

# Periodontal disease and quality of life in patients with circulatory diseases

Doença periodontal e qualidade de vida em pacientes com doenças circulatórias

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## Resumo

**Introdução:** As doenças do aparelho circulatório representam uma das principais causas de mortes. A saúde periodontal é um componente da saúde bucal e saúde geral que contribui para a qualidade de vida. **Objetivo:** Analisar as condições periodontais e a qualidade de vida em pacientes com doenças circulatórias. **Material e método:** Estudo transversal, com pacientes com doenças circulatórias (n=125). O exame clínico periodontal foi realizado considerando: biofilme, sangramento à sondagem, supuração, profundidade de sondagem, recessão gengival e nível de inserção clínica. A qualidade de vida foi avaliada com o *Medical Outcomes Study 36 – Item Short-Form Health Survey (SF-36)* e *Oral Health Impact Profile – short form (OHIP-14)*. Os dados foram analisados com testes paramétricos e não paramétricos ( $\alpha=5\%$ ). **Resultado:** Idosos e os homens tiveram maior severidade da doença periodontal. Idosos apresentaram menores valores nos domínios “Capacidade funcional” e “Aspectos físicos” (SF-36). O domínio “Dor” teve menor valor nos indivíduos com saúde/gengivite. OHIP-14 não apresentou diferenças nas comparações. Não houve correlação entre qualidade de vida e a severidade da doença periodontal. **Conclusão:** Entre os pacientes com doenças circulatórias, os idosos e os homens tiveram maior severidade da doença periodontal. Idosos tiveram pior qualidade de vida (capacidade funcional e aspectos físicos). Não houve correlação entre a severidade da doença periodontal e a qualidade de vida.

**Descritores:** Sistema cardiovascular; doenças cardiovasculares; saúde bucal; doenças periodontais; qualidade de vida.

## Abstract

**Introduction:** Circulatory system diseases are one of the leading causes of death. Periodontal health is a component of oral and general health that contributes to quality of life. **Objective:** To analyze periodontal conditions and quality of life in patients with circulatory diseases. **Material and method:** Cross-sectional study, with patients with circulatory diseases (n=125). The clinical periodontal examination was performed considering: biofilm, bleeding on probing, suppuration, probing depth, gingival recession, and clinical attachment level. Quality of life was assessed with the *Medical Outcomes Study 36 – Item Short-Form Health Survey (SF-36)* and *Oral Health Impact Profile – short form (OHIP-14)*. Data were analyzed with parametric and nonparametric tests ( $\alpha=5\%$ ). **Result:** Elderly and men had a greater severity of periodontal disease. The Elderly had lower values in the domains of “Functional capacity” and “Physical aspects” (SF-36). The domain “Pain” had lower values in subjects with health/gingivitis. OHIP-14 did not show differences in the comparisons. There was no correlation between quality of life and the severity of periodontal disease. **Conclusion:** Among patients with circulatory diseases, the elderly and men had greater severity of periodontal disease. The elderly had a poorer quality of life (functional capacity and physical aspects). There was no correlation between the severity of periodontal disease and quality of life.

**Descriptors:** Cardiovascular system; cardiovascular disease; oral health; periodontal diseases; quality of life.



## INTRODUCTION

Circulatory diseases are one of the leading causes of death worldwide. In 2020, approximately 19.1 million deaths were attributed to cardiovascular diseases. The age-adjusted mortality rate per 100,000 population was 239.8 and the age-adjusted prevalence rate was 7,354.1 per 100,000 population. The highest mortality rates due to cardiovascular diseases in 2020 were in eastern Europe and Central Asia, while the rates were lower in North America (the highest-income region), Asia-Pacific, Latin America, and Western Europe<sup>1</sup>. In Brazil, circulatory diseases caused 10.8 million deaths between 1980 and 2019<sup>2,3</sup>. However, the trend of deaths from circulatory diseases has decreased during this period, but this decrease was uneven between Brazilian states, with greater reductions in the southern and southeastern regions, which have better socioeconomic indicators<sup>2,4</sup>. Regions with higher development and lower social inequality had the lowest mortality rates from circulatory diseases<sup>1,2,5</sup>.

Periodontal disease is a multifactorial inflammatory condition induced by the presence of dental biofilm, which affects the gums and supporting tissues and can lead to bone resorption and tooth loss<sup>6-9</sup>. Periodontal health is a component of an individual's oral and general health that contributes to their well-being and quality of life<sup>6-8</sup>. Periodontitis can be observed in more than 50% of the adult population, and its severe form affects 11% of people, making it the sixth most prevalent disease in humanity<sup>7,8</sup>. Several studies have shown that periodontitis is associated with several systemic conditions including diabetes, circulatory diseases, and premature birth<sup>7,8,10,11</sup>. Individuals with periodontal disease are at increased risk of tooth loss, edentulism, and masticatory dysfunction, which can have a negative impact on their nutrition, quality of life, and self-esteem<sup>12</sup>. Improvement in periodontal conditions contributes to the improvement of systemic health and well-being<sup>7,8</sup>.

