

## Assessment of self-reported symptoms and oral health-related quality of life in patients requiring periodontal treatment

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### Abstract

**Aim:** Oral health-related quality of life (OHRQoL) refers to the impact of social, psychological, and functional factors, as well as problems in the oral-facial region, on individuals' well-being. This observational study aimed to evaluate the relationship between self-reported symptoms and OHRQoL and the periodontal status of patients presenting for periodontal treatment.

**Methodology:** The study comprised 170 individuals recruited from the Department of Periodontology at Necmettin Erbakan University. Participants were divided into three groups based on their periodontal status: periodontally healthy (65 individuals), gingivitis (51 individuals), and periodontitis (54 individuals). Various clinical periodontal parameters, such as the plaque index (PI), gingival index (GI), bleeding on probing (BoP), tooth mobility, and clinical attachment loss (CAL), were assessed alongside self-reported periodontal symptoms. Additionally, participants completed the Oral Health Impact Profile-14 (OHIP-14) questionnaire.

**Results:** Both the periodontitis and gingivitis groups exhibited similar outcomes concerning gingival redness and gingival bleeding during brushing. However, a significantly higher number of affirmative responses for other symptoms were recorded in the periodontitis group ( $p < 0.05$ ). Additionally, the periodontitis group had the highest total OHIP-14 scores and subscale scores, while the periodontally healthy group exhibited the lowest scores ( $p < 0.05$ ).

**Conclusion:** This study demonstrates a significant relationship between OHRQoL, patients' self-reported symptoms, and periodontitis.

**Keywords:** OHRQoL, oral health, periodontitis, OHIP-14, quality of life, periodontal symptoms

## Introduction

Gingivitis is an inflammatory disease caused by the accumulation of dental plaque, leading to redness and bleeding of the gums (1). Periodontitis, on the other hand, is a disease affecting the periodontal tissues, leading to the loss of attachment and destruction of the alveolar bone. The natural progression of periodontal disease results in tooth loss in some, but not all, patients (2). In cases where adequate oral hygiene is not maintained and dental plaque is not removed from the tooth surface, gingivitis or periodontitis may develop progressively (3, 4).

Periodontal disease is diagnosed by pocket depth (PD) and clinical attachment level (CAL). These clinical measurements are crucial to determining the disease state, but the symptoms and outcomes experienced by patients must also be considered (5). In the early stages of periodontitis and gingivitis, patients may not exhibit symptoms, often leading to delays in seeking treatment (6). In the later stages, symptoms such as tooth loss, bad breath, and gingival recession may manifest, adversely affecting patients' quality of life (7,8, 9-12).

Oral health-related quality of life (OHRQoL) is a subjective indicator that shows how an individual's oral and dental conditions impact their quality of life (5). It is a commonly used scale to assess OHRQoL (6, 7). OHIP-14 measures the negative impacts of periodontal disease and dental problems. Evidence from studies has shown that periodontal diseases can have negative effects on OHRQoL by negatively affecting eating, speaking, and social interactions (9-12). Furthermore, there is substantial evidence that periodontal treatment can improve clinical measures of disease, such as PD and CAL, as well as subjective outcomes, as measured by quality of life forms answered by patients (8).

Oral symptoms seen in periodontal diseases negatively affect OHRQoL. The aim of this study was to investigate the effects of periodontitis and gingivitis on OHRQoL using the OHIP-14 questionnaire, self-reported periodontal symptoms, sociodemographic data, and oral hygiene habits.

## Materials and Methods

### Study Design and Study Population

This cross-sectional study was conducted on a sample of 170 patients who requested routine periodontal therapy at the Department of Periodontology in Necmettin Erbakan University Faculty of Dentistry. The study received ethical approval from the Non-Drug and Medical Device Research Ethics Committee of Necmettin Erbakan University, Faculty of Dentistry (Protocol No: 2024/393). Patients were included in the study after reviewing and signing a written informed consent form of the 1975 Declaration of Helsinki, revised in 2013.

