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The assessment of oral health-related quality of life by factor analysis in patients with Behcet's disease and recurrent aphthous stomatitis

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BACKGROUND: The aim of the study was to test multidimensional properties of oral health impact profile-14 (OHIP-14) in Behcet's disease (BD) and recurrent aphthous stomatitis (RAS) patients with active oral ulcers.
METHODS: Ninety-six BD patients, 28 patients with RAS and 117 healthy controls (HC) were included in this study. In patients with active oral ulcers, the frequency and healing time of ulcers were recorded. Multidimensional properties of OHIP-14 were examined by factor analysis.
RESULTS: Factor analysis revealed three subscales and explained 66.49% of overall variance in these patients with active oral ulcers. The score of Subscale 1 was positively correlated with the recurrence of oral ulcers per month ($P = 0.037$). Subscale 3 scores of the patients treated with colchicine were worse than those treated with immunosuppressives ($P = 0.035$).
CONCLUSIONS: The factor structure of OHIP-14 was found to be reliable and sensitive to clinical parameters and treatment modalities in active patients.
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Keywords: Behcet's disease; factor analysis; gender; oral ulcers; quality of life; recurrent aphthous stomatitis; treatment modalities

Introduction

Oral disease can alter appearance and lead to reduction in social interaction and family life. In addition, it has detrimental effects on speech, nutrition, chewing and self-esteem (1–6). 'Oral health-related quality of life' focuses on the aspects of human life affected by oral health problems (3, 7–11) and evaluates not only physical functioning and pain, but also broader constructs such as psycho-social functioning and life satisfaction (10).

Traditionally, clinical decisions in dentistry and medicine are based on clinical indicators of the presence or absence of disease by clinicians, with little input from patients. As patients can impart information regarding changing their oral functions and social life because of clinical pathology, patient-based outcomes can be a component of the decision-making process. Thus, the impact of oral disorders on quality of life is increasingly recognized as an important component of therapy and outcome measures in clinical trials (7, 12, 13).

In our previous study, oral health-related quality of life in patients with Behcet's disease (BD) and recurrent aphthous stomatitis (RAS) was investigated by using an oral health impact profile-14 (OHIP-14) questionnaire. OHIP-14 evaluates the adverse impacts of oral conditions on aspects of well-being including pain, psychological states, social interaction and daily activities (7). Those patients with active oral ulcers reported poor oral health-related quality of life compared with ulcer-free patients. In addition, treatment modalities were found to be a key factor in the evaluation of oral health-related quality of life in BD. Poor oral health-related quality of life was observed in patients treated with colchicine, which does not eliminate oral ulcers efficiently, compared to those treated with immunosuppressives (13). Therefore, additional documentation of this questionnaire's properties is thought to be needed for clinical studies and clinical routine in patients with AOU.

The aim of the study was to test multidimensional properties of OHIP-14 as an outcome measure for prospective clinical studies and clinical decision-making processes by using factor analysis in BD and RAS patients with active oral ulcers.

Materials and methods

Ninety-six BD patients (F/M: 48/48, mean age: 33.6 ± 8.7 years) classified according to the ISG criteria (14), 28 patients with RAS (F/M: 14/14, 32.1 ±

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11.8 years) diagnosed according to the history of complaints and clinical findings (15) and 117 healthy controls (HC; F/M: 58/59, 34.1 ± 11.7 years) were included in this descriptive study. Data were collected by clinical examination and by questionnaire regarding oral health-related quality of life. The exclusion criteria from the study were pregnancy, presence of chronic disease, psychiatric disorders, cancer and other oral mucosal disorders.

In BD group, 55 patients were treated by colchicine (1–2 mg/day), whereas 37 patients used immunosuppressive agents (cyclosporin A, azathioprine and corticosteroids) and four patients did not use any medication regularly due to lack of compliance. Topical steroids and antimicrobial agents were used in the treatment of oral ulcers in RAS ($n = 28$).

As morphological (16) and immunohistological (17) characteristics of oral ulcers were same in patients with BD and RAS, factor analysis was carried out as lesion specific in the study.

