

# Impact of aggressive periodontitis and chronic periodontitis on oral health-related quality of life

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**Abstract:** The purpose of this cross-sectional study was to investigate the effect of different forms of periodontal diseases on Oral Health-Related Quality of Life (OHRQoL). Fifty-two patients with Aggressive Periodontitis (AP) or Chronic Periodontitis (CP) were included: nine patients with Localized Aggressive Periodontitis (LAP), thirty-three patients with Generalized Aggressive Periodontitis (GAP) and ten patients with Generalized Chronic Periodontitis (GCP). Oral Health Impact Profile questionnaires (OHIP-14) were distributed after a clinical examination that measured the following periodontal parameters: tooth loss, bleeding on probing (BoP), probing depth (PD), gingival recession (REC) and clinical attachment level (CAL). The global OHIP-14 score means were 10.6 for LAP, 16.5 for GAP, and 17.5 for GCP. A statistically significant difference ( $p < 0.01$ ) was observed between the LAP group and the other two groups. There was significantly less bleeding and recession in the LAP group than in the patients with the generalized forms of periodontitis. LAP, GAP and GCP have an impact on patient quality of life when measured using the OHIP-14. Patients with GAP and GCP had poorer OHRQoL than LAP patients.

**Keywords:** Periodontal Diseases; Quality of Life; Aggressive Periodontitis; Oral Health; Health Status.

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## Introduction

Periodontal disease affects the supportive tissues surrounding the teeth and includes a variety of inflammatory presentations that can lead to progressive tissue destruction and ultimately tooth loss.<sup>1</sup> From a pathophysiological viewpoint, periodontitis is an inflammatory response to microbial dysbiosis related to dental plaque.<sup>2,3</sup>

Currently, two main distinct presentations of periodontitis are recognized: chronic periodontitis (CP) and aggressive periodontitis (AP).<sup>4</sup> CP rarely develops in the first three decades of life<sup>5</sup> and has a slow rate of cyclical progression.<sup>6</sup> Localized Aggressive Periodontitis (LAP) and Generalized Aggressive Periodontitis (GAP) have been described as rapidly progressive tissue destruction diseases that generally lack correlation to dental plaque deposits, develop early in life and have a higher progression rate relative to CP.<sup>4,7</sup>

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An assessment of Oral Health-Related Quality of Life (OHRQoL) comprehensively reveals the impact of oral health on the lives of patients. Several evaluation tools have been designed for this objective. The Oral Health Impact Profile (OHIP)<sup>8</sup> is an instrument used to measure the impact of treatment and oral health on patient quality of life.<sup>9</sup> It has been widely used in distinct populations, including young adults, and also assesses the impact of periodontal disease on OHRQoL.<sup>10,11,12</sup> The development of these tools represents a paradigm shift from the clinician to a patient-centered approach for the promotion of oral health care.<sup>13</sup> OHIP-14 is a more concise instrument to assess the perceived impact of oral health as an outcome of dental care<sup>8</sup> than the original OHIP-49.<sup>14</sup>

The impact of periodontitis on OHRQoL has received relatively little attention.<sup>15</sup> Understanding the impact of different forms of periodontal disease is essential to evaluate patient perception. The purpose of this cross-sectional study was to investigate the effect of different forms of periodontal diseases on the OHRQoL.

## Methodology

### Sample selection and design

This study was performed at the School of Dentistry, University of Sao Paulo (FOUSP) from September to November 2016. A group of patients who were referred for treatment at FOUSP were selected to participate in this study after diagnosis. These patients were diagnosed according to the 1999 International Workshop for the Classification of Periodontal Diseases and Conditions<sup>4</sup> for GAP, LAP and Generalized Chronic Periodontitis (GCP). After screening and diagnosis, 33 GAP patients, 9 LAP patients and 10 GCP patients were included. Exclusion criteria were being pregnant or lactating, age < 18 years and having systemic diseases that affect periodontal tissues. This study was approved by the Ethics Committee of FOUSP (CAAE: 29698314.1.0000.0075). An Informed Consent Form was obtained from all of the participants.