### Inclusion criteria:

- Aged 18 to 65
- Individuals with healthy periodontium, or those diagnosed with gingivitis or periodontitis

### Exclusion criteria:

- Refusal to be involved in the study
- Presence of physical, mental, or psychiatric disability
- Having received periodontal treatment in the last 6 months
- Being pregnant and lactating
- Having used any medications that may affect periodontal tissues within the last 6 months

## Data Collection

The 170 patients subsumed in the study were classified according to the 2017 periodontal and peri-implant diseases classification (9). They were divided into three groups: periodontally healthy (n = 65), gingivitis (n = 51), and periodontitis (n = 54).

**Sociodemographic variables:** Patients were asked to answer a questionnaire containing the following information about their gender, age, education level, total annual household income, smoking habits (never smoked/former smoker/current smoker), oral hygiene habits, frequency of dental visits (every 6 months/once a year/only when symptomatic), systemic disease status, and body mass index (BMI). Age was recorded in years, gender as male or female, and educational level as primary school, secondary school, or university. Tooth brushing frequency was assessed with three responses (once a day, two or more times a day, and never brushing) (10).

**Periodontal examination:** Prior to undergoing phase 1 treatment, periodontal parameters were measured, including plaque index (PI), gingival index (GI), PD, CAL, and bleeding on probing (BoP) (11). PD was measured as the distance between the deepest point of the periodontal pocket (PP) and the gingival margin. CAL was determined as the distance from the deepest point of the cemento-enamel junction to the PP of the tooth. BoP was recorded as either present or absent. All measurements were conducted by a calibrated periodontist (K.Y.).

Participants were assessed based on the criteria outlined in the consensus report of Working Groups 1 and 2 of the 2017 World Workshop on Classification of Periodontal and Peri-implant Diseases and Conditions (25). Diagnostic criteria included (i) gingival health on an intact periodontium with no CAL,  $PD \leq 3$  mm (assuming no false pockets), BoP less than 10%, and no radiological bone loss; (ii) generalized gingivitis on an intact periodontium with no CAL,  $PD \leq 3$  mm (assuming no false

pockets), BoP greater than 30%, and no radiological bone loss; (iii) periodontitis  $\geq 2$  mm or  $\geq 3$  mm interproximal CAL and radiological bone loss in  $\geq 2$  non-adjacent teeth. Following the clinical assessment, each participant received both verbal and written diagnoses about their oral health status and was encouraged to seek dental care for both prevention and treatment, as needed (9, 12).

**Dental Examination:** While the teeth were examined, notes were taken on a form using the DMFT index (13).

**Self-reported Periodontal Symptoms:** Participants were asked to self-report symptoms such as gingival redness, gingival bleeding on brushing, gingival bleeding while eating, spontaneous gingival bleeding, taste of blood in the mouth when waking up in the morning, gingival pain, gingival swelling, bad breath, gingival recession, tooth mobility, and tooth migration.

**OHIP-14:** To gauge the impact of periodontal condition on OHRQoL, patients completed the OHIP-14 form, consisting of 14 questions. The OHIP-14 assesses how periodontal condition affects OHRQoL using a Likert scale ranging from "nothing" (scored as 0) to "very frequently" (scored as 4). This questionnaire comprises seven domains: disability, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and functional limitation (6). The Turkish version of OHIP-14 was translated and shown to have good credibility and relevance in a study conducted in 2014 (14).

## Statistical analysis

Data were analyzed using IBM SPSS software (SPSS V23, IBM, Armonk, NY, US).

The normality of the data distribution was evaluated using Kolmogorov-Smirnov and Shapiro-Wilk tests. Participant responses were analyzed using chi-square analysis. A One-way ANOVA test was employed to compare measurement values across the groups, and a Bonferroni test was applied as a post-hoc test for significant results. The point of statistical significance was determined at the  $p < 0.05$  level.

