



Evaluation of periodontitis patients according to the Health Protective Behaviors Scale

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Abstract

Background: Understanding and maintaining the link between oral and general health is vital. This research aimed to determine the significance of behavior in assessing potential risk factors for periodontitis and evaluate individuals using the Health Protective Behaviors Scale (HPBS).

Methods: One hundred and four periodontitis patients and 107 periodontally healthy individuals with no difference in age and gender distribution answered the questionnaire. The data were analyzed using SPSS 25. The normality assumption was checked by the Shapiro-Wilk test. The Mann-Whitney U test compared two independent groups without normal distribution. The Kruskal-Wallis test was used to compare three or more independent groups without normal distribution. The post hoc Bonferroni test was used to determine the group or groups that created the difference. Spearman's correlation was used to measure the link between continuous variables and non-normal distribution.

Results: The scores of the HPBS in all its dimensions in people without periodontitis were higher than those of people with periodontitis (P<0.001). Women's scores were higher than men's in general and nutritional behavior, health care, and self-knowledge dimensions (P<0.001). The scores of people aged 66 years and above were higher than those of other age groups regarding the general and nutritional behaviors dimension (P<0.001).

Conclusion: Individuals have good knowledge of some attitudes that can cause periodontitis as age increases. However, knowledge of the links between periodontal diseases and behavioral attitudes is still lacking.

Keywords: Periodontitis, Health behavior, Oral health

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Introduction

Periodontitis is an inflammatory disease that destroys tooth-supporting structures due to complex interactions between bacterial dental plaque and the host response. ¹ The primary etiological factor in the development of periodontitis is known to be bacterial plaque.² However, periodontitis is considered a multifactorial disease because it is affected by many other conditions and diseases.³ In addition to local factors such as plaque and calculus, factors such as genetics, environmental factors, the individual's systemic health, lifestyle choices, and other social determinants play a role in the progression of the disease.^{4,5} The detrimental impacts of periodontopathogens are not limited to the periodontium but extend to the systemic health of patients.⁶

A recent study emphasized a relationship between increased body mass index and the risk of developing periodontitis.⁷ Another recent study reported that individuals who lead a lifestyle characterized by an absence of regular exercise are 10 times more likely to have severe types of periodontitis.⁸ The Health Protection Behaviors Scale (HPBS) is a scale with adequate validity and reliability aiming to investigate the health-protective part of lifestyles and monitor alterations in health-protective behaviors in adults.⁹ Ödek et al demonstrated the validity and reliability of the Turkish version of the 28-question HPBS.¹⁰ In light of this information, our study aimed to evaluate patients with periodontitis who applied to the Department of Periodontology, Gülhane Faculty of Dentistry, University of Health Sciences between November 2023 and February 2024 according to the HPBS and investigate the importance of behavioral factors in the evaluation of possible risk factors for periodontitis.

Methods

The study was authorized by the University of Health Sciences Scientific Research Ethics Committee (2023/340), and each volunteer signed an informed consent form.

Periodontally healthy individuals and patients diagnosed with periodontitis who were referred to the Department of Periodontology, Gülhane Faculty of Dentistry, University



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of Health Sciences, were included in the study (from November 2023 to February 2024).

The sample size was calculated at a 95% confidence level using the G*Power software version 3.1.9.2. Following the analysis, at α = 0.05, the standardized effect size was taken as 0.50 (intermediate level, J. Cohen, 1988)¹¹ due to the lack of similar previous studies, and the smallest sample size required for each group was calculated as 105 with a theoretical power of 0.95.

Patients who were unwilling to participate in the study, were mentally disabled, had severe systemic disorders (e.g., hypertension, diabetes, autoimmune diseases, cardiovascular diseases, cancer, and Crohn's disease), were physically disabled, and were receiving psychiatric treatment were excluded. Pregnant and lactating patients were also excluded from the study. A clinical and radiographic examination, including periapical and panoramic radiographs for periodontitis, was performed on the patients following the guidelines authorized by the American Academy of Periodontology. According to the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions, a patient is considered to have periodontitis if either buccal or oral clinical attachment level (CAL) \geq 3 mm with pocketing > 3 mm is visible in \geq 2 teeth or if interdental CAL is detectable in \geq 2 nonadjacent teeth and the observed CAL cannot be attributed to nonperiodontal sources.12 Individuals with less than the above-mentioned pocket depth and clinical attachment loss, no active gingivitis, and no previous periodontal disease were considered periodontally healthy.

