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Assessing the Impact of Periodontal Disease on Oral Health–Related Quality of Life in Individuals with Different Periodontal Health Status Using OSHIP and OHIP

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Abstract

Background: The aim of this study was to compare the discriminatory ability of the Oral and Systemic Health Impact Profile for Periodontal Disease (OSHIP-Perio) and Oral Health Impact Profile-14 (OHIP-14) questionnaires in distinguishing between different periodontal conditions. By evaluating which instrument demonstrates greater sensitivity to disease severity, the aim was to determine which is more effective in assessing the impact of periodontal disease on oral health–related quality of life.

Methods: This cross-sectional study included 94 participants classified into 5 periodontal status groups (healthy, gingivitis, and periodontitis stages 1-3). Periodontal parameters and oral hygiene indices were recorded. Participants completed the OSHIP-Perio and OHIP-14 questionnaires. Group differences were analyzed using ANOVA or Kruskal–Wallis tests, followed by appropriate post hoc comparisons. A repeated-measures ANOVA compared OSHIP-Perio and OHIP-14 scores. Statistical significance was set at $P < .05$.

Results: Age, bleeding on probing, and plaque index increased with periodontal disease severity. Mean OSHIP-Perio and OHIP-14 scores increased progressively across stages, but ANOVA showed significant differences only for OSHIP ($P = .031$), with higher scores in periodontitis stage 2 compared to healthy participants ($P = .044$). Repeated-measures analysis indicated OSHIP scores were significantly higher than OHIP-14 across all groups ($P < .001$). While OHIP-14 failed to distinguish between periodontal groups, OSHIP significantly differentiated periodontal health from periodontitis. Gingivitis appeared in both post hoc subsets, reflecting its transitional nature between health and periodontitis.

Conclusion: The OSHIP-Perio scale effectively distinguished between periodontal health and periodontitis, highlighting its potential clinical and epidemiological utility. Gingivitis consistently appeared as a transitional stage between health and periodontitis, reflecting its ambiguous clinical nature. While OSHIP-Perio shows promise for identifying clear-cut disease states, its ability to discriminate gingivitis remains limited, suggesting that scale refinement with stage-specific items could improve its sensitivity across the full spectrum of periodontal disease.

Keywords: Oral health, oral health–related quality of life, periodontal diseases, quality of life

What is already known on this topic?

- *The Oral and Systemic Health Impact Profile for Periodontal Disease (OSHIP-Perio) questionnaire was specifically developed to assess the impact of periodontal disease on both oral and systemic health–related quality of life.*
- *While the Oral Health Impact Profile (OHIP) is a widely used tool for measuring oral health–related quality of life (OHRQoL), previous studies have suggested that it may be insufficient in capturing the specific effects of periodontal and systemic conditions.*
- *Therefore, comparing OSHIP-Perio and OHIP-14 can provide a more comprehensive understanding of how periodontal disease affects quality of life, particularly in different contexts.*

INTRODUCTION

Periodontitis is a chronic multifactorial inflammatory disease associated with dysbiotic plaque biofilms and characterized by the progressive destruction of the tooth-supporting structures. When left untreated or inadequately managed, severe periodontitis

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What does this study add to the existing knowledge?

- *This study aims to evaluate the adequacy of the OSHIP-Perio questionnaire, developed specifically to assess the impact of periodontal disease on OHRQoL, by comparing it with the widely used gold standard OHIP-14.*
- *Although the OSHIP-Perio has been validated in Turkish, no studies have yet compared its performance against OHIP-14 in the Turkish population.*
- *By conducting this comparative analysis, the study provides novel insights into the suitability and sensitivity of both tools for evaluating the OHRQoL impacts of periodontal disease, contributing valuable data specific to the Turkish context.*

may result in significant tooth loss, negatively affecting nutrition, systemic health, and increasing healthcare costs. This condition can impair oral function, aesthetics, and social well-being, ultimately reducing an individual's overall quality of life.[1]