## Results

The study included a total of 170 patients, comprising 103 females and 67 males, who presented to the periodontology clinic with varying periodontal statuses: periodontal health ( $n=65$ ), gingivitis ( $n=51$ ), and periodontitis ( $n=54$ ). The sociodemographic characteristics of the patients are detailed in Table 1. Gender distribution showed no significant difference among the groups ( $p > 0.05$ ). However, the average age of patients in the periodontitis group was notably higher than the mean age of patients in the other groups ( $p < 0.05$ ). Regarding educational background, the majority of patients in the periodontal health group had completed university-level education, while most individuals in the gingivitis group had high school education, and the majority in the periodontitis group had completed primary school education ( $p < 0.05$ ).

**Table 1.** Comparison of sociodemographic data of the participants according to groups

| Variables            | Categories     | Periodontally healthy | Gingivitis  | Periodontitis | p-values |
|----------------------|----------------|-----------------------|-------------|---------------|----------|
| Gender               | Female         | %42.7                 | %30.1       | %27.2         | 0.212    |
|                      | Male           | %31.3                 | %29.9       | %38.8         |          |
| Age*†                |                | 23.98±5.79            | 32.92±12.13 | 44.5±11.64    | 0.000*   |
| Education level      | Primary school | %9.3                  | %29.6       | %61.1         | 0.000*   |
|                      | High school    | %20                   | %50         | %30           |          |
|                      | University     | %62.8                 | %23.3       | %14           |          |
| Marital status       | Single         | %64.7                 | %27.1       | %8.2          | 0.000*   |
|                      | Married        | %11.8                 | %32.9       | %55.3         |          |
| Monthly income level | Low            | %40.3                 | %32.8       | %26.9         | 0.174    |
|                      | Medium         | %30.6                 | %30.6       | %38.9         |          |
|                      | High           | %44                   | %24         | %32           |          |

\* $p < 0.05$

Pearson Chi-Square Test; frequency (percentage)

\*Anova, †Post hoc tests: Bonferroni

Table 2 provides details obtained from patient-filled questionnaires regarding systemic diseases, oral hygiene practices, and smoking habits. It was observed that the proportion of smokers was higher in the periodontitis group, whereas the percentage of non-smokers was higher in the periodontally healthy group ( $p<0.05$ ).

Periodontal examination and dental examination data of the participants are given in Table 3. When GI, PI, BoP, and CAL data were analyzed between the groups, all data were higher in the periodontitis group ( $p<0.05$ ).

The data obtained as a result of questioning self-reported periodontal symptoms are provided in Table 4. The prevalence of gingival redness and bleeding while

brushing was significantly higher in the gingivitis and periodontitis groups than in the periodontal health group ( $p<0.05$ ). For all other periodontal symptoms, the periodontitis group answered "yes" with a higher incidence than other groups ( $p<0.05$ ).

Table 5 presents the data obtained from the OHIP-14 questionnaire. Significant variations were observed among the groups concerning total OHIP-14 scores, functional limitations, handicaps, physical pain, physical disability, and psychological disability ( $p<0.05$ ). However, no significant differences were noted between the groups in terms of psychological distress or social impairment ( $p>0.05$ ).

**Table 2.** Comparison of participants' oral hygiene habits, frequency of dental visits, periodontal treatment, body mass index score, presence of systemic diseases and smoking according to groups

| Variables                      | Categories              | Periodontally healthy | Gingivitis | Periodontitis | p-values |
|--------------------------------|-------------------------|-----------------------|------------|---------------|----------|
| Smoking status                 | Current smoker          | %30                   | %18        | %52           | 0.006*   |
|                                | Never smoked            | %41.7                 | %35.7      | %22.6         |          |
|                                | Former smoker           | %40                   | %20        | %40           |          |
| Systemic disease               | Yes                     | %12.5                 | %34.4      | %53.1         | 0.002*   |
|                                | No                      | %44.2                 | %29        | %26.8         |          |
| Frequency of dental visit      | Only when symptomatic   | %20.3                 | %28.4      | %51.4         | <0.001*  |
|                                | Once a year             | %37.5                 | %40        | %22.5         |          |
|                                | Every 6 months          | %62.5                 | %25        | %12.5         |          |
| Frequency of brushing          | Never                   | %0                    | %41.7      | %58.3         | <0.001*  |
|                                | Once a day              | %19.3                 | %29.8      | %50.9         |          |
|                                | Two or more times a day | %60.7                 | %27.0      | %12.4         |          |
| Inter dental cleaning          | Yes                     | %66.7                 | %20.5      | %12.8         | <0.001*  |
|                                | No                      | %29.8                 | %32.8      | %37.4         |          |
| Previous periodontal treatment | Yes                     | %49.1                 | %12.7      | %38.2         | 0.003*   |
|                                | No                      | %33.0                 | %38.3      | %28.7         |          |
| Body mass index*†              |                         | 23.64±4.53            | 25.66±5.5  | 27.22±5.04    | <0.001*  |

