health worldwide. However, especially in low-income countries, the current elderly population

has been submitted to a dental practice philosophy based on curative/invasive procedures, that eventually culminated in partial or extensive sequelae in some individuals. Although the prevalence of partial edentulism, dental caries, periodontitis, dry mouth and oral cancer is high in geriatric patients (PETERSEN et al., 2010; MURRAY, 2014), their perception of OHRQoL may have been affected by cultural and historical aspects related to oral health and dental treatment concepts. Besides that, the elderly frequently present other health conditions (e.g. cardiovascular disease, hypertension, arthritis) that may have a higher negative impact on quality of life than oral health-related factors. Therefore, periodontitis had a lower impact on OHRQoL for the elderly than for patients under 59 years old.

The main strength of this study is to be the  first one to evaluate the relationship between generalized periodontitis stages III and IV and OHRQoL in diabetic and non-diabetic patients who had been selected to periodontal clinical trials following inclusion and exclusion criteria. The few previous publications focusing on this same topic were case-control studies, did not differentiate  gingivitis and periodontitis or extent/severity of disease  ( IRANI; WASSALL; PRESHAW, 2015; MOURÃO et al., 2016; HSU Y-J et al., 2019). Investigations that asses quality of life on populations with specific periodontal diagnosis pre- and post-treatment can contribute to the development of PROMs to be used in future clinical trials in the treatment of periodontal patients. The main limitation of the present study is that OHIP-14 is a tool that aims at assessing general oral health, not periodontal conditions. Questions concerning distinctive periodontal symptoms, such as bleeding and tooth mobility, are not directly approached. In addition, OHIP-14 may not be ideal for the evaluation of the impact of dental treatment on OHRQoL, since it was designed for cross-sectional investigations. A PROM that assesses OHRQoL in periodontal patients and allows comparisons between periodontal treatment outcomes is yet to be validated. The findings of the present study may contribute to the development of such tool.

In conclusion, periodontitis had a higher negative impact on OHRQoL for diabetic patients than for non- diabetic patients.


**ACKNOLEDGEMENTS**

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## 4. CONCLUSÃO

A presença de periodontite estágios III e IV, graus B e C generalizada representou um maior impacto negativo em qualidade de vida relativa à saúde oral

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