The effects of periodontitis extend beyond clinical manifestations, influencing the broader concept of oral health–related quality of life (OHRQoL).[2] Quality of life refers to an individual's perception of their position in life within the context of their culture, value systems, goals, and expectations. In this context, OHRQoL represents a patient-centered approach that reflects how oral health impacts daily functioning, comfort, and psychosocial well-being. Assessing OHRQoL offers a holistic understanding of health, complementing traditional clinical measures by incorporating patients' subjective experiences.[3,4]

Among the various instruments developed to evaluate OHRQoL, the Oral Health Impact Profile-14 (OHIP-14) is one of the most widely used tools due to its brevity and ability to comprehensively assess the negative effects of oral conditions on quality of life.[5] However, since periodontitis is a chronic inflammatory condition with systemic implications, there is a need for instruments that capture its broader health impact. To meet this need, the Oral and Systemic Health Impact Profile for Periodontal Disease (OSHIP-Perio) was developed as a disease-specific instrument designed to evaluate the influence of periodontal disease on both oral health–related and general health–related quality of life.[6] This approach acknowledges the close relationship between oral and systemic health, providing a more comprehensive understanding of how periodontal disease affects overall well-being.

The 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions introduced a comprehensive update to the diagnostic framework for periodontal health, gingivitis, and periodontitis.[1] Unlike the 1999 classification system, periodontitis is no longer categorized based solely on disease type but is instead differentiated by stages and grades. In this new system, staging reflects the severity and extent of clinical attachment loss and is divided into 4 categories (stages 1-4). The distinction between stages 3 and 4 is defined primarily by tooth loss attributable to periodontal destruction, marking a more advanced level of disease progression.[7] This revised classification provides a more detailed and clinically meaningful representation of periodontal conditions and supports more precise evaluation of disease impact on OHRQoL.[8]

The aim of this study was to compare the discriminatory ability of the OSHIP-Perio and OHIP-14 questionnaires across 5 different periodontal conditions: healthy periodontium, gingivitis, and periodontitis stages 1-3. By evaluating which instrument demonstrates greater sensitivity in distinguishing among these periodontal states, this study sought to determine the more effective tool for assessing the impact of periodontal disease on OHRQoL.

MATERIALS AND METHODS

Study Design and Participants

This cross-sectional study aimed to compare the discriminatory ability of the OSHIP-Perio and OHIP-14 questionnaires in differentiating between varying levels of periodontal disease. By examining which instrument exhibits greater sensitivity to disease severity, it was sought to identify the more effective tool for assessing the impact of periodontal conditions on OHRQoL. Ethical approval for the study was obtained from the Istanbul University-Cerrahpaşa Clinical Non-Interventional Research Ethics Committee (Ethics Approval Number: 1394214, Date: August 19, 2025). All procedures were conducted in accordance with the principles of the Declaration of Helsinki, and written informed consent was obtained from all participants prior to data collection. Inclusion

criteria were being at least 18 years of age, being ambulatory, having the ability to understand and independently complete the Turkish health status measure, and having at least 20 occluding dental units. Exclusion criteria included being an inpatient, medically compromised status, diagnosed mental disorders, pregnancy, and periodontal therapy within the past 6 months.

The study was conducted in the Department of Periodontology. Recruitment took place during the routine admission period between August 20 and November 7, 2025, during which 623 new patient registrations were recorded. Of these, 248 patients had pre-treatment appointments that included periodontal measurements and clinical–radiographic examinations, constituting the exposure period. From this group, eligible individuals were invited to participate, and 94 participants consented. Data collection occurred within the same period and included both online questionnaires (OSHIP-Perio and OHIP-14 administered via SoSci Survey) and clinical/radiographic assessments. No additional follow-up beyond baseline assessment was required for this study.

Periodontal Examination and Classification

After medical history and initial screening, subjects completed informed consent, and a comprehensive dental and periodontal examination was conducted.

Participants' periodontal status was assessed by examining the total number of teeth, probing depth, gingival recession instead of clinical attachment level, and radiographic findings. Full-mouth bleeding on probing (BOP) and plaque index (PI) were evaluated as percentages, with PI assessed dichotomously as presence or absence of plaque.