\* $p<0.05$

†Pearson Chi-Square Test; frequency (percentage)

\*Anova, †Post hoc tests: Bonferroni

**Table 3.** Comparison of the data obtained from periodontal examination and dental examination according to the groups

|                                     | Periodontally healthy | Gingivitis  | Periodontitis | p-values |
|-------------------------------------|-----------------------|-------------|---------------|----------|
| Plaque index*†                      | 1.126±0.292           | 1.911±0.509 | 2.25±0.53     | 0.000*   |
| Gingival index*†                    | 0.965±0.224           | 1.683±0.309 | 1.949±0.415   | 0.000*   |
| Bleeding on probing (% of sites)* † | 4.046±2.96            | 63.65±26.4  | 82.631±24.307 | 0.000*   |
| DMFT*†                              | 4.96±3.82             | 6.23±3.88   | 9.27±5.52     | 0.000*   |
| CAL*†                               | 0.00                  | 0.054±0.226 | 1.156±1.17    | 0.000*   |

Abbreviations: Mean ±SD: Mean ± Standard Deviation; DMFT: number of decayed, missing, filled, and total teeth; CAL: Clinical attachment loss  
\*p<0.05

\*Anova, †Post hoc tests: Bonferroni

**Table 4.** Comparison of self-reported periodontal symptoms according to groups

| Periodontal symptoms                                      | Catogories | Periodontal healthy | Gingivitis | Periodontitis | p-values |
|-----------------------------------------------------------|------------|---------------------|------------|---------------|----------|
| Gingival redness                                          | Yes        | %7.1                | %44.4      | %48.5         | 0.000*   |
|                                                           | No         | %81.7               | %9.9       | %8.5          |          |
| Gingival bleeding when brushing                           | Yes        | %10.6               | %40.4      | %49           | 0.000*   |
|                                                           | No         | %81.8               | %13.6      | %4.5          |          |
| Gingival bleeding while eating                            | Yes        | %5.4                | %32.4      | %62.2         | 0.000*   |
|                                                           | No         | %47.4               | %29.3      | %23.3         |          |
| Spontaneous gingival bleeding.                            | Yes        | %0                  | %26.3      | %73.3         | 0.000*   |
|                                                           | No         | %43                 | %30.5      | %26.5         |          |
| Taste of blood in the mouth when waking up in the morning | Yes        | %4                  | %28        | %68           | 0.000*   |
|                                                           | No         | %44.1               | %30.3      | %25.5         |          |
| Gingival pain                                             | Yes        | %8.2                | %29.5      | %62.3         | 0.000*   |
|                                                           | No         | %55                 | %30.3      | %14.7         |          |
| Gingival swelling                                         | Yes        | %10.9               | %34.4      | %54.7         | 0.000*   |
|                                                           | No         | %54.7               | %27.4      | %17.9         |          |
| Bad breath                                                | Yes        | %16                 | %30.7      | %53.3         | 0.000*   |
|                                                           | No         | %55.8               | %29.5      | %14.7         |          |
| Gingival recession                                        | Yes        | %6.9                | %30.6      | %62.5         | 0.000*   |
|                                                           | No         | %61.2               | %29.6      | %9.2          |          |
| Tooth mobility                                            | Yes        | %2.4                | %21.4      | %76.2         | 0.000*   |
|                                                           | No         | %50                 | %32.8      | %17.2         |          |
| Tooth migration                                           | Yes        | %4                  | %20        | %76           | 0.000*   |
|                                                           | No         | %44.1               | %31.7      | %24.1         |          |