Quality of life has been related to the degree of satisfaction with family, romantic, social, and environmental life, and existential aesthetics. It is a dynamic and complex phenomenon, not only a consequence of objective indicators but also of subjective aspects<sup>4,13</sup>. One of the validated generic instruments for evaluating quality of life is the short form health survey (SF-36), which has been applied to patients with systemic involvement and is easy to administer and understand<sup>14</sup>. Quality of life related to oral health is a multidimensional concept determined by a variety of conditions that affect the individual's perception, encompassing issues of physical, psychological, and social health. Therefore, the concepts of quality of life and health are inseparable<sup>13,15-17</sup>. Dental problems can affect eating, sleeping, speaking, communication, social interaction, and self-esteem, leading to difficulties in daily activities and resulting in decreased quality of life<sup>6,12,18,19</sup>. The oral health impact profile short form (OHIP-14) is a validated instrument that allows for the detection of associations between social impact and perceived treatment needs and quantifies the levels of impact with good reliability<sup>6,12,14,19-21</sup>. It also has a diversity of domains, and is of rapid administration and interpretation of results, allowing to evaluate of the severity, extent, and prevalence of negative impacts in a single session<sup>13-18</sup>.

Therefore, this study aimed to analyze periodontal conditions and quality of life in patients with circulatory system diseases.

## METHOD

### Characterization of the Study and Research Subjects

This is a descriptive, quantitative, cross-sectional study with a convenience sample composed of patients with circulatory diseases under regular outpatient care at a university hospital in the state of Paraná, southern Brazil. The research followed the principles and recommendations of

the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) initiative<sup>22</sup> and was approved by the local research ethics committee (Process: 3.028.211; CAAE: 01591118.7.0000.0105), and all volunteers signed the informed consent form.

The sample size was based on the prevalence of cardiovascular diseases in the Brazilian population<sup>3</sup>. Therefore, the calculated minimum sample size was 123 volunteers with a confidence level of 95% and a margin of error of 5%. The inclusion criteria comprised both genders, over 18 years old, with a minimum of 6 teeth, diagnosed with cardiovascular disease (ICD-10)<sup>23</sup>, and no change in medication for at least 2 months. Exclusion criteria included: patients with acute oral conditions (ulcerative lesions, abscesses, and acute infections), uncontrolled chronic systemic disease, those who were unable, for any reason, to answer the questionnaires; lactating or pregnant women; and individuals who underwent periodontal or orthodontic treatment in the last 3 months. Data collection was carried out consecutively and non-probabilistically from November 2018 to November 2019. During this period, 125 patients who met the study inclusion criteria were evaluated.

### **Evaluation of Periodontal Conditions**

The examination of periodontal conditions involved the counting of tooth loss, sites with biofilm presence, bleeding on probing, marginal suppuration, probing depth, gingival recession, and clinical attachment level. Periodontal evaluation was performed using a manual periodontal probe (North Carolina CP-15, Millennium Plus-Golgran Ind. Com. Instr. Odontológicos, São Caetano do Sul, São Paulo, Brazil) at six sites per tooth, with third molars excluded. Taking into account the classification of periodontal diseases and conditions<sup>9</sup>, we assign scores according to the severity of the periodontal disease. Score 1. Periodontal health and gingivitis (gingivitis defined as bleeding on probing  $\geq 10\%$  of sites, absence of attachment loss, and probing depth up to 3mm); Score 2. Periodontitis stages 1 and 2 (clinical attachment level  $\leq 4\text{mm}$  and probing depth  $\leq 5\text{mm}$ ); Score 3. Periodontitis stages 3 and 4 (clinical attachment level  $\geq 5\text{mm}$  and probing depth  $\geq 6\text{mm}$ )<sup>24</sup>.

### **Training and Calibration**

Two trained examiners (LZL and LTN) performed periodontal examinations on a group of patients to assess the inter-examiner reproducibility of measurements of gingival recession, probing depth, and clinical attachment level. Before the study, the investigators discussed and trained on the clinical parameters of dental biofilm, bleeding on probing, and marginal suppuration during the clinical examination of patients in a preliminary phase. Thirteen patients were examined to evaluate reproducibility but were not included in the final study sample. Each examiner made measurements in duplicate, with a 40-minute interval between exams. The Weighted Kappa test was used to assess inter-examiner agreement, which was substantial for gingival recession (0.74), probing depth (0.92), and clinical attachment level (0.85).

### **Quality of Life Assessment**

Quality of life was assessed using the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), an eight-domain questionnaire related to health: social functioning, physical functioning, general health, vitality, mental health, emotional well-being, pain, and role limitations due to physical health. Each domain has a score of 0-100, and the total is a simple average of the domains, with higher values representing a better quality of life<sup>14</sup>. Quality of life-related to oral health was measured using the reduced version of the Oral Health Impact Profile (OHIP-14), consisting of 14 questions divided into 7 dimensions, all related hierarchically<sup>15</sup>. This is an internationally used instrument to evaluate

the quality of life-related to oral health, as it has good psychometric qualities and measures self-perception of the specific consequences of oral conditions<sup>13</sup>.

The SF-36 and OHIP-14 questionnaires were answered in the presence of the interviewer (LT) before the periodontal examination, in the health institution where the subjects were waiting for health appointments.

## Statistical Analysis

Data were tabulated, processed, and analyzed using statistical software (IBM-SPSS Statistical Package for the Social Sciences® for Windows version 20.0, IBM, NY, USA), using descriptive and inferential statistics techniques. Quantitative and ordinal qualitative variables related to periodontal parameters were analyzed according to age and gender. The instruments used to measure quality of life were tested considering age, gender, and severity of periodontal disease. The normality of the data distribution was verified using the Kolmogorov-Smirnov test. After confirming a normal data distribution, comparisons of means between variables were made using independent samples t-tests and one-way ANOVA (with Tukey's post-test). Data that did not present normal distribution and the ordinal qualitative variable (severity scores of periodontal disease) were evaluated with non-parametric tests of Mann-Whitney and Kruskal-Wallis (with Dwass-Steel-Critchlow-Fligner post-test). To test the correlation between quality-of-life variables and the severity of periodontal disease, the Spearman correlation test was performed. The level of significance adopted was 5%.