Periodontal status was determined according to the 2017 World Workshop classification. Based on clinical and radiographic examinations, participants were diagnosed with periodontal health,[9] gingivitis,[10] or periodontitis.[7] Cases diagnosed with periodontitis were further categorized into stages according to the new classification system. Specifically, periodontitis cases were grouped as stages 1, 2, or 3. In total, 5 periodontal conditions were defined: periodontitis stages 1–3, gingivitis, and periodontal health.

Sample Size

In this study, a total of 5 distinct periodontal health status groups were included: healthy, gingivitis, periodontitis stages 1–3. A priori power analysis was conducted using G*Power (GPower 3.1.9.7) to determine the minimum required sample size for detecting a medium effect size (f=0.25) in a one-way ANOVA, with a significance level (α) of 0.05 and statistical power (1-β) of 0.80. The analysis indicated that a minimum total of 65 participants (approximately 13 per group) would be required. However, considering potential variability and the aim to conduct additional analyses comparing the performance of the OHIP-14 and OSHIP-Perio scales, the sample size was increased to 94 participants, distributed across the 5 groups as follows: healthy (n=13), gingivitis (n=25), stage 1 (n=20), stage 2 (n=23), and stage 3 (n=13). Although the group sizes were not perfectly equal, the achieved statistical power was approximately 0.80, which is considered acceptable for detecting significant differences among the groups.

Comparison of the OSHIP-Perio with the OHIP-14 Instruments

Oral and Systemic Health Impact Profile for Periodontal Disease instrument consisted of 14 items, which were classified under 4 dimensions: periodontal, oral function, orofacial pain, and psychosocial impact. These 14 items were scored using a 5-point Likert scale: never (1), hardly ever (2), occasionally (3), fairly often (4), and very often (5). The summation of all 14 responses would give a quantitative measure of the self-reported OHRQoL, with a maximum score of 70 points indicating the worst possible outcome. The validated Turkish version of the OSHIP-Perio was used in this study.[11]

Similarly, the OHIP-14 instrument, also consisting of 14 items, includes 2 items capturing each of the 7 domains. All items in both instruments were scored using the same 5-point Likert scale. Thus, the maximum possible score for both the OHIP-14 and the OSHIP-Perio is 70 points, each reflecting the worst possible OHRQoL outcome. For the OHIP-14, the validated Turkish version was used in this study.[12]

Statistical Analysis

Descriptive statistics including mean, SD, and 95% CI for the lower and upper bounds were calculated for total OHIP-14 and OSHIP-Perio scores within each periodontal health group, which were nominally coded as follows: 1 corresponds to healthy, 2 corresponds to gingivitis, 3 corresponds to periodontitis stage 1, 4 corresponds to periodontitis stage 2, and 5 corresponds to periodontitis stage 3.

The normality of the OHIP-14 and OSHIP-Perio score distributions was assessed using the Shapiro–Wilk test for groups with sample sizes less than 50. Visual inspections of histograms and Q-Q plots complemented the normality assessment. Homogeneity of variances was evaluated using Levene's test.

For comparisons among the 5 groups, parametric or nonparametric tests were selected based on the results of normality and variance homogeneity tests: If normality and equal variances assumptions were met, one-way ANOVA was used for both OHIP-14 and OSHIP-Perio scores. Post hoc analyses included Tukey's test for equal variances or Games–Howell test for unequal variances. If these assumptions were violated, the Kruskal–Wallis test was employed, followed by Dunn–Bonferroni post hoc tests for pairwise comparisons.

Each participant provided 1 OSHIP-Perio and 1 OHIP-14 score, enabling a repeated-measures design with measurement type (OSHIP-Perio vs. OHIP-14) as the within-subjects factor and stage group as the between-subjects factor. A two-factor repeated measures ANOVA was conducted within the framework of the General Linear Model (GLM). The significance level was set at $\alpha = 0.05$. Assumptions of equality of variances and covariances were assessed using Levene's Test and Box's Test, respectively. Cohen's *d* effect sizes were calculated for each stage relative to the healthy group to quantify the magnitude of differences in OHRQoL scores. A significance level of $P < .05$ was considered statistically significant. All analyses were performed using (SPSS, version 26).