The original HPBS was designed by Ping et al in 2018 and consists of 32 items and five dimensions.⁹ Ödek et al developed the Turkish version of the scale based on the original HPBS in 2022 and reported its reliability based on their factor analysis.¹⁰ In their study, Cronbach's alpha internal consistency coefficient was found to be 0.82, and the reliability coefficient was found to be 0.70. These results show that the developed scale is reliable and valid.

Patients who were deemed suitable for the study and were willing to participate were asked to fill out a questionnaire that included basic questions on demographic data (age and gender) as well as questions from the Turkish version of the HPBS prepared to measure the health-protective behaviors of the participants. The scale consists of 28 items (Supplementary file 1) and four dimensions (interpersonal support [items 1 to 7], general and nutritional behavior [items 8 to 16], self-knowledge [items 23 to 28], and health care [items 17 to 22]). A five-point Likert scale was used for each of the 28 items, and participants were asked to mark the response that best described their situation (1 = never), 2 = rarely, 3 = sometimes, 4 = usually, and 5 = always). For each subgroup, subgroup scores were obtained with the sum of the responses given to the specified items, and the HPBS score was calculated as the overall total. The scale's lowest possible score was 28, and its highest achievable score was 140. Increased health-protective behavior corresponds with an increase in the scale's score.

Routine periodontal treatment of the patients was continued after the questionnaires were completed.

Statistical analysis

Statistical descriptions of the data (number, percentage, mean, standard deviation, median, minimum, maximum, and 25% and 75% quartiles) are presented. The scale's dependability was examined. The Shapiro-Wilk test was used to verify the normality assumption in the first stage of the statistical study. Two independent groups without a normal distribution were compared using the Mann-Whitney U test. The Kruskal-Wallis test was used to compare three or more independent groups that did not have a normal distribution. The post hoc Bonferroni test was used to determine the group or groups that created the difference. Spearman's correlation was used to measure the relationships between continuous variables that did not have a normal distribution. Analyses were conducted using IBM SPSS 25.

Results

The participants' allocation based on their demographics is given in Table 1.

The distribution of the participants' HPBS and its dimensions were examined (Table 2). The mean scores were 23.93 ± 4.44 for the interpersonal support dimension, 30.65 ± 6.68 for the general and nutritional behavior dimension, 25.83 ± 4.38 for the health care dimension, and 19.58 ± 4.87 for the self-knowledge dimension; the mean HPBS score was 100.0 ± 17.25 .

According to the answers given by the study participants, a reliability analysis was performed to test the consistency of the test. The HPBS was very reliable, with a Cronbach's alpha reliability coefficient of 0.924. The interpersonal support dimension was found to be highly reliable with

Table 1. Distribution of participants by demographic characteristics

Demographic characteristics	n	%
Gender		
Female	109	51.7
Male	102	48.3
Age groups		
0–18 years old	3	1.4
18–25 years old	15	7.1
26–39 years old	44	20.9
40–55 years old	49	23.2
56–65 years old	41	19.4
66 years and older	59	28.0
Periodontitis		
Yes	104	49.3
No	107	50.7

a Cronbach's alpha reliability coefficient of 0.761; the general and nutritional behavior dimension was found to be highly reliable with a Cronbach's alpha reliability coefficient of 0.817; the health care dimension was found to be highly reliable with a Cronbach's alpha reliability coefficient of 0.883; the self-knowledge dimension was found to be highly reliable with a Cronbach's alpha reliability coefficient of 0.768.

The Mann-Whitney U test was conducted to compare the HPBS and its dimensions according to the participants' gender. The analyses revealed statistically significant differences between the genders regarding general and nutritional behavior, health care, and self-knowledge dimensions and total scale scores (P < 0.001). The scores of women were higher than those of males. No statistically meaningful distinction was found in interpersonal support scores according to gender (P=0.423) (Table 3).