## RESULT

The final sample consisted of 125 participants with circulatory system diseases. The age ranged from 18 to 77 years, with a mean of  $51.6 \pm 13.1$  years, and 30% were over 60 years old. The majority were women (61%) and 66% reported being married/living together. Regarding monthly family income, 91% reported receiving up to 3 minimum wages per month. In terms of educational level, 58% completed elementary school. Obesity was observed in 46% of the individuals. The most prevalent circulatory diseases were lower limb varicose veins (ICD: I83 - 43%) and primary essential hypertension (ICD: I10 - 18%). A total of the 77% of volunteers controlled their systemic alteration with at least one medication. Most volunteers were non-smokers (61%) and non-alcoholic (95%). Data are presented in Table 1.

**Table 1.** Characterization of patients with circulatory system diseases

| Variables                                    | Values n = 125 (100%) |
|--|-----------------------|
| Age in years (mean $\pm$ standard deviation) | 51.6 $\pm$ 13.1       |
| <60 years                                    | 87 (70%)              |
| $\geq$ 60 years                              | 38 (30%)              |
| Gender                                       |                       |
| Female                                       | 76 (61%)              |
| male   | 49 (39%)              |
| Marital status                               |                       |
| Single/ divorced/ widowed                    | 42 (34%)              |
| Stable union/married                         | 83 (66%)              |
| Monthly family income                        |                       |
| $\leq$ 3 minimum wages                       | 114 (91%)             |
| >3 minimum wages                             | 11 (9%)               |
| Educational Level                            |                       |
| Illiterate                                   | 3 (2%)                |

Table 1. Continued...

| Variables   | Values n = 125 (100%) |
|---|-----------------------|
| Elementary  | 72 (58%)              |
| High school   | 44 (35%)              |
| Higher education  | 6 (5%)                |
| Body mass index (mean ± standard deviation)   | 29.7± 6.1             |
| Slim/ normal  | 24 (19%)              |
| Overweight  | 44 (35%)              |
| Obesity   | 57 (46%)              |
| Diagnosis - (ICD-10). Diseases of the circulatory system                                    |                       |
| (I06). Rheumatic aortic valve diseases  | 1 (1%)                |
| (I10). Essential (primary) hypertension   | 23 (18%)              |
| (I20). Angina pectoris  | 6 (5%)                |
| (I24). Other acute ischemic heart diseases  | 4 (3%)                |
| (I25). Chronic ischemic heart disease   | 1 (1%)                |
| (I42). Cardiomyopathies   | 8 (6%)                |
| (I47). Paroxysmal tachycardia   | 2 (2%)                |
| (I48). Atrial flutter and fibrillation  | 1 (1%)                |
| (I49). Other cardiac arrhythmias  | 4 (3%)                |
| (I50). Heart failure  | 5 (4%)                |
| (I65). Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction | 1 (1%)                |
| (I70). Atherosclerosis  | 3 (2%)                |
| (I71). Aortic aneurysm and dissection   | 1 (1%)                |
| (I72). Other aneurysm and dissection  | 1 (1%)                |
| (I74). Arterial embolism and thrombosis   | 2 (2%)                |
| (I82). Other venous embolism and thrombosis   | 4 (3%)                |
| (I83). Varicose veins of lower extremities  | 54 (43%)              |
| (I87). Other disorders of veins   | 4 (3%)                |
| Medication use  |                       |
| None  | 29 (23%)              |
| 1 to 3  | 46 (37%)              |
| >3  | 50 (40%)              |
| Smoker  |                       |
| No  | 84 (67%)              |
| Yes   | 11 (9%)               |
| Former smoker   | 30 (24%)              |
| Alcohol consumption   |                       |
| No  | 119 (95%)             |
| Yes   | 1 (1%)                |
| Former alcoholic  | 5 (4%)                |

Regarding the severity of periodontal disease, 9% of the participants had a healthy or gingivitis status (score 1), 50% had stages 1 and 2 periodontitis (score 2), and 41% had stages 3 and 4 periodontitis (score 3). Elderly individuals and men had higher scores of periodontal disease severity ( $p < 0.05$ ). The population had an average of  $9.2 \pm 7.5$  missing teeth (33%), with individuals with score 1 (healthy/gingivitis) having a significant difference ( $p = 0.038$ ) in dental loss of  $14.4 \pm 7.6$  compared to those with stages 1 and 2 periodontitis ( $7.9 \pm 7.5$ ), which was not significant for patients with stages 3 and 4 periodontitis ( $9.8 \pm 7.1$ ). The probing depth  $\geq 4$  mm was observed in 14% of sites, and the clinical attachment level  $\geq 3$  mm was present in 19% of the sites. Considering age, the elderly ( $\geq 60$  years) had greater dental loss and sites with clinical attachment level than those younger ( $p < 0.001$ ). Men had a higher percentage of sites with clinical attachment loss than women (Table 2).