Personal data from each participant were collected through individual interviews and included age, gender and education level. OHIP questionnaires (OHIP-14) were distributed after a clinical examination

that measured the following periodontal parameters: tooth loss, bleeding on probing (BoP), probing depth (PD), gingival recession (REC) and clinical attachment loss (CAL). The examination was performed using a periodontal probe (PCPUNC, Hu-Friedy™, Chicago, USA) that included all of the teeth at six sites per tooth except for third molars. A trained examiner made all of the measurements. LAP affects first molars and incisors, with a loss of interproximal insertion in at least two permanent teeth, including a first molar, and at most two other permanent teeth (except first molars and incisors). GAP presents as generalized loss of insertion affecting at least three permanent teeth other than the first molars and incisors. Generalized chronic periodontal disease (GCP) is also characterized by disseminated periodontal destruction, but usually at a more advanced age, with slow progression associated with the presence of plaque and calculus and with more than 30% of the patient's sites involved.

The periodontal parameters used for site evaluation were measured by probing the gingival margin to the bottom of the periodontal pocket (PD); by gingival bleeding after gentle probing (BoP); by measuring the cementum-enamel junction to the gingival margin (REC) and the sum of this last measure with the probing depth (CAL). Clinical measures were recorded for all of the groups (LAP, GAP, GCP) as well as all the demographic data.

### Assessment of OHRQoL

The OHIP-14 questionnaire was used to assess the impact of periodontal disease on quality of life in patients from all three groups and was performed by only one investigator. The OHIP-14 is a simplified quality of life questionnaire that has been validated in Brazil (10) and has 14 questions divided into 7 domains that are described as follows: functional limitation, physical discomfort, psychological discomfort, physical disability, psychological incapacity, social incapacity and disability. Each domain contains two questions. Patients responded to the frequency of their negative experiences by following a 5 point Likert-type scale: 0-never, 1-rarely, 2-occasionally, 3-quite often, 4-very often. The total score ranges from 0 to 56, and the higher the number, the greater the patient's negative experience.

## Statistical analyses

The data analysis was performed using SPSS software for Windows (version 5.2). The Chi-square test was used to test the distributions by gender for each group. For the clinical measurements, the ANOVA test with Tukey's post hoc test and the Kruskal-Wallis test with Bonferroni correction were applied. To compare the OHIP-14 values for differences between groups, the Kruskal-Wallis test with Bonferroni correction was also used.

## Results

Table 1 shows the basic demographic and clinical characteristics of the study participants. A total of 52 patients were included and categorized by different periodontitis diagnoses (LAP - 9, GAP - 33, GCP - 10). All of the participants were included in the final analysis. The mean age of each subgroup is shown in Table 1: LAP, 25.56 years; GAP, 30.79 years; and GCP, 50.1 years. There was a statistically significant difference ( $p < 0.05$ ) between the GCP group and both aggressive periodontitis groups. Using the Chi-Square test, no difference was found between groups based on gender distribution.

For the clinical measures, Table 1 presents the percentage of BoP in which there was significantly

less bleeding in the LAP group compared to the generalized forms of periodontitis. In each subgroup, the periodontal examinations were divided into three groups (PPD  $\leq$  3 mm, PPD 4-6 mm and PPD  $\geq$  7 mm). For the PPD  $\leq$  3 mm sites, the LAP group exhibited a significant difference compared to the GAP and GCP groups. For sites between 4 and 6 mm, GAP had fewer sites that were significantly different than the LAP and GCP groups. Meanwhile, for PPD  $\geq$  7 mm, no differences were observed. No statistically significant difference was found between groups when CAL was compared; nevertheless, the GAP group showed an increased mean compared to the other groups. When REC was tested, a statistically significant difference was observed between the three groups, and the LAP group showed fewer recession sites relative to the GCP group, which showed a higher number of sites with recession. No significant differences were found when mobility was evaluated between the groups, although the GAP group showed an increased proportion of mobility when compared to LAP and GCP. Participants in the GCP group exhibited significantly more tooth loss than the LAP and GAP groups.

**Table 1.** The chi-square test was used to analyze the significance of the gender distribution differences between the groups ( $p = 0.19$ ; no significant difference between groups).