The Kruskal-Wallis test was applied to compare the scores of HPBS and its dimensions according to the age of the individuals. The analysis showed significant discrepancies among age groups regarding the general and nutritional behavior and self-knowledge dimensions and total scale scores. The Bonferroni test for general and nutritional behavior scores revealed statistically significant differences between the age groups of 66 years and over, 18–25 years, 26–39 years, and 40–55 years (P=0.004, P=0.006, and P=0.017, respectively). The scores of people aged 66 years and over were higher than those aged 18–25, 26–39, and 40–55. According to the Bonferroni test for self-knowledge scores, statistically, there were significant differences between the age groups of 18–25

years, 55–65 years, and 66 years and over (P=0.006 and P=0.006, respectively). The scores of people in the 55–65 and 66 and over age groups were higher than those in the 18–25 age range. The Bonferroni test results for the HPBS score showed a statistically significant difference between the age groups of 66 years and over and 18–25 years (P=0.009). The scores of people aged 66 years and over were higher than those aged 18–25. There was no statistically significant difference in interpersonal support and health care scores between age groups (P>0.05) (Table 4).

The Mann-Whitney *U* test was performed to compare the scores of the HPBS and its dimensions according to the periodontal status of the participants. The analysis revealed statistically significant differences in the interpersonal support, general and nutritional behavior, health care and self-recognition dimensions, and total scale scores according to periodontal status (P < 0.05). The scores of people without periodontitis were higher than those with periodontitis (Table 5).

Discussion

Studies in developed countries have demonstrated that dental health is a crucial facet of overall health and that both general health and oral health typically share lifestyle-related risk factors.¹³ Through our study, we sought to elucidate the role of health-protective behaviors in preventing and managing periodontal disease, thus contributing to a holistic understanding of the broader implications of lifestyle choices for human health.

The HPBS is a new scale developed to symbolize adults'

 Table 2. Distribution of participants according to the Health Protective Behaviors Scale

	Min.	Max.	Mean	Standard deviation	Median	Cronbach's alpha
Interpersonal support	10.00	33.00	23.93	4.44	24.00	0.761
General and nutritional behavior	13.00	45.00	30.65	6.68	32.00	0.817
Health care	7.00	30.00	25.83	4.38	27.00	0.883
Self-knowledge	7.00	30.00	19.58	4.87	20.00	0.768
Health protective behaviors scale	41.00	135.00	100.00	17.25	105.00	0.924

Table 3. Comparison of the HPBS and its dimensions according to the gender of the participants

	Gender	Mean ± SD	M (25%-75% Quarterly)	Test Statistics	Р
Interpersonal support	Female	24.36 ± 3.62	25 (22–27)	5205.0	0.422
	Male	23.47 ± 5.15	24 (21–27)	5205.0	0.423
General and nutritional behavior	Female	32.75 ± 5.24	34 (30–36)	2602 E	<0.001*
	Male	28.41 ± 7.32	30 (22–34)	5005.5	< 0.001
Health care	Female	27.24 ± 2.97	28 (26–29)	2540.0	< 0.001*
	Male	24.33 ± 5.1	26 (22–28)	3540.0	
Self-knowledge	Female	21.2 ± 3.73	21 (19–24)	2262 5	-0.001*
	Male	17.85 ± 5.35	19 (14–21)	3362.5	< 0.001*
Health protective behaviors scale	Female	105.55 ± 12.11	107 (99–112)	2760.0	-0.001*
	Male	94.07 ± 19.83	101 (79–110)	3769.0	< 0.001*
*P<0.05.					