Post Hoc Analysis

Initially, the study sample was divided into 5 groups based on clinical diagnosis: healthy, gingivitis, periodontitis stages 1, 2, and 3. During preliminary analyses, it was observed that the gingivitis group acted as an intermediate stage, and the post hoc analyses suggested that certain groups exhibited statistically significant differences while others clustered together in homogeneous subsets. Based on these observations, the sample was consolidated into 3 main groups for statistical analysis: healthy, gingivitis, and periodontitis stages 1-3. Levene's test was performed to assess the homogeneity of variances for OSHIP-Perio and OHIP-14 scores. As the assumption of equal variances was confirmed, one-way ANOVA was conducted to examine differences among the 3 groups. Post hoc comparisons were carried out using Tukey's Honestly Significant Difference (HSD) test to identify which groups differed significantly and to determine homogeneous subsets for the measured variables.

RESULTS

A total of 623 patients were initially assessed for potential eligibility. Of these, 248 patients had pre-treatment appointments that included periodontal measurements and examinations, forming the pool of individuals screened for inclusion. Based on the screening, 94 participants met the eligibility criteria and consented to participate in the study. All 94 participants completed the baseline assessments and were included in the analyses, as no additional follow-up was required (Supplementary Figure 1).

Among the 94 participants (55 women, 39 men), periodontal health distribution showed that gingivitis (26.6%) and periodontitis stage 2 (24.5%) were the most prevalent conditions. Healthy periodontal status was more common among women (18.2%) than men (7.7%), whereas periodontitis stage 3 was more frequent in men (25.6%) compared to women (5.5%).

Age increased progressively across periodontal health status, with mean ages ranging from 22.92 in periodontal health to 46.69 in periodontitis stage 3. Similarly, mean BOP % and PI% scores increased with disease severity. Bleeding on probing percentage ranged from 9.45 (periodontal health) to 49.54 (periodontitis stage 3), while PI% scores increased from 24.69 to 62.23 across the same stages.

Table 1. Descriptive Statistics for OSHIP and OHIP Variables Across Different Stages

Variable	Periodontal Status	Mean	SD	95% CI Lower	95% CI Upper
OSHIP	Health	26.23	7.94	21.43	31.03
	Gingivitis	28.48	7.91	25.22	31.74
	Periodontitis 1	31.85	6.95	28.60	35.10
	Periodontitis 2	34.52	10.15	30.13	38.91
	Periodontitis 3	32.77	8.57	27.59	37.94
OHIP	Health	25.23	8.49	20.10	30.36
	Gingivitis	25.84	8.13	22.49	29.19
	Periodontitis 1	28.95	7.54	25.42	32.48
	Periodontitis 2	31.91	8.38	28.29	35.54
	Periodontitis 3	30.15	12.10	22.84	37.47

Mean, SD, and 95% CI are reported.
OHIP, Oral Health Impact Profile; OSHIP, Oral and Systemic Health Impact Profile.

Descriptive analyses of age, gender, PI %, and BOP % according to periodontal health status are presented in the Supplementary Tables (Supplementary Tables 1-4).

Normality of the data was assessed using both the Kolmogorov–Smirnov and Shapiro–Wilk tests. Results indicated that the OHIP-14 and OSHIP-Perio scores were normally distributed across all periodontal health stages ($P > .05$). Therefore, parametric statistical methods were deemed appropriate for subsequent analyses.

Mean OSHIP-Perio and OHIP-14 scores increased with worsening periodontal status. The lowest mean OSHIP-Perio score was observed in the healthy group, while the highest was in periodontitis stage 2. Similarly, OHIP-14 scores showed a comparable pattern, increasing progressively from healthy individuals to those with more severe periodontal conditions (Table 1).

The results of the ANOVA test indicate a statistically significant difference in group means for the OSHIP-Perio variable. On the other hand, the OHIP-14 variable shows no significant difference between groups. Therefore, while OSHIP scores vary significantly across groups, OHIP-14 scores do not demonstrate such variation (Table 2).