**Table 2.** Periodontal parameters (Mean±SD) in patients with circulatory system diseases according to age and gender

| Periodontal parameters        | Total        | Age                  |                      | p-value | Gender         |                 | p-value | Severity of PD        |                      |                       | p-value  |
|-------------------------------|--------------|----------------------|----------------------|---------|----------------|-----------------|---------|-----------------------|----------------------|-----------------------|----------|
|                               | n=125 (100%) | <60 years n=87 (70%) | ≥60 years n=38 (30%) |         | Fem n=76 (61%) | Male n=49 (39%) |         | Score 1 n=11 (9%)     | Score 2 n=63 (50%)   | Score 3 n=51 (41%)    |          |
| Missing teeth (%)             | 33±27        | 28±27                | 45±24                | <0.001* | 33±28          | 32±26           | 0.863   | 52±27                 | 28±27                | 35±25                 | 0.038†   |
| Mean ± SD                     | 9.2±7.5      | 7.8±7.4              | 12.6±6.7             | ---     | 9.3±7.8        | 9.1±7.2         | ---     | 14.5±7.6 <sup>a</sup> | 7.9±7.5 <sup>b</sup> | 9.8±7.1 <sup>ab</sup> | ---      |
| Biofilm (%)                   | 68±26        | 67±24                | 71±29                | 0.332   | 67±25          | 70±26           | 0.467   | 64±28                 | 63±26                | 75±24                 | 0.065    |
| Bleeding on probing (%)       | 48±24        | 51±21                | 39±27                | 0.007*  | 51±23          | 42±24           | 0.034*  | 42±21                 | 47±22                | 50±26                 | 0.474    |
| Suppuration (%)               | 5±13         | 3±9                  | 7±18                 | 0.095   | 5±14           | 4±11            | 0.910   | 0.1±0.4 <sup>a</sup>  | 2±9 <sup>a</sup>     | 8±16 <sup>b</sup>     | <0.001†  |
| Probing depth (%)             |              |                      |                      |         |                |                 |         |                       |                      |                       |          |
| 1-3mm                         | 86±16        | 86±17                | 87±15                | 0.699   | 88±13          | 83±20           | 0.149   | 99±1 <sup>a</sup>     | 92±9 <sup>b</sup>    | 76±20 <sup>c</sup>    | <0.001†† |
| 4-5mm                         | 12±14        | 13±14                | 12±13                | 0.692   | 11±12          | 14±16           | 0.191   | 0.5±1 <sup>a</sup>    | 8±8 <sup>b</sup>     | 20±16 <sup>c</sup>    | <0.001†† |
| ≥6mm                          | 2±14         | 2±5                  | 1±2                  | 0.837   | 1±2            | 2±6             | 0.189   | 0±0 <sup>a</sup>      | 0.2±0.6 <sup>a</sup> | 3±6 <sup>b</sup>      | <0.001†† |
| Gingival recession (%)        |              |                      |                      |         |                |                 |         |                       |                      |                       |          |
| 0mm                           | 82±23        | 88±19                | 67±25                | <0.001* | 85±22          | 77±23           | 0.039*  | 96±9 <sup>a</sup>     | 90±16 <sup>a</sup>   | 69±26 <sup>b</sup>    | <0.001†† |
| 1-3mm                         | 13±15        | 9±13                 | 21±16                | <0.001* | 11±15          | 16±14           | 0.093   | 4±9 <sup>a</sup>      | 9±13 <sup>a</sup>    | 19±15 <sup>b</sup>    | <0.001†† |
| ≥4mm                          | 5±11         | 3±8                  | 10±16                | 0.002*  | 3±10           | 7±13            | 0.054   | 0±0 <sup>a</sup>      | 1±3 <sup>a</sup>     | 11±15 <sup>b</sup>    | <0.001†† |
| Clinical attachment level (%) |              |                      |                      |         |                |                 |         |                       |                      |                       |          |
| 0mm                           | 71±25        | 75±23                | 61±25                | 0.003*  | 75±24          | 64±25           | 0.017*  | 95±8 <sup>a</sup>     | 82±16 <sup>b</sup>   | 52±22 <sup>c</sup>    | <0.001†† |
| 1-2mm                         | 10±12        | 11±13                | 8±8                  | 0.099   | 10±11          | 11±13           | 0.538   | 0.8±2 <sup>a</sup>    | 8±8 <sup>b</sup>     | 15±15 <sup>c</sup>    | <0.001†† |
| 3-4 mm                        | 7±7          | 5±6                  | 10±7                 | <0.001* | 6±6            | 8±8             | 0.100   | 3±6 <sup>a</sup>      | 5±6 <sup>a</sup>     | 9±7 <sup>b</sup>      | <0.001†† |
| ≥5mm                          | 12±19        | 9±16                 | 22±23                | <0.001* | 10±18          | 17±21           | 0.042*  | 1±3 <sup>a</sup>      | 5±11 <sup>a</sup>    | 24±23 <sup>b</sup>    | <0.001†† |
| Severity of PD (scores)       |              |                      |                      |         |                |                 |         |                       |                      |                       |          |
| Mean ± SD                     | 2.3±0.6      | 2.2±0.6              | 2.5±0.6              | 0.030** | 2.2±0.6        | 2.5±0.5         | 0.006** | ---                   | ---                  | ---                   | ---      |
| Median (IQR)                  | 2 (1-3)      | 2 (1-3)              | 3 (1-3)              | ---     | 2 (1-3)        | 3 (1-3)         | ---     | ---                   | ---                  | ---                   | ---      |

(\*) Significant differences; Student's t-test for independent samples,  $p \leq 0.05$ . (\*\*) Significant differences; Mann-Whitney test,  $p \leq 0.05$ . Severity of periodontal disease; (†) Significant differences; ANOVA with Tukey's post-hoc test. (††) Significant differences; Kruskal-Wallis with Dwass-Steel-Critchlow-Fligner post-hoc test; (different letters indicate significant differences,  $p \leq 0.05$ ). PD. Periodontal disease; Score 1 (Health/Gingivitis); Score 2 (Periodontitis Stages 1 and 2); Score 3 (Periodontitis Stages 3 and 4). SD. Standard deviation. IQR. Interquartile range.