\*p<0.05, Pearson Chi-Square Test; frequency (percentage)

**Table 5.** Comparison of the data obtained from the OHIP-14 questionnaire by groups

|                            |                    | Mean ± SD  | Min-Max    | p-value |
|----------------------------|--------------------|------------|------------|---------|
| Total OHIP-14*†            | Periodontal health | 7.47±6.5   | 0.00-28.00 | 0.000*  |
|                            | Gingivitis         | 10.92±7.94 | 0.00-34    |         |
|                            | Periodontitis      | 14.07±7.65 | 0.00-38    |         |
| Functional limitation*†    | Periodontal health | 0.35±0.83  | 0.00-4     | 0.000*  |
|                            | Gingivitis         | 0.94±1.28  | 0.00-5     |         |
|                            | Periodontitis      | 1.53±1.56  | 0.00-7     |         |
| Physical pain*†            | Periodontal health | 1.55±1.56  | 0.00-6     | 0.000*  |
|                            | Gingivitis         | 2.45±1.66  | 0.00-8     |         |
|                            | Periodontitis      | 2.98±1.76  | 0.00-8     |         |
| Psychological discomfort*† | Periodontal health | 2.49±1.89  | 0.00-8     | 0.363   |
|                            | Gingivitis         | 2.03±1.62  | 0.00-8     |         |
|                            | Periodontitis      | 2.31±1.5   | 0.00-6     |         |
| Physical disability*†      | Periodontal health | 0.7±1.12   | 0.00-5     | 0.000*  |
|                            | Gingivitis         | 1.52±1.87  | 0.00-7     |         |
|                            | Periodontitis      | 2.20±1.83  | 0.00-6     |         |
| Psychological disability*† | Periodontal health | 0.98±1.16  | 0.00-4     | 0.008*  |
|                            | Gingivitis         | 1.54±1.66  | 0.00-5     |         |
|                            | Periodontitis      | 1.77±1.47  | 0.00-5     |         |
| Social disability*†        | Periodontal health | 0.81±1.40  | 0.00-7     | 0.21    |
|                            | Gingivitis         | 1.25±1.61  | 0.00-6     |         |
|                            | Periodontitis      | 1.57±1.43  | 0.00-5     |         |
| Handicap*†                 | Periodontal health | 0.56±0.96  | 0.00-4     | 0.000*  |
|                            | Gingivitis         | 1.15±1.43  | 0.00-5     |         |
|                            | Periodontitis      | 1.68±1.53  | 0.00-6     |         |

Abbreviations: Mean ± SD: Mean ± Standard Deviation; Min-Max: Minimum-Maximum

\*p&lt;0.05

\*Annova, †Post hoc tests: Bonferroni

## Discussion

OHRQoL explores patients' personal experiences of dental problems. Alongside objective clinical parameters, it should be integrated into patients' diagnosis and treatment planning. This study was meant to analyze the impact of periodontitis and gingivitis on OHRQoL using the OHIP-14 questionnaire, self-reported periodontal symptoms, sociodemographic data, and oral hygiene habits. The finding indicated that all clinical measurements were highest in periodontitis patients and lowest in periodontally healthy patients, demonstrating that patients with periodontitis had worse OHRQoL.

Numerous studies in divergent populations worldwide have demonstrated a powerful interaction between sociodemographic determinants and periodontal disease (15, 16). For instance, a 2005 publication from the American Academy of Periodontology highlighted gender as a risk factor for periodontal disease. Nevertheless, our study revealed that gender did not significantly influence periodontal condition. This finding may be attributed to the relatively small sample size and an uneven distribution of genders among the groups.

Our study identified a noteworthy correlation between age and periodontal diseases. Patients in the

periodontitis group tended to have a higher average age compared to other groups. Previous studies have confirmed that the occurrence and intensity of periodontal disease improve as individuals age, primarily due to physiological alterations. The increased vulnerability to periodontal damage as one gets older may be attributed to the accumulated exposure to risk factors for periodontal disease throughout one's lifespan (17, 18).