Table 2. One-Way ANOVA Results Comparing OSHIP and OHIP Scores Across Periodontal Health Status Groups

Variable	Between Groups SS	*df*	Within Groups SS	*df*	*F*	*P*
OSHIP	794.685	4	6.323.145	89	2.796	**.031**
OHIP	623.364	4	6.832.136	89	2.030	.097

The table includes between-group and within-group sums of squares (SS), *df*, *F* values, and *P*-values.
OHIP, Oral Health Impact Profile; OSHIP, Oral and Systemic Health Impact Profile; SS, sums of squares.

Table 3. Post Hoc Subset Analysis of OSHIP Scores Across Periodontal Status Groups

Periodontal Status	n	Mean	Subset 1	Subset 2
Health	13	26.23	Subset 1	
Gingivitis	25	28.48	Subset 1	Subset 2
Periodontitis 1	20	31.85		Subset 2
Periodontitis 2	13	32.77		Subset 2
Periodontitis 3	23	34.52		Subset 2

Groups that do not differ significantly from each other are listed under the same subset based on mean values ($P > .05$).
OSHIP, Oral and Systemic Health Impact Profile.

Post hoc analysis for the OSHIP-Perio variable revealed a statistically significant difference between the healthy group and stage 2 periodontitis, with a mean difference of −8.291 ($P = .044$), indicating that participants with periodontitis stage 2 had higher OSHIP scores. No other pairwise comparisons showed statistically significant differences.

A post hoc comparison of OSHIP-Perio scores across periodontal health groups revealed statistically significant differences between certain stages. The healthy and gingivitis groups formed 1 subset with lower mean scores, while periodontitis stages 1-3 formed a second subset with higher scores (Table 3).

A repeated measures GLM analysis revealed a significant main effect of scale type, with OSHIP scores being higher than OHIP-14 scores across all groups ($F(1, 89) = 14.204$, $P < .001$, partial $\eta^2 = 0.138$). The interaction between scale type and periodontal stage was not significant ($F(4, 89) = 0.245$, $P = .912$, partial $\eta^2 = 0.011$). Additionally, a significant main effect of stage was observed for the combined scores ($F(4, 89) = 2.677$, $P = .037$, partial $\eta^2 = 0.107$).

Cohen's *d* effect sizes comparing each periodontal stage with the healthy group were calculated for both OSHIP-Perio and OHIP-14 scores. For OSHIP-Perio, effect sizes were 0.28 for gingivitis, 0.77 for periodontitis stage 1, 0.88 for stage 2 periodontitis, and 0.79 for stage 3 periodontitis. For OHIP-14, effect sizes were 0.07 for gingivitis, 0.47 for periodontitis stage 1, 0.79 for periodontitis stage 2 , and 0.47 for periodontitis stage 3 .

Post Hoc Comparison of Reclassified Periodontal Groups Based on OHRQoL Scores

Initially, participants were classified into 5 periodontal stages (healthy, gingivitis, and periodontitis stages 1-3). However, based on the results of the Tukey HSD subset analysis, which revealed 2 distinct subsets in terms of OSHIP scores with gingivitis falling between healthy individuals and those with periodontitis, a new 3-group classification was created to better represent the observed distribution (Table 3). These groups were defined as Group 1 (healthy), Group 2 (gingivitis), and Group 3 (periodontitis), the latter combining all periodontitis stages (1-3).

Levene's Test confirmed the assumption of homogeneity of variances for both OSHIP-Perio ($P = .870$) and OHIP-14 ($P = .971$), allowing for one-way ANOVA to be conducted. The analysis showed significant differences among the 3 groups for both OSHIP-Perio ($F(2, 91) = 5.087$, $P = .008$) and OHIP-14 scores ($F(2, 91) = 3.468$, $P = .035$). Post hoc comparisons using Tukey HSD indicated a significant difference in OSHIP-Perio scores between the healthy and periodontitis groups (mean difference = −6.930, $P = .023$), while differences between healthy vs. gingivitis ($P = .714$) and gingivitis vs. periodontitis ($P = .058$) were not statistically significant. For OHIP-14, no pairwise comparisons reached significance, although the difference between gingivitis and periodontitis approached significance ($P = .077$). Subset analysis further supported this pattern, with healthy and gingivitis groups clustering together in 1 subset, and periodontitis forming a distinct subset, particularly in OSHIP-Perio scores.