BD and RAS patients were categorized according to the presence or absence of active oral ulcer in the last 3 months. Patients with active oral ulcers ($n = 51$, F/M: 30/21, mean age: 32.8 ± 10.1 years) were included in the Active Oral Ulcer (AOU) group whilst ulcer-free ones were included in the Inactive Oral Ulcer (IOU, $n = 73$, F/M: 32/41, 34.02 ± 8.7 years) group.

In the AOU group, the frequency and healing time of oral ulcers were recorded over the last 3 months. The Visual Analogue Scale score (VAS; 0–100 mm) was used in the evaluation of ulcer-related pain in patients with active oral ulcers. Dental health was also evaluated in these patients.

Oral health-related quality of life was evaluated by OHIP-14. A five-point Likert-type scale was used in scoring each item of the OHIP-14. Responses were coded 0 = 'never', 1 = 'hardly ever', 2 = 'occasionally', 3 = 'fairly often', 4 = 'very often'. Item responses were summed to produce an OHIP-14 total score. Total OHIP-14 scores ranged from 0 (no impact) to 56 (all of the oral health problems were experienced very often). High scores indicated a poor oral health-related quality of life (7, 10). In our previous study, the Turkish version of the OHIP-14 has been proven to be a valid and reliable instrument (13).

Following initial instructions, the patients and controls completed these questionnaires. Trained interviewers ($n = 3$) who were not involved in any dental assessment or treatment helped individuals with visual problems or learning difficulties to complete the questionnaires.

The study was performed according to the principles of the Helsinki Declaration and was approved by the Ethical Committee of the Marmara University Medical School. Informed consent was taken from the study group.

Statistical analysis

Data were analysed by using SPSS 11.5 software (SPSS Inc., Chicago, IL, USA). Mean and standard deviation was used as descriptive statistics. Mean OHIP-14 scores of the study groups were compared by ANOVA, *post hoc* Tukey test and unpaired *t*-test.

Pearson and Spearman correlation analysis were used for the association between clinical variables and scores. A *P*-value of ≤ 0.05 was accepted as statistically significant.

Multidimensional properties of OHIP-14 were tested by Factor analysis. Factor analysis with principal component analysis was undertaken to identify a set of underlying factors contributing to OHIP responses. This was followed by varimax rotation of the factors that accounted for the greatest amount of variation. Following preliminary components analysis, items were grouped into constructs according to factor loadings with 0.40 as the lower cut-off. The reliability of the constructs was then determined by Cronbach's coefficient alpha.

Results

The mean scores of the OHIP-14 were worse in patients with active ulcers (26.46 ± 13.14) compared to those with inactive ones (14.21 ± 12.98; $P = 0.000$) and with the HCs (11.85 ± 12.14; $P = 0.000$). No significant difference was observed between those with inactive ulcers and the HCs ($P = 0.437$; Fig. 1). Internal reliability analysis of the OHIP-14 showed that the Cronbach's coefficient alpha was 0.91 for the active lesion group, 0.93 for the inactive group and 0.95 for the controls, which indicated a high reliability for all groups.

In the AOU group, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett Test of Sphericity (BTS) were conducted on the data prior to factor extraction to ensure that the characteristics of the data set were suitable for the exploratory factor analysis to be conducted. KMO analysis yielded an index of 0.808, and BTS ($\chi^2 = 421.01$, d.f. = 91, $P < 0.001$) was highly significant indicating the data satisfied the criteria for the factor analysis. Principal component analysis produced three distinct factors with eigenvalues >1, explaining 66.85% of the variance.