Quality of life measured with SF-36 had the domain "Social Functioning" with the highest score (70.1±30.2) and the lowest was observed in the "Physical Functioning" domain (40.8±44.6). Considering age, significant differences were observed in the "Physical Functioning" and "Role-Physical" domains, where older adults had lower scores ( $p < 0.05$ ). Women and men had similar results in all SF-36 domains. According to the severity of periodontal disease, the "Pain" domain had a lower score in individuals with score 1 (Health/Gingivitis) compared to patients with scores 2 (Stage 1 and 2 Periodontitis) and 3 (Stage 3 and 4 Periodontitis) (Table 3).

**Table 3.** Correlation between the instruments used to measure quality of life (SF-36), oral health impact on quality of life (OHIP-14), and periodontal disease severity scores

| Quality of life          | Total        | Age                  |                      | P-value | Gender         |                 | P-value | Severity of PD         |                        |                        | p-value |
|--------------------------|--------------|----------------------|----------------------|---------|----------------|-----------------|---------|------------------------|------------------------|------------------------|---------|
|                          | n=125 (100%) | <60 years n=87 (70%) | ≥60 years n=38 (30%) |         | Fem n=76 (61%) | Male n=49 (39%) |         | Score 1 n=11 (9%)      | Score 2 n=63 (50%)     | Score 3 n=51 (41%)     |         |
| <b>SF-36</b>             |              |                      |                      |         |                |                 |         |                        |                        |                        |         |
| Functional capacity      | 54.4±34.7    | 59.9±34.7            | 41.6±31.5            | 0.006*  | 53.6±34.5      | 55.5±35.5       | 0.768   | 48.2±34.9              | 57.5±33.0              | 51.8±37.0              | 0.571   |
| Physical aspects         | 40.8±44.6    | 47.4±44.6            | 25.7±41.3            | 0.012*  | 42.4±44.7      | 38.2±44.8       | 0.612   | 27.3±42.5              | 48.0±44.7              | 34.8±44.2              | 0.183   |
| Pain                     | 55.4±27.8    | 57.4±26.4            | 50.8±30.6            | 0.222   | 52.7±29.1      | 59.6±25.3       | 0.175   | 34.0±16.1 <sup>a</sup> | 58.5±27.3 <sup>b</sup> | 56.1±28.7 <sup>b</sup> | <0.001† |
| General health status    | 61.1±24.6    | 59.4±24.2            | 65.0±25.1            | 0.239   | 62.7±24.5      | 58.6±24.7       | 0.367   | 58.0±26.5              | 61.8±23.5              | 60.8±25.9              | 0.903   |
| Vitality                 | 52.6±25.8    | 53.4±26.6            | 50.5±24.1            | 0.563   | 52.6±27.4      | 52.6±23.2       | 0.998   | 40.9±30.6              | 54.4±25.3              | 52.8±25.2              | 0.409   |
| Social aspects           | 70.1±30.2    | 69.1±31.3            | 72.4±28.1            | 0.581   | 68.8±31.3      | 72.2±28.7       | 0.536   | 68.2±30.3              | 70.0±30.6              | 70.6±30.4              | 0.972   |
| Emotional aspects        | 50.4±47.1    | 55.2±47.4            | 39.5±45.1            | 0.086   | 51.8±47.3      | 48.3±47.2       | 0.690   | 42.4±42.4              | 52.9±48.1              | 49.0±47.3              | 0.747   |
| Mental health            | 61.0±23.3    | 61.0±23.6            | 61.1±23.0            | 0.993   | 59.7±24.7      | 63.0±21.1       | 0.445   | 52.4±21.6              | 61.6±23.4              | 62.2±23.7              | 0.403   |
| Total SF-36              | 55.3±23.1    | 57.9±24.3            | 49.4±19.0            | 0.059   | 54.8±23.8      | 56.0±22.1       | 0.780   | 46.4±22.6              | 58.1±22.9              | 53.7±23.3              | 0.262   |
| <b>OHIP-14</b>           |              |                      |                      |         |                |                 |         |                        |                        |                        |         |
| Functional limitation    | 0.64±0.90    | 0.55±0.83            | 0.84±1.01            | 0.090   | 0.68±0.90      | 0.57±0.90       | 0.521   | 1.00±0.84              | 0.54±0.83              | 0.68±0.98              | 0.247   |
| Physical pain            | 1.30±1.03    | 1.28±1.01            | 1.36±1.10            | 0.695   | 1.34±1.05      | 1.25±1.01       | 0.634   | 1.73±0.82              | 1.25±1.08              | 1.27±1.01              | 0.233   |
| Psychological discomfort | 1.66±1.33    | 1.72±1.36            | 1.51±1.24            | 0.429   | 1.78±1.40      | 1.45±1.21       | 0.208   | 2.32±1.49              | 1.58±1.08              | 1.61±1.08              | 0.318   |
| Physical disability      | 0.96±1.13    | 1.01±1.23            | 0.87±0.90            | 0.536   | 1.10±1.19      | 0.75±1.02       | 0.083   | 1.73±1.45              | 0.86±1.08              | 0.92±1.08              | 0.211   |
| Psychological disability | 1.19±1.13    | 1.20±1.17            | 1.17±1.03            | 0.892   | 1.31±1.16      | 1.00±1.06       | 0.127   | 1.73±1.56              | 1.05±1.11              | 1.26±1.02              | 0.308   |
| Social disability        | 0.71±1.05    | 0.67±1.01            | 0.82±0.98            | 0.466   | 0.76±1.15      | 0.63±0.87       | 0.499   | 1.09±1.45              | 0.63±1.03              | 0.73±0.97              | 0.568   |
| Handicapped              | 0.68±1.07    | 0.69±1.13            | 0.67±0.92            | 0.929   | 0.80±1.19      | 0.50±0.82       | 0.123   | 1.14±1.47              | 0.49±0.99              | 0.82±1.04              | 0.147   |
| OHIP- Total              | 7.14±5.91    | 7.10±6.20            | 7.24±5.35            | 0.908   | 7.78±6.13      | 6.16±5.45       | 0.137   | 10.7±7.84              | 6.40±5.67              | 7.30±5.54              | 0.218   |