DISCUSSION

This study aimed to evaluate the potential of 2 different OHRQoL instruments, OSHIP-Perio and OHIP-14, in distinguishing between various periodontal conditions. The OSHIP-Perio scale has been specifically developed and validated for assessing periodontal disease and was therefore used as the primary tool for evaluating OHRQoL across different periodontal states. In contrast, OHIP-14 is a widely accepted general instrument and was employed in this study as a comparator.

The primary finding indicates that the OHIP-14 scale failed to distinguish between different periodontal groups, while the OSHIP-Perio scale, although not capable of clearly differentiating all stages, was able to significantly distinguish between periodontal health and periodontitis. Notably, gingivitis appeared in both subsets identified through post hoc analysis, suggesting its transitional nature. This aligns well with clinical observations where gingivitis can either regress to a healthy state or progress irreversibly into periodontitis.[13–15] This biological and clinical ambiguity is reflected in the difficulty of distinctly classifying gingivitis based solely on OHRQoL outcomes.

Nevertheless, the fact that OSHIP-Perio could identify a significant difference between periodontal health and periodontitis is promising and highlights its potential utility in clinical and epidemiological contexts. The bridging position of gingivitis across subsets supports existing clinical understanding and disease models, reinforcing its role as a transitional phase. These findings further justified the re-grouping of participants into 3 broader categories (healthy, gingivitis, periodontitis) to better reflect both clinical reality and the observed data patterns. Following this reclassification, it was observed that gingivitis continued to emerge as an intermediate condition, showing characteristics of both health and disease. While the OSHIP-Perio scale revealed a statistically significant difference between the healthy and periodontitis groups, no significant differences were detected between gingivitis and either of the other 2 groups. This pattern was

confirmed through a Tukey HSD post hoc analysis, which again positioned gingivitis across both subsets, reinforcing its transitional nature. These results suggest that although OSHIP-Perio has the potential to distinguish between clear-cut health and disease states, its ability to discriminate gingivitis as a distinct stage remains limited, possibly due to the overlapping clinical and symptomatic features shared with both adjacent stages.

To evaluate the clinical relevance of the differences observed in OHRQoL across all periodontal stages, including healthy, gingivitis, and periodontitis stages 1-3, effect sizes for each group were calculated. In the study by Goergen et al,[15] effect size analysis of OHIP-14 indicated that only individuals with periodontitis stage 3/4+grade C demonstrated a clinically relevant impact on OHRQoL (Effect Size=0.50), whereas the effect size for all other periodontitis diagnoses was small, suggesting limited clinical significance.[8] In contrast, these findings, using the healthy group as reference, revealed that OSHIP scores exhibited large effects across all periodontitis stages, indicating a substantial impact on OHRQoL regardless of disease stage. Oral Health Impact Profile-14 scores in this cohort showed a large effect only in periodontitis stage 2, medium effects in stages 1 and 3, and negligible effect in gingivitis. These results suggest that periodontitis substantially affects OHRQoL, with OSHIP being more sensitive to stage-specific differences than OHIP-14.

One limitation of the present study is that only the periodontitis stage was considered in the analyses, whereas both stage and grade have been evaluated together in another study.[8] Since disease grade reflects the rate of progression, its exclusion may have limited the ability to fully capture the impact of disease dynamics on OHRQoL. Another important consideration is the sample size. Some periodontal condition groups in this study were close to the minimum statistical threshold, potentially reducing the power to detect significant differences across all groups. The lack of statistical significance observed between certain stages may be attributable to this limitation. Future studies with larger sample sizes are needed to confirm whether these trends achieve statistical significance. If larger samples still do not reveal clearer distinctions, modifications to the OSHIP scale may be warranted, particularly to improve its sensitivity to early-stage periodontal differences.