The correlation between marital status and periodontal diseases has been the focus of numerous studies, yielding inconsistent findings. While some research suggests a connection, others fail to identify any significant correlation (19, 20). Our research revealed a correlation between the individuals' marital status and their periodontal health. As individuals age, marriage rates increase, which may correlate with a higher incidence of periodontitis due to cumulative effects. This could explain the observed relationship.

Research indicates a connection between educational achievement and periodontal health. Individuals with only primary school education were more prevalent in the group affected by periodontitis, while those with university degrees were more common among individuals with healthy periodontal conditions. This correlation may stem from heightened awareness of oral health practices and increased regularity of dental



examinations associated with higher educational attainment. Numerous studies have demonstrated a strong correlation between educational level and periodontal status (21, 22). Although some literature suggests a relationship between monthly income and periodontal status, this study found no such association (21, 22).

BMI is utilized to categorize individuals as overweight or obese. This study revealed a higher BMI score among participants in the periodontitis group compared to other groups, suggesting a link between elevated BMI and periodontitis. Additionally, a systemic review has further supported the association between obesity and periodontitis (23).

The data regarding tooth brushing frequency, interdental cleaning, previous periodontal treatment, and frequency of dental visits are consistent with findings from other studies. These results imply that individuals who neglect regular oral hygiene habits or fail to attend regular dental appointments exhibit a higher incidence of periodontal disease (24-26).

Smoking is widely recognized as a significant risk factor for periodontitis (27, 28). This study observed a higher prevalence of smokers within the periodontitis group. Notably, the rate of smoking was higher in the periodontally healthy group compared to the gingivitis group, potentially due to the suppressive impact of smoking on the visible signs of gingivitis.

There is a well-established relationship between systemic diseases and periodontitis (29, 30). In our study, the periodontitis group exhibited a higher prevalence of systemic diseases.

The DMFT index is a well-accepted and straightforward measure used in dentistry to evaluate the patient's oral health status (31). This study identified a significant link between the DMFT index, the count of missing teeth, and both the overall OHIP-14 score and its individual subscale scores. The relationship between tooth loss and OHRQoL can be explained by how tooth loss impacts functions like chewing, appearance, and speech. These findings are consistent with earlier research in the field (32, 33).

During the study, it was noted that complaints such as gingival redness and bleeding during brushing were notably more prevalent in both the periodontitis and gingivitis groups when compared to the periodontally healthy group. Participants reporting swollen and painful gums, bad breath, mobile teeth, and tooth migration were predominantly in the periodontitis group, with worse OHIP-14 scores in this group. This indicates that the signs and symptoms of periodontitis negatively impact the quality of life, consistent with previous studies (34, 35). Existing literature has documented a notable correlation between OHRQoL and complaints associated with periodontal disease (35).

Considering OHRQoL alongside objective clinical measures is crucial when diagnosing and devising treatment plans for patients (36). Therefore, our aim was to assess how periodontitis, gingivitis, clinical health status, and self-reported symptoms impact the quality of life by utilizing OHIP-14 ratings. Periodontitis showed a

strong correlation with elevated total OHIP-14 ratings and scores on all subscales. This suggests that individuals with periodontitis experience a lower quality of life. The results align with prior research (33, 37-40).

The study was conducted among patients seeking treatment at the periodontology department, which could potentially restrict the generalizability of our findings as this population may exhibit a higher frequency of oral health issues compared to the general public.

## Conclusion

This study revealed significant associations between socio-demographic factors, tooth brushing behaviors, perceived oral health status, and periodontal health. Furthermore, the OHIP-14 scores highlighted the considerable impact of periodontal health on quality of life. The findings also underscored that individuals with periodontal issues and symptoms experience poorer oral health-related quality of life. These findings emphasize the importance of public awareness about periodontal diseases and the promotion of good oral hygiene practices. Future research with larger and more diverse populations is warranted to further explore the relationship between periodontal disease and OHRQoL.

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## Disclosures

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**Ethical Approval:** Ethics committee approval was received for this study from the Necmettin Erbakan University, Faculty of Dentistry Non-Drug and Medical Device Research Ethics Committee, in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 2024-393.

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