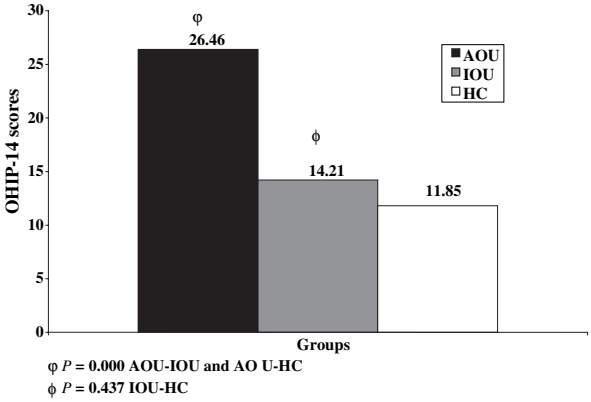

Figure 1 The distribution of oral health impact profile-14 score in Behcet's disease and recurrent apthous stomatitis patients with/without active oral ulcer and healthy controls.

Varimax (orthogonal) rotation produced the following factors and loadings in Table 1. To represent these factors we created three subscales using items with a loading >0.40. Subscale 1 was composed of five items representing physical symptoms and explained 46.01% of the total variance. Subscale 2 was composed of five items, representing psycho-social symptoms and explained 12.06% of the overall variance, and Subscale 3 included four items which represents psychological symptoms and explained 8.41% of the total variance.

Subscale scores were calculated using the items of OHIP-14 in each factor. The mean scores were found to be 9.14 ± 5.44 for Subscale 1, 8.48 ± 5.56 for Subscale 2 and 8.78 ± 4.44 for Subscale 3. A low score indicated an absence of the particular impact and a high score indicated that the impact was strongly experienced. Mean scores by study groups (active, inactive and controls) for each OHIP-14 subscale were also calculated and presented in Table 2.

Cronbach's alpha values were 0.88 for Subscale 1, 0.90 for Subscale 2 and 0.78 for Subscale 3, demonstrating high internal reliability for all subscales.

A one-way ANOVA showed that there were significant differences between study groups on all three

Table 1 Rotated component factors of OHIP-14 in BD and RAS patients with active oral ulcers

	Subscales		
OHIP-14 original subscales	*Subscale 1 (physical symptoms)*	*Subscale 2 (psycho-social symptoms)*	*Subscale 3 (psychological symptoms)*
Functional limitation			
Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?	**0.662**	0.222	0.410
Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?	0.585	0.030	**0.614**
Physical pain			
Have you had painful aching in your mouth?	**0.678**	0.258	0.424
Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?	**0.640**	0.135	0.291
Psychological discomfort			
Have you been self-conscious because of your teeth, mouth or dentures?	0.200	0.225	**0.808**
Have you felt tense because of problems with your teeth, mouth or dentures?	0.198	0.292	**0.760**
Physical disability			
Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?	−0.045	0.057	**0.641**
Have you had to interrupt meals because of problems with your teeth, mouth or dentures?	0.386	**0.455**	0.177
Psychological disability			
Have you found it difficult to relax because of problems with your teeth, mouth or dentures?	0.350	**0.750**	0.239
Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?	0.184	**0.870**	0.169
Social disability			
Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures?	0.159	**0.864**	0.165
Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or dentures?	**0.747**	0.316	−0.054
Handicap			
Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	0.564	**0.635**	0.122
Have you been totally unable to function because of problems with your teeth, mouth or dentures?	**0.753**	0.398	−0.175
Percentage of variance explained	46.01	12.06	8.41
Eigenvalues	6.44	1.68	1.17
Cronbach's α	0.88	0.90	0.78

Bold indicates factor loadings of ≥ 0.40 in the distribution of OHIP-14 items.
OHIP-14, oral health impact profile-14; BD, Behcet's disease; RAS, recurrent apthous stomatitis.

Table 2 Subscale scores of OHIP-14 in BD and RAS patients with/without active oral ulcers and healthy controls

Subscales	*Active ulcer (n = 51)*	*Inactive ulcer (n = 73)*	*Healthy controls (n = 117)*	P-*value*
Scale 1 (physical symptoms)	9.14 ± 5.45	5.01 ± 4.97	3.73 ± 4.49	$F = 21.68$, $P < 0.001$
Scale 2 (psycho-social symptoms)	8.48 ± 5.56	4.15 ± 4.87	3.86 ± 4.72	$F = 16.34$, $P < 0.001$
Scale 3 (psychological symptoms)	8.78 ± 4.44	5.04 ± 4.10	4.19 ± 3.68	$F = 23.53$, $P < 0.001$

Values are expressed as mean ± SD.
OHIP-14, oral health impact profile-14; BD, Behcet's disease; RAS, recurrent apthous stomatitis.