It is also worth noting that while OSHIP-Perio includes questions reflecting advanced clinical features such as mobility or bone loss, the clinical staging of periodontitis may not always translate into distinct, perceivable impacts from the patient's perspective. This may partly explain why gingivitis remained as an intermediate stage in the results. Introducing additional, stage-specific questions—particularly targeting early or subtle clinical features—could help better distinguish this intermediate stage and improve the scale's ability to differentiate between lower stages of periodontitis.

In the OSHIP-Perio questionnaire, 2 items—"Have you experienced shaky teeth?" and "Have you experienced bleeding gums?"—are particularly relevant for distinguishing periodontal stages. Healthy individuals typically answer "no" to both questions, while those with gingivitis generally report only gum bleeding. Periodontitis patients, however, may report tooth mobility, bleeding, or both. Consequently, a gingivitis patient answering "yes" to the bleeding question could have the same OSHIP-Perio response pattern as a periodontitis patient who reports only mobility, particularly in later stages where bleeding may not always accompany mobility or only bleeding in the early stage of periodontitis. This overlap in responses limits the ability of the OSHIP-Perio scale to fully distinguish gingivitis from periodontitis, highlighting a potential area for scale refinement. One potential modification to enhance OSHIP-Perio's discriminative ability could be to include follow-up questions regarding the duration of symptoms. For instance, short-term gum bleeding may indicate early-stage gingivitis, whereas long-standing bleeding combined with responses about tooth mobility could help identify the transition to periodontitis. By integrating symptom duration and combining early- and late-stage indicators, the OSHIP-Perio scale could be refined to better differentiate between early stages of periodontal disease.

In addition to these items, a question regarding gingival recession could be incorporated, such as "Have you noticed your gums pulling away from your teeth?" With the inclusion of this third item, a scoring pattern could more clearly differentiate between stages: healthy individuals would score 0 (no symptoms), gingivitis patients would typically score 1 (bleeding only), and periodontitis patients would score 2 (positive responses for tooth mobility and/or gum recession). This modification could enhance the OSHIP-Perio scale's ability to distinguish between early and more advanced stages of periodontal disease.

Finally, given the trends observed in GLM analyses, future research could explore targeted modifications to the OSHIP-Perio scale. Incorporating stage-specific items, especially for early periodontal changes, may enhance its discriminative power and support its use as a more precise patient-reported outcome measure across the full spectrum of periodontal diseases.

CONCLUSION

The aim of this study was to compare the discriminatory ability of the OSHIP-Perio and OHIP-14 questionnaires across 5 different periodontal conditions: healthy periodontium, gingivitis, and periodontitis stages 1-3. These findings demonstrated that while the OSHIP-Perio scale was able to detect statistically significant differences among periodontal

conditions, the OHIP-14 scale failed to distinguish between any of the periodontal groups. Within the OSHIP-Perio scale, 2 distinct subsets emerged: healthy individuals and those with periodontitis. However, gingivitis appeared in both subsets, which is consistent with its transitional nature in the clinical spectrum of periodontal disease.

These results suggest that the OSHIP-Perio scale may benefit from modifications that enhance its ability to discriminate gingivitis from periodontal health and disease. Future studies with larger sample sizes and a revised version of the OSHIP-Perio scale may provide a more refined model capable of clearly separating gingivitis from other periodontal conditions.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Artificial Intelligence Usage Statement: The author declared that no Artificial Intelligence Tool was used in the preparation of the manuscript.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Istanbul University Cerrahpaşa Clinical Non-Interventional Research Ethics Committee (Approval No.: 1394214; Date: August 19, 2025).

Informed Consent: Written informed consent was obtained from participants who agreed to take part in this study.