Variable	Periodontitis diagnosis		
	Localized aggressive periodontitis	Generalized aggressive periodontitis	Generalized chronic periodontitis
Age	25.56 (7.49) <sup>a</sup>	30.79 (5.07) <sup>a</sup>	50.1 (6.87) <sup>b</sup>
Males (%)	22.22	33.33	60
Females (%)	77.78	66.67	40
BOP (%)	27.03 (12.25) <sup>a</sup>	54.34 (23.97) <sup>b</sup>	63.99 (20.98) <sup>b</sup>
PPD $\leq$ 3 mm (%)	84.46 (8.8) <sup>a</sup>	60.88 (21.45) <sup>b</sup>	68.33 (16.45) <sup>b</sup>
PPD 4–6 mm (%)	12.18 (5.49) <sup>a</sup>	31.04 (16.37) <sup>b</sup>	24.38 (9.13) <sup>ab</sup>
PPD $\geq$ 7mm (%)	3.3 (4.79)	7.07 (8.47)	6.8 (10.49)
CAL	3.01 (0.34)	3.91 (1.25)	3.31 (1.14)
REC (Sites)	7 (6.14) <sup>a</sup>	15.67 (7.83) <sup>b</sup>	38.9 (16.49) <sup>c</sup>
Mobility	4.78 (3.38)	9.30 (6.46)	6.3 (3.68)
Missing teeth	1.78 (1.39) <sup>a</sup>	2.48 (2.66) <sup>a</sup>	5.2 (2.86) <sup>b</sup>

ANOVA was used to assess significant differences between the groups (BOP, PPD  $\leq$  3 mm, PPD 4–6 mm, REC). The differences between the groups were assessed using the Kruskal-Wallis test with Bonferroni post hoc correction (age, PPD  $\geq$  7 mm, CAL, mobility, missing teeth). Different letters indicate significant differences between groups ( $p < 0.05$ ).

Table 2 shows results obtained from the OHIP-14 questionnaire to determine quality of life. For data analysis, the Kruskal-Wallis test with Bonferroni correction were used to assess differences between groups. Table 2 presents the ranges obtained for each group: LAP (0 - 38), GAP (0 - 42) and GCP (0 - 45), with 56 being the highest possible score.

The mean of the global OHIP-14 scores is shown for each form of periodontitis, with means of 10.6 for LAP, 16.5 for GAP, and 17.5 for GCP. A statistically significant difference ( $p < 0.01$ ) for global questionnaire scores was observed between the LAP group and the other groups, indicating a poorer OHRQoL perception for patients who were diagnosed with any of the generalized forms of periodontal disease.

Furthermore, Table 2 presents values obtained from each of the seven domains assessed by the OHIP-14. In two of these seven domains, statistically significant differences were seen between the groups. In the Physical Pain section, there was a statistically significant difference between the LAP group and the GAP and GCP groups ( $p < 0.01$ ), indicating an increased perception of Physical Pain in groups with a generalized presentation of disease. In the Psychological Discomfort domain, the LAP group showed a significantly reduced value compared to the GCP group ( $p < 0.5$ ), although the GAP group was not significantly different from either group. In the remaining domains (Functional Limitation, Physical Disability, Psychological Disability, Social Disability, Handicap), statistically significant differences were

not identified between the groups; nevertheless, in the Handicap group, it was noteworthy that the LAP group exhibited better perception than participants with generalized forms of the disease.

## Discussion

In this study, 52 patients were included in total. After the clinical examination and the completion of questionnaires, the data were analyzed. For each group, the clinical and demographic characteristics were recorded. The distribution of the number of patients by diagnosis was as follows: 9 LAP patients, 33 GAP patients and 10 GCP patients. The difference in the number of patients with generalized and localized aggressive periodontitis is explained by the prevalence of each condition, because LAP is considered a rare condition. This also explains the difference in age and gender between the groups.

AP is a type of periodontal disease identified by a rapid loss of insertion and bone (7). A specific type of biofilm appears to have a critical role and, in addition, the immune response may be impaired.<sup>6</sup> One of the major problems associated with AP is early tooth loss in young individuals ( $< 35$  years), which usually occurs in GAP patients. Family history of the disease, which is associated with the systemic health of the patients, is also an important characteristic.<sup>5</sup>

The periodontal lesions in patients with LAP, GAP or GCP have biochemical similarities to molecular mediators; however, they have differences in the speed

**Table 2.** The differences between groups were assessed using the Kruskal-Wallis test with Bonferroni post hoc correction.