Table 3 The distributions of subscale scores according to gender and treatment modalities in BD and RAS patients with active oral ulcers

	Subscale 1 (physical symptoms)	*Subscale 2 (psycho-social symptoms)*	*Subscale 3 (psychological symptoms)*
Gender			
Female ($n = 30$)	10.72 ± 5.75	9.41 ± 5.89	9.86 ± 4.61
Male ($n = 21$)	7.09 ± 4.42	7.19 ± 4.90	7.28 ± 3.80
P-value	**0.020**[a]	0.165[a]	**0.042**[a]
Treatment modalities[c]			
Colchicine ($n = 24$)	10.66 ± 5.89	9.66 ± 6.47	10.16 ± 4.48
Immunosupressive ($n = 16$)	7.40 ± 4.61	7.73 ± 3.55	7.60 ± 3.18
Local treatment ($n = 8$)	10.37 ± 4.83	7.75 ± 6.01	8.01 ± 5.52
P-value	0.09[b]	0.415[b]	**0.026**[b]

[a]Independent *t*-test.
[b]Kruskal–Wallis test were used in the analysis.
[c]3 patients who did not use any medication regularly were not included in the analysis.
Values are expressed as mean ± SD.
BD, Behcet's disease; RAS, recurrent apthous stomatitis.

subscales. Active ulcer group showed a higher mean score on every subscale with the highest score on psychological subscale (Subscale 3).

The mean VAS score was 67.31 ± 11.11 in patients with active oral ulcers. The VAS score was positively and significantly correlated with all three subscale scores ($r = 0.3$, $P = 0.027$ for Subscale 1; $r = 0.4$, $P = 0.003$ for Subscale 2 and $r = 0.3$, $P = 0.042$ for Subscale 3).

Score of Subscale 1 was positively correlated with the recurrence of oral ulcers per month and the number of extracted teeth ($r = 0.3$, $P = 0.037$ and $r = 0.3$, $P = 0.023$, respectively).

Mean scores of Subscales 1 and 3 were significantly higher in female patients than in males ($P = 0.020$ and $P = 0.042$, respectively). Patients treated with colchicine had significantly higher Subscale 3 scores than those treated with immunosuppressives ($P = 0.035$; Table 3).

Discussion

Oral health-related quality of life has been defined as a multidimensional concept including following domains; absence of impairment, disease, discomfort and pain, appropriate physical, emotional and social functioning and satisfaction with oral health. Oral health-related quality of life questionnaires can serve as outcome measures in the selection and monitoring of treatments (4, 8, 18–20).

This study was designed to examine the factor structure of OHIP-14 items for better understanding of poor oral health-related quality of life in patients with AOU as oral health-related quality of life status was similar in patients with IOU and HC and better than AOU. Poor oral health-related quality of life in AOU was in accordance with our previous results, in which it was observed that oral health-related quality of life was worse in BD and RAS patients with active oral ulcers compared with ulcer-free ones (13).

The factor analysis of OHIP-14 items in the AOU group revealed a three-factor structure according to variables by principal component analysis with varimax rotation. These factors explained 69% of the variance.

The OHIP-14, formed to assess the impact of chronic oral conditions on human life, is a 14-item measure, with statements divided into seven theoretical domains, namely functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability and handicap (21). Yet, we found a three-factor structure in patients with AOU in this study. This difference could be explained by the fact that the factor distribution might change according to patient groups.

Subscale 1, which explained 46.01% of the original matrix, represents physical symptoms and it was significantly associated with the number of episodes of oral ulcers per month and the number of missing teeth.