Age and Gender; (\*) Significant differences; Student's t-test for independent samples, p≤0.05. Severity of periodontal disease: (†) Significant differences; ANOVA with Tukey's post-hoc test; (different letters indicate significant differences, p≤0.05). PD. Periodontal disease; Score 1 (Health/Gingivitis); Score 2 (Periodontitis Stages 1 and 2); Score 3 (Periodontitis Stages 3 and 4). SF-36. Medical Outcomes Study 36 - Item Short-Form Health Survey. OHIP-14. Oral Health Impact Profile.

The impact of oral conditions on quality of life measured by the OHIP-14 instrument had the lowest value in the domain of "Functional Limitation" and the highest in the domain of "Psychological Discomfort." The results of the OHIP-14 domains were similar considering the age, gender, and severity of periodontal disease (Table 3).

There was no significant correlation (p>0.05) between the instruments used to measure quality of life (SF-36 and OHIP-14 domains) and the severity scores of periodontal diseases (Table 4).

**Table 4.** Correlation between the instruments used to measure quality of life (SF-36), oral health impact on quality of life (OHIP-14), and periodontal disease severity scores

| Domains of SF-36          | Severity of Periodontal Disease |         |
|---------------------------|---------------------------------|---------|
|                           | rs                              | p-value |
| Functional capacity       | -0.047                          | 0.605   |
| Physical aspects          | -0.072                          | 0.422   |
| Pain                      | 0.094                           | 0.299   |
| General health status     | 0.016                           | 0.864   |
| Vitality                  | 0.041                           | 0.651   |
| Social aspects            | 0.020                           | 0.829   |
| Emotional aspects         | -0.014                          | 0.876   |
| Mental health             | 0.084                           | 0.349   |
| Total SF-36               | -0.015                          | 0.872   |
| <b>Domains of OHIP-14</b> |                                 |         |
| Functional limitation     | -0.049                          | 0.584   |
| Physical pain             | -0.069                          | 0.441   |
| Psychological discomfort  | -0.066                          | 0.466   |
| Physical disability       | -0.076                          | 0.411   |
| Psychological disability  | 0.026                           | 0.778   |
| Social disability         | 0.024                           | 0.791   |
| Handicapped               | 0.127                           | 0.158   |
| OHIP- Total               | -0.001                          | 0.999   |

rs. Spearman correlation coefficient ( $p > 0.05$ , non-significant correlation).

Severity of Periodontal Disease; Score 1 (Health/Gingivitis); Score 2 (Periodontitis Stages 1 and 2); Score 3 (Periodontitis Stages 3 and 4).

## DISCUSSION

Our results showed that 91% of patients with cardiovascular diseases had some stage of periodontitis. Elderly people and men showed higher severity of periodontal disease. Our data showed a high prevalence of periodontal disease (50% for stages 1 and 2 and 41% for stages 3 and 4) similar to other studies with populations that never received periodontal treatment<sup>11</sup> and with patients with cardiovascular diseases<sup>6,11</sup>. However, the prevalence of severe periodontal disease in the general population is lower (8 to 11%)<sup>7,8</sup>.

In our investigation, we confirmed results found in other studies in the literature that point to age, systemic condition, family income, and education level as possible factors associated with a higher prevalence of periodontal disease<sup>4,7,8,18</sup>. The dental loss found in our investigation was 33%, higher in the elderly group (45%). Other studies confirm this finding, indicating that the elderly are at increased risk of dental loss<sup>5,11</sup>, and factors such as hypertension also increase the risk of dental loss<sup>10</sup>.

Our findings showed that older adults had lower values for the domains "Physical functioning" and "Role-physical" in the SF-36 questionnaire. Other studies have shown that age can be a factor that influences quality of life, as well as chronic systemic diseases<sup>4,6,21</sup>. Considering individuals with different degrees of severity of periodontal disease, we observed differences in the "Pain" domain (SF-36), with patients with gingivitis/periodontal health having the worst results. We also observed that people diagnosed with gingivitis/periodontal health had a higher rate of tooth loss (52%). This result suggests that these patients had already lost their teeth under less favorable conditions, which could be responsible for the worse results in the "Pain" domain.