	Age groups	Mean±SD	M (25%-75% quarterly)	Test statistics	Р
Interpersonal support	0–18 years old	24.67 ± 2.52	25 (22–27)		0.397
	18–25 years old	23.4 ± 3.04	23 (21–25)		
	26–39 years old	23.93 ± 4.69	25 (22–26)		
	40–55 years old	24.24 ± 4.75	25 (22–28)	5.156	
	56–65 years old	23.02 ± 4.13	23 (20–26)		
	66 years and older	24.39 ± 4.6	25 (21–28)		
	0–18 years old	23.67 ± 12.5	18 (15–38)		< 0.001*
	18–25 years old	26.73 ± 7.16	29 (21–32)		
Consultant autitional habation	26–39 years old	29.11 ± 6.79	31.5 (23–34)	22.021	
General and nutritional behavior	40–55 years old	29.98 ± 6.34	31 (27–34)	23.031	
	56–65 years old	30.8 ± 6.57	33 (27–34)		
	66 years and older	33.61 ± 5.39	35 (31–37)		
	0–18 years old	17.67 ± 7.37	15 (12–26)		0.064
	18–25 years old	25 ± 3.18	27 (23–27)		
Liselah sena	26–39 years old	26.16 ± 3.79	27 (24–29)	10.439	
Health Care	40–55 years old	26.2 ± 4.9	28 (25–29)		
	56–65 years old	25.63 ± 3.94	27 (23–28)		
	66 years and older	26.05 ± 4.47	28 (24–29)		
	0–18 years old	11.67 ± 6.43	9 (7–19)		
	18–25 years old	15.4 ± 5.33	16 (10–19)		
	26–39 years old	19.18 ± 4.74	20 (16–22.5)	21 (27	0.001*
Sell-knowledge	40–55 years old	19.16 ± 4.8	20 (16–22)	21.627	
	56–65 years old	20.83 ± 4.08	21 (19–24)		
	66 years and older	20.83 ± 4.43	20 (19–24)		
	0–18 years old	77.67 ± 26.5	66 (59–108)		0.006*
	18–25 years old	90.53 ± 16.56	95 (75–101)		
Health protective behaviours scale	26–39 years old	98.39 ± 16.81	103.5 (84.5–108.5)	16 467	
	40–55 years old	99.59 ± 18.37	103 (96–111)	16.467	
	56–65 years old	100.29 ± 15.52	107 (93–110)		
	66 years and older	104.88 ± 16.02	108 (98–114)		

Table 4. Comparison of the scores of the HPBS and its dimensions according to the age groups of the participants

*P<0.05.

Table 5. Comparison of the scores of the HPBS and its dimensions according to the periodontal disease status of the participants

	Periodontal disease	Mean ± SD	M (25%–75% Quarterly)	Test statistics	Р
Interpersonal support	Yes	22.61 ± 5.23	23 (19–26)	2750 5	< 0.001*
	No	25.21 ± 3.02	25 (23–27)	3758.5	
General and nutritional behavior	Yes	28.58 ± 7.65	31 (22–34.5)	2024 5	< 0.001*
	No	32.67 ± 4.82	34 (30–36)	3924.5	
Health care	Yes	24.16 ± 5.35	25 (21–29)	3665.0	< 0.001*
	No	27.46 ± 2.19	28 (27–29)		
Self-knowledge	Yes	18.22 ± 5.89	19 (13.5–23)	4100 5	0.001*
	No	20.91 ± 3.11	21 (19–23)	4100.5	
Health protective behaviours scale	Yes	93.57 ± 21.01	98 (77.5–110)	2600.0	< 0.001*
	No	106.25 ± 8.97	107 (101–112)	3698.0	

^{*}*P*<0.05

health-protective practices. Although many studies have investigated the relationship between health protective

behaviors and oral health and gingival disease, to our knowledge, no studies have compared periodontal disease

and HPBS scores.14

In recent decades, there has been growing interest in the potential effects of dietary habits on periodontal health. A well-rounded and nutritious diet that includes a variety of fruits, vegetables, proteins, and essential vitamins and minerals is integral to maintaining good periodontal health. On the other hand, poor dietary choices high in sugars and processed foods and a lack of key nutrients can contribute to the development and progression of periodontal disease.¹⁵ In our study, the fact that the general and nutritional behavior scores of individuals with periodontal disease were higher than those without periodontal disease is an important result supported by the literature.