OHIP-14	Periodontitis Diagnosis		
	Localized aggressive periodontitis	Generalized aggressive periodontitis	Generalized chronic periodontitis
Range	0-38	0-42	0-45
Total Score	10.6 (11.36) <sup>a**</sup>	16.5 (11.17) <sup>b</sup>	17.5 (13.44) <sup>b</sup>
Domains			
Function limitation	0.3 (0.92)	0.7 (1.11)	0.6 (0.88)
Physical pain	0.9 (0.91) <sup>a**</sup>	1.72 (1.08) <sup>b</sup>	1.95 (1.19) <sup>b</sup>
Psychological discomfort	1 (1.03) <sup>a*</sup>	1.81 (1.45) <sup>ab</sup>	2.15 (1.39) <sup>b</sup>
Physical disability	0.95 (1.19)	0.84 (1,16)	1 (1.49)
Psychological disability	1.05 (1.28)	1.48 (1.48)	1.3 (1.45)
Social disability	0.85 (1.31)	0.89 (1.17)	1.05 (1.43)
Handicap	0.25 (0.79)	0.80 (1.20)	0.7 (1.08)

Different letters indicate significant differences between groups. \* $p < 0.05$ ; \*\* $p < 0.01$

of their progression.<sup>16</sup> A different biofilm appears to be associated with LAP compared to GAP and GCP.<sup>16</sup> This difference in the progression of the diseases, especially in GAP cases, can compromise patient quality of life because they often lose several teeth in the early stages.<sup>17</sup>

The OHRQoL evaluation helps better understand the impact of oral health on patient lives.<sup>12</sup> This focus on quality of life comes stems the fact that health is an important concept and not just the absence of a pathological condition.<sup>8</sup> OHIP-14 is a simplified quality of life questionnaire that has been validated in Brazil.<sup>10</sup> It is a patient-related outcome tool based on the disease–impairment–disability–handicap model developed by the WHO,<sup>18</sup> which, as previously described, has 14 questions divided into 7 domains: functional limitation, physical discomfort, psychological discomfort, physical disability, psychological incapacity, social incapacity and handicap. Responses range from 0 to 4 on the Likert scale: 0-never, 1-rarely, 2-occasionally, 3-quite frequently, and 4-very often. The total score varies from 0 to 56, and the higher the absolute value, the greater the patient's negative experience.<sup>10</sup> The OHRQoL enhancement represents a conceptual shift from a purely clinical view to a patient-centered outcome.<sup>19,13</sup>

Regarding the OHIP findings in this study, the global scores for patients with generalized forms of the disease (GAP and GCP) have significantly higher values than those for LAP patients, reflecting that GAP and GCP patients have a poorer perception of OHRQoL than the LAP group.

A study by Ng and Leung<sup>18</sup> evaluated the impact of OHRQoL-related periodontal status in 767 patients and observed a positive statistical correlation between patient education level and OHIP-14. They also reported that more than 10% of patients had some type of functional limitation, physical limitation or pain quite often or very often. These characteristics were considered by the authors as difficulty chewing or discomfort when eating or properly enjoying meals because of problems with their mouth and teeth. Habashneh et al.<sup>20</sup> found similar results in their study, noting that severe and moderate forms of periodontal disease have a negative impact on quality of life (QOL).

Regarding clinical evaluation, Eltas et al.<sup>21</sup> studied the indices of BoP, PD, CAL, REC and mobility and their relation with OHRQoL. They found that the clinical parameters most affecting QOL were BoP, REC and dental mobility. Our present data show that GCP patients have significantly more tooth loss than the LAP and GAP groups. The same kind of difference is observed for REC between the three groups: the LAP group has fewer recession sites relative to GCP, the group with the higher number of recession sites. There is significantly less bleeding in the LAP group than in the GAP and GCP groups.