In stages 3 and 4 of periodontal disease, there is loss of attachment ( $\geq 5\text{mm}$ ), dental mobility, and tooth loss, which can lead to masticatory dysfunction<sup>9</sup>, and negatively impact quality of life<sup>6,12,14,16,20,21</sup>. However, our results showed that the severity of periodontal disease did not influence most quality-of-life domains as measured by the instruments used. These findings were different from those of the literature, as our study included patients with circulatory system diseases who were under periodic control. Another aspect that may have been responsible for the differences between the results is the various methods used to classify periodontal diseases observed in other studies<sup>6,14,16,20,21</sup>.

The values obtained for the OHIP-14 domains were low, indicating that periodontal conditions had little influence on the quality of life of patients with circulatory diseases in our sample. The total scores for OHIP-14 for people with health/gingivitis, stage 1 and 2 periodontitis, and stage 3 and 4 periodontitis were 10.7, 6.4, and 7.3, respectively. These results were similar to other studies, where the total scores for OHIP-14 were low<sup>21,24</sup>. However, they differ from other studies that showed that the severity of periodontal disease may influence quality of life<sup>6,14,16,21</sup>. The differences found between our results and other studies may be related to population characteristics, where factors such as systemic conditions, family income, education level, and different methods of classifying periodontal diseases can influence the quality of life<sup>16,24</sup>. The correlation between the severity scores of periodontal diseases and the quality-of-life domains measured by the instruments SF-36 and OHIP-14 was weak, confirming that the severity of periodontal disease had little influence on the quality of life of patients with circulatory diseases under periodic control. Other studies have also shown a weak correlation between periodontal parameters (plaque index, gingival bleeding, probing depth, and periodontal condition) and quality of life indicators<sup>17,19</sup>.

As a limitation of the study, we can point out the variety of cardiovascular disorders (ICD-10)<sup>23</sup>, in our sample, in which we had 18 patients with different circulatory diseases, making the sample heterogeneous. Furthermore, 77% of the volunteers were taking medication to control their systemic condition, which can cause alterations in the oral cavity<sup>25</sup>. The experimental design (cross-sectional study) does not allow the analysis of variable behavior over time or the determination of causal interrelationships. Despite the sample size obtained through a confidence interval calculation for a proportion, there was no balanced distribution considering age, gender, and severity of periodontal disease, which may have influenced the results of the statistical tests.

However, we can highlight several positive aspects of the methodology, as we used several clinical parameters to characterize a periodontal disease, and the evaluators were trained and calibrated, which favored the consistency of the data obtained. Although only two instruments were used to assess quality of life, both SF-36 and OHIP-14 are widely used with consistent results<sup>6,12,17,19-21,24</sup>.

Our study provides additional information in the literature that contributes to understanding periodontal conditions and their influence on the quality of life of patients with chronic diseases. On the other hand, our results showed that the severity of periodontal disease interfered with the "Pain" domain. We also found that the domains "Functional Capacity" and "Physical Aspects" were influenced by age. These findings may help facilitate the development of strategies for dental treatment of patients with chronic diseases, aiming to improve their quality of life.

## CONCLUSION

Among patients with circulatory system diseases, older adults and men had a higher severity of periodontal disease.

Older adults had a worse quality of life in the domains of functional capacity and physical aspects. There was no correlation between the severity of periodontal disease and indicators of quality of life.

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## REFERENCES

1. Tsao CW, Aday AW, Almarzooq ZI, Anderson CAM, Arora P, Avery CL, et al. Heart disease and stroke statistics-2023 update: a report from the American Heart Association. *Circulation*. 2023 Feb;147(8):e93-621. <http://dx.doi.org/10.1161/CIR.0000000000001123>. PMID:36695182.
2. Bastos LAVM, Bichara JLP, Nascimento GS, Villela PB, Oliveira GMM. Mortality from diseases of the circulatory system in Brazil and its relationship with social determinants focusing on vulnerability: an ecological study. *BMC Public Health*. 2022;22(1):1947. <http://dx.doi.org/10.1186/s12889-022-14294-3>. PMID:36266678.
3. Oliveira GMM, Brant LCC, Polanczyk CA, Biolo A, Nascimento BR, Malta DC, et al. Estatística cardiovascular - Brasil 2020. *Arq Bras Cardiol*. 2020;115(3):308-439. <http://dx.doi.org/10.36660/abc.20200812>. PMID:33027364.
4. Paz LFA, Medeiros CA, Martins SM, Bezerra SMMS, Oliveira W Jr, Silva MBA. Quality of life related to health for heart failure patients. *Rev Bras Enferm*. 2019;72(Suppl 2):140-6. <http://dx.doi.org/10.1590/0034-7167-2018-0368>. PMID:31826203.
5. Helal O, Göstemeyer G, Krois J, Fawzy El Sayed K, Graetz C, Schwendicke F. Predictors for tooth loss in periodontitis patients: systematic review and meta-analysis. *J Clin Periodontol*. 2019 Jul;46(7):699-712. <http://dx.doi.org/10.1111/jcpe.13118>. PMID:31025366.
6. Lazureanu PC, Popescu FG, Stef L, Focsa M, Vaida MA, Mihaila R. The influence of periodontal disease on oral health quality of life in patients with cardiovascular disease: a cross-sectional observational single-center study. *Medicina (Kaunas)*. 2022 Apr;58(5):584. <http://dx.doi.org/10.3390/medicina58050584>. PMID:35630001.
7. Chen MX, Zhong YJ, Dong QQ, Wong HM, Wen YF. Global, regional, and national burden of severe periodontitis, 1990-2019: an analysis of the global burden of disease study 2019. *J Clin Periodontol*. 2021 Sep;48(9):1165-88. <http://dx.doi.org/10.1111/jcpe.13506>. PMID:34101223.
8. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of severe periodontitis in 1990-2010: a systematic review and meta-regression. *J Dent Res*. 2014 Nov;93(11):1045-53. <http://dx.doi.org/10.1177/0022034514552491>. PMID:25261053.
9. Steffens JP, Marcantonio RAC. Classificação das doenças e condições periodontais e peri-implantares 2018: guia prático e pontos-chave. *Rev Odontol UNESP*. 2018 Ago;47(4):189-97. <http://dx.doi.org/10.1590/1807-2577.04704>.
10. Xu K, Yu W, Li Y, Li Y, Wan Q, Chen L, et al. Association between tooth loss and hypertension: a systematic review and meta-analysis. *J Dent*. 2022 Aug;123:104178. <http://dx.doi.org/10.1016/j.jdent.2022.104178>. PMID:35661800.
11. Pejcic A, Kostic M, Marko I, Obradovic R, Minic I, Bradic-Vasic M, et al. Tooth loss and periodontal status in patients with cardiovascular disease in the Serbian population: a randomized prospective study. *Int J Dent Hyg*. 2023 May;21(2):317-27. <http://dx.doi.org/10.1111/idh.12663>. PMID:36578147.
12. Nisanci Yilmaz MN, Bulut S, Bakirarar B. Impact of stage-grade of periodontitis and self-reported symptoms on oral health-related quality of life. *Int J Dent Hyg*. 2022 May;20(2):291-300. <http://dx.doi.org/10.1111/idh.12551>. PMID:34478610.
13. Allen PF. Assessment of oral health related quality of life. *Health Qual Life Outcomes*. 2003 Sep;1(1):40. <http://dx.doi.org/10.1186/1477-7525-1-40>. PMID:14514355.