Numerous studies show that people's oral and general health behavior is strongly influenced by their socioeconomic status.^{16,17} A recent study of older individuals showed that income level is associated with awareness of implant treatment.¹⁸ In contrast, another study reported that the habit of cleaning removable dentures decreases with decreasing income levels.¹⁹ In this study, the scores of individuals without periodontitis were significantly higher in the health care subcategory, which included a question about whether the patient had sufficient income to meet their general needs. Lack of adequate income might be a contributing factor to the emergence of periodontal disease associated with dental plaque, as it may prevent the purchase of oral hygiene products and timely access to health services.

According to Sung et al, periodontal status is associated with cognitive impairment, and cognitive function decreases as the severity of periodontal disease increases.²⁰ Similarly, cohort and cross-sectional studies show that mild cognitive impairment in older individuals is positively associated with the severity of periodontal inflammation.^{21,22} In support of these findings, we expected that cognitive behaviors such as using seat belts, paying attention to occupational health and safety, and not using expired medicines would decrease with age. However, in our study, the occurrence of health-protective behaviors among older individuals was higher. Considering that the scores of periodontitis patients were lower, our study does not support the view that the prevalence of periodontitis increases with age.

The relationship between nutritional and periodontal disease has been investigated in many past studies, and the general opinion is that vitamin deficiencies are involved in the etiology of periodontal disease. Isola et al also reported a bidirectional relationship where periodontitis patients had lower serum vitamin D levels.²³ Various studies have reported that periodontitis patients have lower serum vitamin C levels and lower amounts of vitamin C in their diets.^{24,25} Moreover, recent studies have reported that vitamin E supplementation in the treatment of periodontitis improves clinical parameters by

reducing inflammation.^{26,27} In our study, individuals with high daily fruit and vegetable consumption were often periodontally healthy.

The importance of integrating oral health promotion into overall health promotion is growing as an integrated strategy is probably more economical than individual disease-focused initiatives. In this regard, the relationship of behavioral factors with periodontal disease and other oral and dental health problems should be investigated in larger populations.

Study limitations

The primary limitation of our research is that it only included participants who were registered with the Dentistry Faculty. Therefore, the sample was limited to periodontology clinic patients who volunteered to participate in the study, representing a relevant and healthy population; thus, the results may not be generalizable to other populations; the results need to be confirmed in a larger sample. Our study's heavy reliance on selfreport, which is susceptible to reporting biases, is another significant weakness.

Conclusion

Given the limitations of this investigation, it may be noted that the likelihood of periodontal disease increases in individuals who attach less importance to healthprotective behaviors. Understanding and maintaining the link between general and oral health is crucial. Regular dental examinations, a healthy diet, and proper oral hygiene are essential to preventing periodontal issues and supporting overall health.

Authors' Contribution

Conceptualization: Özlem Saraç Atagün. Data curation: Özlem Saraç Atagün, Seval Ceylan Şen. Investigation: Özlem Saraç Atagün, Seval Ceylan Şen. Formal analysis: Özlem Saraç Atagün, Seval Ceylan Şen. Methodology: Özlem Saraç Atagün, Seval Ceylan Şen, Gülbahar Ustaoğlu. Project administration: Özlem Saraç Atagün. Supervision: Gülbahar Ustaoğlu. Software: Seval Ceylan Şen. Resources: Özlem Saraç Atagün, Seval Ceylan Şen. Validation: Özlem Saraç Atagün, Seval Ceylan Şen. Visualization: Özlem Saraç Atagün, Seval Ceylan Şen. Visualization: Özlem Saraç Atagün, Seval Ceylan Şen.

Writing-review & editing: Özlem Saraç Atagün, Gülbahar Ustaoğlu.

Competing Interests

The authors declare that they have no conflict of interest.

Data Availability Statement

Data for this study can be obtained from the corresponding author upon reasonable request.

Ethical Approval

This study was approved by the University of Health Sciences Scientific Research Ethics Committee (2023/340).

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Supplementary File

Supplementary File 1. Distribution of participants according to their answers to the "Health Protective Behaviors Scale" questions.

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