A recent systematic review by Buset et al.<sup>22</sup> studied the relationship between periodontal disease and OHRQoL and demonstrated that this association is evident: the impact of periodontal disease on QOL was more pronounced when the extent and severity of periodontal disease were greater. They added that OHIP-14 was the most commonly used tool in the studies evaluated and that the presence of comorbidities in patients has an impact on OHRQoL. In another recent systematic review, Haag et al.<sup>19</sup> reported that the impact of a clinical outcome on QOL is more evident in young adults than in older adults. Such an impact would have the possible explanation that, for older adults, tooth loss is a normal consequence of aging. Another explanation would be that the presence of other systemic diseases in this population might reveal the impact of OHRQoL on patients.<sup>19,23</sup> Nevertheless, our study shows that LAP is the group with the lowest mean age (25.56 years  $\pm$  7.49) and has a better OHRQoL score than GCP with statistically significant differences. This could be related to the impact of the clinical characteristics with statistically significant differences, such as the increased percentage of BoP, more sites with periodontal pockets, more recession and an increased number of missing teeth, compared to the LAP group.

In this study, the mean age of the patients in each group was 25.56 years for LAP, 30.79 years for GAP and 50.1 years for GCP, showing a significant difference between the aggressive forms of the disease and the chronic form. Patients diagnosed with each type of periodontitis exhibited the same patterns described in the literature: patients



diagnosed with aggressive periodontitis (LAP and GAP) had mean ages closer to the second/third decades of life, whereas patients diagnosed with chronic periodontitis had a mean age closer to the fifth decade of life.

In 2013, a study by Durham et al.<sup>24</sup> matched 89 periodontal disease patients with 89 healthy patients according to sex and age to evaluate two types of QOL questionnaires. OHRQoL scores were significantly lower in periodontal patients than in healthy patients. The present study compares the clinical, demographic and OHRQoL data between groups with three different forms of periodontitis.

According to Al-Harathi et al.,<sup>15</sup> investigating and describing differences in impact prevalence, extent and severity would strengthen the consistency of findings. Armitage<sup>16</sup> recommends that the severity of periodontitis be categorized by the amount of periodontal attachment as follows: slight,  $1 \pm 2$  mm; moderate,  $3 \pm 4$  mm; and severe, 5 mm or more clinical attachment loss. The results of this study for PPD  $\leq 3$  mm sites showed a significant difference for the LAP group compared to the GAP and GCP groups. For sites between 4 and 6 mm, the GAP group showed fewer sites than the others, with a statistically significant difference compared to LAP and GCP. However, for PPD  $\geq 7$  mm, no differences were observed between groups. Nevertheless, our results suggest that a fundamental principle when investigating periodontitis and OHRQoL is to use a range of clinical measures and case definitions to examine the strength of the association.<sup>15</sup>

The AP sample size described in this study, especially the LAP group, is its major limitation. Despite importance in the pool of periodontal diseases, AP has a low prevalence, with rates from 0.3% to 5.5%<sup>25,26</sup> in comparison to CP, which affects 19.4% of

adult Brazilians (SB Brazil 2010: National Research on Oral Health: Main Results). The GCP group was included to show data from a disease with a higher prevalence in the population and to achieve a certain critical balance in data visualization. In addition, this is a cross-sectional study in which the data analysis was only descriptive. Follow-up with the patients included in this study to measure clinical parameters and QOL after periodontal treatment and during the maintenance phase could generate qualitative and quantitative data that are critical to the treatment of these patients.

AP and CP can lead to tooth loss because of the large loss of periodontal insertion,<sup>27</sup> early or late. This important clinical characteristic induces dental mobility, tooth migration by tongue placement, unbalanced occlusal contacts and parafunction. Because of this, many of these patients require prosthetic rehabilitation with a multidisciplinary team, including periodontics, orthodontics, dental implants, prosthesis and speech therapy. The response to periodontal treatment might be considered the initial step to improve the QOL of these patients.

## Conclusion

In this study, our findings suggest that different forms of periodontal disease have a distinct impact on the QOL of patients when measured by the OHIP-14. Patients with a diagnosis of generalized forms of chronic or aggressive periodontitis showed poorer OHRQoL than those diagnosed with localized aggressive periodontitis, which was shown mainly by the significant difference in the physical pain and psychological discomfort domains of the assessment tool.

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