14. Ustaoglu G, Goller Bulut D, Gümüş KÇ, Ankarali H. Evaluation of the effects of different forms of periodontal diseases on quality of life with OHIP-14 and SF-36 questionnaires: A cross-sectional study. *Int J Dent Hyg.* 2019 Nov;17(4):343-9. <http://dx.doi.org/10.1111/idh.12409>. PMID:31125483.
15. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community Dent Health.* 1994 Mar;11(1):3-11. PMID:8193981.
16. Llanos AH, Silva CGB, Ichimura KT, Rebeis ES, Giudicissi M, Romano MM, et al. Impact of aggressive periodontitis and chronic periodontitis on oral health-related quality of life. *Braz Oral Res.* 2018;32(0):e006. <http://dx.doi.org/10.1590/1807-3107bor-2018.vol32.0006>. PMID:29451591.
17. Molania T, Malekzadeh Shafaroudi A, Taghavi M, Ehsani H, Moosazadeh M, Haddadi A, et al. Oral health-related quality of life (OHRQoL) in cardiovascular patients referring to Fatima Zahra Hospital in Sari, Iran. *BMC Oral Health.* 2021 Aug;21(1):391. <http://dx.doi.org/10.1186/s12903-021-01756-0>. PMID:34380490.
18. Locker D, Quiñonez C. To what extent do oral disorders compromise the quality of life? *Community Dent Oral Epidemiol.* 2011 Feb;39(1):3-11. <http://dx.doi.org/10.1111/j.1600-0528.2010.00597.x>. PMID:21114518.
19. Shamim R, Nayak R, Satpathy A, Mohanty R, Pattnaik N. Self-esteem and oral health-related quality of life of women with periodontal disease - A cross-sectional study. *J Indian Soc Periodontol.* 2022 Jul-Aug;26(4):390-6. [http://dx.doi.org/10.4103/jisp.jisp\\_263\\_21](http://dx.doi.org/10.4103/jisp.jisp_263_21). PMID:35959305.
20. Wąsacz K, Chomyszyn-Gajewska M, Hukowska D. Oral health-related quality of life (OHRQoL) in Polish adults with periodontal diseases, oral mucosal diseases and dental caries. *Dent Med Probl.* 2022 Oct-Dec;59(4):573-81. <http://dx.doi.org/10.17219/dmp/146195>. PMID:36583840.
21. Jaumet L, Hamdi Z, Julia C, Herberg S, Touvier M, Bouchard P, et al. Periodontitis assessed with a new screening tool and oral health-related quality of life: cross-sectional findings among general-population adults. *Qual Life Res.* 2023 Jan;32(1):259-72. <http://dx.doi.org/10.1007/s11136-022-03215-x>. PMID:35948787.
22. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet.* 2007 Oct;370(9596):1453-7. [http://dx.doi.org/10.1016/S0140-6736\(07\)61602-X](http://dx.doi.org/10.1016/S0140-6736(07)61602-X). PMID:18064739.
23. World Health Organization - WHO. International statistical classification of diseases and related health problems [Internet]. 5th ed. Geneva: WHO; 2016. Available from: <https://apps.who.int/iris/bitstream/handle/10665/246208/9789241549165-V1-eng.pdf>
24. Sødal ATT, Skudutyte-Rysstad R, Diep MT, Koldslund OC, Hove LH. Periodontitis in a 65-year-old population: risk indicators and impact on oral health-related quality of life. *BMC Oral Health.* 2022 Dec;22(1):640. <http://dx.doi.org/10.1186/s12903-022-02662-9>. PMID:36566179.
25. Critchlow D. Part 3: impact of systemic conditions and medications on oral health. *Br J Community Nurs.* 2017 Apr;22(4):181-90. <http://dx.doi.org/10.12968/bjcn.2017.22.4.181>. PMID:28414538.

## CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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