BD and RAS patients with active oral ulcers reported poor oral health-related quality of life compared with ulcer-free ones (13). Similarly, poor oral quality of life was seen in patients with ulcer blisters (10) and ulcerative lichen planus (2). The number of teeth was also considered an important factor affecting the impact of oral health status on quality of life. Having more teeth was associated with a better oral quality of life (3, 21–25). In contrast, increase in number of extracted teeth was observed in patients with BD and RAS in our previous study (26).

Subscales 1 and 3 scores were significantly higher in females than males. Thus, we conclude that these subscales of OHIP-14 may be used to assess gender differences in oral health-related life quality in BD and RAS patients. Literature findings show that oral health-related quality of life was more impaired in female BD and RAS patients compared with male patients (27) although an impaired prognosis of BD is observed in males, who have a higher mortality risk due to earlier disease onset and greater vascular involvement (28, 29). Similar gender difference was observed in the evaluation of general quality of life carried out by SF-36 in patients with BD (30). Females perceive oral health as having a greater impact than do men (31, 32). Gender variations could also be seen in the perception of the social and psychological impacts of oral health. Thus, gender is thought to be an important factor in the evaluation of outcome measures in clinical studies (27, 31).

Subscale 3 scores, which represented psychological symptoms, were significantly higher in patients who were treated with colchicine compared to those treated with immunosuppressive. Oral health-related quality of life was better in patients treated with immunosuppressives which are effective medications for the elimination of oral ulcers compared to colchicine in patients with BD (13). This finding was in accordance with our previous results. Subscale 3 may be a useful tool for comparing and monitoring the outcomes of different medications in BD patients.

In addition to clinical findings, the monitoring of treatment effects on oral health-related quality of life may give important information about treatment planning. Health-related quality of life information is seen as increasingly important in documenting therapeutic outcomes (1, 7). Maintaining good oral functions and preventing their deterioration are primary goals in the treatment (33). In dentistry, patient-based outcome measures are a necessary component of a comprehensive definition of 'oral health' and the decision-making process (12). Therefore, short version of OHIP instrument has also been used in clinical trials and shown to be sensitive to different treatment modalities (34, 35).

Increased pain intensity of oral ulcers was linked with poor oral health-related quality of life in all subscales in our study. Similarly, Hegarthy et al. (2) found that increase in pain evaluated by VAS score was associated with poor oral health-related quality of life in patients with lichen planus. Pain is an important factor in the limitation of oral functions and other everyday functions in patients. Based on the existing literature, oral health problems can result in pain and discomfort and can lead to problems in eating, interpersonal relationships, appearance and the individual's positive self-image (4, 33–37). Depression subsequent to discomfort or functional limitations can then lead to negative perceptions of oral quality of life (37). Consequently, oral health problems can adversely affect an individual's quality of life by impairing physical functioning, social functioning and self-esteem. Therefore, the elimination of pain due to oral diseases can improve the oral quality of life.

The global assessment of quality of life is fairly complex in BD, a chronic multisystem disorder characterized by vasculitis. In addition to oral ulcers, cutaneous, ocular, rheumatological, vascular, neurological and gastrointestinal involvements are also observed in BD. Although the BD-QoL questionnaire is a general instrument for assessing the effects of BD symptoms on QoL, the evaluation of oral health-related QoL was not included as a part of QoL (38). Therefore, the understanding of the multidimensional properties of oral health-related quality of life by OHIP-14 questionnaire in BD patients with active oral ulcers is relevant in the light of our current efforts to evaluate new treatment strategies.

The clinical diagnosis of oral disease may give an indication of its cause and the prognosis but may not directly reflect the resulting level of impairment. Little research exists on the impact of oral health problems for the treatment of stomatological disorders. Oral health-related quality of life is relevant as a co-end point for clinical decision-making and for disease management strategies between the patient and clinician (10).

It is well known that the measurements must be simple and practical enough for clinicians and patients to use and interpret (12). The factor structure of the OHIP-14 as an impairment-based outcome measure was found to be reliable, simple to use and sensitive to clinical parameters and treatment modalities. Therefore it can be administered to assess as an oral health outcome tool in prospective controlled clinical studies and clinical routines in patients with active oral ulcers.

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