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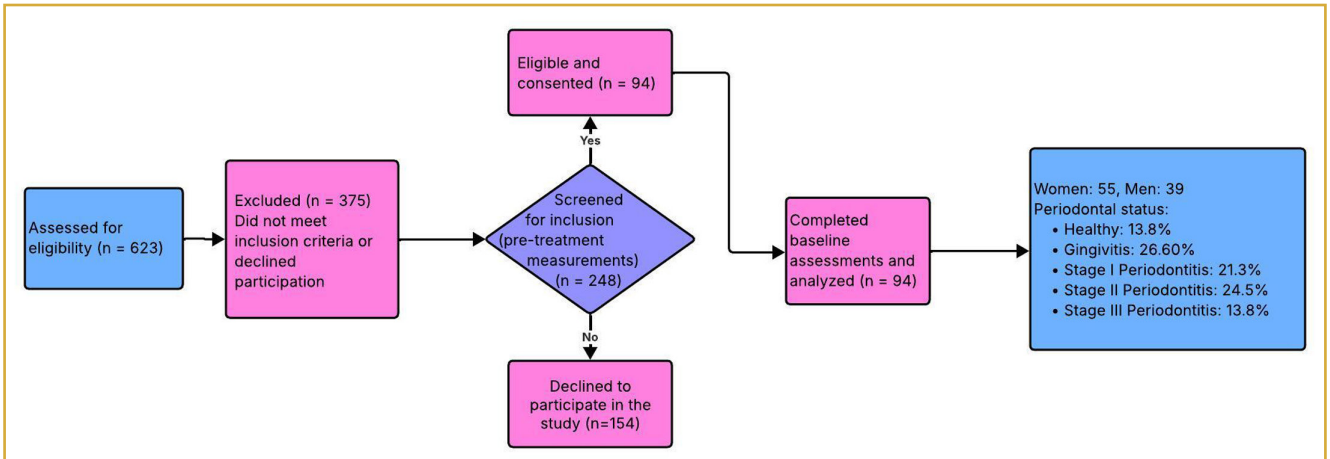

Supplementary Figure 1. Flow diagram.

Supplementary Table 1. Descriptive statistics for participants' age according to periodontal health stages. Values include mean, SD, and 95% CI

Periodontal Health Status	Mean (age)	Std. Dev.	95% CI (Lower)	95% CI (Upper)
Health	22.92	5.392	19.66	26.18
Gingivitis	23.32	6.568	20.61	26.03
Periodontitis I	30.85	11.798	25.33	36.37
Periodontitis II	42.39	9.213	38.41	46.38
Periodontitis III	46.69	10.379	40.42	52.96

Supplementary Table 2. Distribution of participants by periodontal health status according to sex. Frequencies and percentages are presented for each stage of periodontal health in both women and men

Periodontal Health Status	Number of women	Women %	Number of men	Men %	Total number	Total %
Health	10	18.20	3	7.70	13	13.80
Gingivitis	18	32.70	7	17.90	25	26.60
Periodontitis I	12	21.80	8	20.50	20	21.30
Periodontitis II	12	21.80	11	28.20	23	24.50
Periodontitis III	3	5.50	10	25.60	13	13.80
Total	**55**	**100**	**39**	**100**	**94**	**100**

Supplementary Table 3. Descriptive statistics for Plaque Index (PI) scores (%) according to periodontal health stages. The table includes mean, SD, and 95% CI for each stage

Periodontal Health Status	Mean	Std. Dev.	95% CI (Lower)	95% CI (Upper)
Health	24.69	17.404	14.18	35.21
Gingivitis	47.64	17.000	40.62	54.66
Periodontitis I	58.05	26.106	45.83	70.27
Periodontitis II	63.78	24.342	53.26	74.31
Periodontitis III	62.23	21.580	49.19	75.27

Supplementary Table 4. Descriptive statistics for Bleeding on Probing (BOP) scores (%) according to periodontal health stages. The table includes mean, SD, and 95% CI for each stage

Periodontal Health Status	Mean	Std. Dev.	95% CI (Lower)	95% CI (Upper)
Health	9.45	1.01	8.9	10.0
Gingivitis	23.52	17.945	16.11	30.93
Periodontitis I	42.05	35.047	25.65	58.45
Periodontitis II	46.30	28.242	34.09	58.52
Periodontitis III	49.54	36.576	27.44	71.64